**Australian Government**

**Productivity Commission**

# An Ageing Australia: Preparing for the Future

## Productivity Commission Research Paper

November 2013

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*The Productivity Commission*

The Productivity Commission is the Australian Government's independent research and advisory body on a range of economic, social and environmental issues affecting the welfare of Australians. Its role, expressed most simply, is to help governments make better policies, in the long term interest of the Australian community.

The Commission's independence is underpinned by an Act of Parliament. Its processes and outputs are open to public scrutiny and are driven by concern for the wellbeing of the community as a whole.

Further information on the Productivity Commission can be obtained from the Commission's website (www.pc.gov.au) or by contacting Media and Publications on (03) 9653 2244 or email: maps@pc.gov.au

# Foreword

This Research paper is the first of a series we plan to produce annually, taking a research topic of significant national interest and considering it not just for analytical purposes but for some examples of potential policy implications. The content of these papers are designed to be an input into an area of wide research applicability — in this case, a contribution to the Australian Government's next Intergenerational Report and the sweeping question of how Australia copes with an ageing population.

The policy issues are carefully chosen to address needs that if not immediate, will necessarily be so tomorrow. The intent is that the paper supports an informed discussion and leads towards policy thought in anticipation of need, rather than in the face of it.

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Peter Harris

Chair

November 2013

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# Abbreviations and explanations

## Abbreviations

| | |
|---|---|
| 3Ps | Population, Participation and Productivity |
| ABS | Australian Bureau of Statistics |
| AIHW | Australian Institute of Health and Welfare |
| ARIMA | Auto-Regressive Integrated Moving Average |
| CGE | Computable General Equilibrium |
| COAG | Council of Australian Governments |
| CPI | Consumer Price Index |
| DALY | Disability-Adjusted Life Year |
| DSP | Disability Support Pension |
| GVA | Gross Value added |
| GDP | Gross Domestic Product |
| GST | Goods and Services Tax |
| HALE | Health-Adjusted Life Expectancy |
| HILDA | Household, Income and Labour Dynamics in Australia survey |
| IAC | Industries Assistance Commission |
| IC | Industry Commission |
| IGR | Intergenerational Report |
| IHME | Institute for Health Metrics and Evaluation |
| LC | Lee-Carter |
| NAIRU | Non-Accelerating Inflation Rate of Unemployment |
| NLF | Not in the Labour Force |
| MFP | Multifactor Productivity |
| MMRF | Monash Multi-Regional Forecasting model |
| MTAWE | Male Total Average Weekly Earnings |

| | |
|---|---|
| NRA | National Reform Agenda |
| NOM | Net Overseas Migration |
| OECD | Organisation for Economic Co-operation and Development |
| PBS | Pharmaceutical Benefits Scheme |
| PC | Productivity Commission |
| PCPOP | PC Population model (available from the Commission website) |
| QALY | Quality-Adjusted Life Year |
| RNNDI | Real Net National Disposable Income |
| TFR | Total Fertility Rate |

## Explanations

| | |
|---|---|
| Billion | The convention used for a billion is a thousand million ($10^9$). |

# OVERVIEW

# Overview

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**Key points**

Australia's population will both grow strongly and become older. Such slow but profound shifts in the nature of a society do not elicit the same scrutiny as immediate policy issues. The preferable time to contemplate the implications is while these near-inevitable trends are still in their infancy.

Population ageing is largely a positive outcome, primarily reflecting improved life expectancy. A female (male) born in 2012 will on average live for an estimated 94.4 (91.6) years.

However, population growth and ageing will affect labour supply, economic output, infrastructure requirements and governments' budgets.

Australia's population is projected to rise to around 38 million by 2060, or around 15 million more than the population in 2012. Sydney and Melbourne can be expected to grow by around 3 million each over this period.

The population aged 75 or more years is expected to rise by 4 million from 2012 to 2060, increasing from about 6.4 to 14.4 per cent of the population. In 2012, there was roughly one person aged 100 years old or more to every 100 babies. By 2060, it is projected there will be around 25 such centenarians.

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

Labour participation rates are expected to fall from around 65 to 60 per cent from 2012 to 2060, and overall labour supply per capita to contract by 5 per cent.

Average labour productivity growth is projected to be around 1.5 per cent per annum from 2012-13, well below the high productivity period from 1988-89 to 2003-04. Real disposable income per capita is expected to grow at 1.1 per cent per annum compared with the average 2.7 per cent annual growth over the last 20 years.

Collectively, it is projected that Australian governments will face additional pressures on their budgets equivalent to around 6 per cent of national GDP by 2060, principally reflecting the growth of expenditure on health, aged care and the Age Pension.

Major impending economic and social changes can create the impetus for new reform approaches not currently on the policy horizon. For example:

- The design of the Age Pension and broader retirement income system might be linked to life expectancy after completion of the current transition to 67 years in 2023.
- Using some of the annual *growth* in the housing equity of older Australians could help ensure higher quality options for aged care services and lower fiscal costs.
- Wide-ranging health care reforms could improve productivity in the sector that is the largest contributor to fiscal pressures. Even modest improvements in this area would reduce fiscal pressures significantly.

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In 2005, the Commission reported that timely action to address the consequences of demographic change could avoid the future need for 'big bang' policy interventions later. Over eight years later, the discussion of the possible opportunities and policy challenges presented by an ageing population seems to have waned. The most recent Intergenerational Report, which also highlights these issues, is now nearly four years old. Even with ever more information on trends, the near inevitability of significant fiscal and policy consequences of demographic change seems not to have created much genuine desire for reform. Further, recent interventions to address the threats posed by global economic events have left Australian governments less well placed to handle the effects of ageing than most would have expected in initial debates. On top of these factors, Australia is much closer to the time when the most significant effects of ageing are likely to be felt.

Against this background, the Commission has looked afresh at the economic issues raised by population ageing. Like any analysis associated with forecasting very long term trends, this study is exposed to the charge that it extrapolates in ways that may not be representative of reality. The apparent neat precision of any particular number is not meant to convey that this shall inevitably be the result, when over a 50 year period a wide variety of unknown factors will arise. But the existence of unknown factors is no basis for not considering the trends, which are the important aspect of this analysis. The trends are unmistakable in most cases. They point to the need for serious contemplation of future policy measures sooner rather than later.

## How will Australia's population change over the next 50 years?

Australia's population is projected to increase to more than 38 million by 2060, more than 15 million above the population in 2012. While significant variations are possible around that estimate, it is unlikely that the population would be less than 34 million or more than 42 million (figure 1). Notwithstanding the large projected increase in the population *level*, population *growth* rates are projected to fall over time, halving from 2012 to 2060.

The likely population growth will place pressure on Australian cities. All of Australia's major cities are projected to grow substantially. Sydney and Melbourne may grow by around 3 million each over the next 50 years (figure 2). In response to the significant increase in the size of Australian cities, significant investment in transport and other infrastructure is likely to be required. This is true both within the cities themselves and for the links between regional and major cities. Policies will be needed to reduce congestion problems, and to ensure adequate infrastructure funding and investment efficiency.

Figure 1

**The Australian population will probably grow by around 15 million over the next 50 years**

End June 2011-12 to 2059-60
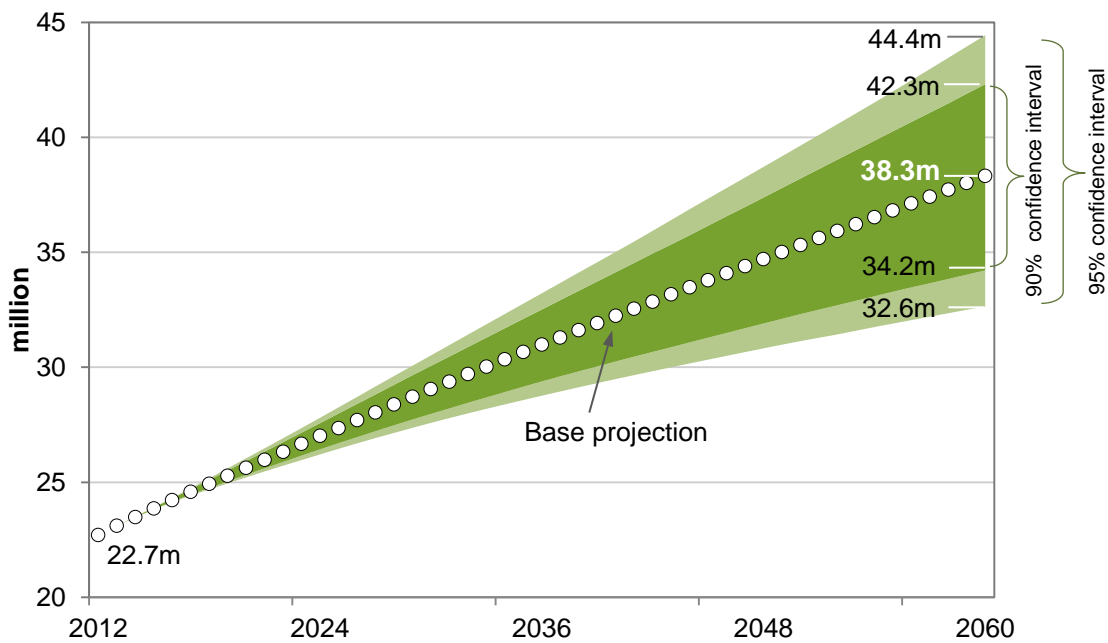


Figure 2     **Australia's two biggest cities may exceed 7 million**

Projected city populations, end June 2011-12 and 2059-60
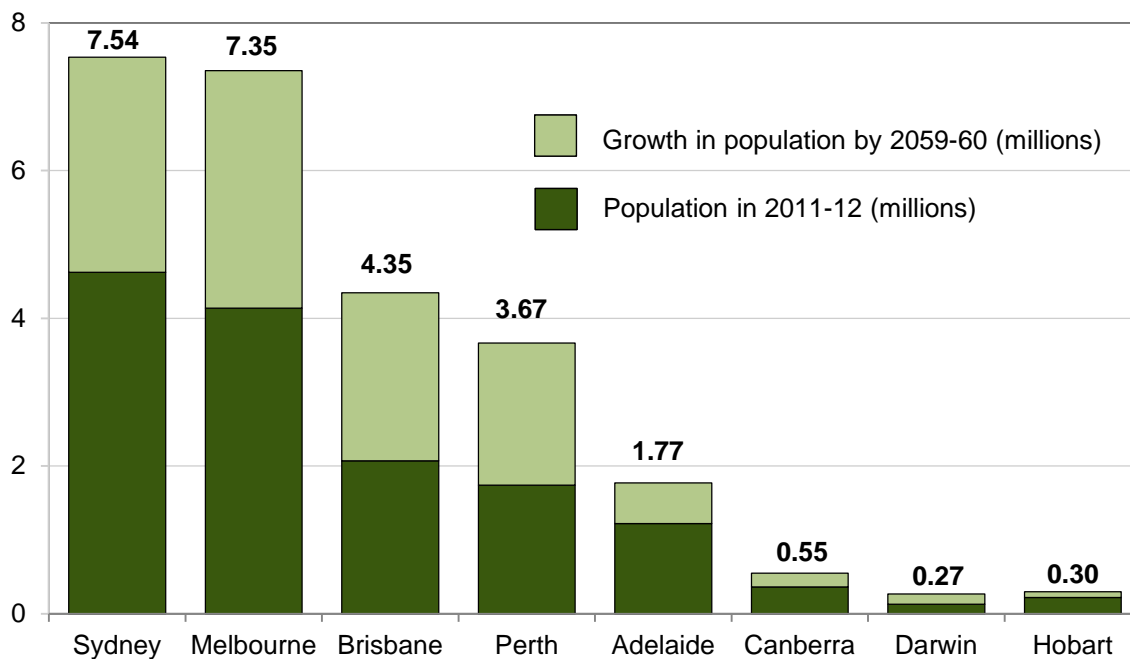
While having relatively high rates of immigration and fertility compared with other developed economies, Australia's population will still age dramatically over the coming years. The primary 'culprit' is a virtuous one — Australians are experiencing lower mortality rates and enjoying longer lives (figure 3). Moreover, the figures for life expectancy usually quoted by statistical agencies can significantly understate people's actual longevity because they do not take into account the likely future reductions in mortality rates as a person ages:

- Using such 'cohort' life expectancies, the life expectancy of a girl born in 2012 is projected to be more than 94 years and for a boy nearly 92 years.

- Such cohort life expectancies are particularly useful in considering the length of people's customary retirement periods. Using the usually published life expectancies, it might appear that a person born in 2012 could expect to live for 19 more years after they reach 65 years old. In fact, it is projected that they will live for around 29 years after that age. This raises issues about optimal retirement ages, provision for publicly funded pensions and rules about access to superannuation savings — an issue explored in more detail later.

Figure 3 **Death rates have fallen**

The chance of dying over the next year (%),1921 to 2011
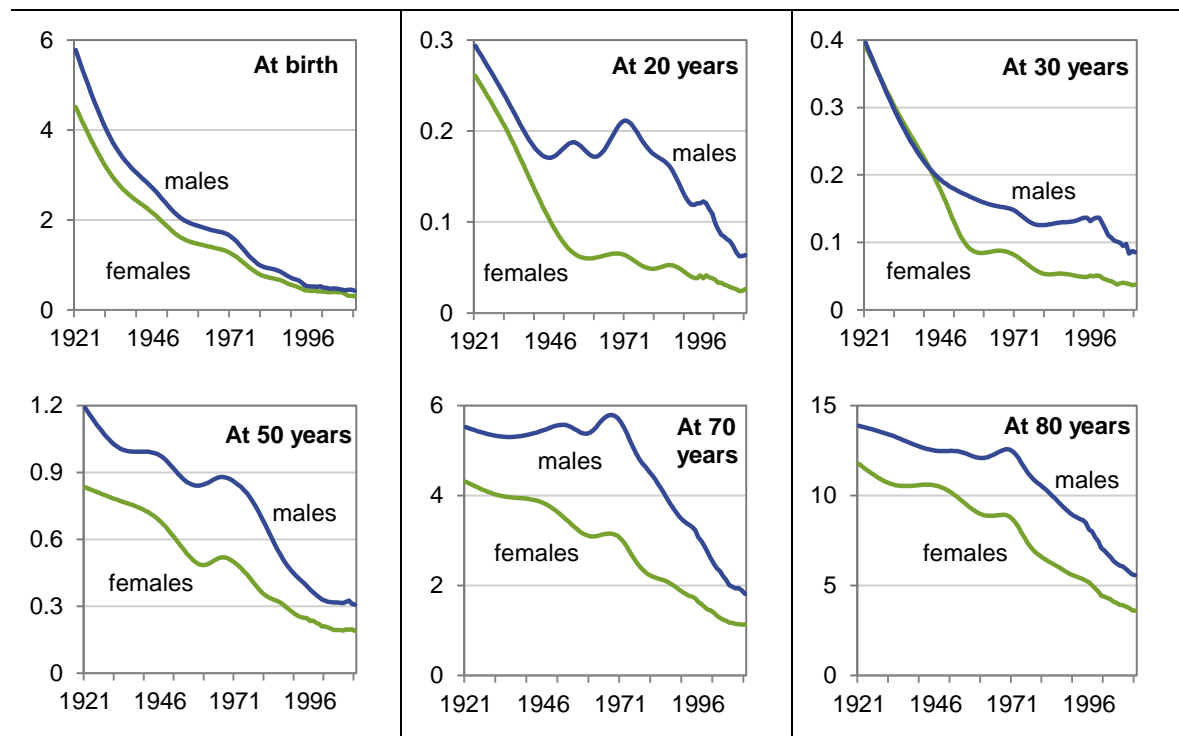


The pyramid age structure that characterised Australia's young population at Federation has gradually shifted so that it currently bulges most at middle age. By the end of this century, the pyramid will have entirely disappeared, with the much

more uniform distribution across ages characteristic of a highly aged population (figure 4).

### Figure 4 Population ageing until the 22nd century



**Growth rates of the oldest is set to dramatically increase over the next 20 years**

**The age structure becomes more uniformly distributed across ages**
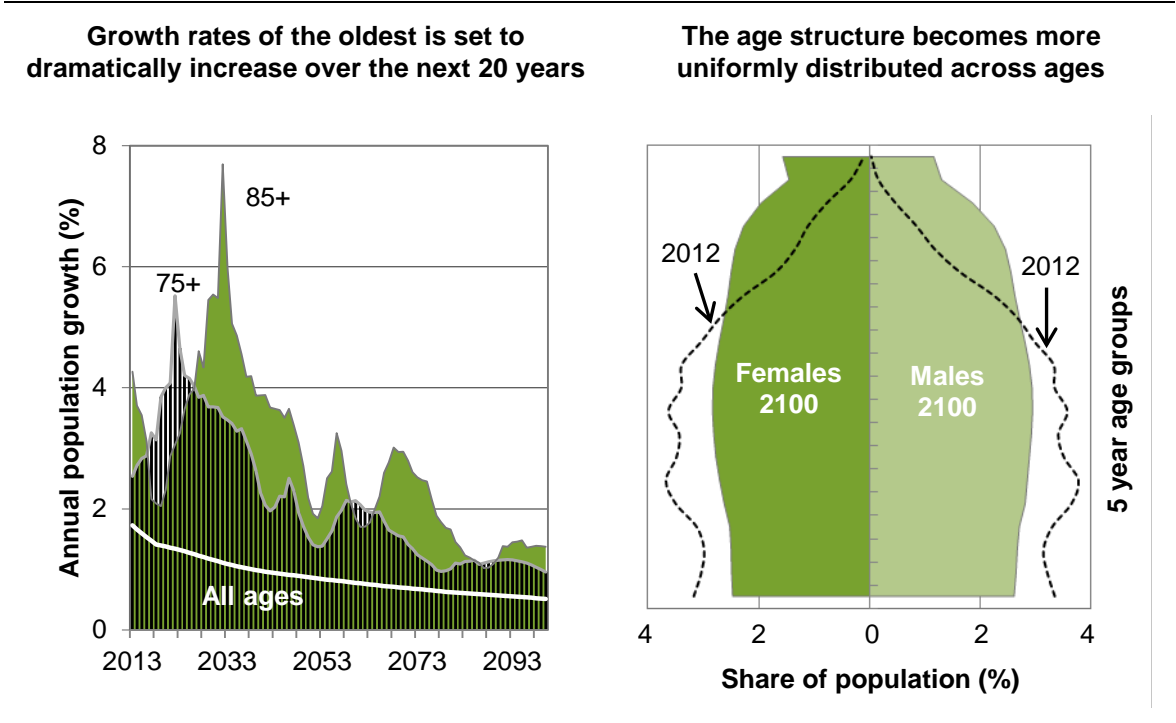
Growth rates of the oldest segments of the population will accelerate over the coming years, as the baby boomer generation enters old age (figure 4). The number of people aged 75 years and over is projected to increase by about 4 million between 2012 and 2060 — an increase roughly equivalent to the current population of Sydney. The most striking illustration of ageing is the growth in the population of people surviving past 100 years of age. In 2012, there was roughly one person aged 100 years old or more to every 100 babies. By 2060, it is projected that there will be around 25 centenarians for every 100 babies, and with continued small increases in longevity, by 2100, there will be more people aged 100 or more years than babies born in that year.

## Labour supply

With an aggregate labour force participation rate[1] always exceeding 65 per cent, the period from 2007–2025 represents a peak in labour market engagement in Australia

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[1] This is the number of people aged 15 years or more who are in, or looking actively for, work, divided by the population aged 15 years or more.

not exceeded since 1914. After 2025, aggregate participation rates gradually fall to a projected rate of just below 60 per cent by 2059-60 (figure 5).

Figure 5        **Labour force participation rates**
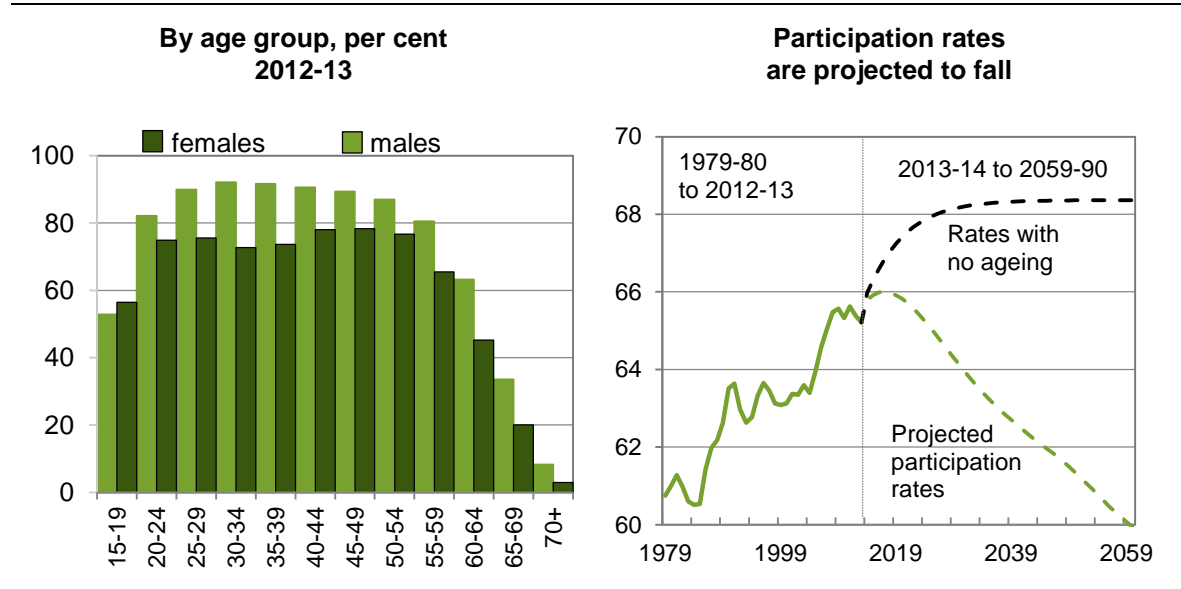


Paradoxically, this is despite the likelihood that in nearly every relevant age group, and especially among older Australians, people's projected engagement in the labour force will increase. The reason for the aggregate decline is that, even with those age-specific increases, older Australians have much lower participation rates than the prime-aged working population (those between 25 and 54 years), with population ageing shifting many more into the older age brackets. In fact, were the age structure of the population not to change over the next fifty years, aggregate labour force participation rates would be expected to rise to more than 68 per cent.

In the Commission's analysis, small increases in hours worked per employee and falls in unemployment rates over the next 50 years partly offset the effect of lower aggregate participation rates on labour supply (best measured as hours worked per capita). The only other major factor determining labour supply per capita is the declining share of people aged 0-14 years, who are excluded from any count of the potential labour force. Given this offsetting influence, overall labour supply per capita is projected to fall by nearly 5 per cent by 2059-60 (figure 6).

While the projected labour force estimates take account of historical trends, they may not fully account for two important influences on future labour supply by older workers:

- the future old will be better educated than both previous generations of older workers and the future young, reflecting the long-run impacts of the large

expansion in tertiary education and the stabilisation of tertiary participation rates at younger ages. Higher levels of tertiary education are strongly associated with greater labour force participation, and this effect may not be fully reflected in historical labour force participation trends

- there is conflicting evidence on trends in disability rates among older Australians. Population surveys of disability suggest rates have been falling, but labour market surveys and usage of the Disability Support Pension tell, at best, a mixed story. Disability is highly associated with low labour force participation. If nothing else, the above evidence suggests an imperative to find out more about the real trends in disability rates relevant to people's engagement in the labour market, and to understand the policies that may improve engagement. Current policy reforms in disability support should shed light on this over time.

Figure 6       **Contribution to the reduction in hours worked per capita**
100 x change in natural log values, 2012-13 to 2059-60
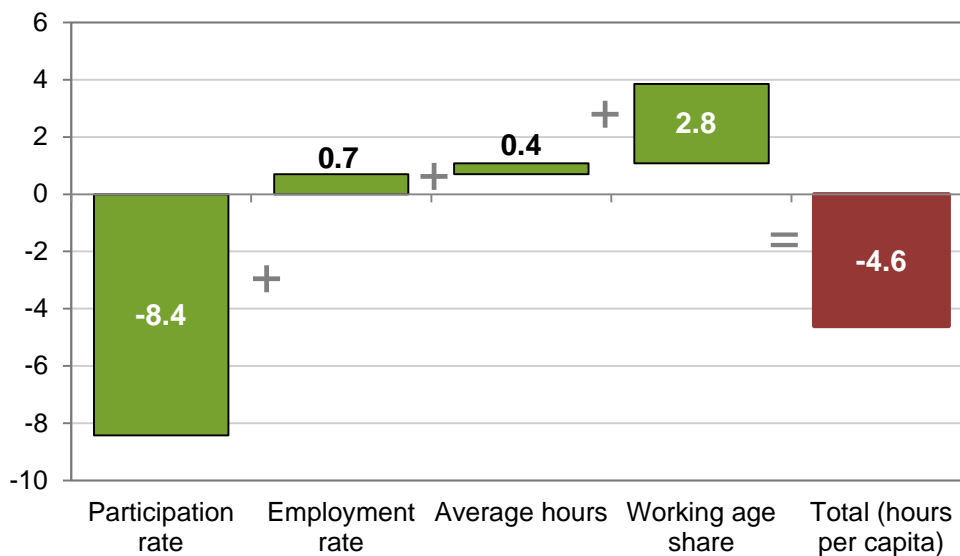


## What about productivity?

The remaining critical ingredient to future economic growth is productivity, which has a greater impact than the reduction in labour supply per capita. Australia's labour and multifactor productivity (MFP) growth has languished in recent years. Without broader policy reforms, it appears that it will be difficult to return to the higher growth rates experienced in the 1990s. In part, this reflects the structural shift to (often government-supplied) services, where productivity growth rates have, on average, been lower than other parts of the economy.

Average labour productivity growth is projected to be around 1.5 per cent per annum from 2011-12 to 2059-60 (with multifactor productivity growth contributing 0.7 percentage points). This is considerably below the estimates used in most previous studies of future economic growth. In contrast, prior to the recent slowdown, average peak-to-peak labour productivity growth from 1998-99 to 2003-04 exceeded 1.8 per cent per year.

Around 0.8 percentage points of the projected annual labour productivity growth rate reflects the contribution of capital accumulation. It is projected that the gross fixed capital spending (by the private and the public sectors) required to underpin capital deepening will be around $38 trillion over the next 50 years in constant 2011-12 prices. This is around 5 times more than the sum of investment required over the previous half century (1959-60 to 2011-12). Given this, it is crucial to have economic settings conducive to efficient capital investment and to its financing.

Increases in productivity growth have sizable impacts on output growth. As an illustration, using the Commission's base case value of labour productivity, the cumulative sum of annual GDP values from 2012-13 to 2059-60 is around $140 trillion in constant 2011-12 prices. An increase in labour productivity of 0.3 percentage points a year increases the cumulative value by $13 trillion. This is equivalent to around 8 years of Australia's GDP value in 2012-13. Where the improved productivity growth arises from 'doing things better' rather than capital deepening, this value could support some or all of the very significant expected increase in consumption of health, aged care and training services, underlining the link between economic and social policy. Australia has instigated important programs, such as the National Disability Insurance Scheme, to support people in need, and will come under pressure to ensure adequate resourcing of future health and aged care services. The income that underpins such social programs needs to be created in order to be distributed.

## The implications for economic growth and national incomes

While the supply-side of the economy is clearly critical to Australia's future prosperity, a country's standard of living is ultimately dependent on the value of its *disposable* income. This takes account of the terms of trade, transfers to foreigners and the need to pay for capital accumulation. The terms of trade is projected to decline so that, with the additional impacts of contracting growth rates of labour supply and labour productivity, disposable income is projected to grow at a much slower rate compared with the boom period from 1993 to 2012 (figure 7).

The bottom line is that the combined cocktail of falling labour supply per capita, a declining terms of trade and poorer productivity growth rates mean that Australians can expect that the growth in disposable income per capita will fall to less than half that of the boom years. A period of truly diminished outcomes is likely to be at hand, unless luck or appropriate policy initiatives intervene.

Figure 7      **A major slowdown in income growth is impending**

Percentage change in real net national disposable income per capita
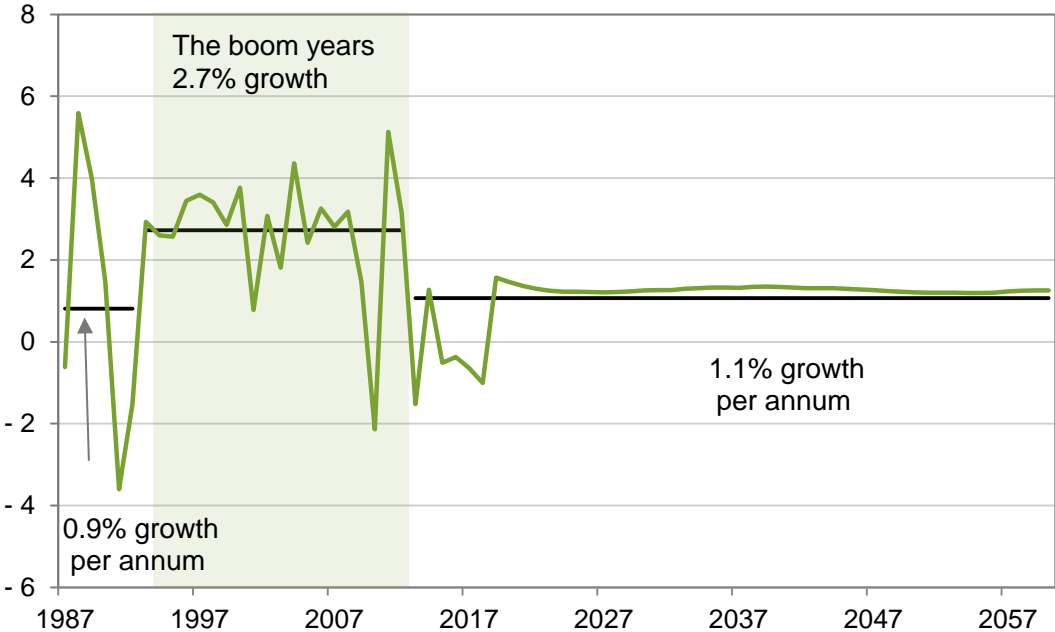


**Growing fiscal pressures coincide with lower economic growth**

Diminishing economic expectations are likely to coincide with increasing expectations for public spending. Australian governments will face major fiscal pressures over the ensuing decades. This reflects that government expenditure is strongly weighted towards older Australians, and that population ageing will expand their relative importance dramatically (figure 8).

The principal indicator of future fiscal pressure is the degree to which government spending outpaces revenue when the ratio of government tax revenue to GDP is held constant. This provides a measure of the increase in revenue or reduction in aggregate spending required to provide a balanced budget (table 1). Overall, the Australian Government must find funding sufficient to cover additional expenditure of 4.4 per cent of GDP, and combined state and territory governments must find an additional 1.4 per cent of GDP. It is possible that given the limited taxation options

available to the states and territories, much of their fiscal pressure could be 'passed on' to the Australian Government in the form of greater demands on federally collected taxes.

The main sources of such pressures over the next 50 years are likely to be rising obligations for publicly-funded health care, aged care and retirement. There is likely to be relatively minor fiscal relief from obligations that typically relate to lower age groups.

Figure 8    **Age-related government spending**
All governments, $'000 per person, 2011-12
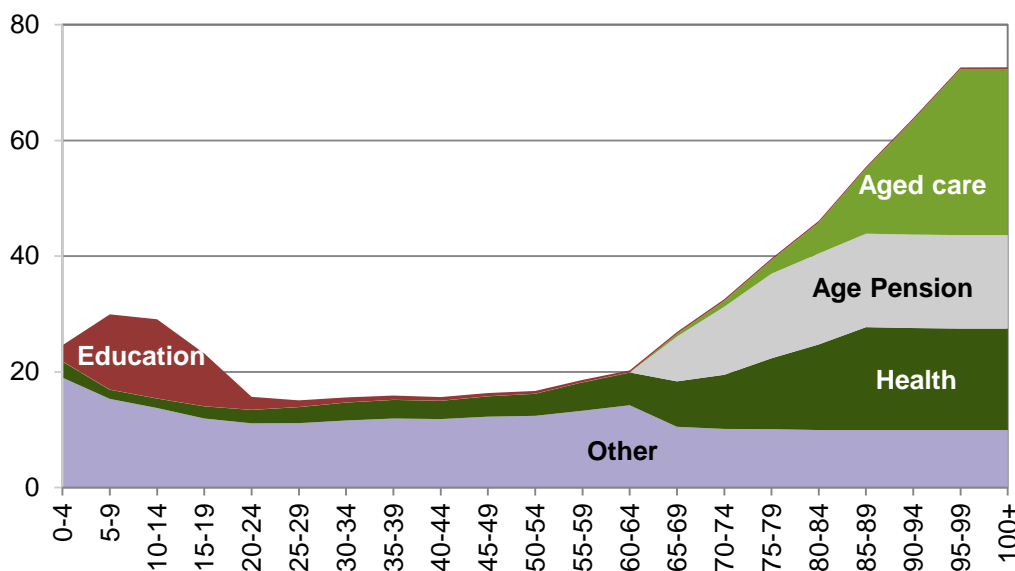


Table 1    **Budget pressures grow over the next 50 years**

|  | *2011-12* | *2059-60* | *Change* |
|---|---|---|---|
|  | Share of GDP (%) | Share of GDP (%) | Share of GDP (%) |
| **Australian Government** | | | |
| Health care | 4.1 | 7.0 | 2.9 |
| Age Pension | 2.7 | 3.7 | 1.0 |
| Aged Care | 0.8 | 2.6 | 1.8 |
| Education | 1.9 | 1.7 | -0.2 |
| Other (including disability) | 11.2 | 10.2 | -1.0 |
| Sum | 20.7 | 25.1 | 4.4 |
| **State and territory governments** | | | |
| Health care | 2.4 | 3.8 | 1.4 |
| Education | 3.5 | 3.2 | -0.3 |
| Disability | 0.2 | 0.5 | 0.3 |
| Sum | 6.1 | 7.5 | 1.4 |

Numbers may not add to totals due to rounding.

The pressures on health care, the most important driver of fiscal pressure, reflect two related factors:

- Health care costs rise with age, given greater service use at older ages. For example, in 2010-11, the cost of Pharmaceutical Benefits Scheme drugs per person aged 75 or more years was nearly 50 times greater than the cost per person aged under 18 years. Similarly, dramatic relationships between age and per person costs are apparent for other health services, such as hospitals (figure 9).

- This pressure is compounded by non-demographic factors that affect costs, such as advances in the quality of services, and new technologies. Even for a given population age structure, costs per capita in health care tend to rise at around 0.6 to 0.9 percentage points above real GDP per capita growth, depending on the segment of the health care sector.

Figure 9     **Hospital costs by age and sex, 2010-11**
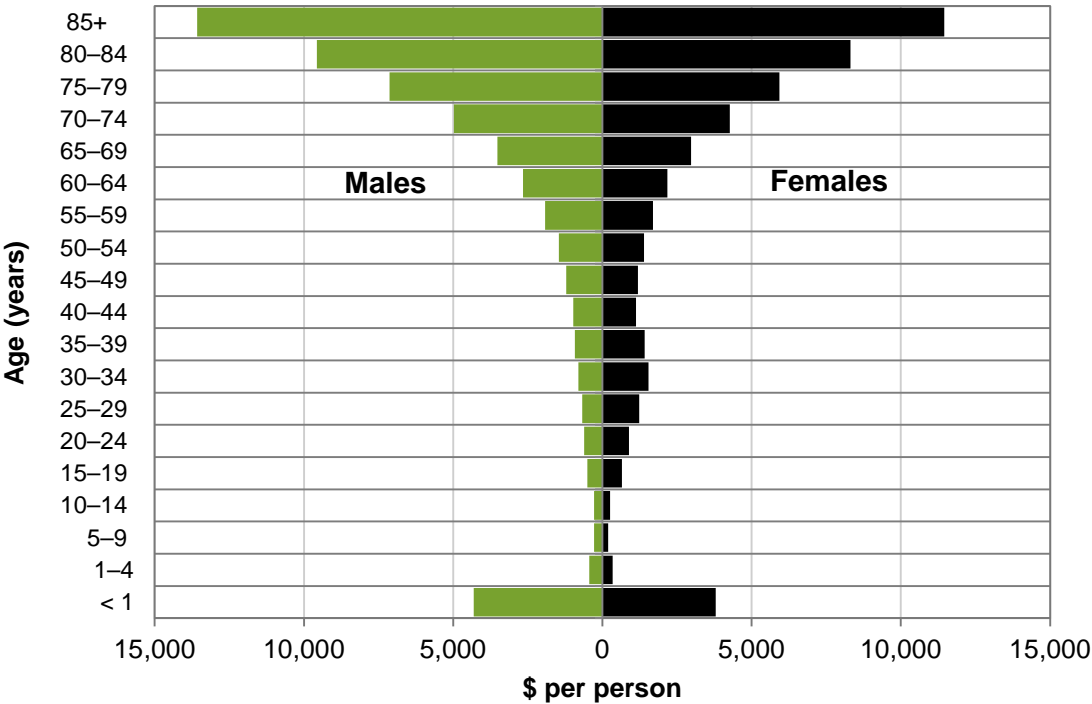


The two factors are interlinked because many technological innovations occur for health interventions intensively used by older Australians. This trend may be accentuated as businesses develop technologies targeting the needs of the aged. The budgetary impact of a new drug (costing some $2100 per script) that targets macular degeneration among the aged provides a vivid example of this process. Over just a

few years, prescription numbers increased more than sixfold, with annual costs to government rising from $45 million to nearly $310 million (figure 10).

## Closing the fiscal gap

All governments face the long-run fiscal reality most bluntly put by the character Micawber in Charles Dickens' novel *David Copperfield*: 'Annual income twenty pounds, annual expenditure nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery'. While governments, unlike Micawber, have the capacity to borrow over reasonably lengthy periods, neither that strategy nor selling assets purely on revenue raising grounds are sustainable long-term options to address the widening fiscal gap. (There may of course still be strong efficiency grounds for privatisation.)

Figure 10    **The rising costs of a drug for age-related macular degeneration**
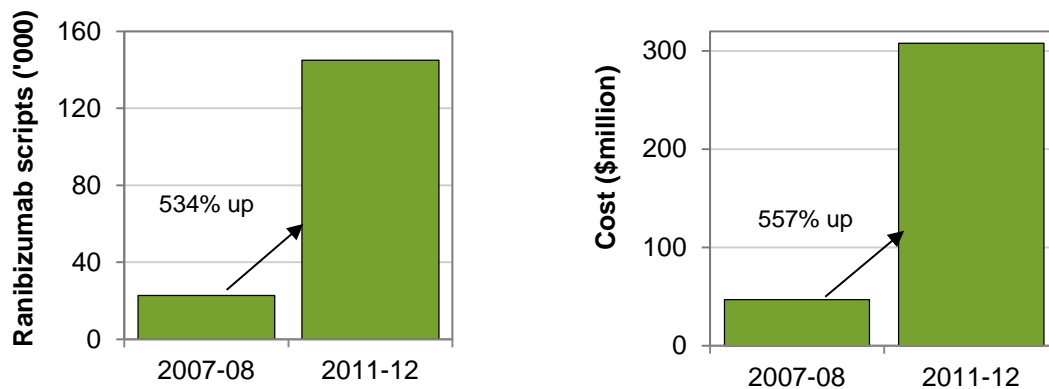


Accordingly, governments can respond to *long-term* pressures only by raising taxes, cutting aggregate spending or some hybrid. To give a picture of the size of the aggregate funding gap facing all governments, its closure would require that total taxes collected by all Australian governments increased from around 28 to 34 per cent of GDP (about a 21 per cent increase), or roughly an equivalent reduction in the existing expenditure to GDP, or some mix of the two. The key issue will be how governments can manage to close a gap of this size in an orderly, efficient and equitable way. Taxation will inevitably be part of the story, as will be targeting of any wasteful or inefficient spending. But some creative options also warrant exploration in the policy debate that Australia must have.

## Some reforms represent opportunities to overcome ageing fiscal pressure and warrant further debate

*Increasing workforce participation amongst older workers*

People are living much longer, yet for the last hundred years, there has been little change in the age at which people are eligible for the Age Pension or the period spent in the labour force (figure 11). The average life expectancy from age 15 years of a male born in the so-called 'Oldest Generation' between 1901 to 1925 was just over 55 years. After age 15 years, he would spend just 13 years (or less than 25 per cent) of his remaining lifetime outside the labour force. In contrast, it is estimated that the male generations born between 2006–2060 ('GenWhats') will live an additional 78 years once they reach 15 years old, of which 33 years will be spent outside the labour force (mostly not in education).

If time in full-time equivalent work is considered, the average male 'GenWhat' aged 15 years is projected to work for an estimated 39 years compared with around 44 years for their 'Oldest Generation' counterpart. The additional years in retirement appear likely to be mainly healthy ones.

Figure 11    **What is the future of people's lives once they have reached 15 years old?**

Successive male generations 1901 to 2060
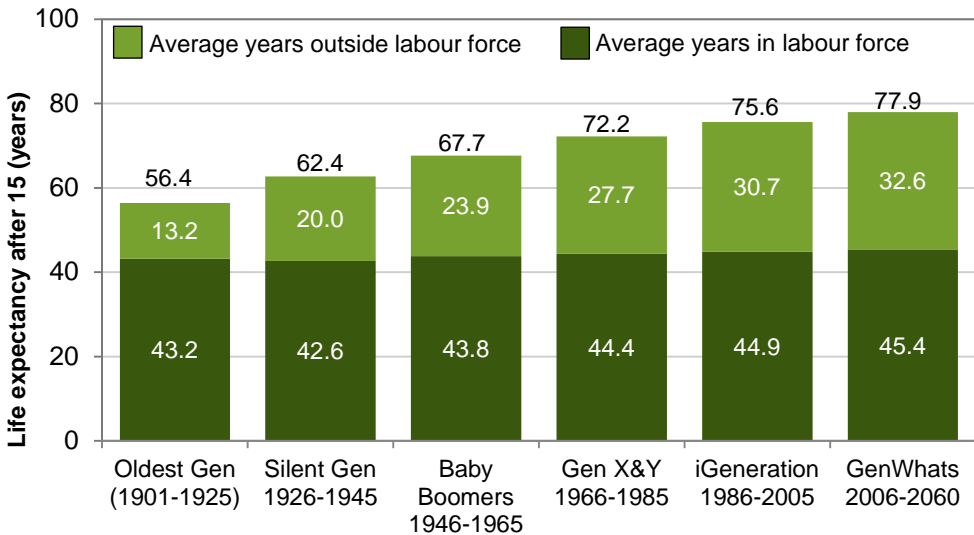


Rounding errors means numbers may not exactly sum.

In part, the tendency for people to spend a greater proportion of their lives outside the labour force reflects participation in education in the years from 16 to 20 years

(though many students still work), greater wealth and savings, and the high value of leisure. However, there are several major obstacles to the employment of older people, of which the financial incentives of (and the social norms established by) the tax, superannuation and pension systems figure prominently.

Only in recent times has the eligibility age for the Age Pension (and indeed the former statutory provision for mandatory retirement) been seen as out of step with older people's greater life expectancy and their capacity to contribute to society through paid work. Older Australians are characteristically neither infirm nor inept. While the pension age is scheduled to gradually increase to 67 years by 2023 for both men and women, an important issue is whether there are grounds to make slow and automatic changes to the eligibility age in line with future life expectancy gains — a position advocated by the OECD.

The Age Pension serves a number of purposes and, consequently, it is difficult to determine the optimal eligibility age. Nevertheless, increasing the eligibility age in line with increases in life expectancy would prima facie have some benefits. As an illustration of the impacts of rising pension eligibility ages, gradually increasing the pensionable age from 67 to 70 years could:

- increase participation rates for people in the relevant ages by around 3–10 per cent, taking account of the fact that some people would be unable to work (and would transfer to the Disability Support Pension), some would be already working, and others with sufficient privately-funded superannuation would largely not be affected by a change in the publicly-provided pension

- yield ongoing fiscal savings of around 0.15 per cent of GDP per annum in the late 2030s after accounting for some increase in Disability Support Pension recipients (and then falling to 0.1 per cent of GDP in the long run). Over the full period from 2025-26 to 2059-60, the accumulated (undiscounted) savings would be around $150 billion in constant 2011-12 prices.

There are several complexities in implementing any link between the pensionable age and life expectancy, but these are surmountable (as suggested by the operation of such links in some countries). Shifts in attitudes and expectations amongst employers and the labour force will be important to the effectiveness of any policies in this area.

Aspects of the superannuation system, particularly the taxation arrangements and preservation age, also have incentive effects on labour supply and entail taxpayer costs of a similar magnitude to those posed by the Age Pension eligibility age. The issues raised by growing longevity should be considered for the whole retirement income system.

*Examining new ways to help fund government-provided services*

Among other concerns, affordability has been an obstacle to greater co-contributions by older people for the taxpayer-funded services they use. However, many people may be able to tap certain assets in innovative ways without compromising their current living standards. Many may also wish to contribute if it underpins more consumer-directed service delivery and reduces the risk of rationing of services central to their wellbeing — such as high quality aged and health care.

Any future policy debate about the possibility of innovative arrangements for greater co-contributions should be informed by facts and analysis.

Most households and individuals already save for their retirement, consistently building wealth over their working lives and then using it to fund their retirement. But retirees tend not to draw down the wealth in their home, which represents a significant share of their total wealth (figure 12). Over 80 per cent of older households own their home, overwhelmingly without any mortgage. Even those on the Age Pension often fully own their own home. Evidence on bequests over the past ten years, which most commonly relate to the family home, suggests this trend is continuing.

**Figure 12    Older Australians are often income poor but asset rich**
2009-10
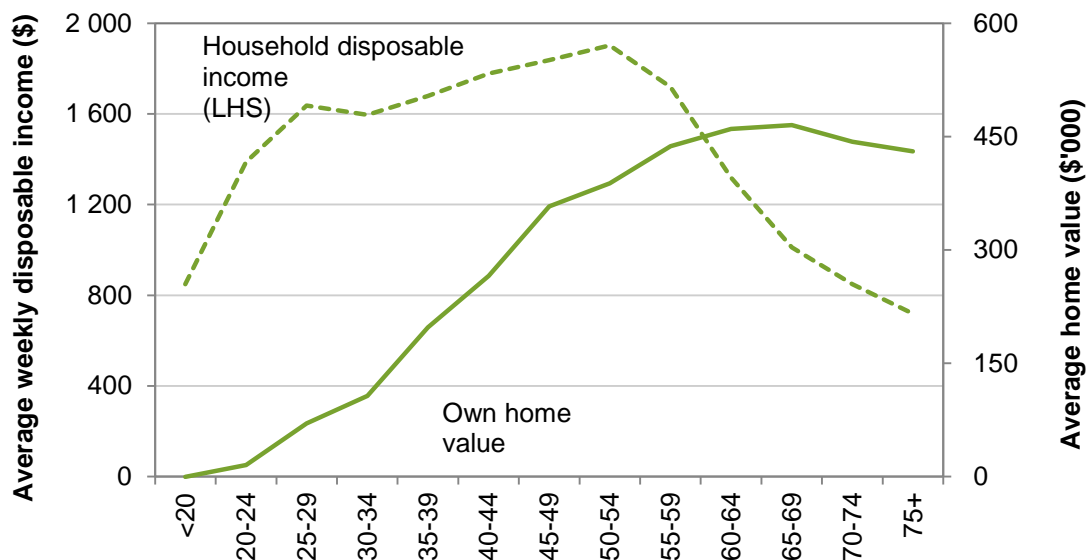


One option, which is already in use to help households pay their council rates, is a government equity release scheme targeted at older households. Having individuals contribute even half the annual real increase in their home values towards aged care

services could reduce government expenditures by around 30 per cent (a conservative estimate). An equity release scheme of this kind would still leave older households with an appreciating asset base and provide a means to increase the quality of services provided over the longer term.

The viability of any such scheme depends on many other matters, but the evidence suggests that further investigation is warranted.

*Productivity reforms in health care delivery*

Improvements in the productivity of the health sector and more efficient allocation of resources would generally help directly reduce fiscal pressures and, in some cases, improve outcomes for people (such as by avoiding adverse hospital outcomes).

The evidence suggests that there are significant variations in the productivity of different health service providers, providing scope for productivity improvements from shifting the performance of laggards. In Australia, for example, a study found that there were around 200 procedures where the cost can vary from half to around one-and-a-half times the average cost, depending on the hospital undertaking the procedure.

Productivity improving reform can be instituted at an organisational or governmental level (such as funding initiatives, or coordinating databases of clinical evidence).

An illustration of organisational reform at the point of service delivery is the application of 'lean' care models, which apply to hospital care some of the management techniques used in modern logistics. As an example, one hospital found that the major source of delays or cancellation of surgery was a bottleneck in just one link of the chain — the post-anaesthesia (and surgery) care unit. Instead of just providing more beds at that point, the usual response to a bottleneck, hospital management managed the flow of patients into the care unit from areas providing anaesthesia, resolving the bottleneck without more resources.

More broadly, across the whole health system, decisions about what resources to use, for whom and when, are informed by a messy assortment of sound evidence, and information that is out of date or not well founded. In the United Kingdom, frustration with the costs of poorly founded practices led to the development of so-called 'do not do' lists, which identified health care practices that were not cost effective. The basic infrastructure for evidence-based practices already exists — such as through the international Cochrane collaboration, and the practices of

bodies like Australia's Pharmaceutical Benefits Advisory Committee and the United Kingdom's National Institute for Clinical Evidence. However, diffusing the results of such evidence has proved more difficult, indicating that there may need to be complementary reforms to incentives and institutional arrangements.

Of course, effective preventive and early intervention may avoid the use of costly procedures at a later time (or simply the avoidance of poor outcomes) — the principle behind public health. Many adverse health outcomes — examples cover areas such as those arising from accident trauma, lung cancer, cardiovascular disease, diabetes and illicit drug use — can benefit from preventative approaches. Nevertheless, while it is likely that many prevention strategies are warranted and effective, crafting cost-effective prevention strategies is not straightforward, as reflected, for example, in the case of obesity prevention. The analytical methods used to establish cost-effectiveness need improvement if they are to make a significant contribution to the health reform agenda.

There are several other well-known and promising areas for reforms that may lead to improvements in both productivity and cost effectiveness. These have often been frustrated by problems in implementation (such as the divided responsibility for, and structure of, associated funding) or the actions of interest groups adversely affected by them. The potential reform areas include:

- *Workforce demarcation and regulation*: current arrangements likely inhibit more efficient skill mixes and create unnecessary regulatory burdens.

- *Procurement in the health sector*: particularly in hospitals, increased purchasing power could be leveraged by aggregating some purchases, and achieving efficiencies in the purchasing process itself.

- *Financial and regulatory incentives*: regulation of the health sector and differentiated health funding can distort choices between procedures, and providers (such as emergency departments and general practitioners). The split in funding responsibilities between levels of government can contribute to this issue.

However, as with all significant policy change, careful consideration and analysis of the policies, and the best manner of implementation, is warranted.

Estimates of the benefits from some recent health reforms suggest that these could bring significant benefits and help to alleviate fiscal pressures. Just a 5 per cent improvement in health sector productivity would reduce the projected fiscal pressures for all Australian governments by 0.5 percentage points of GDP in 2059-60.

## Planning for the future

Population ageing is a desirable side product of success. All highly-developed countries have longer life expectancy and lower fertility rates than poor countries. However, population ageing entails major economic and social transformation for Australia at a time when it is likely that the terms of trade reverts to its lower long-term average and productivity growth rates fall below the historical norm. Growth rates in output and income per capita are likely to slow, while increased demands on governments to fund age-related expenditure will generate fiscal pressures. Any cyclical downturns will add to these pressures.

The preferable time to contemplate the policy implications of these developments is while these near-inescapable trends are still in their infancy.

# 1    Introduction

Much of the focus of the recent economic commentary concerning Australia's prospects is on Australia's current circumstances. Notwithstanding reasonable concerns about aspects of Australia's current economic performance — especially its recent poor productivity performance — the average Australian has nevertheless fared well in the last two decades in terms of net national disposable income per capita, low inflation and low unemployment. Australia's fundamental problems have been masked by high prices for our exports and the income that this generates.

Past reforms have also put Australia on strong ground. People born in 1975 would not, over the ensuing years, have experienced as an adult any major economic downturn and might regard the recent global financial crisis as an interesting, but largely 'foreign' phenomenon. The underlying concern from these circumstances is that the impetus for continuous reform wanes in such a benign environment. Unlike the United States, Europe and Japan, where economic circumstances are now spurring reforms, the post National Competition Policy period in Australia has seen little reform.

Yet latent risks for Australia are present. Recent reform attempts have been stymied. More significantly, there is no immediate crisis to spur reform. Rather, the prospect is for a slow decline into a low growth scenario, with the possibility of certain sectoral exceptions.

This is not the basis on which to contemplate the inexorable impacts of ageing on economic growth and the demands it places on government budgets through growing age-related expenditures.

## 1.1    What this report is about

This study — a new style of research report aiming at matters of current policy interest — focuses on the effects of ageing on economic output (underpinned by changes in population, participation and productivity) and the resulting implications for government budgets were current policy settings to be maintained. In that context, it will help inform the forthcoming Intergenerational Report (IGR).

It is intended to:

- update some of the projections undertaken in past Commission work, including of population and labour supply

- explore and in some cases, apply projection methods that have not generally been used in previous official assessments of Australia's demographic and economic futures — for example, statistical methods in modelling mortality and labour force participation

- shed new light on the impacts of productivity (both across the economy and in those sectors that provide age-related services, particularly healthcare)

- canvass policy approaches currently over-the-horizon, but nevertheless relevant to a deeper consideration of the challenges of an ageing Australia (including the role of non-fungible housing equity as a financing method and the link between labour force participation and the Age Pension eligibility age).

However, it should be noted that a fuller exploration of the *economic* implications of ageing would go further — exploring the effects of ageing on the wellbeing of Australians. To do so would also require the examination of inter-linkages between social and environmental changes and ageing — areas beyond the scope of this report.

This study does not aim to be as comprehensive as the periodic Australian Government Intergenerational Reports. Even so, the scenarios, methods, and policy issues discussed in this study should be useful to future Intergenerational Reports. As far as possible, the spreadsheets, sources and methods used in this study have been made public on the Commission's website as an aid to others' work in this area.

## It is not a blank slate

Reporting on ageing is not new. The Commission has undertaken considerable work in this area — most recently the Caring for Older Australians inquiry report (PC 2011a), but also through studies on the Economic Implications of an Ageing Australia (PC 2005d), the National Reform Agenda (PC 2006b), fertility (Lattimore and Pobke 2008a), and separate research on male and female labour participation (Gilfillan and Andrews 2011; Lattimore 2007b) — most of which have been relevant to policy reform agendas.

Treasury has also prepared three IGRs, most recently in 2010 (with the next due in 2014). These reports have been designed to frame the discussion about future

challenges facing Australian governments. As put by a former Secretary to the Treasury:

> I think of the IGR as a framing document, a document to motivate discussions around the key challenges we will face over coming decades. …
>
> Since the first IGR in 2002, IGRs have been used as a tool for raising awareness of the challenges presented by an ageing population.
>
> IGRs have also influenced thinking more broadly, with the 3Ps decomposition of the supply-side drivers of GDP and GDP per capita — population, participation and productivity — being used to guide government decision-making and debate across a range of policy areas. (Henry 2010, pp. 2–3)

Along with Australia, many other developed countries — such as Canada, New Zealand, the United Kingdom and the United States — have reported on the fiscal implications of ageing as part of their examination of 'fiscal sustainability'. Apparent from their reports are a number of practices in relation to scope and content, as well as governance and accountability arrangements (box 1.1). These have informed the approach in this study.

- *A fiscal focus.* This study has considered not just the fiscal implications of ageing, but also broader economic implications in some areas — such as the issues created for transport and the development of cities from increasing population levels (chapter 2) and the need to make capital investments over the next 50 years that dwarf those of the past 50 years. However, this report has not generally considered the environmental or social implications of ageing.

- *Level of government.* Although focusing on the fiscal implications of ageing for the Australian Government, the study has also considered the likely future magnitude of state and territory government financial obligations in healthcare (chapter 5). Given the scope of this report, it has not been possible to explore the broader roles of state and territory governments in providing and funding all ageing-related services, nor their control over policies that can help raise productivity in the economy (which will be a key to managing the economic transition to an older society). These issues warrant wider analysis.

- *Treatment of uncertainty.* Given the length of the projection horizon, there is considerable uncertainty about what constitutes reasonable assumptions in a range of areas — such as mortality, fertility, productivity and health care spending. Sensitivity analysis helps to test the degree to which uncertainty matters, and to gauge the possible benefits of accelerated reform (as in the case of productivity scenarios). It also provides a measure of the degree to which different projection methods reach different outcomes (for example, as in the two methods used to examine labour force participation rates), which may guide methodological developments. Sensitivity analysis has been undertaken in

demographic, revenue, expenditure, and productivity projections (chapters 2, 4 and 5). This has been supplemented by stochastic modelling — which provides a statistical basis for sensitivity analysis — in the population and productivity growth projections (chapters 2 and 4).

- *Impacts of past and future reforms.* The impacts on projections of past and possible reforms can provide useful information to governments and the wider community. For example, this paper considers the impacts of changing the eligibility age for the Age Pension on expenditure projections (chapter 6).

- *Transparency of methodology, assumptions and data.* Transparency helps to ensure the credibility and continual improvement of the projections (for example, by allowing the projections to be replicated). In some specialist areas — demography and productivity — detailed methodology and assumptions are set out in appendices to this report. The key data used in the projections, as well as the projections themselves, are available from the Commission's website.

## Why the interest in the fiscal dimensions of ageing?

Long-term economic and demographic trends can have major impacts on the fiscal position of governments and on the incomes of Australians, raising issues about fiscal management, the provision of services, and policies that attempt to address the supply-side impacts of the transition to a much older society. For these reasons, regular reporting on fiscal policy was expanded in the 1998 *Charter of Budget Honesty (Cwlth)* to include an examination of Australia's long-term economic and fiscal position. This was to be achieved through the publication of an intergenerational report that sought to:

> … assess the long term sustainability of current Government policies over the 40 years following the release of the report, including by taking account of the financial implications of demographic change. (p. 15)

Reporting on the long-term fiscal implications of current policy settings provides governments with the opportunity to overcome problems before they arise. It also places additional pressure on governments to be mindful of the implications of their spending commitments. As put by Gruen and Spender:

> In earlier times, governments in Australia and elsewhere typically made spending commitments without any systematic attempt to estimate, or address, their long term fiscal consequences. (2012, p. 2)

Box 1.1    **Features of the recent reports of Australia and other countries**

Several other countries have reported on the fiscal implications of ageing. The institutions producing the reports are: Finance Canada and the Canadian Parliamentary Budget Officer (PBO); New Zealand Treasury; United Kingdom (UK) Office for Budget Responsibility (OBR); the United States (US) Congressional Budget Office (CBO), Office of Management and Budget (OMB) and Government Accountability Office (GAO). Their reports have provided useful lessons for this study.

**Report scope and content**

*A fiscal and economic growth focus.* All reports emphasise the fiscal consequences of ageing, which involves projecting government expenditures and revenues based on demographic projections on a year-by-year basis. They aim to identify future 'fiscal gaps' and the extent of required budget adjustments.

*Level of government.* The coverage of reports varies. Canada, the UK and the US GAO cover central and other governments, whereas Australia and the US OMB and CBO only cover the central government. Reports that cover only one level of government can give an incomplete picture of the fiscal implications of ageing.

*Addressing uncertainty.* Deterministic sensitivity analysis is one way of dealing with uncertainty about the projections. All reports apply some sensitivity analysis. For example, the Canadian PBO's (2012) report assesses the sensitivity of its baseline projections to alternative fiscal policy assumptions and to different demographic and economic projections (p. 36). Alternatively, some use stochastic modelling to more directly deal with uncertainty. New Zealand's 2013 report provides one example of this.

*Ex post analysis.* Comparing current projections with past projections helps test the robustness of the current projections and identify reasons for any differences. However, the reports generally make limited use of ex post analysis, although it is used in Australia's 2010 IGR (2010, pp. 40, 41, 46), as well as appendix D of this report.

*Impacts of past and possible reforms.* The impacts on projections of past and possible reforms can provide useful information to governments and the wider community. New Zealand's 2013 report, for example, analyses the impacts of raising the eligibility age for a NZ Super payment (New Zealand Treasury 2013b, pp. 30–43).

**Governance and accountability**

*Responsibility for preparing the reports.* As long as transparency, contestability and other conditions are evident, different governance models can be effective. Some reports are produced by independent institutions — for example, the UK OBR. Some reports are produced in a contested environment — for example, in the United States and Canada. The US CBO's forecasts have been found to have had a 'disciplining effect' on the OMB's forecasts (IMF 2013, p. 40).

*Transparency of methods and data.* Transparency enhances the credibility and contestability of projections. Only some institutions make their data publicly available.

*Frequency of reporting.* Frequent reporting keeps governments and the wider community informed and allows the most up-to-data and information to be used in projections. Across countries reporting frequency varies — from annually in the UK, the US and in Canada, to three to five yearly in Australia and New Zealand.

*Sources*: Anderson and Sheppard (2009); Bascand (2012b); OMB (2013) CBO (2012); EC (2012a, 2012b); GAO (2013a, 2013b); Finance Canada (2012); NZ Treasury (2013a, 2013b); OBR (2013); PBO (2012); Australian Government (2010); IMF (2013).

So, while examining the supply-side and fiscal implications of ageing will not capture all of the economic implications of an ageing society, it does provide governments with information on which to make better informed policy and spending decisions.

## What is the nature of the projections in this study?

The terms 'projections' and 'forecasts' are often distinguished in exercises that look into the future. A projection is a 'what if' experiment. It indicates what will happen *if* a certain set of conditions are met. Often, different projections are made, showing the results of different sets of assumptions. For example, the Australian Bureau of Statistics produces three major scenarios for Australia's future population (and offers many other tailor-made choices to users) — allowing users to then choose the series they believe is most appropriate for their purpose. In contrast, a forecast is an assessment of the most likely outcome.

In this report, the Commission's assessment of the impacts of ageing are based on projections, updating those made in the Commission's 2005 ageing report (PC 2005d). The horizon for most of the projections is 2059-60 (though examinations of lifetime workforce participation require longer timeframes). The projections are intended to be a sensible guide to what would happen under existing government policies if people's behaviour continues in much the same way as it has recently. The projections are not forecasts of likely outcomes. Indeed, in many instances, the projected outcomes will not occur because their potential realisation would elicit policy and behavioural responses that deal with the adverse consequences they reveal. For example, governments will almost certainly avoid large fiscal deficits through a mix of strategies, such as increasing taxes, reducing services, improving the cost-effectiveness of services or changing their funding sources. The projections could only eventuate if governments chose to do nothing — an improbable and potentially infeasible option.

Nevertheless, the projections are not arbitrary. Rather, they draw extensively on theory and statistical evidence, as well as judgment to test their reasonableness. Those judgments are, of course, accompanied by considerable uncertainty, given developments in future health treatments, disability rates, the effects of climate change on economic activity, and technological advancements. This is one reason for the use of sensitivity analysis throughout this study.

## 1.2 Basic methodologies for examining the economic implications of ageing

Two broad approaches are often used to consider the economic implications of an ageing Australia:

- *the '3Ps' approach,* where the effects of demographic change are explored in terms of their impact on the supply side of the economy — population, participation and productivity. This provides estimates of GDP growth over time. This is accompanied by analysis of government spending patterns, mainly based on the differences in the consumption patterns of people of different ages

- *general equilibrium modelling,* where an economywide model is used to explore both the direct and indirect effects of demographic change. This incorporates most of the elements of the 3Ps framework, but also takes account of feedbacks in the economy (such as the movement of capital and labour between industries).

### The 3Ps approach

Under the 3Ps framework (figure 1.1 and Australian Government 2010),[2] projections of real economic growth are estimated as a function of:

- the number of people of working age (*population*). To project the composition of the population, assumptions are made about fertility, mortality and migration trends. All these have gender and age-specific dimensions and combine to provide a picture of the age and gender structure of the population

- total labour supply in the economy — the average hours worked by each working person (loosely termed *participation*) — derived from estimates of the labour force, employment and hours of work

- the average output per hour worked (*productivity*), derived from assumptions about labour productivity growth and/or its proximate determinants (capital deepening and multifactor productivity growth). This report uses a disaggregated approach based on estimates of productivity at the industry level, and projections of labour movements between industries. In the latest IGR, the average labour productivity performance over the past 30 years was used to form its projections of real GDP (Australian Government 2010, p. 13).

The above framework can be elaborated to estimate real net national disposable income. This is the best single measure of Australia's material wellbeing since it

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[2] The full framework is discussed in more detail in chapters 3 and 4, and spelt out in mathematical terms in appendix E.

determines people's consumption levels. It takes account of relative export and import prices, the need to replenish physical capital in an economy, and the fact that there are income transfers to and from abroad (chapter 4).

Figure 1.1    **The 3Ps framework for real GDP and real incomes per capita**
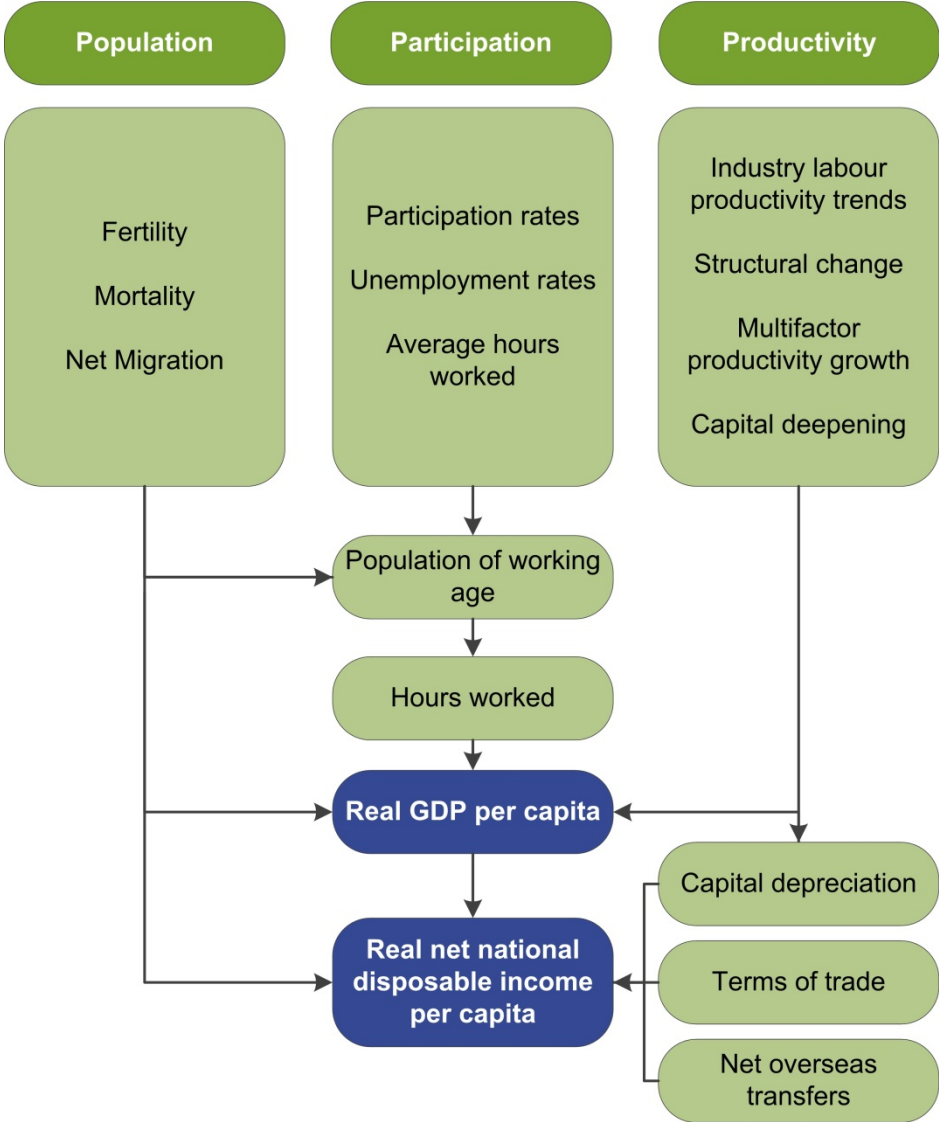
## General equilibrium modelling

Computable general equilibrium models replicate the essential relationships in an economy, providing a coherent year-by-year treatment of capital and labour allocation among competing industries (and occupations), prices, consumption, total output and income. CGE models can also replicate population dynamics though the

integration of cohort-based demographic modelling with economic modelling (appendix F). Their key advantages are that they ensure that any projections are internally consistent, and also allow the examination of policy experiments that take account of the main feedbacks in an economy, and between the economy, labour markets and demography. Properly constructed, they can avoid the mechanical aspects and many of the simplifying assumptions of the 3Ps framework.

For these reasons, a recursive-dynamic general equilibrium model (as described in CoPS (2008) and PC (2012b)) is, in principle, well suited to the analysis of population ageing (and any other likely developments) over the coming decades. For example, the models can build up a picture of economywide labour productivity by aggregating labour productivity trends at the detailed industry level, and taking account of the time it takes to move resources from one industry to another and between regions, in computing these. These productivity differences have flow on effects in terms of relative prices. Further, aspects such as population dynamics changes in the terms of trade and changes in the participation of population groups in the workforce can be simultaneously assessed.

As an illustration of the insights of such modelling, the Commission examined the magnitude and timing of the impacts of a series of COAG reforms (PC 2012a). The approach adopted in that work has been used in various parts of this paper to illustrate possible broad trends in the economic environment in which ageing is occurring.

This report primarily draws on the 3Ps approach, but it does use some of the insights of general equilibrium modelling. Over the longer run, the latter approach is likely to provide more robust and richer insights.


## 1.3    Structure of the report

This report is divided into three thematic areas: the supply side, the allocation of resources, and a focused consideration of three policy areas (figure 1.2).

Chapter 2 outlines the dimensions of expected demographic change in Australia over the coming decades. The resulting impact of this change on the supply side of the economy — the availability of labour, productivity and economic growth — is explored in chapters 3 and 4. Chapter 4 also considers the implications for national income.

Chapter 5 presents projections of the impacts of the ageing population on governments' expenditure and revenue, with a particular emphasis on the areas where the pressure will be greatest (health and aged care).

Figure 1.2    **The structure of the report**
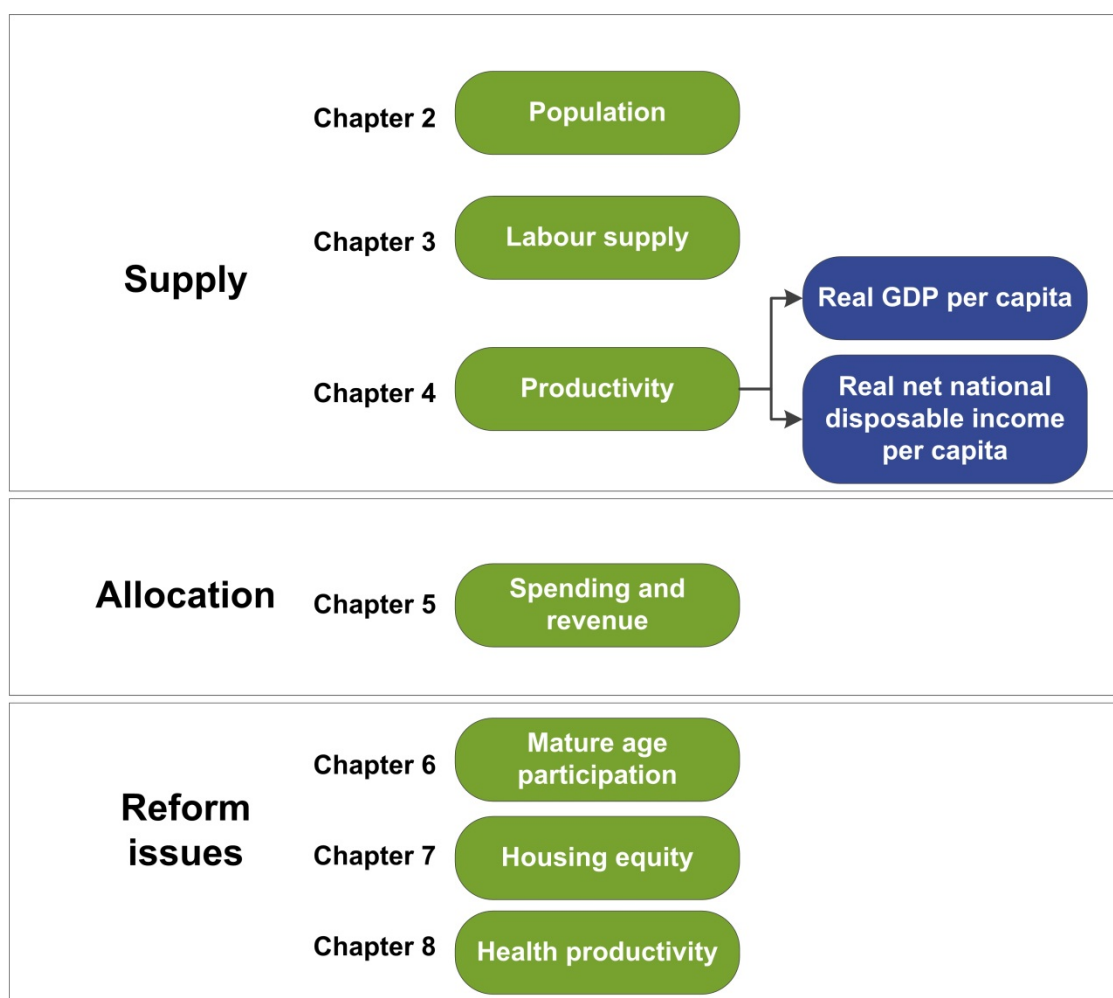


The final three chapters of this report explore some of the approaches that would provide opportunities for future change, should it be considered necessary. The approaches examined are either sourced from relevant overseas experience or have been the subject of recent review in Australia, but are currently over-the-horizon.

- While workforce participation rates have been rising for older Australians, they are still at comparatively low levels. Australia is failing to fully capitalise on the capabilities of this group of people. This reflects various obstacles to workforce participation and indeed, in some instances, positive inducements for people to leave their jobs. Chapter 6 examines some of the possible options for increasing workforce participation of older workers while relieving some of the fiscal pressures associated with their premature exit from the workforce.

- Older people are often cash strapped but asset rich. There may be scope for creative mechanisms that allow people to help finance high quality services through access to some of their housing equity, without them having to reduce

their existing consumption. Chapter 7 explores the issues associated with reform options in this area, drawing on previous Commission analysis (PC 2011a).

- Healthcare is likely to be a major source of pressure on government budgets, reflecting that older people tend to use more health services, combined with the likely continued trend for more advanced and costly services. Appropriate increases in the efficiency of the healthcare sector could relieve these fiscal pressures without diluting the quality of services (chapter 8).

Supporting detail about the Commission's projections and methodologies is provided in appendices, data and models available on the Commission's website (www.pc.gov.au).

# 2    Australia's demographic future

**Key points**

Australia's population is projected to increase to around 38 million by 2059-60, about 15.5 million more than the population at the end of 2011-12. However, population growth rates will fall significantly over time, more than halving from around 1.7 per cent in 2011-12 to less than 0.8 per cent in 2059-60.

Significant population growth will occur even if there are substantial sustained reductions in fertility rates and net migration levels. It is improbable that Australia's population would be less than 34 million by 2059-60.

Australia's capital cities are projected to grow by around 11 million people by 2059-60 — experiencing faster growth rates than the regions. Sydney and Melbourne alone can be expected to grow by around 3 million each over the next fifty years.

- Significant investment in transport and other infrastructure will be required in Australian cities — and for the links between regional and major cities. Policies will need to reduce congestion problems, and to ensure adequate infrastructure funding and investment efficiency.

Population ageing will accelerate, reflecting gains in life expectancy and lower fertility rates. The projections suggest that:

- a female (male) born in 2012 will on average live for around 94.4 (91.6) years
- a female (male) born in 2012 could expect to live for 31 (29) more years after they reach 65 years old, raising issues about optimal retirement policy
- the proportion of the population aged 65 years or more will increase from around one in seven Australians in 2012 to one in four Australians by 2060, and close to 1 in 3.5 at the turn of the next century
- the numbers of those aged over 75 years will increase by about 4 million people between 2012 and 2060 — an increase roughly equivalent to the current population of Sydney
- by 2060, there will be around 25 people aged 100 or more years to every 100 children aged under 1 year. In contrast, in 2012, there was roughly one centenarian to every 100 babies. With continued small increases in longevity, by 2100, there would be more centenarians than babies.
- deaths will rise from 6.5 to nearly 8 people per 1000 in the population by 2060. Given the significant health costs often associated with the last few years of life, this is likely to equate to large health care costs.

All developed countries are ageing rapidly, which will tend to reduce their overall growth rates. Global ageing also provides some positive economic opportunities.

Australia's population is increasing rapidly and inexorably ageing. Its ageing primarily reflects significant (historical and future) reductions in mortality and, to a lesser extent, lower fertility rates. The movement into older ages of a large cohort of people born in the baby boomer period between 1946–1964 accentuates population ageing. From an international perspective, Australia is neither unique nor the most extreme in the degree to which it is ageing.

This chapter provides a picture of Australia's demographic future over the period from 2011-12 to 2059-60. It:

- uses the most recent data and applies systematic modelling to estimate future life expectancy and the age structure. This requires analysis of trends in mortality rates, net overseas migration and fertility. Of these, mortality rates are the most critical determinant of the long-run age structure of any population, which is why this is where the payoff from analysis is greatest. Fertility and net overseas migration nevertheless have important effects on medium-run population age structures and population numbers

- considers uncertainty in a more systematic way than most prior official analysis. Barring catastrophe, Australia's population will be both older and very much bigger by 2059-60, but historical attempts to assess future demographic trends have often proved inaccurate. In many areas of policy (and in insurance), risk assessment is critical, with a particular focus on what credible risks might emerge

- places Australia's demographic transition into a global context, since most of our important trading partners are experiencing similar (and indeed, sometimes more extreme) transitions.

Much of Australia's ageing story is best told graphically, and this is reflected in the approach taken in this chapter.

## 2.1 How are population projections produced?

There are several methods for estimating future populations. The most common approach — as used in this report and in most projections undertaken internationally — involves forecasts of age-sex-specific mortality rates, age-specific fertility rates among women aged 15 to 49 years, and age-sex-specific net overseas migration. These are then inputs into the 'cohort component model' (figure 2.1), which is a mechanistic model that determines the number of people by age and sex (PC 2005c; Rowland 2003). The results from this model are the inputs into other calculations in this report — such as labour force numbers and health cost projections.

Figure 2.1    **Developing population projections**[a]
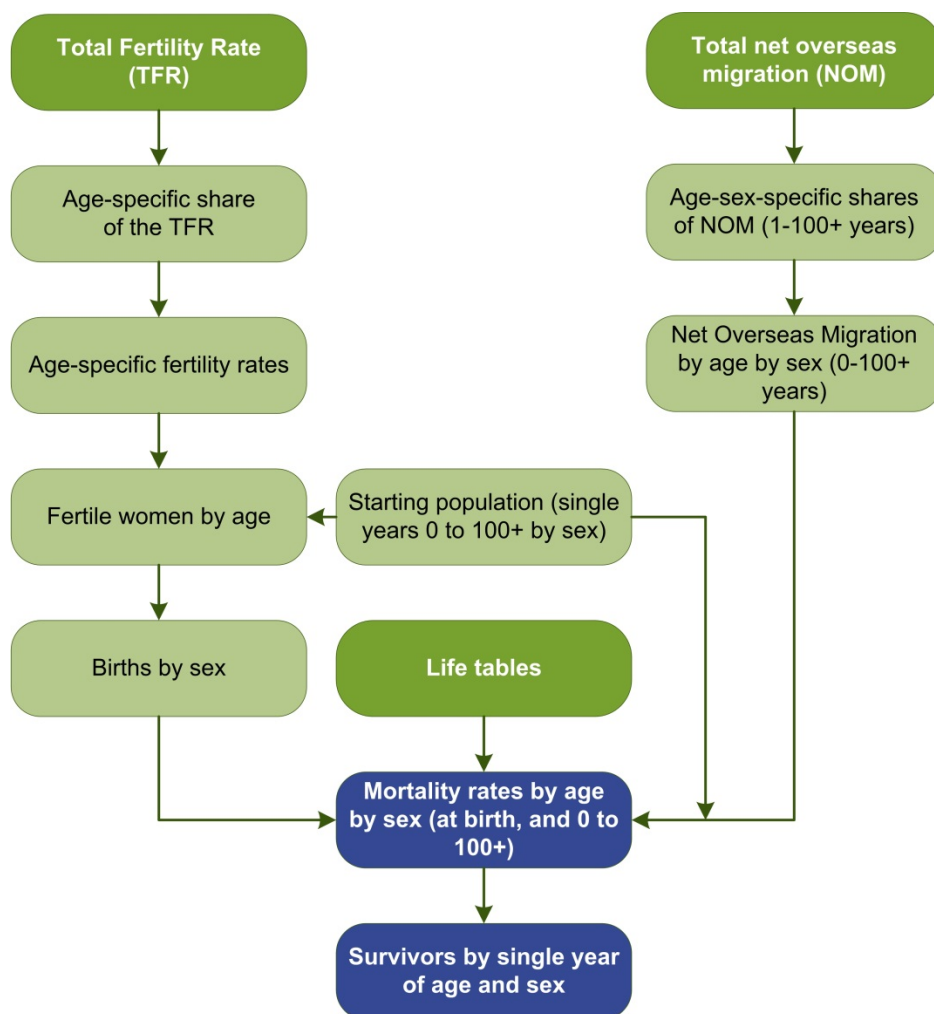


**a** It is common to refer to population 'projections'. For example, the ABS refers to its estimates of future population in this way. While the estimates attempt to be realistic, and use statistical methods where possible, they nevertheless embody many assumptions, some of which are dependent on government policy (such as migration policy).

In structure, the model replicates that used by the Australian Bureau of Statistics (ABS) and other statistical agencies worldwide. The software used to produce the projections, PCPOP, is available on the Productivity Commission's web page in *MS Excel* form. PCPOP allows users to amend the underlying assumptions with ease if they want to undertake sensitivity analysis or explore the effects of alternative assumptions to those in this report. Moreover, PCPOP is easily updated as new data become available so that it is possible to produce population projections at any time (recognising that there are often several years between new releases of the official ABS projections).[3]

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3  For example, in recent times, the ABS produced estimates in 2008, 2006 and 2003. It will release new estimates in 2013.

This report uses the estimated residential population at the end of June 2012 as its starting point.[4] This has the advantage that it takes into account the information provided by the 2011 Population Census. However, demographic (and indeed other) projections are only as good as the assumptions and models that underpin them. Their credibility depends on the extent to which:

- the projected trends represent significant departures from historical patterns of fertility, mortality and net overseas migration, and why this might legitimately be the case

- they are transparent and replicable, with divulgence of any data and calculations that have led to them. (On this score, this study makes its models and data freely available on the Commission's web page)

- the methods used have performed reasonably well in the past, recognising that no model will provide a fully accurate forecast

- the results are sensitive to changes in assumptions and models in a way that is policy relevant. As Pagan (2012, p. 13) has noted of the Intergenerational Reports, variations between the three reports have been most striking for the demographic projections. Similarly, previous demographic projections by the Australian Bureau of Statistics and the Productivity Commission have not been realised in the short-run, and more recent projections have tended to use quite different long-run assumptions (as discussed later). There are a bewildering range of models of mortality available from the 'demography technical supermarket', and no demographic projections will be completely accurate. It may well be that some models are superior to others (and thus should be preferred), but a crucial question is whether aside from their varying sophistication, the results from them differ in a way that policymakers would find relevant.

Accordingly, sections 2.2 to 2.4 explore the most appropriate default assumptions for the key factors that enter the cohort component model, and consider reasonable sensitivity assumptions.

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4 Based on ABS, 2013, *Australian Demographic Statistics*, Table 59, Estimated Resident Population By Single Year Of Age, Australia, Cat. No. 3101.0, 20 June. This study generally adopts the demographic concepts and definitions used by the ABS — such as that relating to the estimated residential population. Rather than repeating their detailed definitions, these are set out in ABS (2009, *Population Estimates, Concepts, Sources and Methods*, Cat. No. 3228.0, 12 June).

## 2.2    Net overseas migration

While the technical definition and estimation of net overseas migration (NOM) is complex, it is a measure of long-term arrivals less long-term departures.[5] NOM has been a critical factor behind Australia's population growth and will continue to be so (PC 2011d).

Unlike either fertility or mortality, NOM is more readily controllable by the Australian Government (DIAC 2013). Most particularly, the Government can set quotas on its migration program — which comprises three categories of migrant (humanitarian, skilled and family re-union). That said, the Australian Government does not have full control over NOM as any number of Australians (and New Zealanders) can arrive or depart. Moreover, the number of temporary entrants, such as long-term visitors and working holiday makers, is effectively uncapped. Their numbers are largely driven by other factors, such as economic conditions. However, since temporary entrants ultimately leave, they do not contribute to long-run population growth.

Currently, NOM is around 230 000 per year, which is well above the longer-term average. From 1948 to 2003, NOM was around 90 000 per year, with no upwards trend. In contrast, in the period 2003–2012, the average NOM was around 200 000 and the trend growth was around 10 000 per year (figure 2.2).

DIAC (2013) forecasts that current high levels of NOM will persist at least until 2017, but that its growth rate will decline. It projects NOM of around 250 000 in 2017. Were such levels of NOM to persist over the next 50 years, it would imply a considerably more populous Australia than most population projections.

It is difficult to establish whether a level of NOM around 200 000–250 000 is likely to persist. In part, the high recent levels may reflect strong relative economic and income growth in Australia compared to other countries, which make Australia an attractive destination. Given that the terms of trade are now declining, it is possible that NOM will fall somewhat from its current level.

The contribution of high relative fertility rates and migration means that Australia's population is growing at a rate well above most OECD countries. Over the period from 1999 to 2010, Australia had the 4th highest population growth rate among OECD countries, with higher growth rates than some less developed economies, such as Mexico and Turkey (OECD 2013). The average growth rate for Australia

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5   The Australian Bureau of Statistics discuss the measurement issues closely in a technical note on the 12/16 month rule methodology for calculating net overseas migration (released on 15th August 2012 and available from http://www.abs.gov.au/AUSSTATS).

(1.47 per cent growth per annum) was more than four times that for the 27 European Union countries (0.35 per cent per annum) and more than twice that of the OECD overall (0.68 per cent per annum). The persistence of NOM of 250 000 persons per year would underpin continued high growth rates of this order. Typically, advanced countries experience population growth slowdowns as their population numbers rise, and some reversion of Australian population growth rates to the average OECD rate might ultimately be expected.

**Figure 2.2    Measures of Australia's net overseas migration**[a]
1948 to 2017
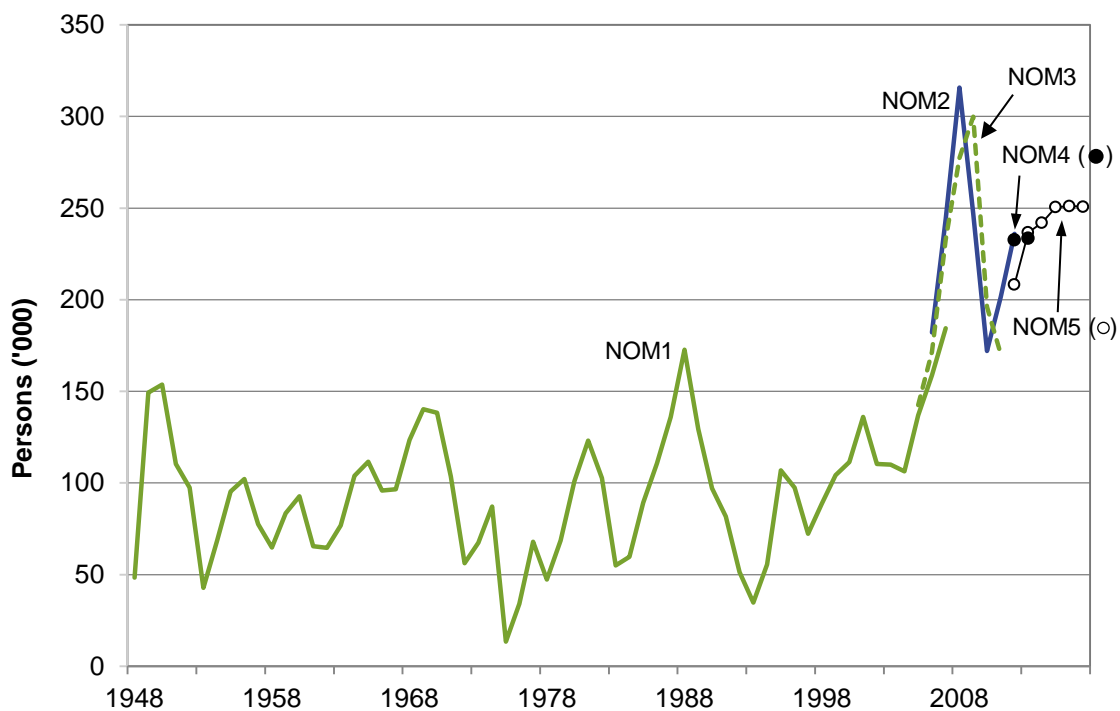


**a** NOM1 is based on the ABS historical calendar year series before the application of the 12/16 Rule (which means that a person can only contribute to the NOM if they have stayed in, or been absent from, Australia for a period of 12 months or more over a 16 month period). NOM2 is also a calendar year measure, but uses the 12/16 Rule. NOM3 uses the same method, but is on a fiscal year basis. NOM4 uses data and projection methods from the Department of Immigration and Citizenship (DIAC) on a calendar year basis. NOM5 is based on DIAC data, but on a fiscal year basis.

*Sources*: ABS 2008, *Australian Historical Population Statistics*, Cat. No. 3105.0.65.001, 5 August; ABS 2012, *Australian Demographic Statistics*, Cat. No. 3101.0, 15 August; DIAC (2013).

In this international and historical context, the base case projections in this report assume long-run NOM of 180 000 annually through to 2060, with a transition over five years from the estimated 236 700 value for the fiscal year 2012-13.[6] The assumption of a fixed level of net overseas migrants means that the ratio of NOM to the population will decrease significantly over the projection period. (The Commission's PCPOP model allows a user to set a fixed NOM-to-population ratio, but this is probably unrealistic over long periods, given its implications for population growth.) A level of NOM of 180 000 is still around double that of the period prior to the migration surge in the mid-2000s. It is also notable that in its 2008 demographic projections, the ABS projected a 'medium' value of NOM of 180 000 persons per year over its 95 year projection horizon.[7]

Nevertheless, there are particularly high levels of uncertainty about NOM, and the various population scenarios and stochastic projections discussed in section 2.5 reflect this. In its exploration of scenarios, the study considers alternative values of NOM of between 120 000 and 240 000 persons per year.

Levels of NOM much lower than 120 000 per annum are assumed to be unlikely, given that the greatest contributor to the change in long-term migrant intakes reflects an increasing emphasis on skill-based migrants (Phillips, Klapdor and Simon-Davies 2010) — a need that may well grow over time given labour force pressures (chapter 3). Moreover, given ageing pressures, a rapid reduction in net migration would initially accentuate population ageing (though in the long run, NOM cannot affect the population age structure to any great extent unless migration levels rise to unrealistically high levels). It is also notable that a move to much lower net migration levels would imply major shifts in the relative importance given to migration in successive governments' policies. For example, were net overseas migration to fall to 50 000 (less than 25 per cent of its current level), this study's projections show that the ratio of NOM to population would decrease from just under 1 per cent in 2012 to around 0.15 per cent by 2060. While governments could set such limits on migration, projection exercises of this type reasonably set boundaries on likely outcomes.

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[6] DIAC (Department of Immigration and Citizenship) 2013, *The Outlook for Net Overseas Migration*, March 2013, p. 3.

[7] Based on ABS (2008, *Population Projections, 2006 to 2101, Australia*, Cat. No. 3222.0). The ABS's 'B series' uses migration and fertility projections lying midway between its high population series (series A), and low population series (series C), and with a life expectancy less than the A series. The ABS characterises the A and C series as the outer boundaries of outcomes in the near future, given past trends. While the ABS does not characterise the B series as a forecast, many policymakers use it as the most likely outcome, and it is therefore a useful benchmark for this study.

## 2.3 The total and completed fertility rate

The total fertility rate is a synthetic measure of fertility convenient for demographic modelling, rather than a measure of an average woman's likelihood of giving birth over her lifetime. It is the average number of children that would be born to a woman over her reproductive life were she to experience the *current* age-specific fertility rates through her life, and were she to survive throughout her childbearing years (15 to 49 years being used by the ABS).[8] Given an assumption about the future total fertility rate, the age-specific fertility rates for women can be inferred by multiplying the total fertility rate by the age-share of the total rate.[9] Accordingly, most demographic models make assumptions about future total fertility rates, translate these into age-specific fertility rates, and with prior population estimates of women by age group, then estimate the number of births each year.

What is a sensible choice for fertility rates? The historical data shows that total fertility rates have fluctuated substantially, with a high of 3.56 at the peak of the postwar baby boom to 1.73 in 2001 (figure 2.3). However, trends and fluctuations in the total fertility rate can be misleading because variations in the age at which women bear children over their lifetimes create apparent peaks and troughs in total fertility rates, but may have much weaker effects on their lifetime realised fertility (their 'completed' fertility). The ABS and the first Australian Government Intergenerational Report gave too much prominence to the downward trend in the total fertility rate at the time of their studies, without taking into account that much of the reduction was a reflection of postponed childbearing, rather than a reduction in lifetime fertility (Lattimore and Pobke 2008b). As the cohort of women who had postponed their babies at earlier ages started to bear children in their older years, the total fertility rate recuperated.

It is therefore important to consider such tempo effects and other critical aspects of fertility, such as the number of women deciding never to have children, and changes in the distribution of so-called 'parities', which are the shares of women having one, two, three or more children (McDonald 2011).

Given current information and some extrapolation of age-specific fertility rates, it is estimated that women aged 15 years old in 2011 will bear around two children over

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[8]  In the rare cases where babies are born to younger or older women, they are allocated to either the 15 year or 49 year age brackets respectively.

[9]  Typically multiplied by 1000 to express the value as live births per 1000 women of a given age.

their lifetimes (the so-called 'completed fertility rate').[10] This is a little more than the current total fertility rate, and much more than would have been inferred from the trends around the 2000s. The completed fertility rate appears to have been relatively stable in the last few decades years (averaging 1.98 from 1985 to 2011, with a maximum of 2.01 and a minimum of 1.96). Prima facie, this suggests that the completed fertility rate may well continue to hover around two in the future. And because the total fertility rate converges on the completed fertility rate, this suggests that it would be reasonable to set a base case assumption of two for the total fertility rate.

**Figure 2.3**    **Completed and total fertility rates**[a]

1921 to 2050
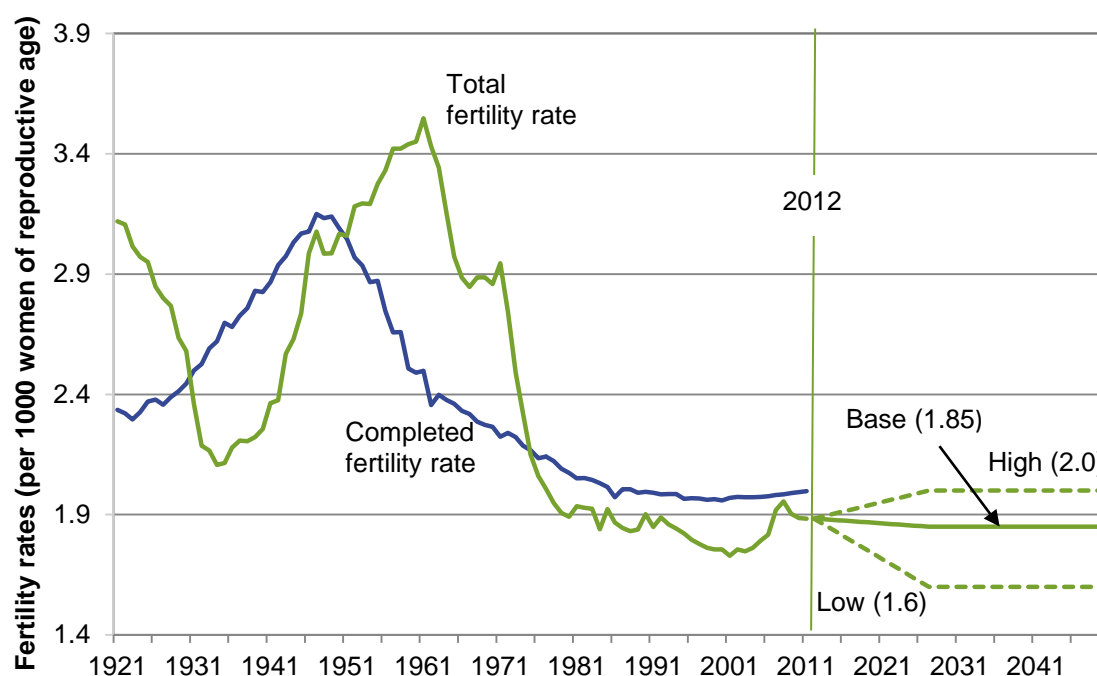


**a** The completed fertility rate (CFR) at a given time, t, is the average number of children that a woman aged 15 at time t, will have over her reproductive life (to age 49 years). Accordingly, the CFR shown in 1921 is the average lifetime number of children born to women aged 15 years in 1921 (and therefore requires information on age-specific fertility rates until 1955). As there is incomplete data for women aged 15 or more years from 1978, the missing age-specific fertility rates were estimated using various extrapolative methods. This enabled the estimation of CFRs up until 2011. Accordingly, the CFR for recent years should be seen as an estimate.

*Source*s: ABS 2008, *Australian Historical Population Statistics*, Cat. No. 3105.0.65.001, 5 August; ABS 2012, *Births, Australia, 2011*, Cat. No. 3301.0, table 11.1, 25 October; and PCPOP.

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[10] The current completed fertility rate cannot be observed because many women of reproductive age will have their babies sometime in the future. However, it is possible to infer the completed fertility rate by extrapolating age-specific fertility rates.

However, there is also contrary evidence and judgments that long-term total fertility rates might be lower for Australia. For example, a global model of the total fertility rate using sophisticated statistical methods suggests Australia would have a long-run rate of 1.7 (Alkema et al. 2011, p. 833). The Treasury fertility assumption for the 2013-14 Budget is that the total fertility rate would fall from its current rate of close to 1.9 to 1.85 over the long run.[11]

A major problem in extrapolation in all these cases is an underlying assumption that the factors that drive fertility decisions remain much the same. However, that may not be the case.

Australia has enjoyed remarkably buoyant economic times in the last two decades, with low unemployment, high income growth and shared prosperity (Greenville, Pobke and Rogers 2013). Good economic times appear to encourage childbearing (Lattimore and Pobke 2008b). However, recently the terms of trade have been declining, while multifactor productivity growth rates have been low (chapter 4). This raises the risk that growth rates of real net national disposable income will be less than their recent high historical levels. Governments will face growing budget pressures associated with age-related social responsibilities, requiring higher taxes, cuts in other spending or both (chapter 5). Lower disposable income or reductions in publicly-funded social supports for families may then reduce prospective fertility rates. Moreover, to the extent that additional revenue requirements are raised through taxes on labour income, this provides a disincentive for labour force involvement by women — further affecting incomes.

Of course, these trends may be countered by other factors, such as medical advances allowing higher rates of successful reproduction and, to a less certain degree, greater gender equality.[12] Moreover, higher female labour force participation rates also appear to raise fertility rates (Luci and Thevenon 2010). Most projections suggest that female rates will continue to climb in Australia (chapter 3).

Against this messy background, there is no straightforward statistical answer to the likely total fertility rate. It seems unlikely that it will increase much above two unless social norms change, and so this study uses this as the upper case for its scenarios. A long-run total fertility rate of 1.85 is used as the base case estimate — consistent with the broad assessment by Lattimore and Pobke (2008b, p. xv) that

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[11] Australian Government (2013a).

[12] The paper by Miettinen (2011) summarises the contemporary, sometimes opposing, findings on the impacts of gender equality on fertility rates and intentions.

total fertility rates, which were once well below 1.8, are likely to stabilise between 1.75 and 1.9.[13]

While the total fertility rate has never fallen below 1.7 in Australia, it has done so in many other countries — and is currently 1.2 in Singapore, 1.4 in Germany, Austria, Greece, Portugal, Italy and Spain, 1.5 in Switzerland and 1.6 in Canada (World Bank 2012). The circumstances that have led to very low rates in some of these countries — especially those in Southern Europe — may reflect social attitudes that are not present in Australia (McDonald 2013). Nevertheless, Canada shares many social and economic similarities with Australia, so that a value as low as 1.6 seems a credible possibility.

Translating an estimate of the total fertility rate into age-specific fertility rates requires estimates of age-shares of the total rate. In PCPOP, these are largely based on the current age shares, although they take account of the fact that, empirically, changes in the total fertility rate are accompanied by small changes in the age shares (with lower total fertility rates associated with decreasing age shares for younger women and increasing age shares for older women). This study assumes that there is a 15 year transition to the long-run total fertility rate — reflecting the typically slow adjustment of fertility — (though the PCPOP model also allows users to choose different transition periods).

## 2.4 Mortality rates and life expectancy

As in other developed economies, Australians have experienced rapid reductions in their age-specific mortality rates over the past century and, accordingly, an increase in life expectancy. This is a key driver of population ageing. Many of the early increases in life expectancy reflected lower infant mortality rates and, indeed, mortality rates among males aged 60 years or more hardly fell from 1921 to 1971 (figure 2.4).

However, in the subsequent 40 years, the largest reductions in mortality have occurred among the old for both genders. As fertility rates fall (as discussed above), the effect on the population age structure of increased survival rates among the aged becomes more prominent.

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[13] The ABS used an estimate of 1.8 in its 2008 series B population estimates.

## Figure 2.4  **Indexes of male mortality rates, 1921 to 2011**

Relative to the 1921 mortality rate for each age and gender[a]
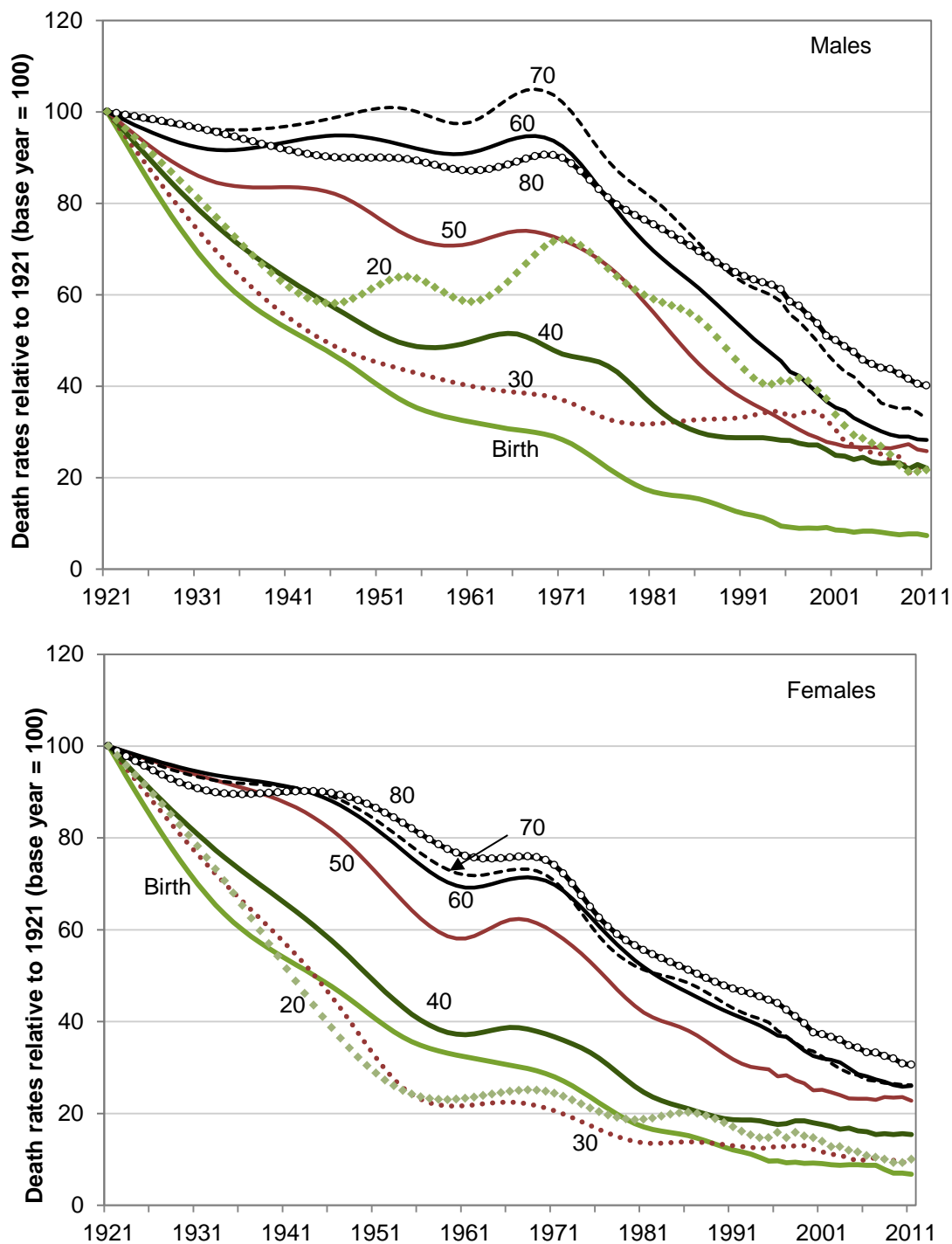


**a** For a given year, sex and age, the index I(x,s,t) = 100 Q(x,s,t)/Q(x,s,1921), where Q and other variables are as defined in box 2.1 The graphs shows how each age group's mortality rates fall over time (relative to 1921), but not the relative risk of dying between age groups. Data for any time t reflect the average of life table data from t-1 to t+1.

*Sources*: ABS 2008, *Australian Historical Population Statistics*, Cat. No. 3105.0.65.001; and ABS (various issues), *Life Tables, States, Territories and Australia*, Cat. No. 3302055001DO001. Some missing data have been interpolated by the PC.

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Box 2.1    **A small note on dying**

There are multiple ways of measuring death, and knowing how they differ is important in understanding their implications.

- The *crude death rate* is the number of people actually dying in a given year per 1000 of the population. The crude death rate can rise or fall even if age-specific death rates are fixed, and so does not provide information about the extent to which mortality patterns might change the long-run age structure of the population. However, changes in the crude death rate (and the associated number of people dying) are a useful indicator of the potential significance of health care costs associated with the preceding months to death.

- The *age specific central death rate* is the number of people dying at age x in a year divided by the mid-year population of that age.

- The *standardised death rate* is the number of deaths per capita that controls for the effect on the crude death rate of the changing age structure of males and females. It is measured by holding the age structure of a population constant and then calculating the crude death rate that would result given the observed age-specific death rates.

- q(x) is the proportion of people dying between *exact* ages x to x+1. For example, for a 50 year old this would be the likelihood that a person turning 50 on a given date will be die before their next birthday.

- Q(x,t) is the probability of a person whose age is x dying over the next year, regardless of how long has elapsed since their birthday. The relevant age is not exact age (as in a standard life table), but rather age at last birthday (that is, someone whose age, A, is in the interval x ≤ A < x +1). The advantage of Qx (which can be derived from a life table) is that it can be applied directly to the population of people aged x at the end of a given year to estimate survivors by the end of the next year. In this chapter, mortality trends are estimated directly using these death probabilities, rather than central death rates. The ABS Life tables derive death rates and probabilities by averaging results over a three year period. Accordingly, Q(x) for 2010 relates to data for 2009 to 2011.

*Sources*: PC (2005); ABS 2012, *Life Tables, States, Territories and Australia, 2009-2011*, Cat. No. 3302.0.55.001; and Rowland (2003).

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The effect of this transformation is that, while the aged are much more likely to die in a particular year than are younger people, the number of people in a given older age group who will die over the coming year has fallen dramatically (table 2.1). For example, of any 1000 men aged 80 years at June 1981, on average over 100 would die before June 1982. In 2011, the comparable number of deaths would be 56.

Even without any future mortality reductions, Australia's population age structure will grow older, simply as younger cohorts benefit from lower than historical death rates as they age (table 2.2).

Table 2.1    **The numbers of old people who survive another year has grown dramatically**

Likely deaths per 1000 people of a given age over the next year[a]

|  | Males | | Females | |
|---|---|---|---|---|
|  | *1981* | *2011* | *1981* | *2011* |
| At age 0 | 2.2 | 1.1 | 1.8 | 0.8 |
| At age 20 | 1.7 | 0.6 | 0.5 | 0.3 |
| At age 40 | 2.3 | 1.4 | 1.3 | 0.8 |
| At age 60 | 17.5 | 7.1 | 8.5 | 4.2 |
| At age 80 | 104.6 | 55.7 | 65.4 | 35.9 |
| At age 100+ | 410.7 | 365.6 | 422.6 | 343.5 |

**a** The death probabilities are defined as 1000* Q(x,s,t) (box 2.2). The data for 1981 relate to the average of life table information from 1980 to 1982. Similarly, the 2011 data relate to the period from 2010 to 2012.

*Source*: As in figure 2.4.


Table 2.2    **The population shares of older Australians if are no further mortality reductions from 2012**

2012 to 2100[a]

| Shares of population by age group | *2012* | *2020* | *2030* | *2040* | *2050* | *2060* | *2100* |
|---|---|---|---|---|---|---|---|
| 65+ share (%) | 14.2 | 16.2 | 18.5 | 19.7 | 20.3 | 21.1 | 22.0 |
| 75+ share (%) | 6.3 | 7.1 | 8.8 | 10.1 | 10.5 | 10.8 | 11.7 |
| 85+ share (%) | 1.9 | 2.0 | 2.4 | 3.1 | 3.4 | 3.5 | 3.9 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ yrs (ratio) | 2.0 | 1.8 | 1.7 | 1.7 | 1.6 | 1.6 | 1.6 |

**a** The results reflect the base case assumptions for future net overseas migration and the total fertility rate, but without any improvement in mortality rates.

*Source*: PCPOP model.

However, future reductions in mortality rates are also likely. The Commission has estimated death rates based on a widely used statistical technique (the Lee-Carter method, discussed in appendix A) that draws on historical trends over the last 30 years. It is estimated that by the end of 2059-60:

- the (period) life expectancy of males will be 89.1 years, compared with around 80.3 years at the end of 2012. (Period life expectancies — as discussed later — assume no reductions in the future age-specific mortality rates of a person as they age, but are still useful for modelling purposes.)

- the life expectancy of females will be 91.4 years, compared with around 84.6 years at the end of 2012.[14]

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[14] In its B series estimates, the ABS assumes life expectancies of 85 and 88 years in 2056 for males and females respectively. The PCPOP estimates for the same year are 88.6 and 90.9 years for males and females respectively. Note that these are 'period' life expectancies from life tables, and are not the number of years a person born in 2059-60 can expect to live.

It is apparent from figure 2.4 that advances in life expectancy have sometimes been erratic. This reflects the many factors that can affect mortality — such as food and water quality, sanitation and housing (all particularly important during the early 20th century); the use of antibiotics and mass immunisation (important from the 1940s); new medications for blood pressure, reduced smoking, a greater capacity for surgical interventions and lower injury rates (more important from the 1980s).[15] The source of future reductions is uncertain, but is likely to stem from lower tobacco use and continuing advances in medical diagnosis and intervention. However, other factors may reduce the growth in life expectancy (and, in extreme circumstances, actually decrease it) such as:

- the increase in antibiotic resistant bacteria (and the few new antibacterial medications in the pharmaceutical pipeline)

- growing obesity — with its links to type 2 diabetes and other diseases. The full effects of growing obesity among the young take some time to emerge in the mortality statistics for older people. Failure to take account of this delay may lead to overly optimistic projections of mortality declines. The initial evidence is that younger cohorts may not experience the same degree of life expectancy gains as apparent for previous generations (Gutterman 2012).[16] Growing obesity also appears to increase health costs (chapter 5).

- the risk of global pandemics.

Nevertheless, previous predictions of a slowdown in life expectancy gains have proved wrong. The unreliability of the numbers was first emphasised by the ABS in its population projections for 1981 to 2021:

> With hindsight, mortality projections have proven to be as unreliable as any of the other components of population change. For instance, population projections in the mid 1950s assumed rather significant declines in mortality for the 1960s which did not eventuate, whilst population projections of the early 1970s which assumed constant levels of mortality were invalidated by the sustained rapid decline in mortality in the past 10 years.[17]

In fact, that publication forecast a life expectancy for males of 73.42 years by 2021, whereas the life expectancy in 2010 was already 6.3 years greater than this. Typically, with revisions to historical mortality trends, projected life expectancies

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[15] For example, ABS (2012e, pp. 253–4); Cutler and Meara (2001); and Willets et al. (2004).

[16] For instance, Walls et al. (2012); Montez and Zajacova (2013); and Olshansky et al.(2005).

[17] This report ushered in the more sophisticated analysis of Australia's future populations (ABS, 1982, *Projections of the Population of* Australia, *1981 to 2021*, 29 November, Cat. No. 3204.0, 30 November).

have tended to grow significantly, though what will actually occur has yet to be observed (table 2.3).

Table 2.3    **Revisions to projected life expectancy at birth for males**
             Males[a]

|  | | | | *Projection year* | | |
| Publication | 1986 | 2021 | 2031 | 2041 | 2051 | 2101 |
|---|---|---|---|---|---|---|
| ABS 1981 to 2021 | 72.25 | 73.42 | .. | .. | .. | .. |
| ABS 1984 to 2021 | .. | 73.50 | 73.50 | 73.50 | 73.50 | 73.50 |
| ABS 1987 to 2031 | .. | 76.40 | 77.00 | .. | .. | .. |
| ABS 1989 to 2031 | .. | .. | 78.90 | .. | .. | .. |
| ABS 1993 to 2041 | .. | .. | 78.85 | 79.60 | .. | .. |
| ABS 1995–2051 | .. | 78.70 | .. | .. | 81.10 | .. |
| ABS 1997 to 2051 | .. | .. | .. | 81.14 | 81.97 | .. |
| ABS 1999 to 2101 | .. | .. | .. | .. | 83.30 | 83.30 |
| ABS 2002 to 2101 | .. | .. | .. | .. | 84.20 | 84.20 |
| ABS 2004 to 2101 | .. | .. | .. | .. | 84.90 | 84.90 |
| ABS 2006 to 2101 | .. | .. | .. | .. | .. | 85.00 |
| Booth & Tickle | .. | .. | .. | .. | 88.00 | .. |
| This study | .. | 82.16 | 84.29 | 86.15 | 87.77 | 92.74 |

**a**    For comparison, the period life expectancy for males in 2010 was 79.7 years. A similar, albeit less extreme, set of amendments to life expectancies occurred for females.

*Sources*: Based on various ABS issues of *Projections of the Population of Australia*; projections produced by Booth and Tickle for the PC (2005d) study into ageing.


## 'Period' versus 'cohort' life expectancy

The usually quoted 'period' life expectancy is a synthetic measure of longevity (akin to that of fertility given by the total fertility rate). It measures the longevity of a person at birth were that person to experience the *current* age-specific survival rates as they grew older.

Period life expectancies are useful constructs for making demographic projections, and are those most commonly reported by the media. However, they can be seriously misleading for actuarial and policy purposes. In particular, pension and labour market policies need to take into account how long existing cohorts will live. Life expectancies that take into account the expected survival rates for each year of a person's life — so-called cohort life expectancies — are the appropriate measure in this case.

In general, cohort life expectancies exceed period life expectancies because, historically, mortality rates have usually fallen over time. Accordingly, for a current 0 year old, the likelihood of surviving to 100 needs to take into account shifts in the survival probabilities for all ages 1 to 100 over the next 100 years (their cohort life

expectancy). Since those survival rates are likely to improve, the (expected) cohort life expectancy exceeds the period life expectancy (figure 2.5).

Figure 2.5     **Life expectancy**[a]
             1921 to 2060
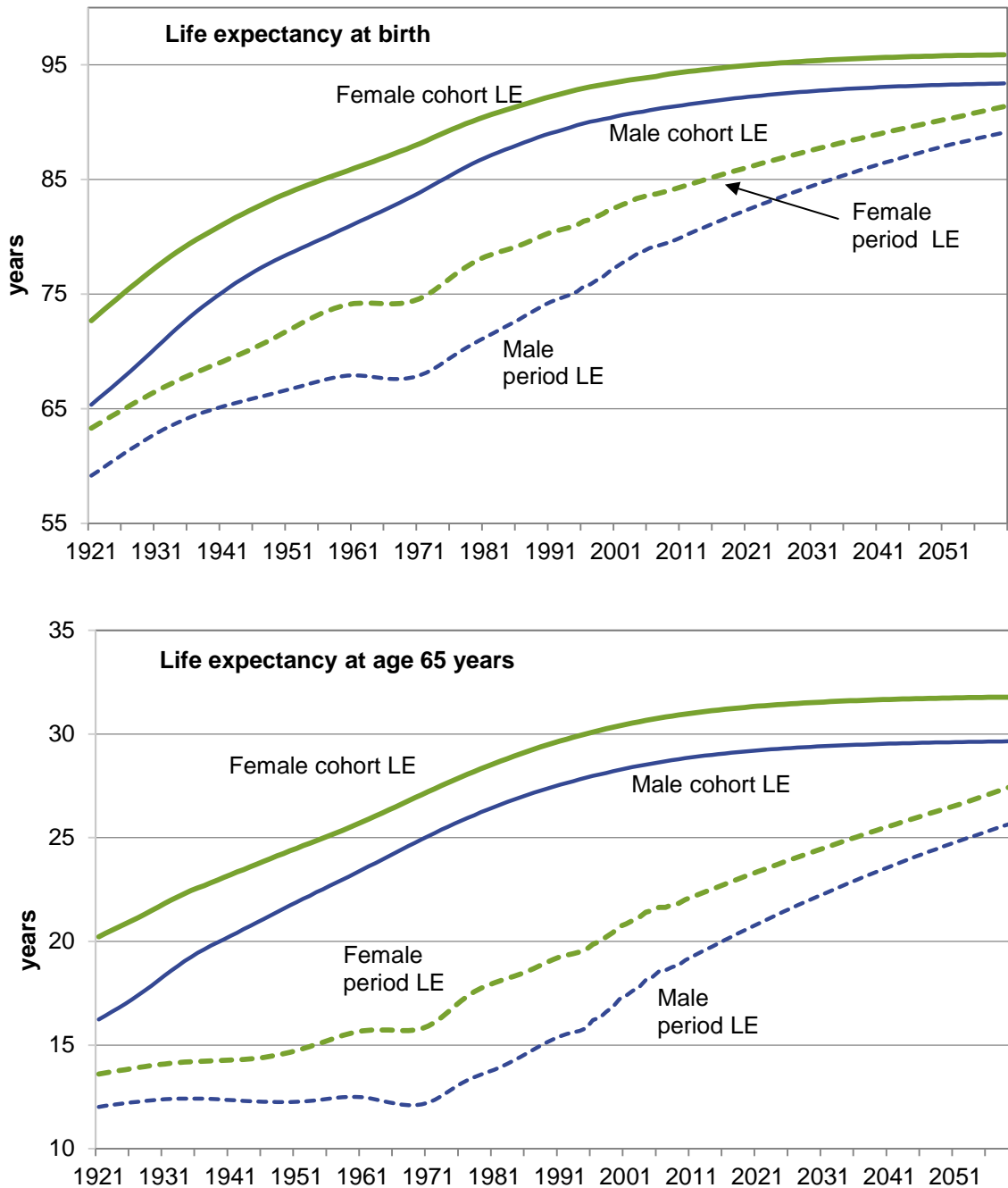


**a** Cohort life expectancies require projections until 100 years after the year of birth of each cohort, and this is true for period life expectancies after 2010.

*Source*: Using PCPOP and the data sources cited in figure 2.4.

To illustrate, in 1921 the probability of a person aged 99 years dying over the next year was around 46 per cent. The period life expectancy from birth of a person born in 1921 would assume that this death probability would apply when that person reached 99 years. However, the projected likelihood of dying when a person born in 1921 reaches 99 years is 27.5 per cent (in 2020) — a rather more rosy prospect. Given that this overstatement occurs for each year of the life of the 1921 birth cohort, the effect on life expectancy can be large. The period life expectancy for a male born in 1921 was 59.1 years, but the actual likely life expectancy of a person born at that time is 65.3 years.

This study forecasts that a girl born in 2012 will live for around 94.4 years (and 91.6 years for a boy). This is much more than the corresponding period life expectancies of 84.6 and 80.3 years for females and males in 2012.

Cohort life expectancies are particularly useful in considering the length of people's customary retirement periods. Using current period life expectancies, it might appear that a person born in 2012 could expect to live for 19 more years after they reach 65 years old. In fact, it is projected that they will live for around 29 years after that age. This raises issues about optimal retirement ages, provision for publicly-funded pensions and rules about access to superannuation savings — an issue explored in more detail in chapter 6.

## 2.5    The projections

### Australia's population will inevitably be much larger by 2060

Australia's population is projected to increase to around 38 million by 2059-60, or about 15.5 million more than the population at the end of 2011-12 (figure 2.6). However, population growth rates fall significantly over time, halving from around 1.7 per cent in 2011-12 to less than 0.8 per cent in 2059-60.

Significant population growth is inescapable, even with substantial changes to fertility rates and net overseas migration (table 2.4). While proportional changes in net overseas migration have a lower impact on the population estimates than comparable changes in fertility rates, migration is more readily amenable to policy decisions. However, even low net migration levels of 120 000 (around half the current levels) would result in a population increase of 12 million by 2059-60. Accordingly, quite aside from the issue of an ageing population, Australia will have

to ensure that its economic, social and environmental policy settings recognise the substantial and unavoidable growth in its population.[18]

Figure 2.6　**Australia's population numbers and growth**[a]
　　　　　2011-12 to 2059-60
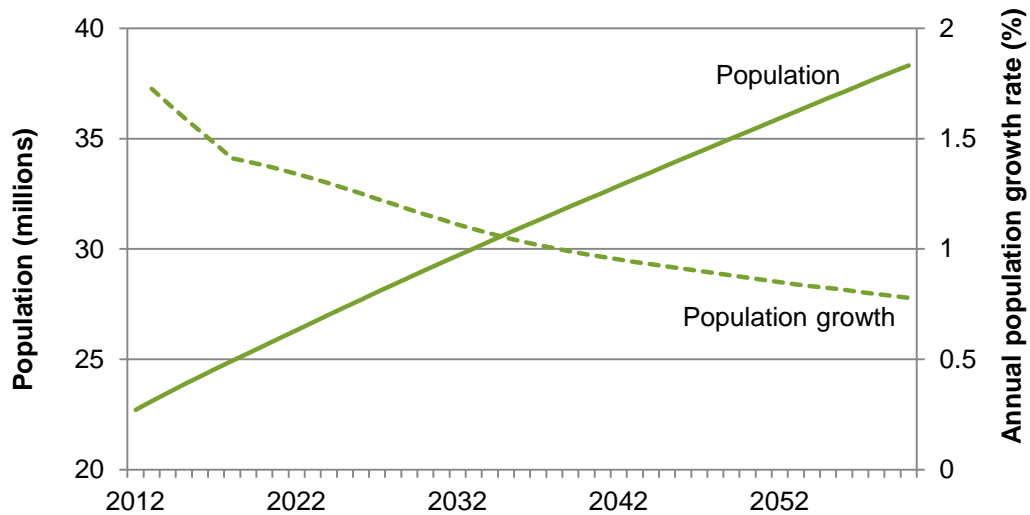


**a** Based on the base case described above. The 2008 demographic projections from the ABS estimated a population of 36.4 million be end June 2060 — or about 14 million greater than the 2012 figure.

*Sources*: Commission estimates shown in PCPOP and ABS 2008, *Population* Projections, *2006 to 2101*, Australia, Cat. No. 3222.0.

As an example of these challenges, all of Australia's major cities will grow (figure 2.7). Australia's eight capital cities accounted for just over 60 per cent of Australia's total population in 2012, with this share likely to rise. Future population growth will occur at a somewhat higher rate in capital cities than in other areas of Australia.[19] The Commission's projections suggest that between 2012 and 2060, Sydney's population will grow by about 2.9 million (up 63 per cent), Melbourne by 3.2 million (up 78 per cent), Brisbane by 2.3 million (up 110 per cent) and Perth by 1.9 million (up 110 per cent). Overall, the total population in Australia's capital cities is projected to increase by more than 75 per cent over this projection period, and around 50 per cent in the rest of Australia.

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[18] Even with zero net overseas migration, the Australian population would rise by around 4 million from 2012 to 2060.

[19] As suggested by the ABS's regional projections in its 2008 demographic series (*Population Projections, 2006 to 2101, Australia*, Cat. No. 3222.0). Other data also suggests that growth in capital and regional cities significantly exceeds that of non-metropolitan areas (ABS 2013, *Regional Population Growth, Australia, 2011-12*, Cat. No. 3218.0, 30th April). Treasury has estimated similar numbers (Henry 2009, p. 7).

Table 2.4     **Different population scenarios, end June 2012–2060**

| *Scenarios* | *2012* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| | Population (million) | | | | | |
| **Base case** (NOM =180 000 and TFR = 1.85, life expectancy of males 89.1 and females 91.4 years | 22.7 | 25.6 | 29.0 | 32.2 | 35.3 | 38.3 |
| **Net overseas migration (number)** | | | | | | |
| 240 000 | 22.7 | 25.9 | 30.1 | 34.2 | 38.2 | 42.2 |
| 120 000 | 22.7 | 25.3 | 28.0 | 30.3 | 32.4 | 34.4 |
| **Total fertility rate** | | | | | | |
| 2.0 | 22.7 | 25.7 | 29.3 | 32.8 | 36.3 | 39.8 |
| 1.6 | 22.7 | 25.5 | 28.6 | 31.3 | 33.8 | 36.0 |
| **Life expectancy** | | | | | | |
| Females = 88 years, males = 85.6 years by 2060 | 22.7 | 25.6 | 28.9 | 31.8 | 34.5 | 37.3 |
| Females = 95 years, males = 92.6 years by 2060 | 22.7 | 25.7 | 29.2 | 32.6 | 36.0 | 39.3 |

*Source*: Results are based on PCPOP. TFR is the total fertility rate while NOM is net overseas migration.

Figure 2.7     **Australia's two biggest cities may exceed 7 million**

Projected city populations, end June 2012 and 2060[a]
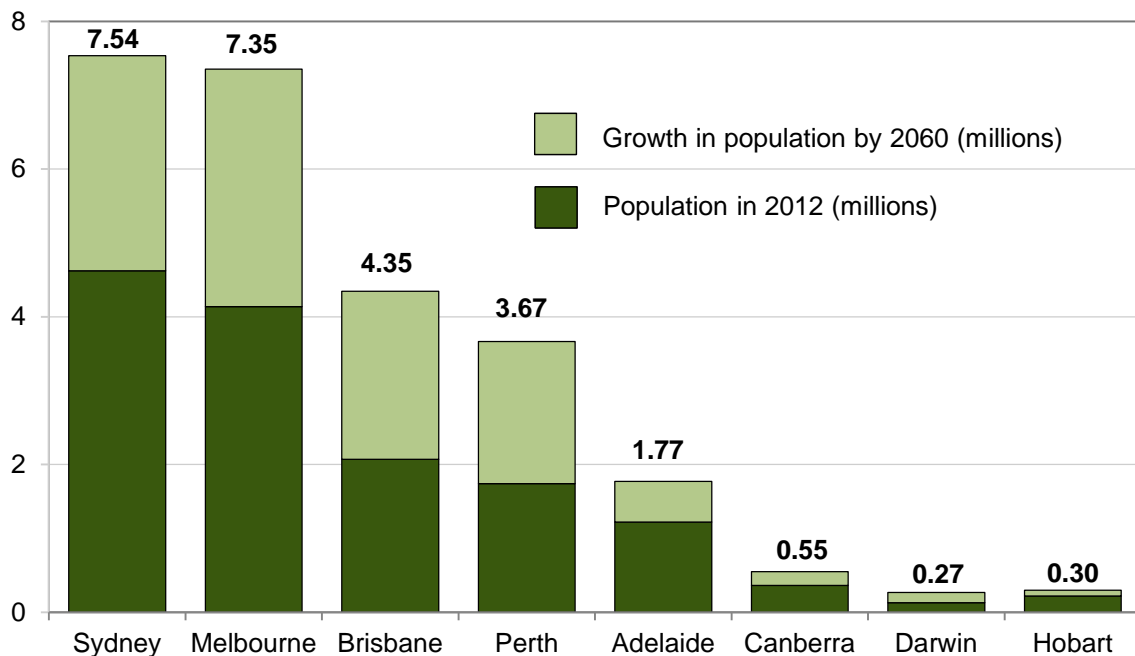


**a** The shares of Australia's total population accounted for by capital cities from 2012 to 2057 were calculated from the 2008 ABS B series projections. These shares were then extrapolated using past trends to estimate shares up to 2060. These shares were then applied to the Commission's Australia-wide population projections to derive population estimates at the capital city level.

*Sources*: Commission estimates; PCPOP, ABS 2008, *Population Projections, 2006 to 2101, Australia*, Cat. No. 3222.0.

Significant investment in transport and other infrastructure will be required in these rapidly expanding cities — and for the links between regional and major cities. Zoning regulations may need to change, as may the financing arrangements for large public good infrastructure projects. Planning for such projects would need to occur well ahead of the actual increases in population given their long lead times. New solutions will probably be required to address growing urban congestion — such as congestion pricing and intelligent transport systems. Many of the critical parts of infrastructure to serve growing populations — most notably water and electricity networks — are natural monopolies subject to regulatory oversight. It would be critical that those regulations neither stymies nor over-encourages investment. (The historical experiences in electricity networks, where premature investment seems to have occurred, provides a salutary lesson — PC (2013b)). Inefficiencies in any of the above policy areas will impose large costs on Australians.

## Ageing

The statistics indicate that Australia is likely to move into a demographic environment entirely unfamiliar to us. The profound shift in the age structure of Australia's population over the coming decades will reveal itself in many ways:

- The proportion of the population aged 65 years or more is projected to increase from around one in seven Australians in 2012 to one in four Australians by 2060 to close to 1 in 3.5 at the turn of the next century (table 2.5). This is important because people in this age bracket have relatively low labour force participation rates (chapter 3) and rely on either their own savings or government transfers to fund their retirement.

- The oldest old are projected to grow more rapidly than the 'young' old (figures 2.8 and 2.9). The number of those aged over 75 years is projected to increase by about 4 million between 2012 and 2060 — an increase roughly equivalent to the current population of Sydney. This is particularly important because people in older age brackets tend to be major users of government services — such as health care, aged care (by definition), and public housing (AIHW 2012d; McNelis 2007 and chapter 5). The 'waves' in figure 2.9 reflect the impacts of baby booms and droughts, and variations in mortality rates over time.

- One of the most telling statistics relates the oldest to the youngest. In 2012, there was roughly one person aged 100 years or more to every 100 children aged less than 1 year old. By 2060, the ratio is projected to be 25 to 100 and, with continued small increases in longevity, in the year 2100, there will be more centenarians than babies.

- The age structure of the Australian population was roughly a pyramid in 1950, but has gradually thickened in the middle and will, over the next 50 to 100 years, approach the more uniformly distributed shape typical of highly aged societies (figure 2.10).

- This study calculates that the median age (the age at which exactly half the population are above that age) will change from 33.7 years in 2012 to 42.2 by 2060 and 46 years by 2100. (To provide a longer-term perspective — the median age was around 32 in 1990.)

- The political influence of older Australians will increase. In 2012, people aged over 50 years accounted for almost 41 per cent of voters, but by 2060, is projected to account for just over 51 per cent, and by 2100 around 55 per cent. That is no bad thing in itself, but reforms of any kinds have winners and losers. It might be expected that older Australians will be strongly and justifiably aware of policy settings — such as those relating to pension eligibility ages and aged care funding — that might advantage or disadvantage themselves relative to other segments of the community. While many older people's political beliefs will reflect the broad public interest, it may be that over time there will be greater political resistance to policies that shift any funding responsibilities for age-related social transfers from younger to older people. Given this, there could be an argument to pursue reforms gradually and soon, rather than through crisis-led deferred policy initiatives that create sudden losers.

Table 2.5    **The population shares of the very old will rise dramatically**
2012 to 2100

| Age group (years) | 2012 | 2020 | 2030 | 2040 | 2050 | 2060 | 2100 |
|---|---|---|---|---|---|---|---|
| | Population shares (%) | | | | | | |
| 0-14 | 18.9 | 18.9 | 18.2 | 17.1 | 16.7 | 16.5 | 15.4 |
| 15-49 | 48.8 | 46.8 | 45.3 | 43.7 | 42.5 | 41.7 | 39.2 |
| 50-64 | 18.1 | 17.9 | 17.1 | 17.6 | 17.5 | 16.8 | 16.5 |
| 65-74 | 7.8 | 9.2 | 9.8 | 9.8 | 10.0 | 10.5 | 10.2 |
| **75-84** | 4.5 | 5.1 | 6.8 | 7.8 | 8.1 | 8.5 | 9.4 |
| **85+** | 1.9 | 2.1 | 2.7 | 4.0 | 5.1 | 5.9 | 9.3 |
| **100+** | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 1.3 |
| **65+** | 14.2 | 16.4 | 19.4 | 21.6 | 23.2 | 25.0 | 28.9 |

*Source*: Based on PCPOP.

**Figure 2.8    Growth in the aged far outstrips that of younger people**

2012 to 2060**a**

| The change in population numbers by age group | The percentage increase in population numbers by age group |
|---|---|
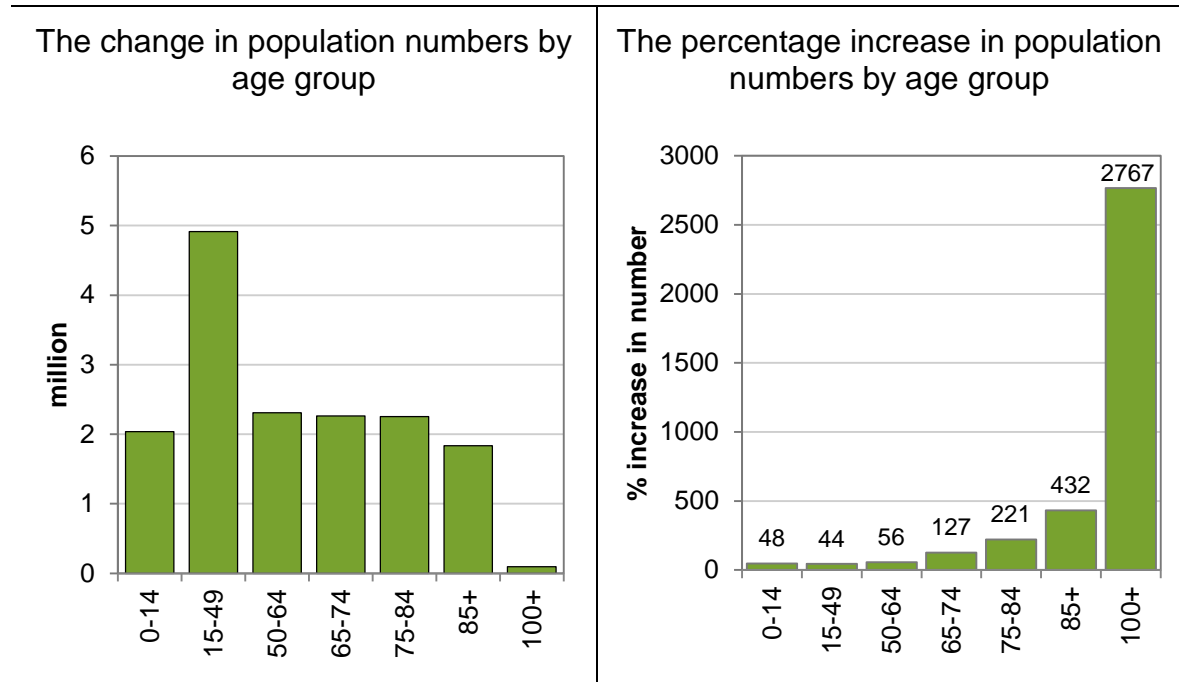


**a** 85+ and 100+ are both open-ended age intervals that relate to all people aged 85 years or more and 100 years or more respectively. The 85+ group accordingly also includes the 100+ group.

*Source*: Based on PCPOP.

**Figure 2.9    Population growth rates for the oldest old will start to soar in one decade**

Population growth rates for different age groups, 2013–2100
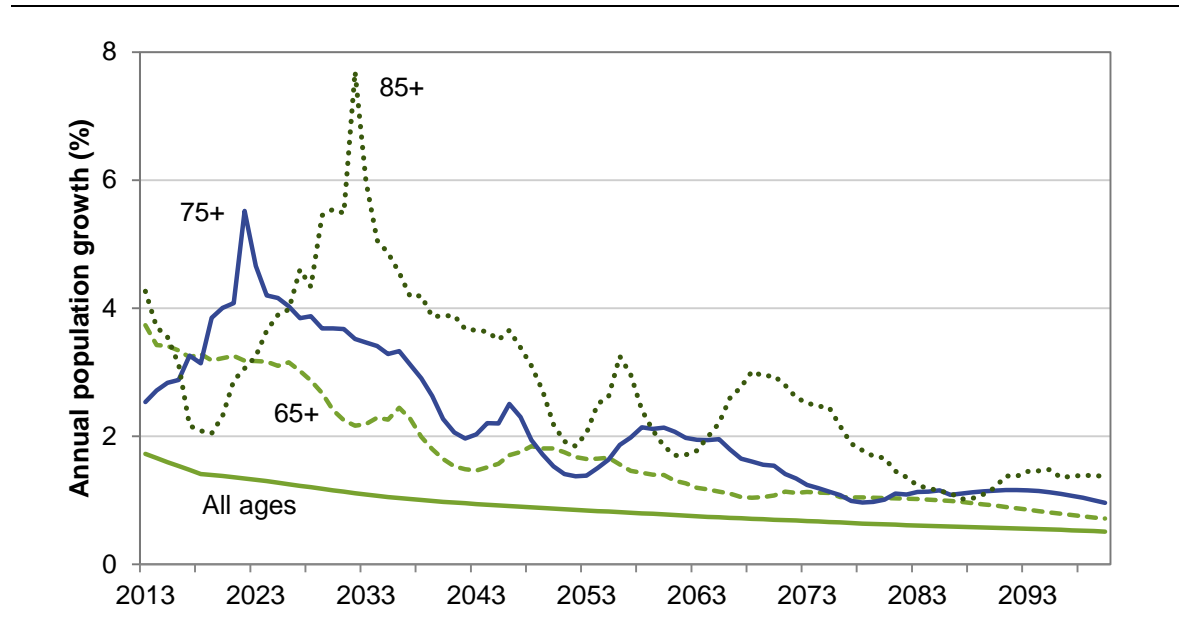


*Source*: PCPOP.

### Figure 2.10 **The population age structure**

Percentage of population by single year of age (excluding 100+)
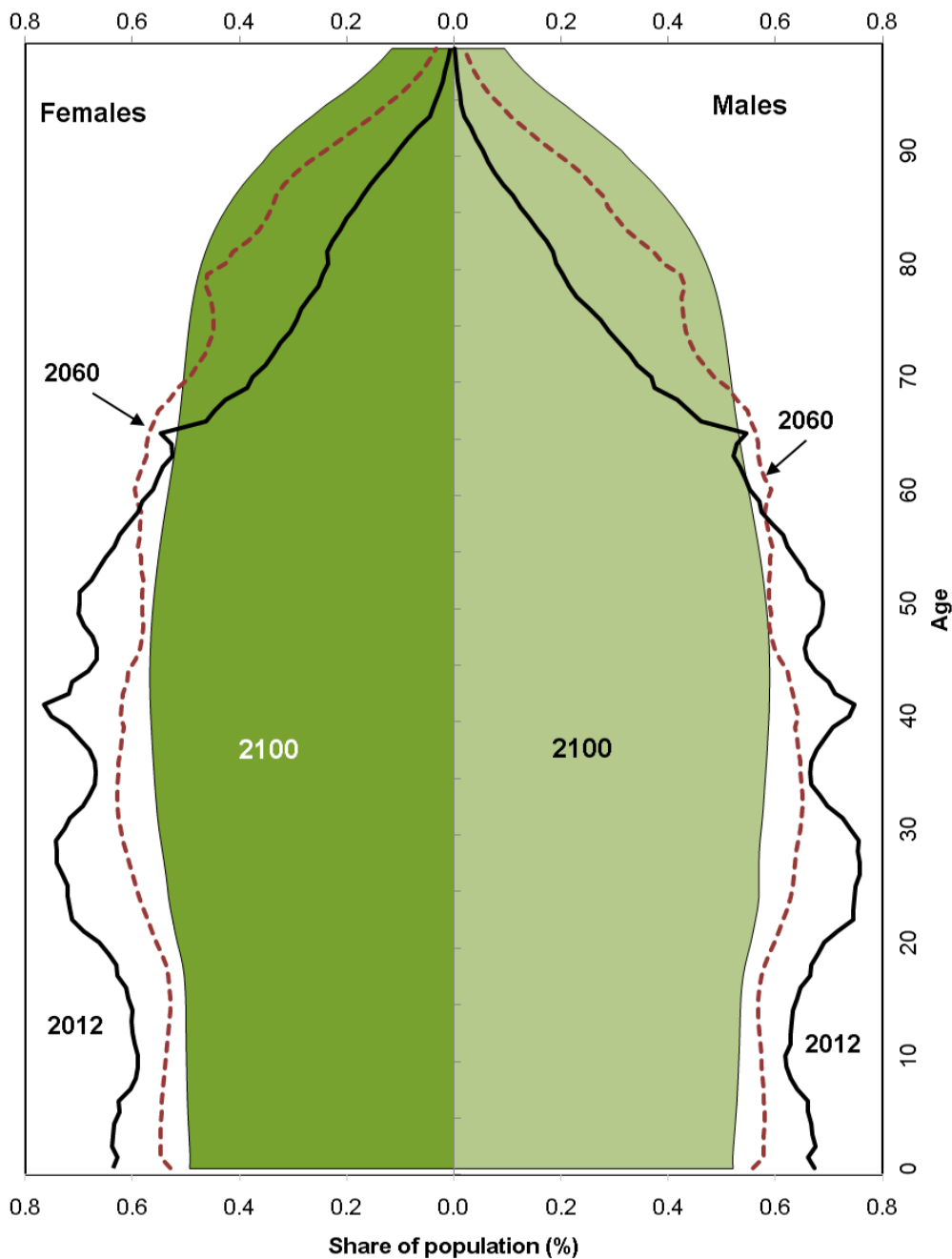


*Sources*: PC (2005d); ABS 2013, *Australian Demographic Statistics*, Table 59, Estimated Resident Population By Single Year Of Age, Australia, Cat. No. 3101.0, 20th June; and PCPOP.

An associated aspect of ageing is that the crude death rate will increase significantly in Australia from around 6.5 per 1000 in the population in 2012 to a projected 8 per 1000 by 2060 and about 9 by 2100. This is in stark contrast to the long-term historical decline in crude death rates (figure 2.11). Given the significant health costs associated with the last few years of life, the increased crude death rate will translate to large health care costs (as discussed in chapter 5).

Figure 2.11     **The crude death rate will rise after 2022**
1901 to 2100
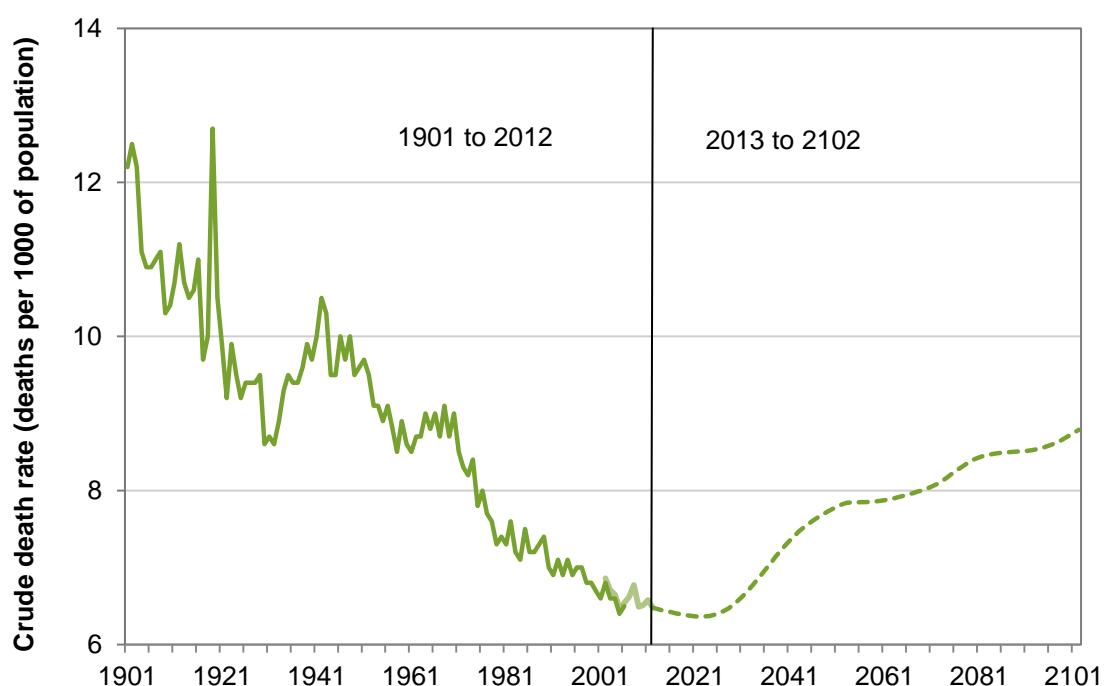
## Sensitivity of the results

Substantial ageing will occur for any realistic contingencies in mortality, net overseas migration and fertility (table 2.6). Greater life expectancy and lower net overseas migration have the largest effect on the relative importance of the oldest old (the 85+ year group). Under the most extreme case where 'high' life expectancy, 'low' fertility and 'low' net overseas migration coincide (not shown in table 2.6), the share of 85+ year olds in Australia would be 8.8 per cent in 2060 and 14.8 per cent in 2100 — an enormous shift in Australia's age structure compared to the present.

Table 2.6 **Impacts of different scenarios on the age distribution**
2012 to 2100

| Scenario | 2012 | 2020 | 2030 | 2040 | 2050 | 2060 | 2100 |
|---|---|---|---|---|---|---|---|
| | | | | *Base case* | | | |
| 65-74 share (%) | 7.8 | 9.2 | 9.8 | 9.8 | 10.0 | 10.5 | 10.2 |
| 75-84 share (%) | 4.5 | 5.1 | 6.8 | 7.8 | 8.1 | 8.5 | 9.4 |
| 85+ share (%) | 1.9 | 2.1 | 2.7 | 4.0 | 5.1 | 5.9 | 9.3 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 |
| | | | *High migration (NOM = 240,000)* | | | | |
| 65-74 share (%) | 7.8 | 9.1 | 9.5 | 9.4 | 9.6 | 10.2 | 10.2 |
| 75-84 share (%) | 4.5 | 5.1 | 6.6 | 7.4 | 7.6 | 8.0 | 9.1 |
| 85+ share (%) | 1.9 | 2.1 | 2.6 | 3.8 | 4.7 | 5.4 | 8.9 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.7 | 1.6 | 1.6 | 1.5 | 1.3 |
| | | | *Low migration (NOM = 120,000)* | | | | |
| 65-74 share (%) | 7.8 | 9.3 | 10.1 | 10.3 | 10.5 | 10.9 | 10.3 |
| 75-84 share (%) | 4.5 | 5.2 | 7.1 | 8.2 | 8.6 | 9.1 | 9.8 |
| 85+ share (%) | 1.9 | 2.1 | 2.8 | 4.2 | 5.5 | 6.5 | 9.9 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 |
| | | | *High fertility (TFR = 2.0)* | | | | |
| 65-74 share (%) | 7.8 | 9.1 | 9.7 | 9.6 | 9.8 | 10.2 | 9.8 |
| 75-84 share (%) | 4.5 | 5.1 | 6.8 | 7.6 | 7.9 | 8.2 | 8.8 |
| 85+ share (%) | 1.9 | 2.1 | 2.7 | 3.9 | 4.9 | 5.7 | 8.5 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.6 | 1.5 | 1.5 | 1.4 | 1.3 |
| | | | *Low fertility (TFR =1.6)* | | | | |
| 65-74 share (%) | 7.8 | 9.2 | 10.0 | 10.1 | 10.5 | 11.2 | 10.9 |
| 75-84 share (%) | 4.5 | 5.1 | 6.9 | 8.0 | 8.5 | 9.1 | 10.4 |
| 85+ share (%) | 1.9 | 2.1 | 2.8 | 4.1 | 5.3 | 6.3 | 10.8 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.9 | 1.7 | 1.7 | 1.5 | 1.4 | 1.2 |
| | | *Greater life expectancy (males = 92.6, females = 95)* | | | | | |
| 65-74 share (%) | 7.8 | 9.2 | 9.9 | 9.9 | 10.1 | 10.6 | 10.1 |
| 75-84 share (%) | 4.5 | 5.2 | 7.0 | 8.0 | 8.3 | 8.8 | 9.5 |
| 85+ share (%) | 1.9 | 2.1 | 3.0 | 4.7 | 6.3 | 7.6 | 12.3 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.3 | 1.2 |
| | | *Lower life expectancy (males = 85.6, females = 88)* | | | | | |
| 65-74 share (%) | 7.8 | 9.2 | 9.8 | 9.9 | 10.2 | 10.7 | 10.6 |
| 75-84 share (%) | 4.5 | 5.1 | 6.7 | 7.6 | 7.9 | 8.4 | 9.5 |
| 85+ share (%) | 1.9 | 2.0 | 2.5 | 3.3 | 3.9 | 4.3 | 7.1 |
| Pop. 15-64 yrs old to Pop. 0-14 and 65+ years (ratio) | 2.0 | 1.8 | 1.7 | 1.7 | 1.6 | 1.5 | 1.3 |

*Source*: PCPOP.

As noted in chapter 1, neither the ABS nor the Australian Treasury have developed models of population numbers or the age structure that take account of the probabilistic nature of the projections (though such 'stochastic' projections are being increasingly used in other countries). The advantage of stochastic approaches are that they:

- can provide some indication of the confidence intervals around a forecast

- provide an insight into the likely worst-case and best case scenarios, which is particularly useful for risk management

- take into account that extreme outcomes in migration, fertility and life expectancy are unlikely to coincide. Scenario analysis of the kind depicted in table 2.6 cannot address this issue.

This study developed stochastic projections for the share of the 'old' (aged 65 years or over), the 'oldest old' (85 years or over) and the total population (figures 2.12 to 2.14).

Figure 2.12 **Stochastic projections of the share of people aged 65 or more years**[a]

Confidence intervals, 2011-12 to 2059-60
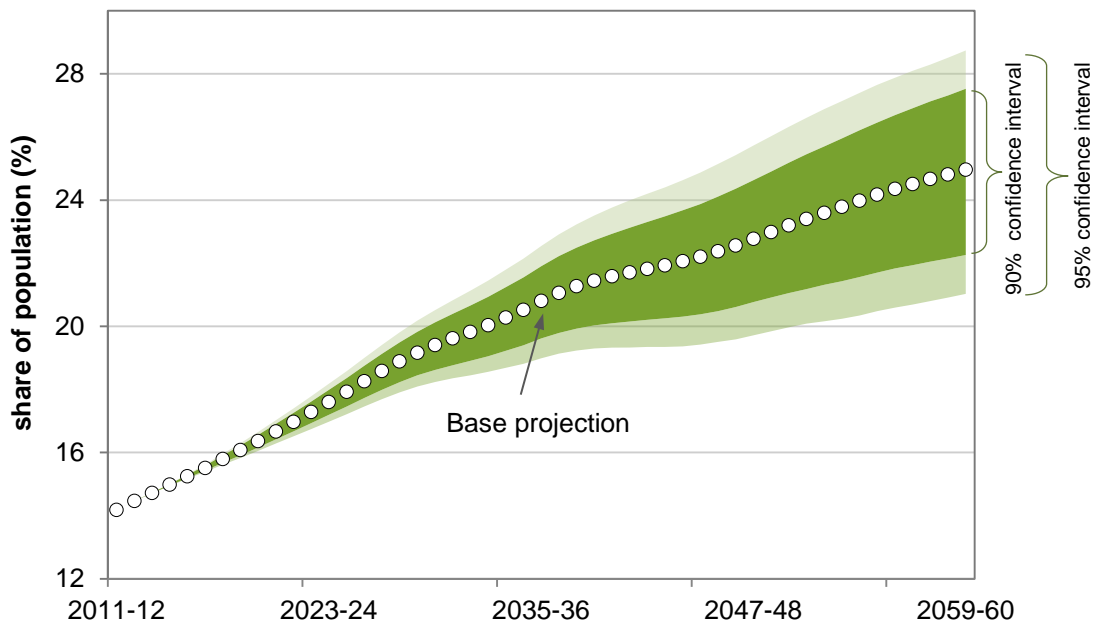


**a** The resulting confidence intervals (CI) and those of the two later stochastic estimates were derived using 2000 simulations. Beta distributions were used for extracting random samples of life expectancy, net overseas migration and the total fertility rate, with alpha and beta set to ensure that the means corresponded with the non-stochastic estimates. The choice of the relevant distributions and their bounds were based on judgment (though see appendix A for a discussion of the bounds suggested by Lee-Carter methods for life expectancy).

*Source*: Commission estimates.

## Figure 2.13 Stochastic projections of the share of people aged 85 years or more
2011-12 to 2059-60
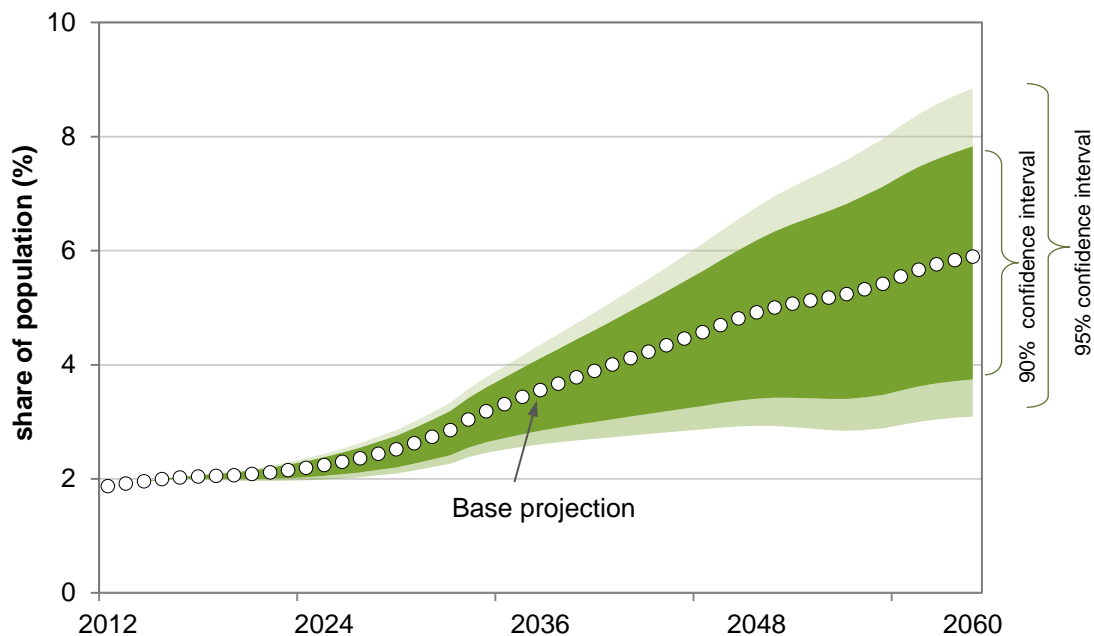


*Source*: Commission estimates.

## Figure 2.14 Stochastic projections of the total Australian population
2011-12 to 2059-60
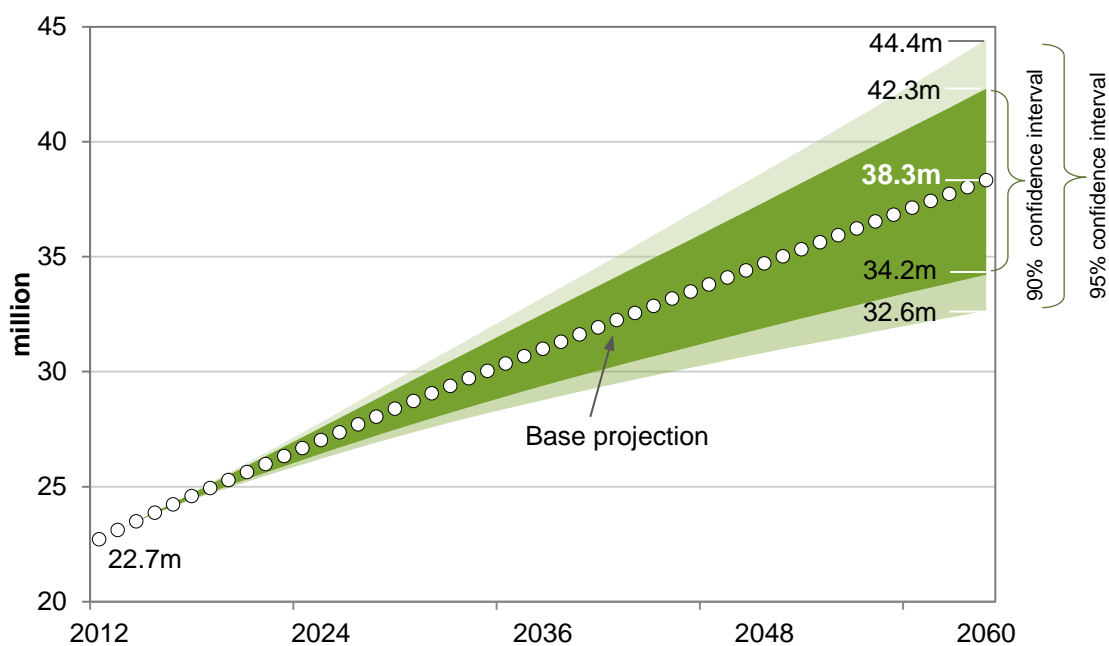


*Source*: Commission estimates.

The analysis reveals that there are genuine risks that ageing will be more pronounced than suggested by the base projection. This is particularly clear for the oldest old (figure 2.13). The stochastic approach also confirms that, while population numbers may vary considerably around the projection value, it is highly likely that Australia will continue to experience strong (if abating) population growth (figure 2.14 above).

## 2.6    Ageing is a global phenomenon

Not surprisingly, the forces that have led to ageing in Australia — particularly the lower probability of death at all ages and, to a lesser extent, the weakening of the social and economic drivers for large families — are common among many countries (figures 2.15 to figures 2.18). All of Australia's major trading partners will go through a major demographic transformation to older societies. Japan is already experiencing what is referred to as 'super ageing', with the prospect that by 2060, one in eight of its population will be aged 85 years or more (compared with one in 17 in Australia). In the case of China, Australia's top trading partner, the rapidity and scope of the demographic transition is remarkable. In 2010, the share of people aged 65 or more years was just over 8 per cent (around 5 percentage points less than Australia). By 2060, it is projected to be over 28 per cent (or around 5 percentage points *greater* than Australia in that year).

Global ageing brings opportunities, such as the ability to:

- learn from multiple policy experiments internationally that address the social and economic implications of ageing

- access new technologies that meet the needs of ageing societies (whether these relate to labour-displacing technologies, improved aged and health care or that give greater opportunities for social and economic participation by older Australians)

- find new export opportunities geared to ageing trading partners (such as e-health services, medical services, and age-friendly tourism).

It may also bring challenges. The same processes that reduce labour inputs per capita in Australia are likely to dampen economic growth in most of Australia's trading partners — with potential demand-side effects on Australia's exports. Reduced labour supply growth may also result in greater global competition for skilled labour. Lower global saving may affect international capital availability. More problematically, many countries have institutionalised unfunded obligations for the future old (for example, through generous pensions). Failures to reform such arrangements may affect future global growth, with adverse consequences for Australia.

## Figure 2.15    Australia in the ageing century: Global population trends
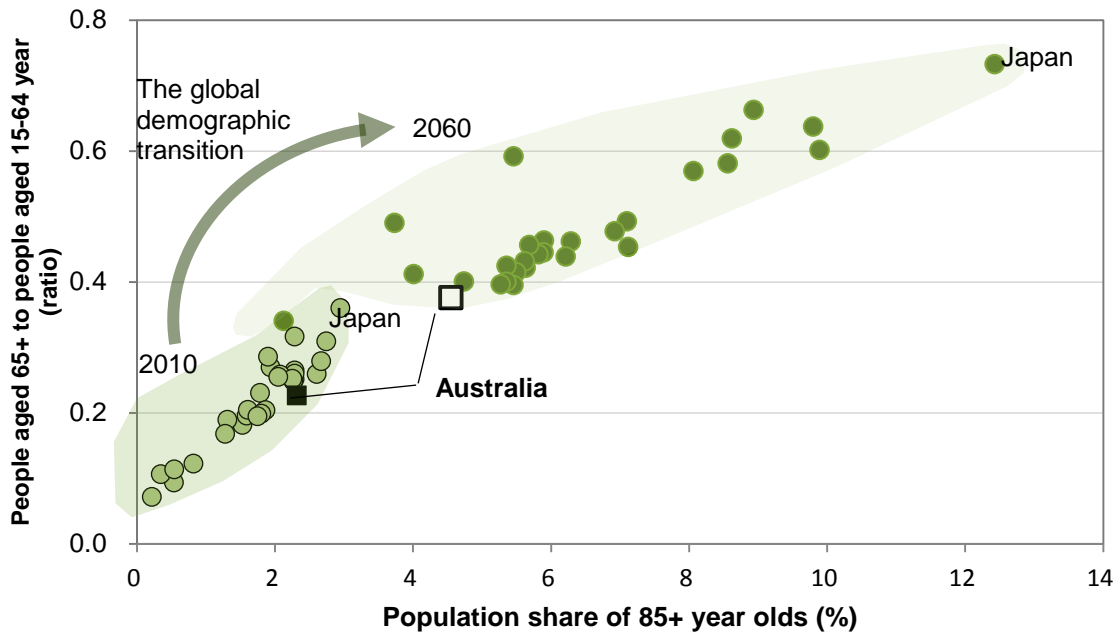


**a** Each country is denoted by a dot. The data covers the countries shown in figure 2.16.

*Source*: Based on United Nations (2013).

## Figure 2.16    Projections of the ratio of people aged 65+ to the working age population aged 15-64 years
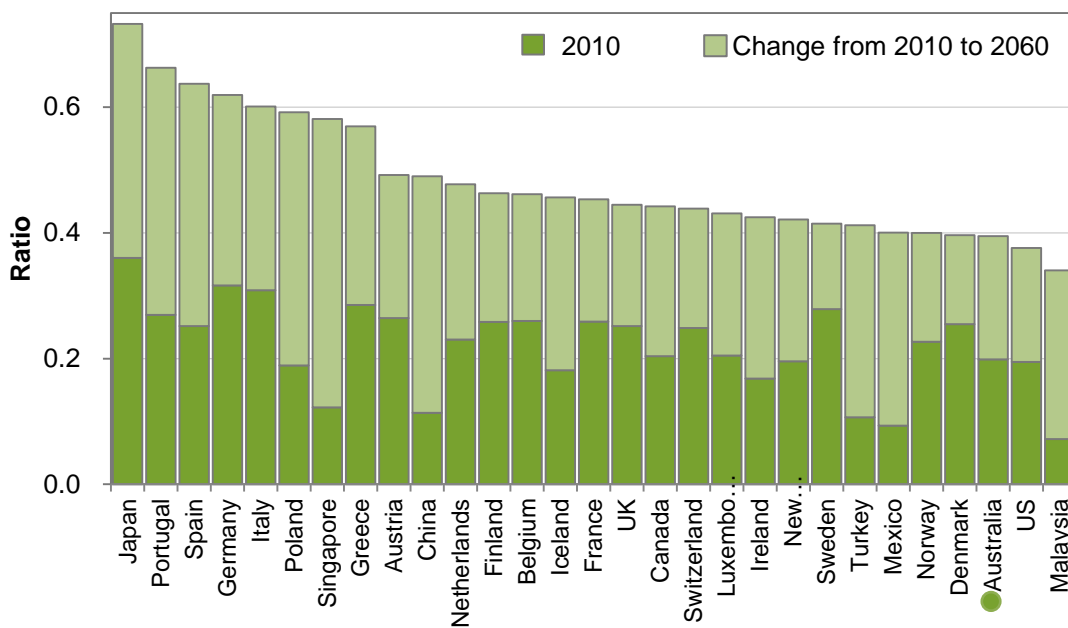


*Source*: United Nations (2013).

Figure 2.17    **Projected share of population aged 65+ years**
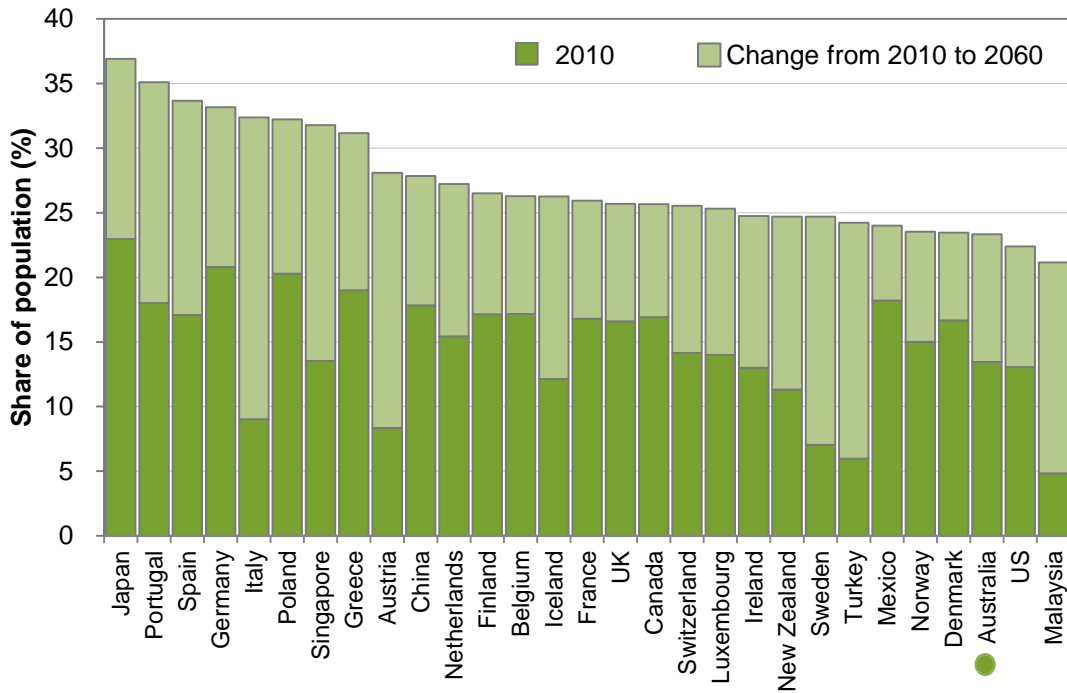


*Source*: United Nations (2013).

Figure 2.18    **Projected share of population aged 85+ years**
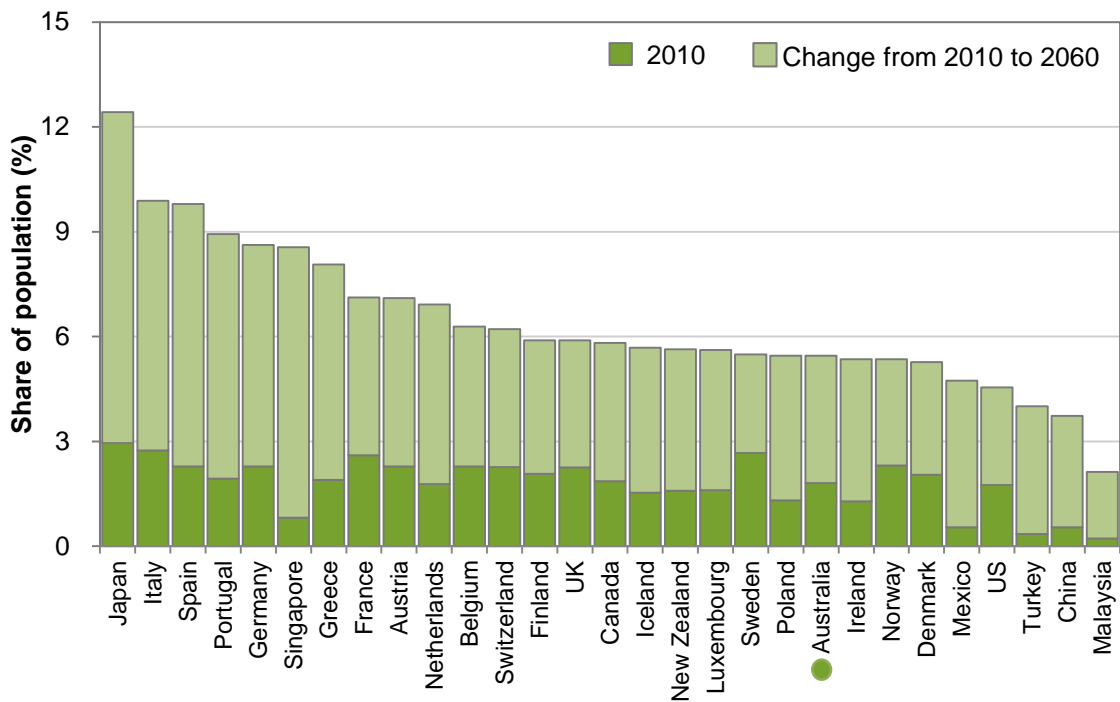


*Source*: United Nations (2013).

# 3   Labour supply

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**Key points**

Age-specific labour participation rates are likely to grow significantly for older workers, buoyed by growing educational attainment levels, greater lifetime attachment of women to the labour force, and a general pattern of deferred retirement. Participation rates for:

- males aged 60-64 and 65-69 years are projected to increase from 63 to 75 per cent and from 33 to 40 per cent, respectively, by 2059-60

- females aged 60-64 and 65-69 years are projected to increase from 45 to 58 per cent and from 20 to 35 per cent, respectively, by 2059-60.

Successive generations of older workers are likely to retire later since they are better educated and may have improved job opportunities in the service sector, which is more amenable to part-time and flexible work.

However, there are uncertainties in these projections:

- rising personal wealth and inheritances may encourage earlier than predicted retirement

- there is ambiguous evidence about trends in disability and chronic illness, which are major motivating factors for exits from the labour market

- Australian participation rates among prime aged females are well below the 80th percentile of OECD rates, and this study may have downplayed the capacity for catch-up to these higher rates.

Population ageing shifts more people into the age groups where labour participation rates are lower, thus depressing the aggregate labour force participation rate.

- The aggregate participation rate is projected to fall from 65.2 per cent in 2012-13 to 59.9 per cent in 2059-60. Had the population age structure remained at its 2012-13 values, then the participation rate would have been more than 68 per cent, highlighting the importance of population ageing.

Older workers have a greater tendency for part-time employment so that, overall, the study projects that the part-time share of employment rises from 29.9 to 31.9 per cent from 2012-13 to 2059-60.

After controlling for full-time and part-time shares, there are few clear trends in average hours worked per week, and so this contributes little to the change in the labour supply over the next 50 years.

These various labour and population factors imply that projected hours worked per capita will fall by around 4.5 per cent from 2012-13 to 2059-60, with an equivalent impact on GDP (compared with the case of no change in age-specific trends and ageing).

## 3.1 A broad view of the supply-side of the economy

This and the next chapter consider the future supply side of the economy — which is critical to Australia's material prosperity.

In 1960, few would have been able to predict accurately Australia's economic fortunes over the following 50 years. They may well have missed the huge rise in female participation rates, the ebbs and flows of the business cycle, the energy shock, the large changes in the industrial relations landscape, and the major consequences of trade liberalisation and microeconomic reform. There are equally many challenges in considering Australia's future economic prospects. However, long-term economic projections are not forecasts of what *will* happen, so much as indicators of possible futures that would arise with the continuation of current trends or under given policies. As much as anything, projections highlight areas where policies should change to avoid the projection from becoming a reality. Nevertheless, projections should use realistic assumptions and account, as much as possible, for the critical factors that drive labour supply, economic growth and national income.

In its prior research in this area, the Productivity Commission and the Treasury Intergenerational Reports have primarily relied on the '3Ps' framework (population, participation and productivity) in considering Australia's future labour supply and economic growth prospects. This framework represents a sound, albeit relatively simple, starting basis for projections. This chapter considers the most recent evidence on the labour supply components of the 3Ps over the next 50 years, and the extent to which this reflects demographic pressures. Chapter 4 combines these labour supply results with productivity estimates to derive projections of Australia's economic growth and national income.

## 3.2 The 3Ps framework for labour supply and economic growth

The 3Ps approach[20] is based on breaking GDP into its multiplicative components:

- the population
- hours worked per capita (broadly speaking, 'participation')
- the amount produced per hour (productivity).

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[20] The mechanics of the approach are described in more detail in appendix E.

In fact, the 3Ps is more a convenient label than a literal description of the supply side of the economy that it models, since 'participation' as described above depends on labour force participation rates, employment rates and average hours worked, which are best analysed separately.

## 3.3    The 'working age' gap

A simple indicator of the effect of demography on future labour supply is the size of any gap between the growth rate of the population as a whole and the growth in the section of the population that makes up most of Australia's workers (those aged between 20 and 59 years).[21] A gap will occur throughout the projection period to 2059-60, and is most pronounced in the early 2020s (figure 3.1). Other things equal, this must slow economic growth per capita compared with the counterfactual.

Figure 3.1    **Population growth will exceed the growth
of the prime potential workforce**
2012-13 to 2059-60[a]
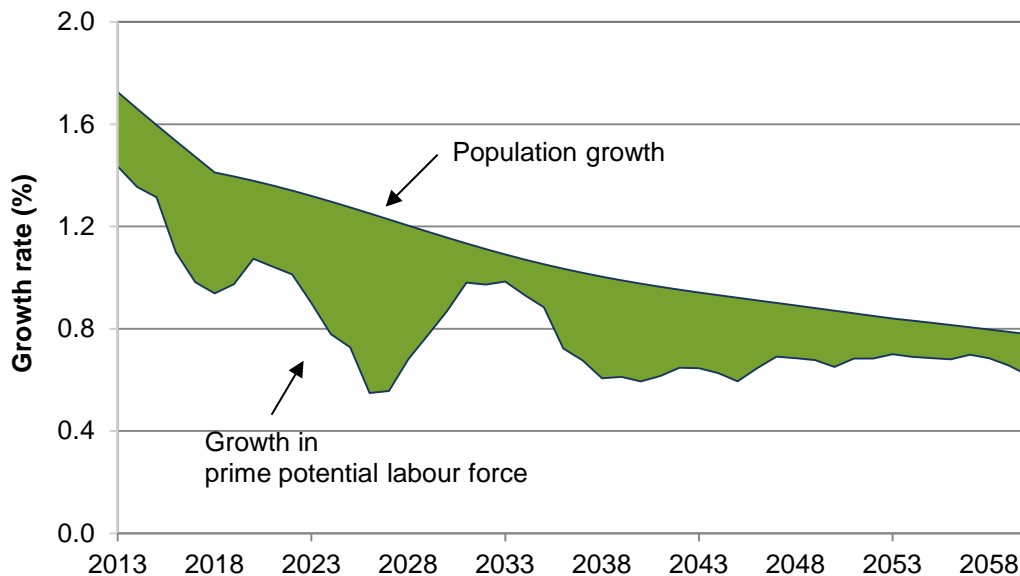


**a** The prime potential workforce comprises those aged between 25 and 54 years, which are the age groups with the highest labour force participation rates.

*Data source*: PCPOP estimates.

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21 As discussed later, the ratio of the total potential workforce as defined by the ABS (all of those aged 15 years and over) to the population rises weakly from 2012-13 to 2059-60, but many of these 'potential' workers are unlikely to work.

However, breaking down the labour market into age groups provides a more nuanced view of the likely labour market outcomes over the coming decades. Accordingly, this study estimates *conditional* forecasts for a range of labour market variables by age and sex. They are conditional in that they do not take account of any major shifts in government policy; assume the continuation of historical trends; are constrained by sensible steady states; and take into account known features of the labour market. For example, in the case of forecasts of participation rates:

- they ignore the effects of possible increases in the pension age or other measures that governments may use to encourage greater labour force participation

- the labour force participation rate of a particular age-sex group cannot continue to rise by a constant trend rate or it will exceed 100 per cent. This is addressed by setting a ceiling on participation rates in any estimation method

- it is likely that the inverse u-shaped profile of labour force participation by age will be preserved, with relatively low participation rates in the early years (when people are often in full-time education) and in older ages (when many people have retired)

- it would be improbable — at least in the medium term — that participation rates of women in their key childbearing years would exceed those of men.

Using the 3Ps framework, this study produces such conditional forecasts for participation rates, employment rates, part-time shares of employment, the part-time and full-time average hours worked, and the ratio of civilians aged 15 or more years to the population (figure 3.2).[22] As alluded to earlier, this study, as in the Commission's earlier work on ageing, considers these labour market variables by age and sex (PC 2005d). Altogether, in addition to the population shares derived in chapter 2, this forecasting exercise requires projections for 144 labour market variables from 2011-12 to 2059-60. The ultimate measure of labour supply — total hours — is derived through the series of sequential calculations shown in and figure 3.2, with each major component the subject of the following sections.

## 3.4    Participation rates

There are many factors that influence participation rates — the subject of this section.

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[22] The use of the civilian population aged 15 years or more rather than the total population aged 15 years or more reflects the ABS's methodology in its labour force surveys (appendix E).

Figure 3.2    **Creating a picture of Australia's future labour supply**
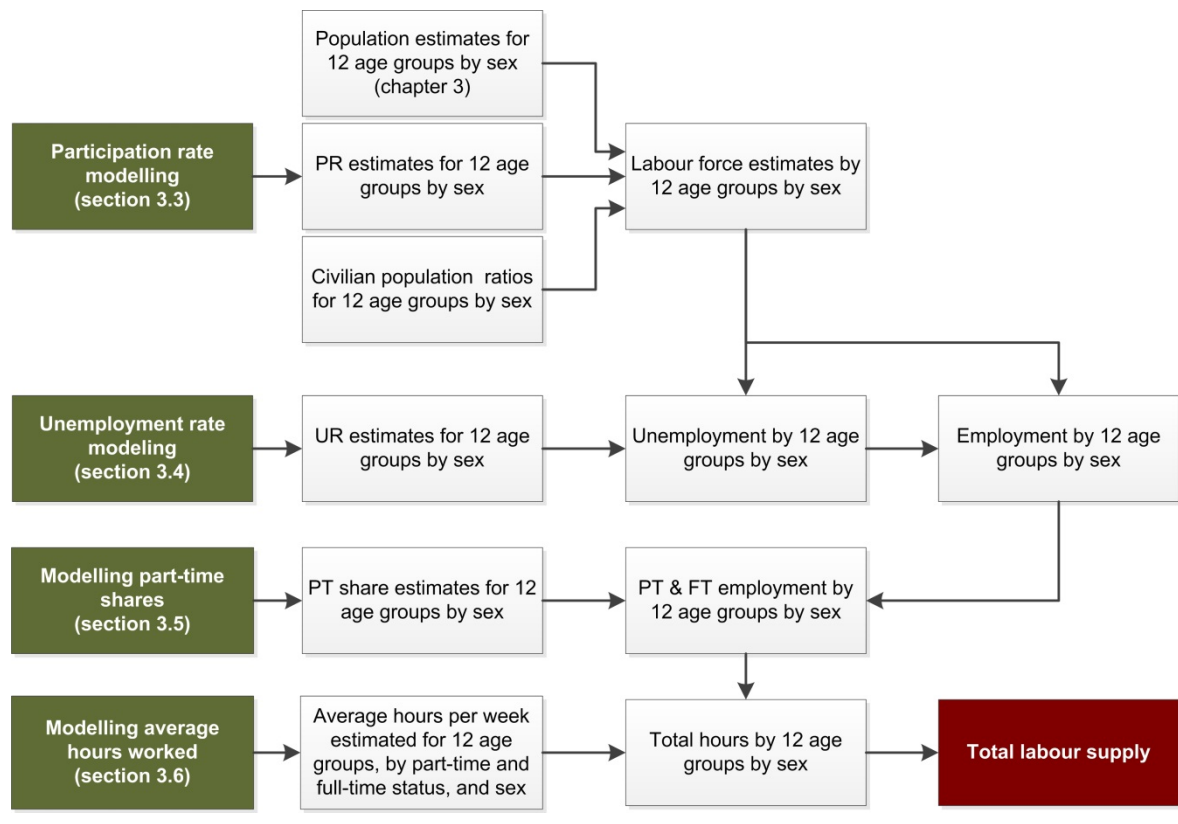


## Population ageing reduces aggregate participation rates

Labour participation rates decline significantly after age 55 years. For example, there is around a 10 percentage points reduction in labour force participation rates for males and females over the (average five year) transition from 55–59 to 60-64, and a further 20 percentage points fall over the next five-year age range. Population ageing shifts more people into the older age brackets and, even were participation rates to remain fixed at their age-sex specific levels, aggregate participation rates would fall.

## Education is an important, but complex, driver of lifetime labour participation

Educational participation has twin effects on labour participation.

- The two are substitutes at the time when people are studying (though some students work part-time while in education). Much of the reduction in the labour participation rates of younger people over the last 30 years reflects this

substitution effect. However, the long-run decline in labour participation rates for the young has now ceased.

- There is a strong association between higher educational attainment and subsequent labour participation rates (figures 3.3 and 3.4). This is likely to reflect that wage rates rise with education, full-time work is more readily available, and unemployment probabilities are low,[23] so that the pecuniary and non-pecuniary costs of exiting the labour market are higher. Moreover, jobs that require higher qualifications tend to involve fewer risks of acquiring a disability. Many people on the Disability Support Pension have lower skills, and their disabilities often arise from musculoskeletal injuries (Lattimore 2007a). In 2010-11, only 14.2 per cent of people whose occupation was as a labourer before retirement retired at age 65 years or later. The comparable figures for (generally highly educated) managers and professionals were 22.9 and 26.2 per cent respectively.[24]

**Figure 3.3    People with greater educational attainment tend to have higher labour market attachment**

Participation rates by age and educational attainment (%), 2011
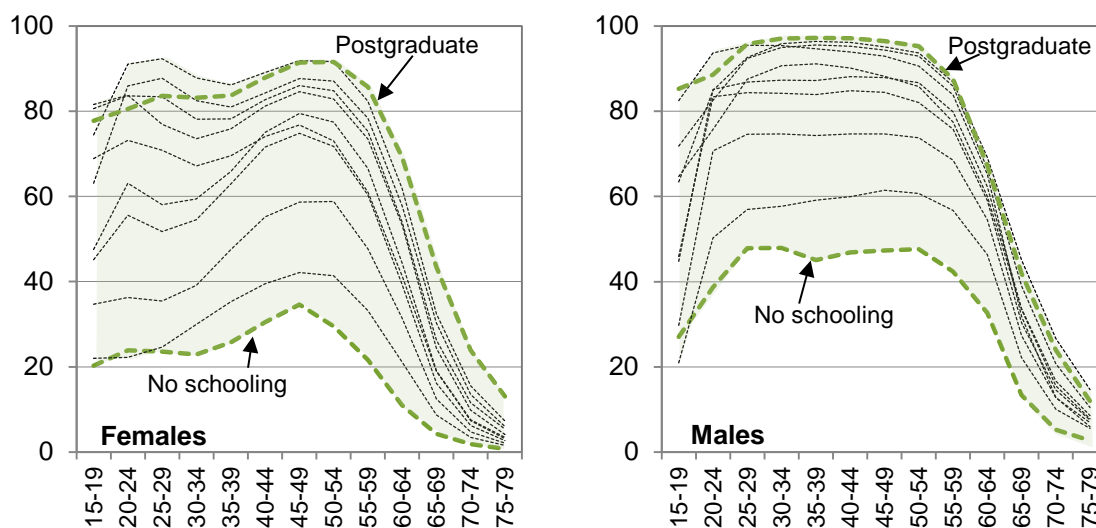


**a** For ease of illustration, not all qualification categories are shown, such as people with certificate qualifications, various individual years of school, graduate diplomas and bachelor's degrees. The lowest participation rates are nearly always associated with people with no schooling. The highest varies, but tends more often to be postgraduate training (especially for males).

*Data source*: Derived from the ABS 2011 Population Census.

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[23] While an unemployed person is still in the labour force, it is more likely that a person will exit from the labour market if they are unemployed than employed

[24] Based on ABS 2011, *Retirement and Retirement Intentions, Australia*, Cat. No. 6238, 13 December, table 4.1.

Figure 3.4    **Education has its biggest *relative* impacts on participation rates at the oldest ages**

Ratio of outcomes for highest versus lowest educational qualifications, 2011[a]
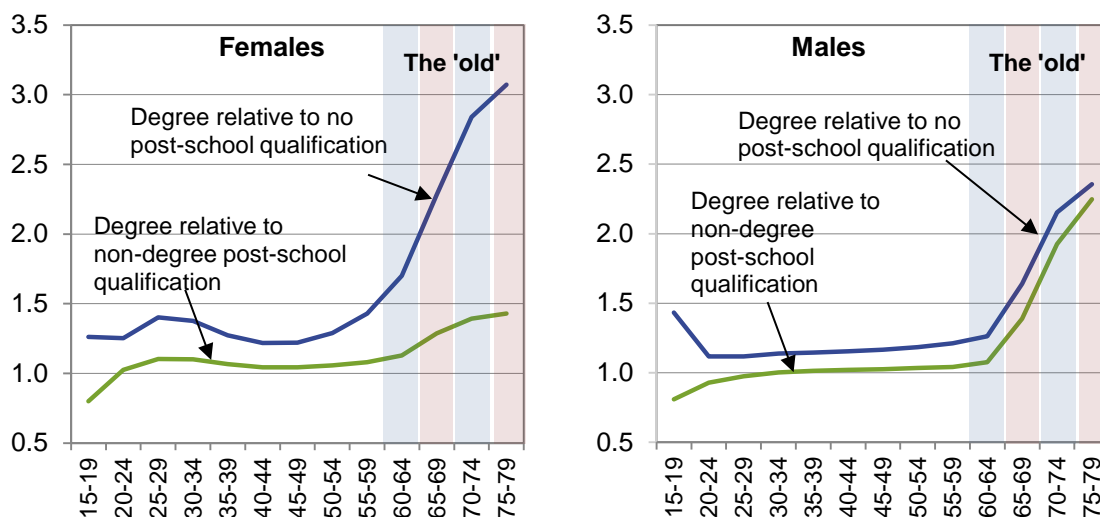


**a** The chart shows the ratio of the participation rate for those with a degree or higher to people with other post-school qualifications and to people with no post-school qualifications.

*Data source*: Commission estimates using the ABS 2011 Census of Population and Housing.

There is a continuing trend for greater educational participation at all ages, particularly for university degrees. However, some saturation level of the university completion rate will ultimately be reached for younger age groups. By definition, as these cohorts age they can only increase their qualifications. Accordingly, the current pattern showing that the young are more qualified than the old will reverse (as illustrated in figure 3.5).

This fact, and the substantial benefits of higher qualifications for participation rates, suggests that the future old will have much greater attachment to the labour force than will the current cohort of the old. However, the aggregate effects may be different from those suggested by the cross-sectional evidence in figure 3.3. The current cohort of highly qualified older people were educated at a time when it was more difficult to enter higher education institutions. Universities have since expanded greatly, drawing on a much bigger pool of people, with differing characteristics and intrinsic ability. It cannot be assumed that the average labour participation outcomes at age 60 years for a person leaving university in 1970 would be the same as a university graduate leaving in 2010. Moreover, to the extent that it is more likely that people with higher innate ability enter university, then the average ability of the diminishing pool of people without a university qualification would tend to decline, worsening their labour market outcomes.

So while it can be expected that the rising human capital among Australians will ultimately increase their labour force participation rates when they grow old, the cross-sectional relativities in performance may provide a distorted perspective of aggregate outcomes.[25]

Figure 3.5    **The future 'old' will be well educated**

Share of people with a university qualification (per cent)[a]
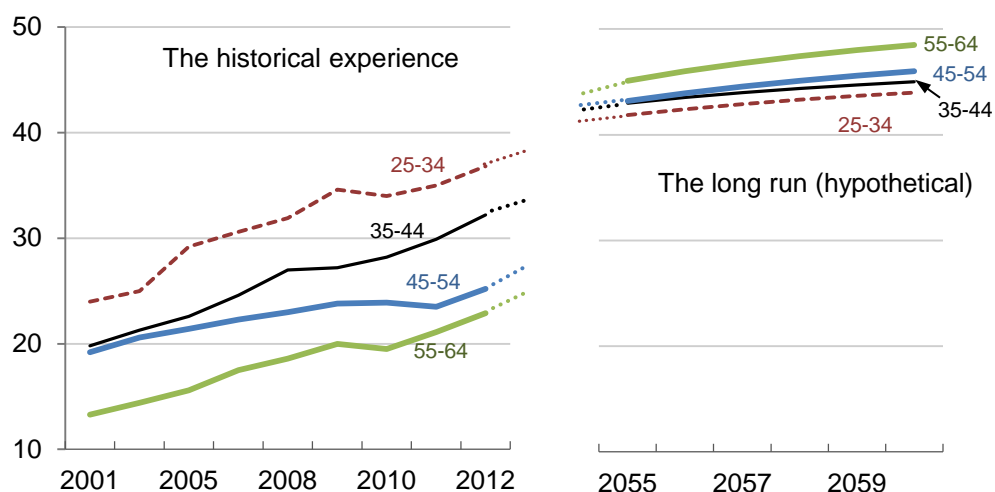


**a** The data to 2012 are from ABS data, while the long-run estimates of maximum attainments are hypothetical. The essential point is that it can be expected that at some time, graduate education rates will reach a plateau, and that as younger cohorts age, all ages will converge on that rate.

*Data source*: ABS 2012, *Education and Work, Australia, May 2012*, Cat. No. 62270DO001_201205, 29 November.

Moreover, while less qualified people still have lower than average participation rates than those with higher qualifications, the gap appears to have narrowed in the last decade:

- Participation rates for all prime aged men fell from 1981 to 2001, with the greatest reductions for men with low educational attainment. (Rates plunged by nearly 14 percentage points from 1981 to 2001.) However, there has been a recovery since, with 2011 participation rates for men with the lowest educational attainment recovering by 4 percentage points. There was virtually no recovery in participation rates for higher skilled men (figure 3.6).

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[25] The Commission discussed some of these issues in its 2005 ageing report (PC 2005d, pp. 347–353) its consideration of the VET sector (PC 2012b, p. 45), its research on 'men not in the labour force' (Lattimore 2007a, pp. 187–226) and on labour force participation generally (Laplagne, Glover and Shomos 2007, pp. 16–17,47–48). Beblavy et al. (2013) recently reviewed the theoretical and empirical literature examining the impacts of rapidly rising tertiary enrolments.

- The pattern for women is different because women as a group have increased their participation rates across all educational attainment levels from 1981 to 2011. As with men, the labour participation rates for women with the least educational attainment levels grew relatively strongly from 2001 to 2011.

Figure 3.6    **But in the last decade, growth in participation rates has been greatest among the *least* educated**

Participation rates of 25 to 54 year olds
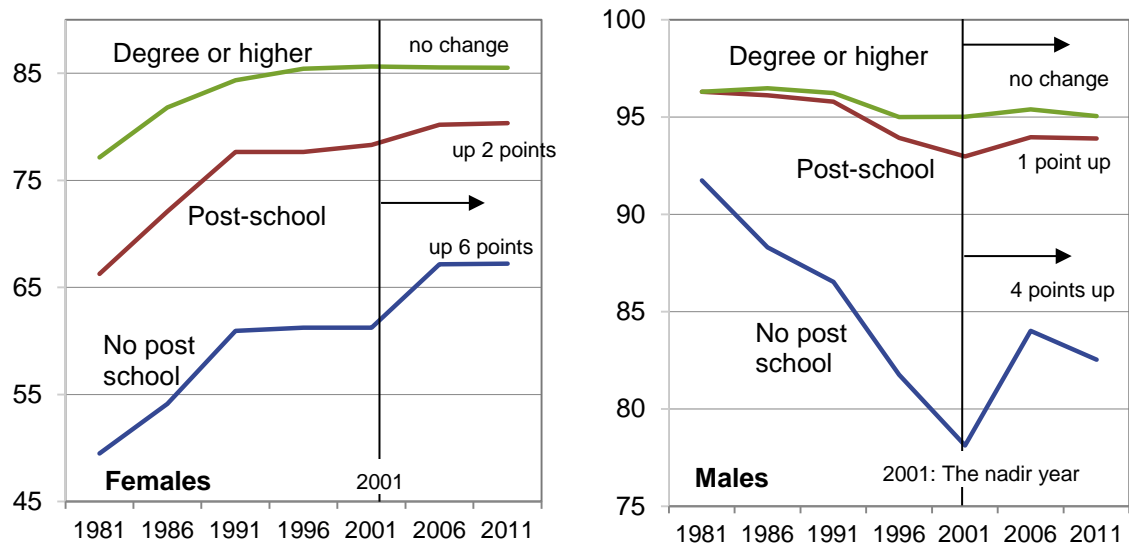


*Data source*: ABS 2011 Census of Population and Housing, and Kennedy et al. (2009).

Several factors may explain this pattern, including:

- the greater capacity for work by low-skilled workers in part-time and flexible jobs, an influence identified as relevant for mature aged men particularly (Kennedy, Stoney and Vance 2009, p. 28)

- the continued expansion of the service sector, which may be better able to accommodate low-skilled workers than the declining manufacturing sector, may also be part of the story[26]

- probably most importantly, the outcome of more stable economic growth over the last decade. Low skill workers are most vulnerable to economic downturns

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[26] The Longitudinal Study of Australian Youth (LSAY) follows young people from year 9 over future years. The experiences of the oldest cohort — those in year 9 in 1995 (the Y95 cohort) — up until 2006, provide a medium-run view of the job destinations by skill and achievement level. For those with the least school achievements, the most common occupations for the Y95 group in 2006 were elementary and intermediate clerical and service jobs, while such occupations were relatively much less important for the highest achievers. Production jobs were much less important as destinations for either group (LSAY data from www.lsay.edu.au).

so, when economic conditions improve, they have more scope to increase participation rates than higher skilled workers, who tend to have high participation rates regardless of the economic cycle.

While the main effects of increasing educational attainment levels may be more evident in income and employment rates, they will probably still raise future participation rates of older workers. Given historical experiences, the importance of qualifications to overall labour force participation will be accentuated if there are any significant economic downturns over the next few decades.

## There is potential for higher female participation rates

The biggest transformation in Australia's labour markets over the past thirty or more years has been the growing involvement of women (figure 3.7) — reflecting changing social norms, lower fertility rates, greater educational attainment of women and the better availability of childcare facilities (Gilfillan and Andrews 2010; Connolly, Davis and Spence 2011).

Figure 3.7    **Women are playing a much greater role in labour markets, but both sexes are staying at work longer**

Participation rates, 1978-79 and 2012-13
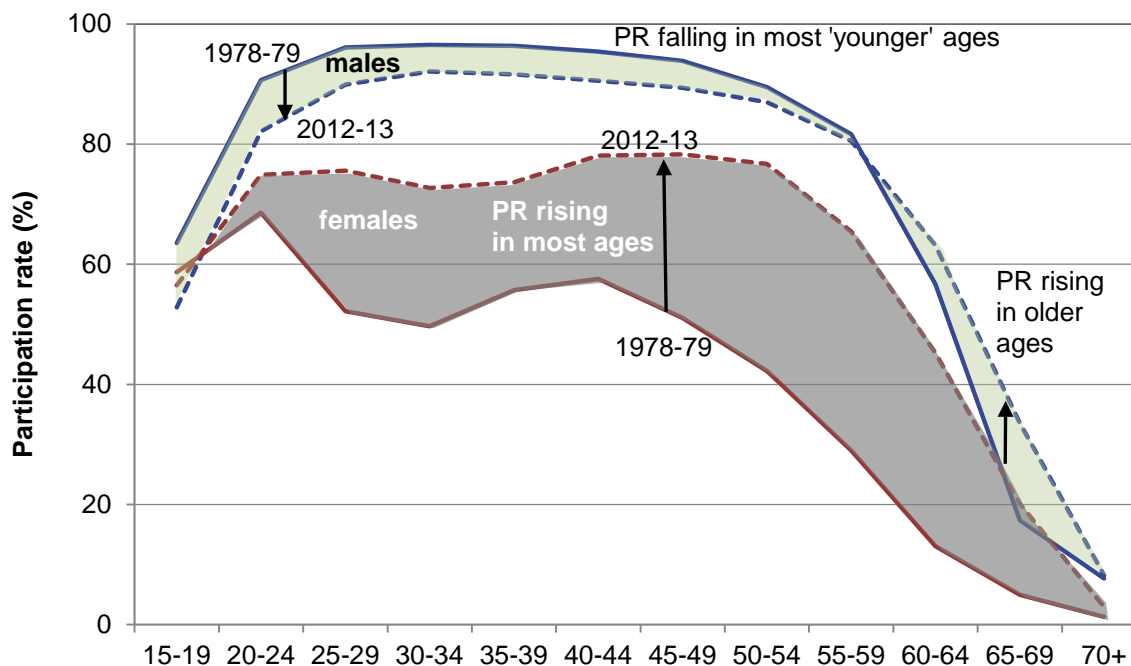


*Data source*: ABS 2013, *Labour Force, Australia*, Detailed - Electronic Delivery, table LM2.

Participation rates for women of older ages are still rising significantly, and this trend is likely to continue. In contrast, increases in labour participation rates have slowed in recent years for women of prime childbearing ages (figure 3.8).

Figure 3.8    **Growth rates in participation rates are higher for older women**
7 year backward average trend rate of growth (% p.a.), 1984-85 to 2012-13
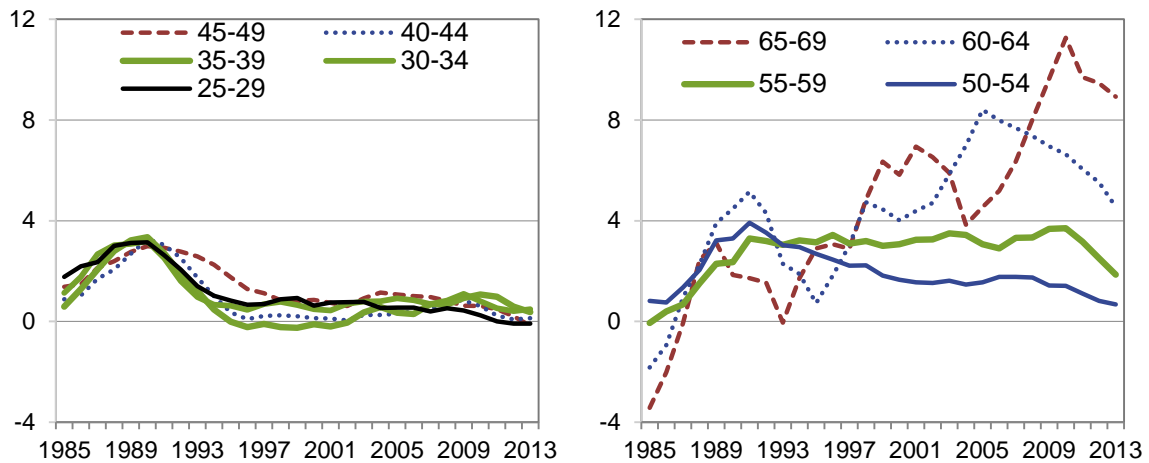


**a** The trend growth rates (measured by regressing the logged values of the participation rate against time) were calculated for the past seven years for each year from 1984-85 to 2012-13.

*Data source*: ABS 2013, Labour Force, Australia, Detailed - Electronic Delivery, table LM2.

This raises the question of whether it is likely that there will be further substantial increases in participation rates of women aged 29-49 years. The international evidence suggests that higher rates of labour force participation for women of childbearing age may be achievable in Australia. Over the next 50 years, there may be some catch-up of Australian participation rates towards the higher end of the distribution of rates observed in the OECD as the educational attainment of Australian women increases, occupational barriers decrease with the expansion of female-intensive service sector jobs, part-time flexible jobs increase in importance, and social norms continue to change (chapters 4 and 6). Australian fertility rates also appear to have stabilised and the shift to older ages of childbearing appears to have significantly slowed,[27] noting that parenthood is one of the most important

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[27] Over the full period from 1975 to 2011, age-specific fertility rates rose only for women aged 30 years or more — primarily reflecting the delay of childbearing, rather than a decline in the completed fertility rate (Lattimore and Pobke 2008b). In recent years, the age-specific fertility rates of women aged 30 or more years fell by around 2 per cent from 2008–2011, whereas in the preceding three year period, they grew by around 13 per cent. To give a more graphic example, the age-specific fertility rate of women aged 40 years increased by 1 per cent from 2008–2011, but by 30 per cent in the preceding 3 years (ABS 2012b). NSW population forecasts based on analysis of first births projects nearly no change in fertility rates over the next 40 years in that state (Department of Planning and Infrastructure 2013).

factors explaining lower participation rates among women aged 25-45[28] (Gong, Breunig and King 2010). Policies affecting childcare are therefore also likely to be important.

If nothing else, the higher end of the rates observed in OECD countries is useful for providing:

- a realistic top range for this study's projections of Australian participation rates for women of childbearing ages

- a 'what if' scenario that provides some indication of the labour participation rates were Australia to adopt policies similar to those countries with the highest rates.

Currently, participation rates for Australian women aged above 25 years are well below those countries with the highest rates (table 3.1 and figure 3.9).

Table 3.1    **Australian female participation rates compared with the OECD**
Percentage points, 2012**a**

| Age group | Australia 2012 | 80th OECD percentile | Difference |
|---|---|---|---|
| | % | % | Percentage points |
| 25-29 | 75.0 | 82.3 | 7.3 |
| 30-34 | 72.7 | 85.5 | 12.8 |
| 35-39 | 73.4 | 84.9 | 11.5 |
| 40-44 | 77.6 | 87.5 | 10.0 |
| 45-49 | 78.5 | 88.5 | 9.9 |
| 50-54 | 76.3 | 83.8 | 7.4 |
| 55-59 | 65.6 | 76.7 | 11.1 |
| 60-64 | 44.4 | 49.3 | 4.9 |
| 65-69 | 20.0 | 25.9 | 5.9 |

**a** The 80th percentile calculations excludes Chile, Mexico and Turkey (as discussed in the note to figure 3.9). Comparisons of participation rates between countries can be affected by different measurement conventions, and the importance of certain social policies. For example, women on paid maternity leave are typically categorised as in the labour force, but some countries have schemes that provide payments for longer periods than others, artificially increasing their participation rates (Abhayaratna and Lattimore 2006). However, the comparisons will largely be valid.

*Data sources*: Commission estimates and OECD StatExtracts, accessed 2 September 2013.

The gap between Australian female participation rates and the 80th percentile of OECD countries is often more than 10 percentage points. In absolute terms, the gap is most narrow for women aged 60 years or more (and indeed Australian women in

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28 As shown in various Australian and overseas studies, such as the European Commission (2013a); Gong et al. (2010); and Baxter (2004).

this age group have labour participation rates above the average OECD level). The widest gap occurs for women of prime childbearing age.

Figure 3.9     **Australian versus OECD female labour participation rates, 2012**a
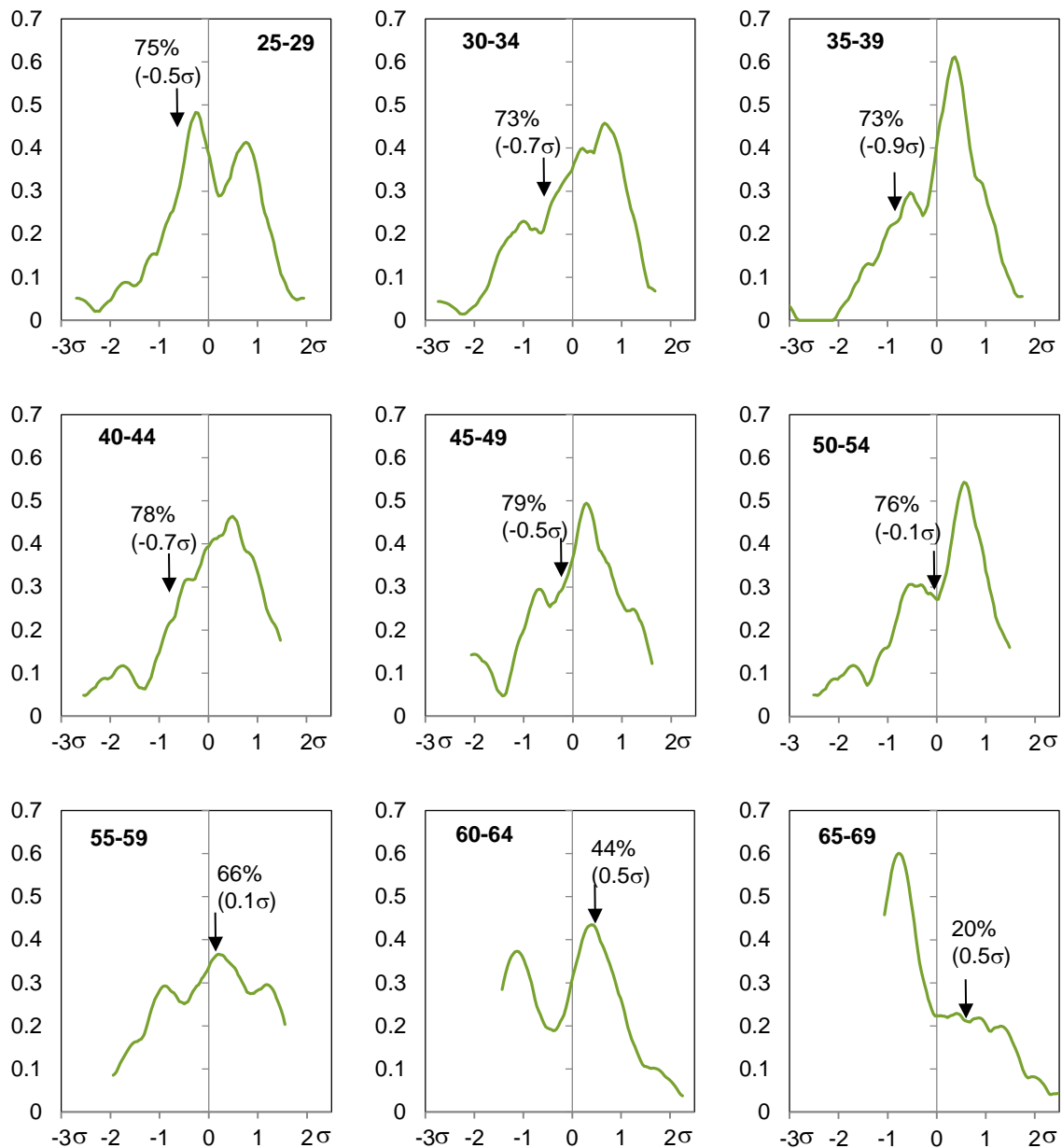


**a** The graphs show the estimated distribution of labour participation rates across all OECD countries. Results for Chile, Mexico and Turkey have been excluded because these countries have exceptionally low female participation rates by OECD standards, and are effectively outliers. Rather than show raw participation rates on the horizontal axis, the graph shows standardised participation rates (the deviation of participation rates from the mean in units of standard deviations). A value of -3σ for example, means that a country has a participation rate 3 standard deviations away from the mean. The densities are estimated using an Epanechnikov kernel. The arrows mark Australia's position — with the text describing the percentage participation rate (and in brackets, the standard deviations away from the mean rate).

*Data sources*: Commission estimates and OECD StatExtracts, accessed 2 September 2013.

Were Australian female age-specific participation rates to be equal to the higher of the 80$^{th}$ OECD percentile and the existing Australian rate then, in 2012-13, the overall female participation rate would be more than 65 per cent, compared with its current level of 59 per cent. Assuming that employment rates remained fixed, then this would translate to around 575 000 more female employees in 2012-13. (Current female employment is 5.3 million.)

However, any convergence of participation rates to the 80$^{th}$ percentile benchmark would take some time. Its effect on aggregate labour market participation would then be reduced as the female population age structure shifted away from those ages where the prospective increases were greatest. For example, this study projects that the effect of achieving the OECD benchmark would raise the aggregate female participation rate in 2059-60 by around 2 percentage points (and with increased employment of around 300 000) above the counterfactual level. The relatively small effect on aggregate female participation rates of achieving the benchmark reflects:

- that the counterfactual already factors in some increase in participation rates over the next fifty years

- population ageing pushes women into older age groups where the participation rates are lower.

## Workforce history matters

The labour participation rate of a person at a given age is shaped partly by their labour market status in previous periods. For example, many people who exit from the labour market to the Disability Support Pension remain on this payment or another form of income support for the remainder of their lives (Harris and Kalb 2005; Lattimore 2007a; Melbourne Institute 2011). Similarly, some factors that encourage labour market exits, such as having children, have enduring effects on future labour market status partly because children require care for some years after their birth, but also because of reduced work experience.

Exit rates from the labour force amongst workers aged 40 or more years have generally been declining in Australia (figures 3.10 and 3.11). This reflects a host of factors, such as educational attainment, improved labour market conditions and income support policies (of the kind discussed above).

**Figure 3.10    Exit rates from the labour force**

1983-84 to 2012-13**a**
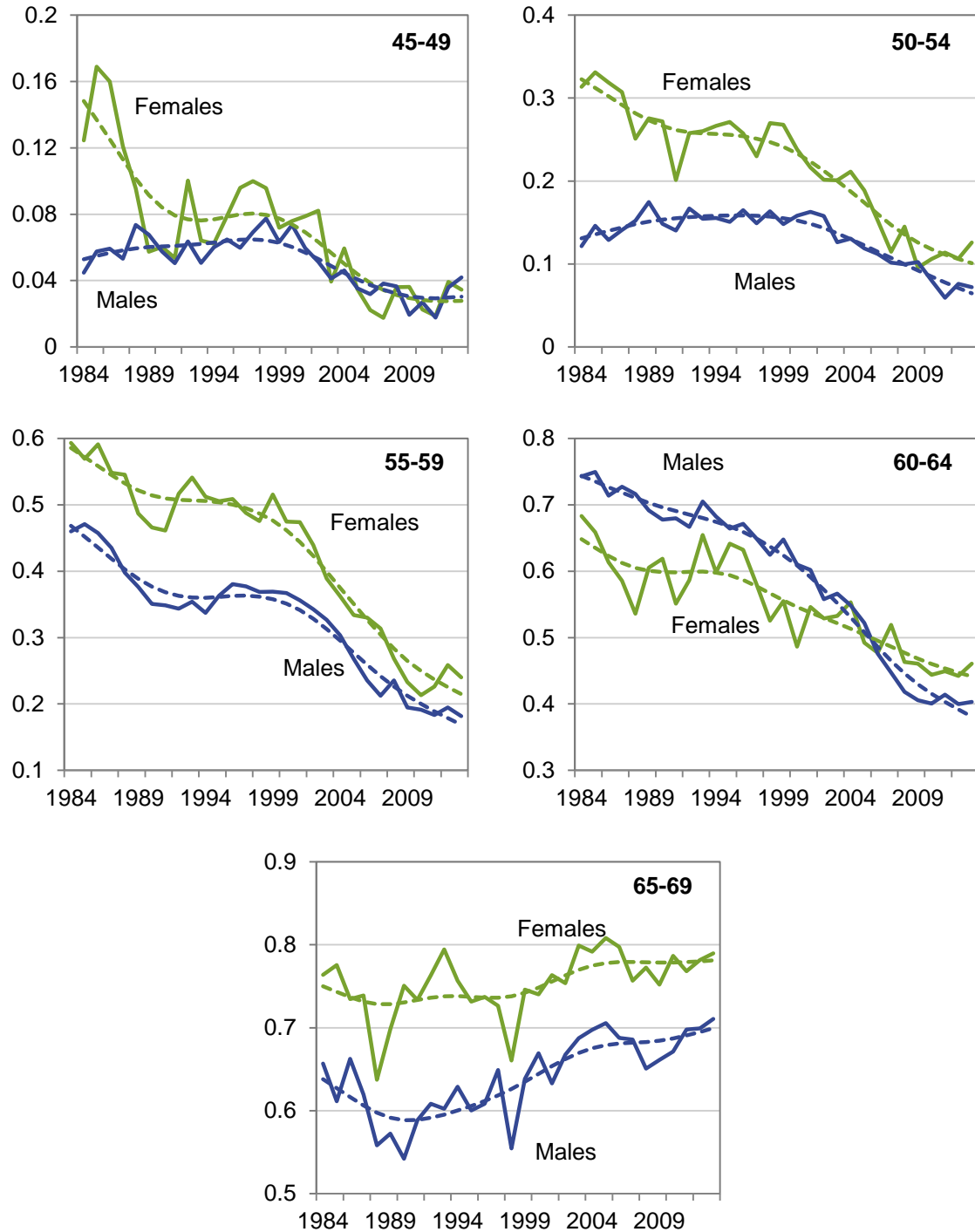


**a** The exit rate is defined as 1-PR(t)/PR(t-5) where PR(t) is the participation rate for a given sex and five yearly age group at time t. The dashed lines above are the smoothed trends using a Hodrick-Prescott filter. The increasing exit rates for the group aged 65-69 reflects the fact that if more people stay in the workforce at earlier ages, then the exit rate from 68–69 years to the open interval age group of 70+ years must grow (noting that most people retire before they die).

*Data source*: Commission estimates and ABS 2013, *Labour Force, Australia, Detailed* - Electronic Delivery, table LM2.

Figure 3.11    **Trends in gross labour market exit and entry rates**
Trend growth rates (per cent), 1997 to 2012**a**
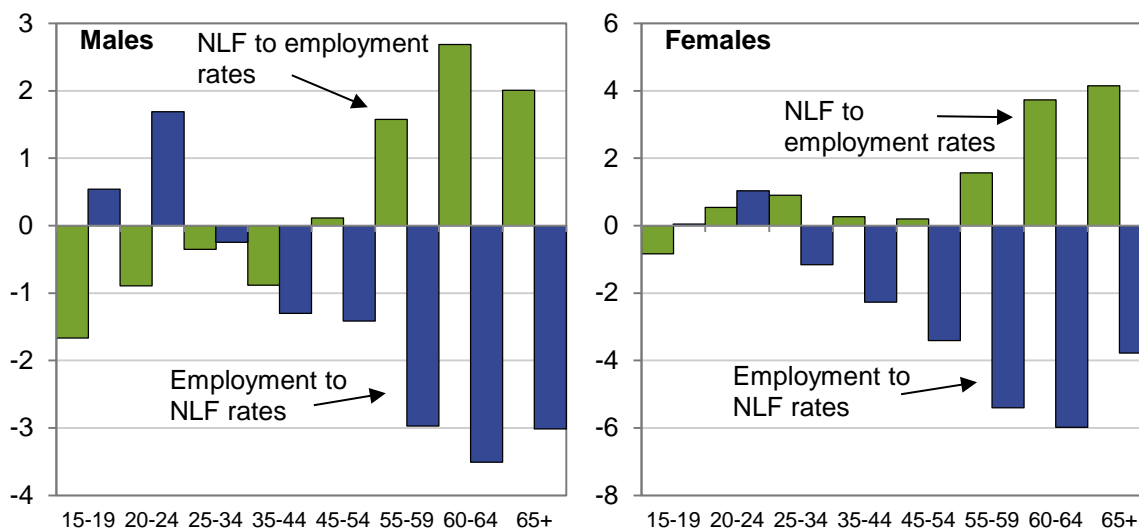


**a** The ABS produces data on the monthly gross flows from one labour market state to another, including transitions from employment to 'not in the labour force' (NLF) and from NLF to employment. These can be converted into transition rates by dividing by the source population. For example, the transition rate from employment to NLF is calculated as the number of movements divided by the initial level of employment. The yearly average transition rates were calculated, and the trends in these rates were estimated by regressing the logged values of the transition rates against a time trend for the period from 1997 to 2012.

*Data source*: ABS 2013, *Labour Force, Australia, Detailed* - Electronic Delivery Gross Flows (ST GM1) Gross Flows by State, Age, Sex.

Putting aside the reasons for the changes in exit rates, their lower values have important, sometimes overlooked, dynamic effects. Lower exit rates for a group of people of a given age at a given time increase the number of people in the labour force at all later ages, raising future labour force participation rates, even if the exit rates at those older ages stays fixed. This study considered these cohort patterns in producing one set of estimates of future labour participation rates (as discussed later).

The importance of past labour force status also has policy implications. Policies that aim to increase labour participation rates of older people do not necessarily have to be targeted at the old. Successful policies that encourage lower labour market exit rates at younger ages can stimulate higher labour supply at older ages — an issue touched on in chapter 6.

## The paradox of 'declining' disability rates

Disability and ill-health are major obstacles to labour force participation. Other than intended retirement, the most common reason for people giving up employment is

sickness, injury and disability (26 per cent of men and 21 per cent of women in 2010-11).[29] For people retiring before the age of 55 years, this was by far the most common single reason for retirement (56 per cent for men and 28 per cent for women). The prevalence of disability and ill-health is important for projections of future labour force participation because older workers have much higher rates of disability and chronic illness, and because there are trends in age-sex specific disability rates.

Population surveys show that age-specific prevalence rates of disability among working age people have significantly decreased between 2003 and 2009, with the exception of women aged 60-64 years (table 3.2). On face value, these reductions auger well for future age-specific participation rates.

However, paradoxically, labour force outcomes only partly reflect these trends.

- The share of working age people who are outside the labour force who say that they are 'permanently unable to work' has increased substantially, particularly since 2001-02 (figure 3.12). The increase has been greatest for females, but has also applied to males.

- The share of people outside the labour force who say that their 'main activity' is disability or sickness (a curious wording that reflects the way the ABS poses the survey questions) has been also strongly rising for females aged 45-64 years from 1994 to 2012 (figure 3.13). The comparable disability/sickness rates for men are higher than females, but have been falling.[30]

- There has been a substantial increase in the share of older age population of women on the Disability Support Pension (DSP), but not for men (FaHCSIA 2012, p. 8). Yet recipiency rates of the DSP are climbing at younger ages for both men and women (figure 3.14).

The contrasting pictures of disability may, in part, reflect how disability is perceived by people and how it is categorised for income support purposes. This is probably most applicable to women aged 60-64, who have shifted from the Age pension to the DSP as the eligibility age for the Aged Pension has risen.

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[29] Based on ABS 2011, *Retirement and Retirement Intentions, Australia*, Cat. No. 6238, 13 December, p. 5.

[30] Based on analysis of ABS 2013, *Persons Not in the Labour Force, Australia - Main activity when not in the labour force*, Cat. No. 6220, 19 March. Data were adjusted to take account of a series break.

Table 3.2    **Nearly all directly measured disability rates of working age people are apparently falling**

1998–2009

| | Males | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 2003 | 2009 | Change in ratio 1998-2009 | 1998 | 2003 | 2009 | Change in ratio 1998-2009 |
| | % | % | % | % | % | % | % | % |
| Share of the population with a schooling or employment restriction | | | | | | | | |
| 15–24 | 6.3 | 6.3 | 4.6 | -27.6 | 4.7 | 5.5 | 4.4 | -7.1 |
| 25–34 | 8.0 | 8.3 | 5.7 | -28.1 | 6.9 | 6.1 | 5.9 | -15.0 |
| 35–44 | 11.3 | 9.8 | 8.6 | -24.1 | 11.0 | 9.6 | 8.7 | -21.1 |
| 45–54 | 16.9 | 15.9 | 12.3 | -27.3 | 16.3 | 15.7 | 13.5 | -17.3 |
| 55–59 | 24.3 | 22.5 | 18.2 | -25.1 | 23.2 | 23.2 | 20.6 | -11.4 |
| 60–64 | 28.8 | 27.9 | 23.5 | -18.5 | 19.4 | 23.8 | 24.3 | 25.3 |
| Share of the population with a severe or profound disability | | | | | | | | |
| 15–24 | 2.1 | 2.2 | 1.9 | -10.2 | 1.7 | 2.2 | 1.7 | 0.7 |
| 25–34 | 2.5 | 2.3 | 1.8 | -29.0 | 2.5 | 2.3 | 2.2 | -10.7 |
| 35–44 | 3.0 | 3.2 | 2.3 | -24.3 | 4.0 | 3.5 | 3.2 | -18.7 |
| 45–54 | 5.5 | 4.2 | 3.7 | -33.7 | 6.7 | 5.5 | 4.7 | -29.3 |
| 55–59 | 8.8 | 6.4 | 5.9 | -32.9 | 7.9 | 8.2 | 7.8 | -2.4 |
| 60–64 | 8.3 | 7.6 | 8.2 | -0.9 | 9.3 | 9.9 | 8.8 | -5.0 |
| Share of the population with any disability[a] | | | | | | | | |
| 15–24 | 9.5 | 8.9 | 6.7 | -29.9 | 7.7 | 9.0 | 6.6 | -15.0 |
| 25–34 | 11.5 | 11.7 | 8.8 | -23.9 | 9.8 | 9.7 | 8.5 | -13.9 |
| 35–44 | 15.7 | 14.5 | 12.8 | -18.7 | 14.6 | 13.9 | 12.9 | -11.7 |
| 45–54 | 22.3 | 21.6 | 17.2 | -23.1 | 22.8 | 21.5 | 18.9 | -17.4 |
| 55–59 | 31.7 | 28.7 | 26.7 | -15.8 | 32.3 | 31.9 | 28.7 | -11.1 |
| 60–64 | 42.0 | 40.6 | 35.0 | -16.7 | 35.5 | 37.1 | 36.9 | 4.1 |

[a] These are people with a specific limitation or restriction. The number is the sum of people with mild, moderate, severe and profound core activity limitations and, where these are not already included in those groups, people with a schooling or employment restriction.

*Source*: ABS, *Disability, Ageing and Carers*, 1998, 2003 and 2009 surveys, Cat. No. 4430.0.

It may also be that this move has been reinforced by the growing gap between Newstart Allowance and DSP payments, so that women previously unemployed have shifted to the DSP.[31] Since few people return to work from the DSP, this may dampen the long-run growth in participation by women (a matter for some policy concern). Similarly, the growing rates of recipiency of the DSP among younger males and females suggests that this will have long-lasting impacts on the participation rates of these younger cohorts as they age.

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[31] This is not to say that their disability is contrived, but that people's self-perception of disability as the barrier to work is greater if the social welfare benefits associated with unemployment are low.

But there is much that remains mysterious about what is happening to disability rates, and especially the conflicting stories for men. Accordingly, this report has not produced a set of labour force projections that take account of disability directly, though their effects will be partly reflected in the extrapolation of historical participation rate trends (see below).

Figure 3.12    **People outside the labour force who say they are 'permanently unable to work'**

1978-79 to 2012-13, share of population (%)[a]
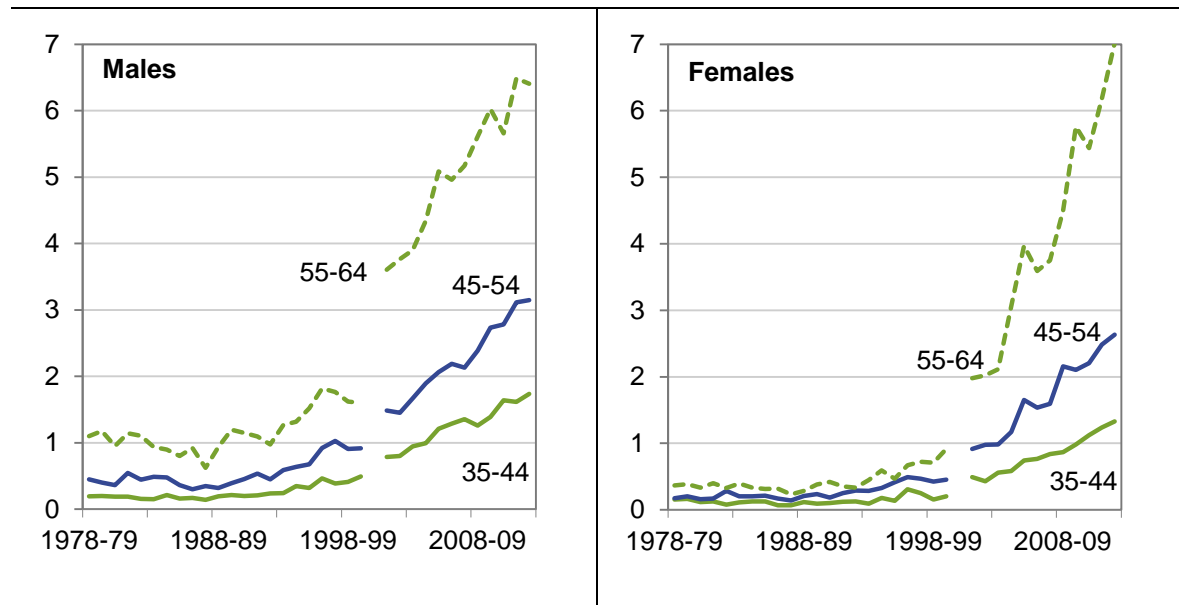


**a** The shares are shown as a share of the population to place them on an equivalent basis as the disability rates shown in table 3.2. There was a break in the series in 2001 based on a change in the labour force survey. One feature of the change is that the category 'Own illness' as an explanation for being not in the labour force was omitted in the current series. It is likely that some people who would have given illness as the reason will have now responded 'permanently unable to work'. However, even when the 'own illness' category is added to the 'permanently unable to work' category for the pre 2001 period, the trends look much the same.

*Data source*: ABS 2009, *Labour Force Historical Time series, Australia, February 2009*, Cat. No. 6204.0.55.001; ABS 2013, *Labour Force, Australia, Detailed - Electronic Delivery, July 2013*, Cat. No. 6291.0.55.001.

## Figure 3.13 People outside the labour force who say they are sick or have a disability

1994 to 2012, share of population (%)[a]
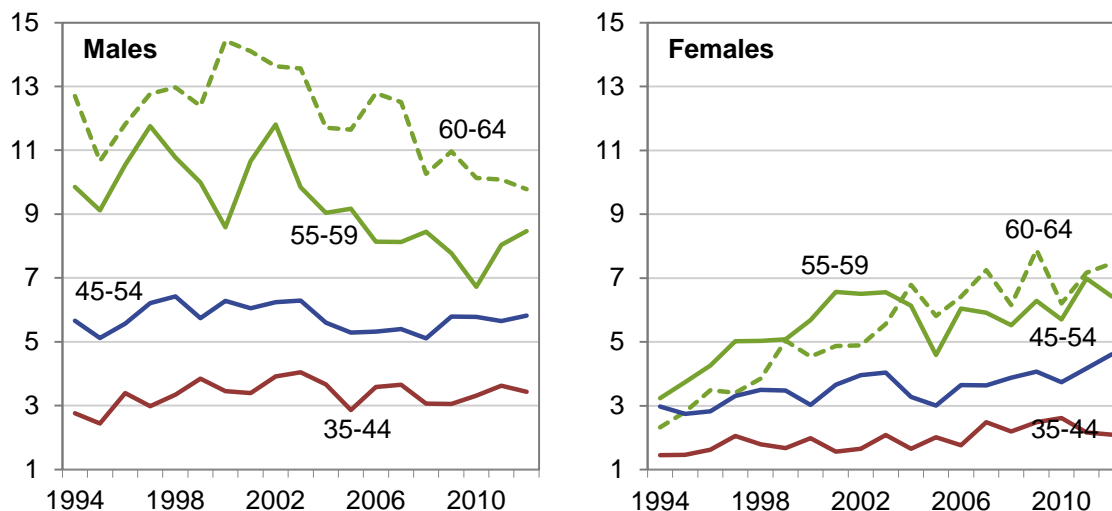


**a** The ABS survey asks people about their 'main activity' when not in the labour force. One factor for the female pattern is that people who had both a disability and some other main activity (such as retirement, or 'home duties') re-categorised their main activity as disability or sickness when they could no longer receive the age pension (for those aged 60-64 years) or if, for social reasons, they no longer see their activities as 'home duties'. In effect, the historical data may have hidden a latent higher level of disability.

*Data source*: ABS (various issues), *Persons Not in the Labour Force, Australia - Main activity when not in the labour force*, Cat. No. 62200TS0013.

## Figure 3.14 Usage rate of the Disability Support Pension

1969-70 to 2010-11, share of population (%)
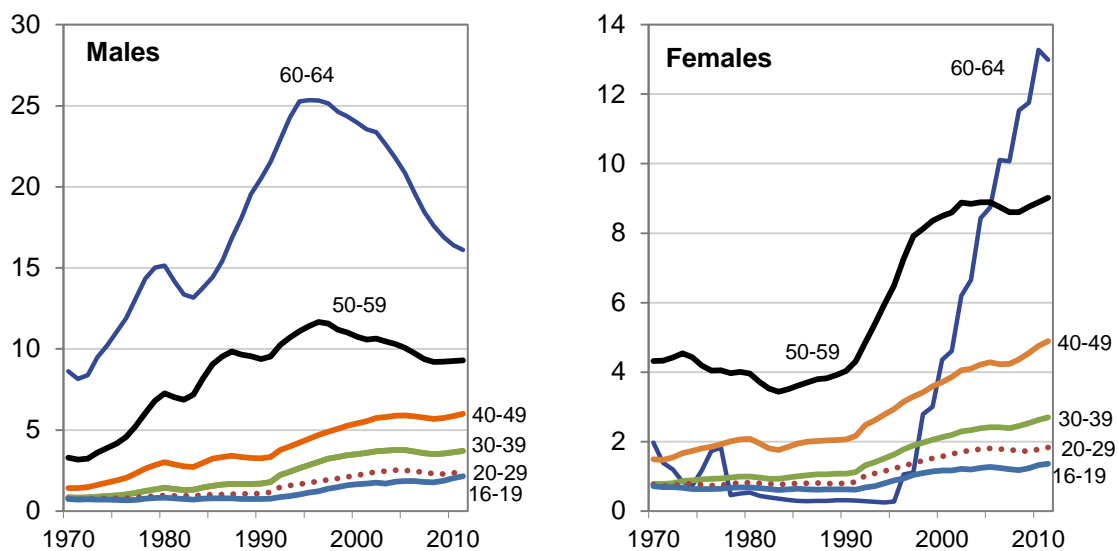


*Data sources*: DSP data from Annual Reports on Social Security recipients from various employment departments and FaHCSIA, and the Australian Government Treasury (for early years). Population data are from ABS 2013, *Australian Demographic Statistics*, Dec 2012, Cat. No. 3101.0.

## Tax rates and the welfare system

Labour supply responds to the tradeoffs between the intangible and pecuniary benefits of working compared with not doing so. The tradeoff takes account of the relationships between pre-tax wages, labour taxes, and interactions with the income transfer system (noting that most social security payments are means-tested, with relatively steep taper rates leading to high effective marginal tax rates). The treatment of asset holdings in eligibility tests for income support payments may also affect retirement decisions.

In this study's modelling, there are no tax rate increases, as a major purpose of the projections is to highlight the fiscal pressures from ageing if governments do nothing to restore fiscal balances. Moreover, it is assumed that long-run social welfare payments are indexed to real wages because under alternatives, such as adjusting by inflation alone, the social welfare payment share of GDP would decline to low levels over the long run. This would be inconsistent with historical patterns and government policy. Accordingly, as in the various Treasury IGRs, in the analysis in this report, there is no modelling of the labour supply effects resulting from the likely future changes to the tax-transfer system.

However, while it is reasonable to abstract from the impacts of taxes in considering projections of labour supply under a no-policy change assumption, in reality governments will have to finance the emerging fiscal gaps. If they did so through higher labour income taxes, this would discourage labour supply (in both hours supplied and labour participation rates). This would then aggravate the real supply-side impacts of ageing. The effects would not be trivial — especially for the supply of labour by married women, who empirically are the most responsive to wages. An international meta study (Bargain and Peichl 2013) found that for every 10 per cent decrease in after-tax wage rates:

- married women and single mothers withdraw an average of around 5 per cent of their hours supplied[32]

- married and single men withdraw an average 1 per cent of their hours supplied

- single childless women withdraw an average 1.5 per cent of their hours supplied.

One of the advantages of the Commission's MMRF model (which is in development for the analysis of population ageing) is that it can indicate the labour supply effects of fiscal gaps financed through various taxes, including those on labour.

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[32] Another international meta study finds even larger long-run effects for women (Keane 2010).

## Changes to wealth may affect participation rates among the future old

Greater wealth holdings tend to increase the probability of withdrawal from the labour market. Since privately-funded wealth holdings are projected to increase substantially over the next 50 years (chapter 7), this creates a countervailing force against the existing pattern of delayed retirement.[33] This pattern may be reinforced by the growing value of bequests to successive generations as bequests have been shown to encourage retirement (Brown, Coile and Weisbenner 2010; Conley and Thompson 2013). The implication is also that reductions in expected wealth — such as those that occurred with the advent of the global financial crisis — temporarily delay retirement. It may be that some of the recent increases in participation rates by older Australians reflect this. To the extent that this is true, extrapolation on the basis of recent trends may exaggerate the future likely level of participation by the old.

The design of the retirement income support system provides another conduit for the impact of wealth on retirement decisions — in this case, in the opposite direction. Government decisions to defer access to publicly-funded pensions represent reductions in the net present value of the expected future stream of benefits — and therefore are equivalent to a reduction in wealth (chapter 6).

## Older people want to work, but do their preferences translate to higher participation rates?

Many people in mature age groups want to increase their participation in the workforce. For example, in 2011 there were over 185 000 people between the ages of 55 and 64 years who were not currently working and wanted a paid job (1.5 per cent of the current total labour force). In addition, there were 132 000 people over the age of 65 years who were not currently working and wanted a paid job (1.1 per cent of the current total labour force). Of these groups, only 67 000 (55-64 years) and 5000 (65 years and over) were officially unemployed, suggesting that a large proportion of this group have been discouraged from searching for work (ABS 2012d).

In addition, there were nearly 100 000 workers aged 55 years or more who were underemployed, meaning that they do work, but they would like to increase the number of hours that they work. Of this group, 20 per cent cited 'being considered too old by employers' as their main difficulty in increasing the hours they work.

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[33] This is partly compensated by the fact that people expect to live longer, so greater asset holdings are required to sustain an adequate retirement income.

However, the main concern was a lack of vacancies or too many applicants, which was cited by 51 per cent of this group (ABS 2010).

The extent to which the desire by mature age people to work is likely to raise actual future labour supply is hard to measure.

If mature aged people's relative preferences for work and leisure were to change, or if they were to search for jobs more actively, then this would represent a positive labour supply shock (akin to an increase in immigration or some other demographic change that leads to a new pool of able workers). In this case, there is likely to be an increase in participation rates and employment. The rapidly increasing participation rates of older Australians suggests that this factor is at work, underpinned by the fundamental drivers discussed earlier.

On the other hand, it is important to distinguish between these drivers of increased participation and the mere existence of an unsatisfied preference to work. The latter need not have any impact on actual labour supplied if employers are not willing to hire such workers at existing wages or offer potential older employees the hours or conditions they desire. There is a given structural rate of unemployment, which depends on the nature of industrial relations law, minimum wages, the tax/transfer system, employer attitudes and the traits of those seeking work. So preferences may remain unsatisfied. Consequently, it cannot be assumed that the data cited above provide robust evidence of a readily tapped source of labour.

This issue is connected to another often misunderstood facet of workforce ageing and higher dependency ratios. It is sometimes claimed that population ageing will create labour shortages and that labour markets will therefore become more accommodating to mature aged workers, even if those workers would not have formerly been able to find jobs. It is certainly the case that the size of the prime-aged labour force to the population will decline with population ageing (as shown in figure 3.1). Were labour demand fixed, then this would create persistent labour shortages, which would be partly relieved through the greater labour force involvement of people previously unable to get jobs or more hours. However, the proposition that labour demand is fixed is fallacious — the so-called 'lump of labour' fallacy (Brücker 2013; de Koning et al. 2004).[34] If effective labour supply per capita falls — as it will with population ageing — then all things being equal, aggregate labour demand also falls. Accordingly, it is not clear that future labour

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[34] The best illustration of the fallacy are early retirement policies. The idea was that by removing older people from the workplace, younger unemployed people would be able to take their places. It did not work as the unemployed were not substitutable for the displaced workers. Labour demand fell, and the economies that introduced such policies simply became poorer (Layard, Nickell and Jackman 2005).

markets will automatically be any more accommodating of marginal workers, regardless of their age. This is why it is important to consider any structural obstacles that discourage labour supply by mature aged workers, such as incentives for premature retirement posed by the income retirement system (chapter 6) and age discrimination.

## What might happen to aggregate participation rates?

Ideally, participation rates would be projected by modelling the long-run effects of shifts in education, disability, female attachment and taxes on the labour force. However, given the complexities described above, such modelling is beyond the scope of this study, although future IGRs could re-examine the potential for such statistical and economic analysis.[35]

While there are forces that work in opposing directions, on balance, the evidence suggests that *age-sex specific* participation rates should rise over the next 50 years. This study has used two simple methods for projecting age-sex specific labour participation rates (box 3.1):

- extrapolation methods that take account of trends in labour participation rates from 1978-79 to 2012-13 for males and females by five year age groups. The IGR reports have used this approach.

- modelling of exit rates out of, and entry rates into, the labour market by different age-sex cohorts over their lives, noting that this has the advantage that it can take into account the effects in later life of early labour market participation decisions. However, it can also introduce spurious 'bumps' in future participation rates.

Qualitatively, the results are similar, revealing that participation rates are expected to rise in most age brackets over the next 50 years, with the most pronounced increase among workers aged over 55 years (table 3.3 and figure 3.15). This report uses the results from the extrapolation method because they tend to evolve more smoothly, although the results from the alternative method are much the same.

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[35] A complementary approach is to use general equilibrium models to examine labour supply projections, taking account of occupational mixes, shifts in consumption associated with ageing, and most importantly the economic feedbacks to labour supply changes. The Monash Model has been used for this purpose (Giesecke and Meagher 2009), and the Commission is developing its associated MMRF model for more elaborate analysis in this area.

Box 3.1　**Forecasting participation rates**

In the Commission's earlier analysis, a 'cohort' approach was used to estimate exit and entry rates by each age-sex cohort out of, or into, the labour market in the next period (PC 2005a). For example, by estimating an exit rate over the next five years of people aged between 55-59 years old, it is possible to measure the number of people in the labour force aged 60-64 years old in the next period.

This approach has several conceptual advantages. In particular, it means that, other things equal, changes in entry or exit rates of a younger person in a given period affects participation rates at all later ages. For example, if fewer people aged 55-59 years exit the labour market over the next five years, then there would be:

- more people aged 60-64 years in the labour force in the next five year period than otherwise
- more people aged 65-69 years in the labour force 10 years later than otherwise, so long as the exit rates of 60-64 year old employees stayed the same (and counting for population changes).

However, this virtue is also a potential vice, since any single unrealistic outcome for the exit/entry rates for a given age-cohort ripples throughout all subsequent age groups in later years. This can result in counterintuitive 'waves' in future participation rates over the projection period, which only vanish close to the end of the projection period. While the study was able to estimate a cohort model that was largely free of such 'waves', some quite reasonable model variants did display this feature. (Fortunately, all variants produced intuitively plausible long-run participation rates for all age groups).

Since male participation rates evolve more smoothly than female ones, this study used extrapolative methods to forecast participation rates directly for males, with smooth transitions from current levels to a future steady state level. Then female participation rates were derived by modelling the ratio of female to male participation rates, which takes account of the fact that the long-run ratio of male to female rates is likely to be stable. Various statistical smoothing and econometric methods were used to determine the long-run level, but judgment played a role in the forecasts. The econometric methods are identical to those used in technical paper 3 (PC 2005a), but were based on using participation rates, not exit or entry rates. The only exception was modelling of participation rates for 15 to 19 year olds, which were modelled using time series methods. Given that the data appeared to be non-trending, a Box-Jenkins approach was employed. Moreover, as participation rates cannot permanently trend up or down, the specification for the ARIMA model assumed integration of order 0. Ultimately, an AR(1) model fitted the data best.

In future, it would be useful to consider various other statistical methods. Some of the techniques applied in demographic modelling, such as the Lee-Carter method, may be useful. There is also some promise in considering some of the structural determinants of labour force participation, such as trends in education, the availability of childcare and timing of births, pension rates and retirement ages.

Nevertheless, the methods used in this study provide plausible measures of likely participation rates.

Table 3.3 **Projected participation rates using different methods**

Outcome in 2059-60

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | 2012-13 | Extrapolation 2059-60 | Cohort 2059-60 | 2012-13 | Extrapolation 2059-60 | Cohort 2059-60 |
| 15-19 | 52.8 | 56.0 | 56.0 | 56.5 | 58.9 | 58.9 |
| 20-24 | 82.1 | 80.0 | 79.7 | 74.9 | 75.0 | 73.8 |
| 25-29 | 89.9 | 90.6 | 87.0 | 75.6 | 75.7 | 74.7 |
| 30-34 | 92.1 | 92.1 | 89.4 | 72.7 | 74.1 | 73.7 |
| 35-39 | 91.6 | 93.0 | 90.3 | 73.7 | 77.8 | 76.5 |
| 40-44 | 90.6 | 90.6 | 89.5 | 78.1 | 79.8 | 83.2 |
| 45-49 | 89.4 | 89.6 | 89.5 | 78.3 | 79.9 | 84.3 |
| 50-54 | 87.0 | 87.9 | 87.5 | 76.7 | 83.0 | 82.0 |
| 55-59 | 80.5 | 85.0 | 85.5 | 65.5 | 75.0 | 76.9 |
| 60-64 | 63.2 | 75.0 | 76.5 | 45.3 | 58.6 | 62.6 |
| 65-69 | 33.5 | 40.1 | 50.8 | 20.1 | 35.0 | 38.8 |
| 70 | 8.2 | 12.0 | 10.8 | 2.9 | 4.2 | 8.3 |

*Source*: Commission estimates using the methods described in box 3.1.

In the absence of the change in the age structure of the population, continuation of current age-sex specific participation rates would *increase* aggregate participation rates to over 68 per cent by 2059-60, or around 3 percentage points from its 2011-12 rate (figure 3.16).

However, the positive effects of trends at the age-sex level are overwhelmed by the shift of more people into lower participating age groups. Accordingly, labour force participation rates are projected to fall to 59.6 per cent,[36] opening up a 9 percentage point gap compared with a 'no-ageing' counterfactual. Labour force growth over the period from 2013-14 to 2059-60 is projected to be around half that applying over the previous 30 years (figure 3.17).

No conceivable policy package can eliminate that gap, but there is likely to be scope to narrow it through adjustments to the retirement income system, taxation and community norms (chapter 6). This is most promising for people who have completed their education, and with participation rates below 90 per cent (older workers and prime working age women). As discussed in chapter 6, greater workforce participation, in itself, would not necessarily promote community-wide benefits. However, eliminating inefficient economic and social obstacles to working would do so.

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[36] The IGR 2010 report (Australian Government 2010, p. 12) projects a participation rate for 2049-50 of 60.6 per cent. This study finds a very similar number for this year (of just under 61 per cent).

Figure 3.15    **Labour force participation rates**

Percentage rates, average of the year ending June 1979 to June 2060
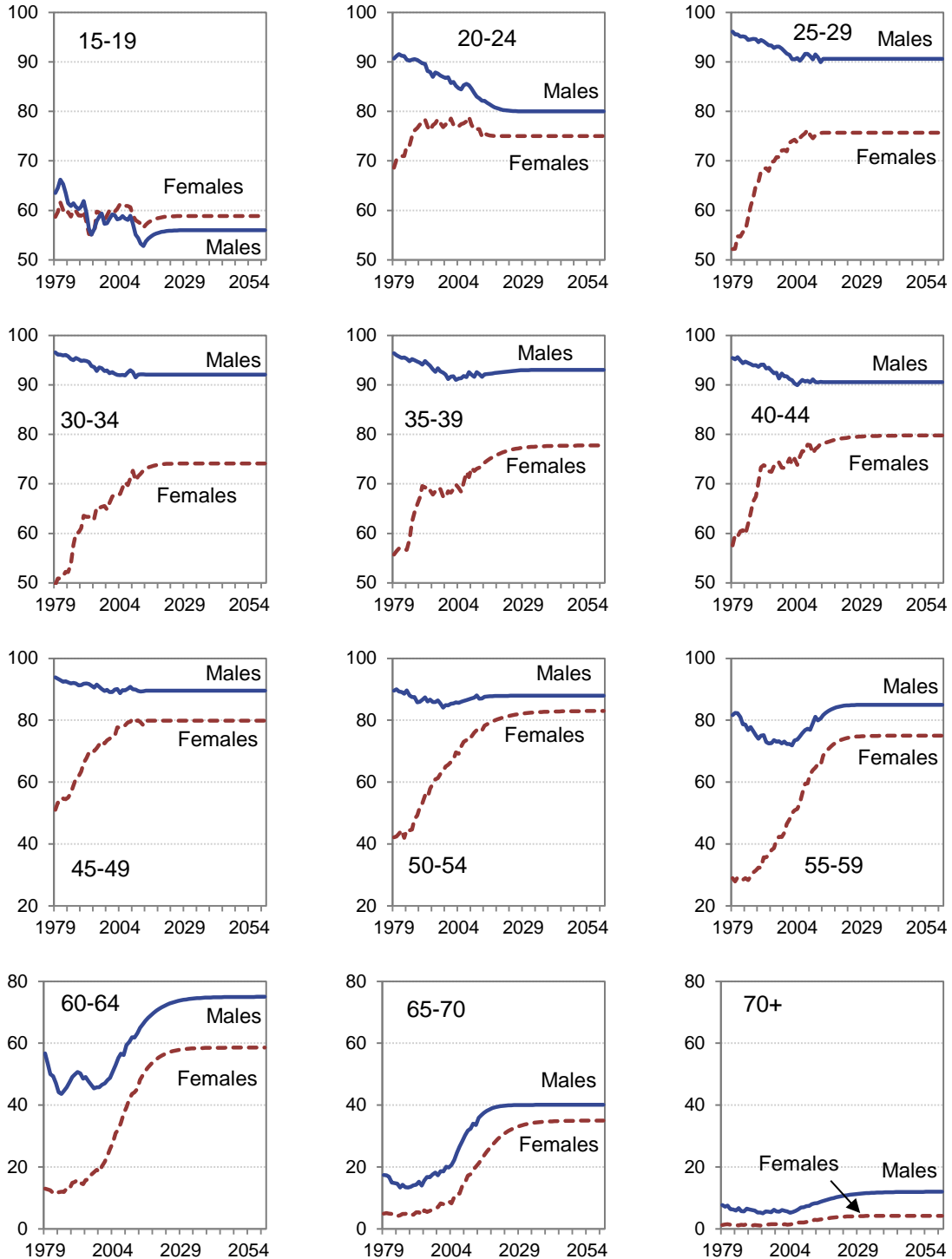


**a** The projected participation rates for 70 year olds may be too optimistic since the past trends on which they are based will not fully account for the large future increase in the share of the 70+ population who are very old (and who have very low participation rates).

*Data source*: PC extrapolation-based forecasts and ABS 2013, *Labour Force, Australia, Detailed* - Electronic Delivery, table LM2.

## Figure 3.16　Aggregate labour force participation rates

1979-80 to 2059-60, per cent
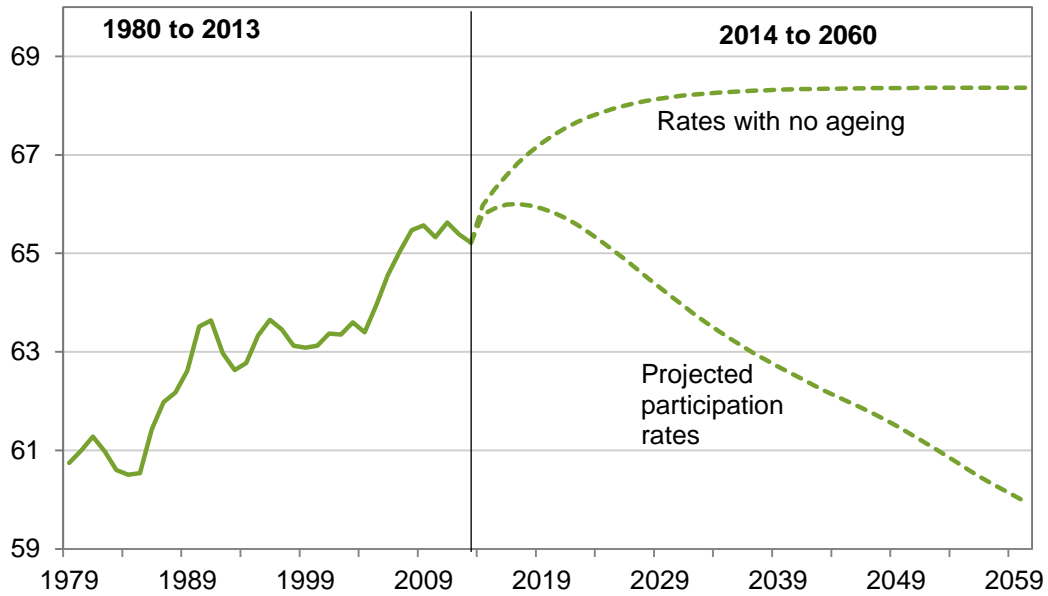


*Data source*: As above.

## Figure 3.17　Growth in the aggregate labour force

1979-80 to 2059-60
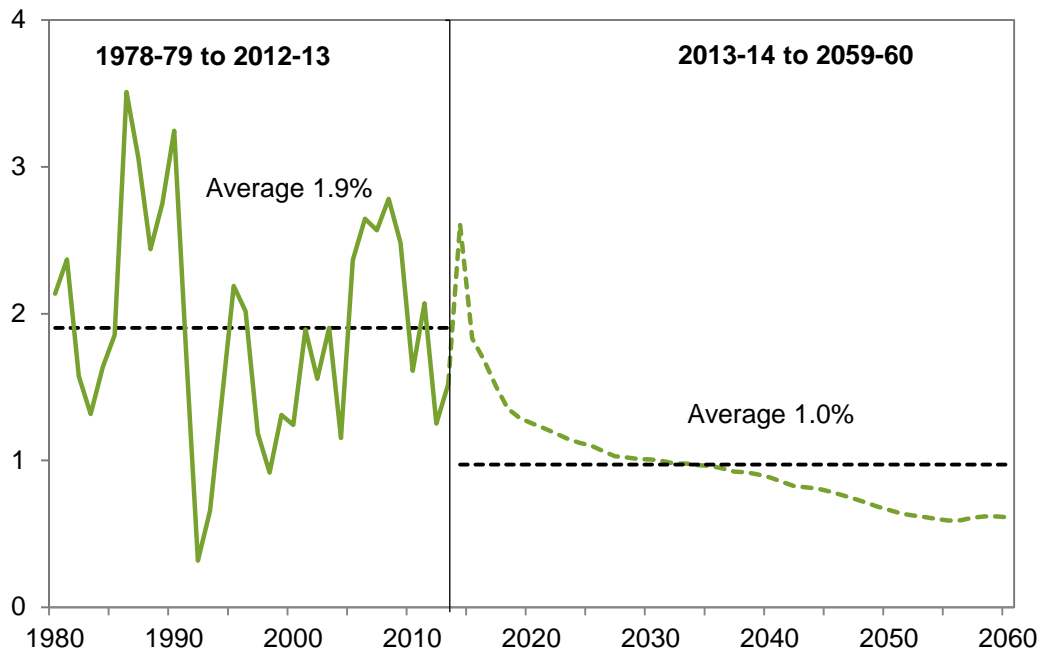


*Data source*: Based on the data produced using the extrapolation method.

## 3.5    Unemployment (and employment) rates

Participation rates do not contribute to economic output unless people are in jobs. The employment rate is the share of the labour force in a job. The unemployment rate is 1 minus the employment rate, so forecasting one rate will implicitly forecast the other. As in the IGR 2010 (Australian Government 2010, p. 13), the projections in this study are based on the rate of unemployment that can be sustained without upward pressure on inflation rates (the so-called 'non-accelerating rate of unemployment', or NAIRU). While short-run unemployment rates reflect the business cycle, the NAIRU is influenced by skill mismatch, the wage bargaining process, industrial relations laws, unemployment insurance arrangements and rigidities in labour markets (Gianella et al. 2008; Kennedy 2007).

In the decade up to 2012-13, Australia had relatively modest and stable unemployment rates and a low inflation rate (figures 3.18 and 3.19). While unemployment rates may rise in the short-run over the next few years in line with recent forecasts, current unemployment rates may be a reasonable measure of the NAIRU. However, unemployment rates for some older groups — most notably males aged 65-69 years and 70+ years, and females aged 60-64 years and 70+ years — appear to be trending upwards.

One explanation for this pattern may be a link between the recent rising participation rates of older people and their job search behaviour. Unemployment rates for older workers are very low because they exit the labour force if they cannot find jobs and, once outside the labour force, they do not attempt to re-enter. However, when older people have an increasing propensity to participate in the labour force, they must search for jobs if they re-enter the labour market or if they switch from one job to another. Searching for jobs takes time, thus raising unemployment rates. In addition, older job searchers — particularly those making a transition to work from outside the labour force — are likely, on average, to possess slightly lower skills than insiders, decreasing the probability of immediately finding a job. That said, this story can only be a partial and tentative explanation because there is no upward trend in unemployment rates for 60-64 year old men or 65-69 year old females, despite these groups also experiencing significantly rising participation rates.

**Figure 3.18   Male unemployment rates by age group**

1978-79 to 2011-12[a]
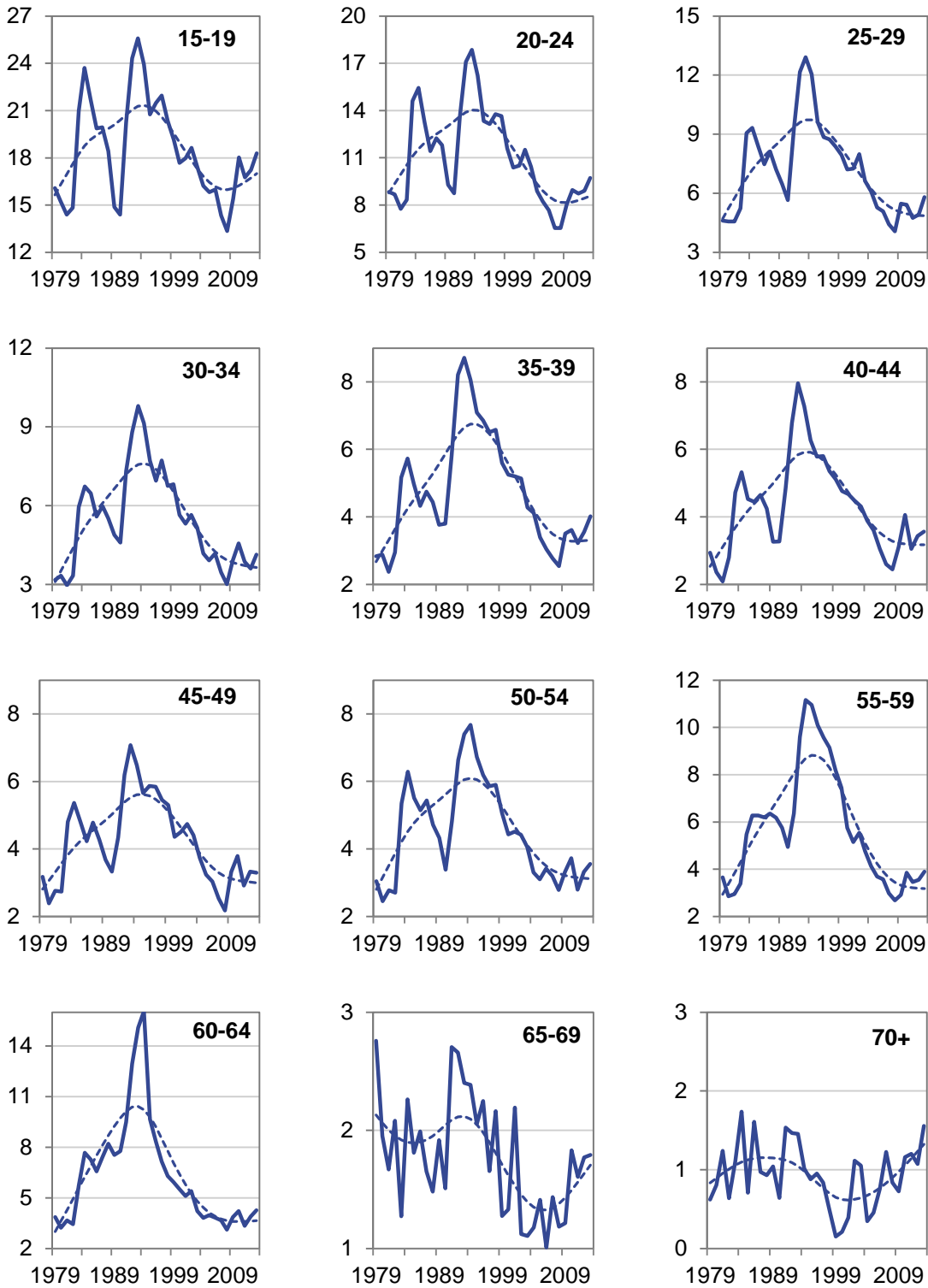


**a** The smooth line through each of the actual observed data series (used to consider likely trends) was derived from the application of a Hodrick-Prescott filter.

*Data source*: Commission estimates and ABS 2013, *Labour Force, Australia*.

## Figure 3.19    **Female unemployment rates by age group**
### 1978-79 to 2011-12
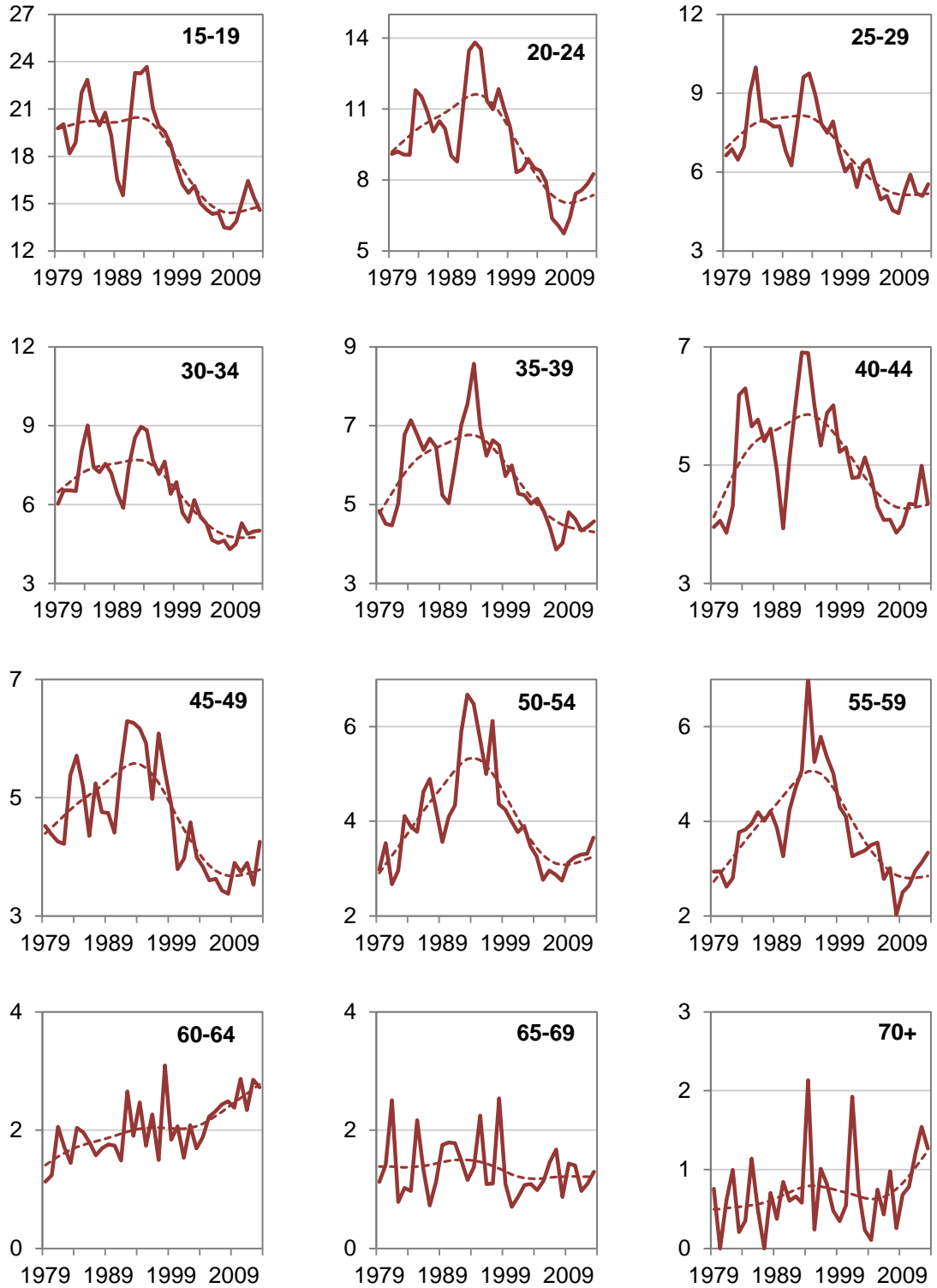


*Data source*: Commission estimates (as used in figure 3.18).

Regardless, the increasing trends in unemployment suggest that it may not be realistic to assume that unemployment rates for the relevant groups should be set at current levels for the projection period. Accordingly, statistical modelling of the trends was used to assess the long-run unemployment rates. The results suggested relatively small increases in the unemployment rates for these groups.[37]

However, this modest age-specific pressure for higher unemployment rates is offset by the shift in the age structure of the workforce. Workforce ageing means that *aggregate* unemployment rates are projected to fall over the next 50 years, albeit by a small amount (from 5.4 per cent in 2012-13 to 4.7 per cent by 2059-60). This estimate is in line with the 2010 IGR report (which assumed a long-run unemployment rate of 5 per cent). The data shown in figure 3.20 do not incorporate any short-run effects of the projected economic slowdown in 2013-14.[38] Moreover, they assume no major economic downturns, which can have relatively enduring impacts on unemployment rates.

The level of employment in the economy is then a product of the population, the participation rate, the employment rate and the ratio of the civilian population aged 15 years or more to the total population (as shown in box 3.1). The latter will rise weakly as the share of the young fall in the population (figure 3.21). The shares of the population with the highest participation rates (those aged between 25 and 54 years) are projected to decline. Overall, employment is projected to increase from around 11.6 to 18.4 million from 2012-13 to 2059-60.

## 3.6    Many older workers work part-time

For males, there is a clear u-shaped profile of part-time work by age, with high part-time rates for the young and for those aged 60 or more years (figure 3.22). Data analysis suggested that this profile is unlikely to change appreciably over the next 50 years. However, by shifting more males into age groups where part-time work is predominant, population ageing will raise overall male part-time rates. Around 164 males per 1000 employed worked part-time in 2012-13. This is projected to rise by around 15 per cent to around 190 males per 1000 by 2059-60.

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[37] All changes in unemployment rates were below 1.5 percentage points. For example, for males aged 65-69 years, the unemployment rate was projected to rise from 1.6 per cent to 2.4 per cent.

[38] The Australian Government Treasury forecasts that slower economic growth will raise unemployment rates to 6.25 per cent for 2013-14 and 2014-15, before they return to 5 per cent in subsequent years (Australian Government 2013d).

## Figure 3.20    Unemployment rates

Average over year ending June, per cent
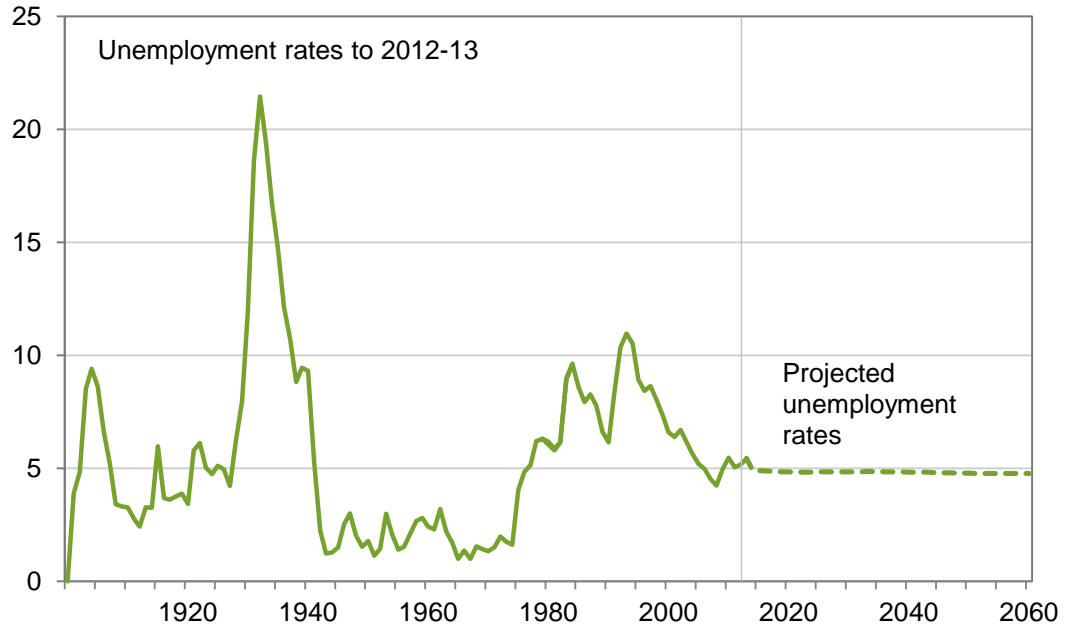


*Data source*: As used in figure 3.18.

## Figure 3.21    Measures of the potential labour force

Ratios of civilian population to total population 1979-80 to 2059-60
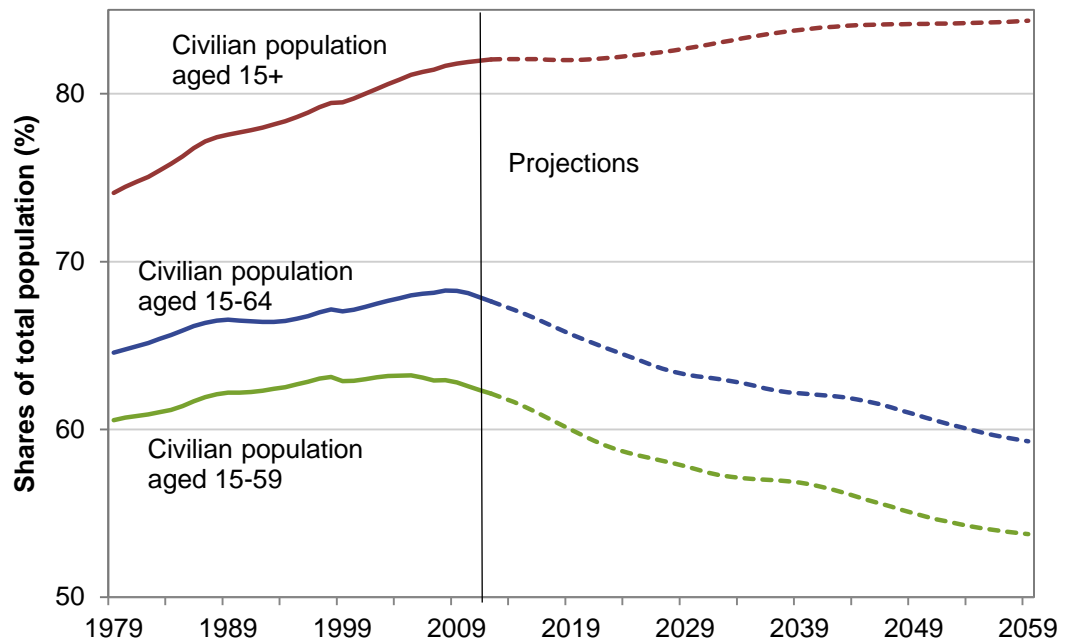


*Data source*: Commission estimates.

Female involvement in the labour market is quite different. Females have relatively high part-time rates throughout their working lives, reflecting their continued dominant role as child carers. Nevertheless, as for males, the cross-sectional data for 2012-13 reveal that part-time jobs predominate after age 60 years. Unlike males, this study projects that the part-time rates for females do change over time for some age groups — but not by a degree that fundamentally shifts the age profile of part-time work. Overall, the aggregate female part-time employment is projected to change from 459 to 475 per 1000 females between 2012-13 and 2059-60 (or a percentage change of less than 4 per cent).

The overall share of people employed part-time is expected to rise by around 10 per cent (and by 2 percentage points) over the next 50 years (figure 3.23).

Figure 3.22  **Part-time shares of employment by age**

2012-13, per cent
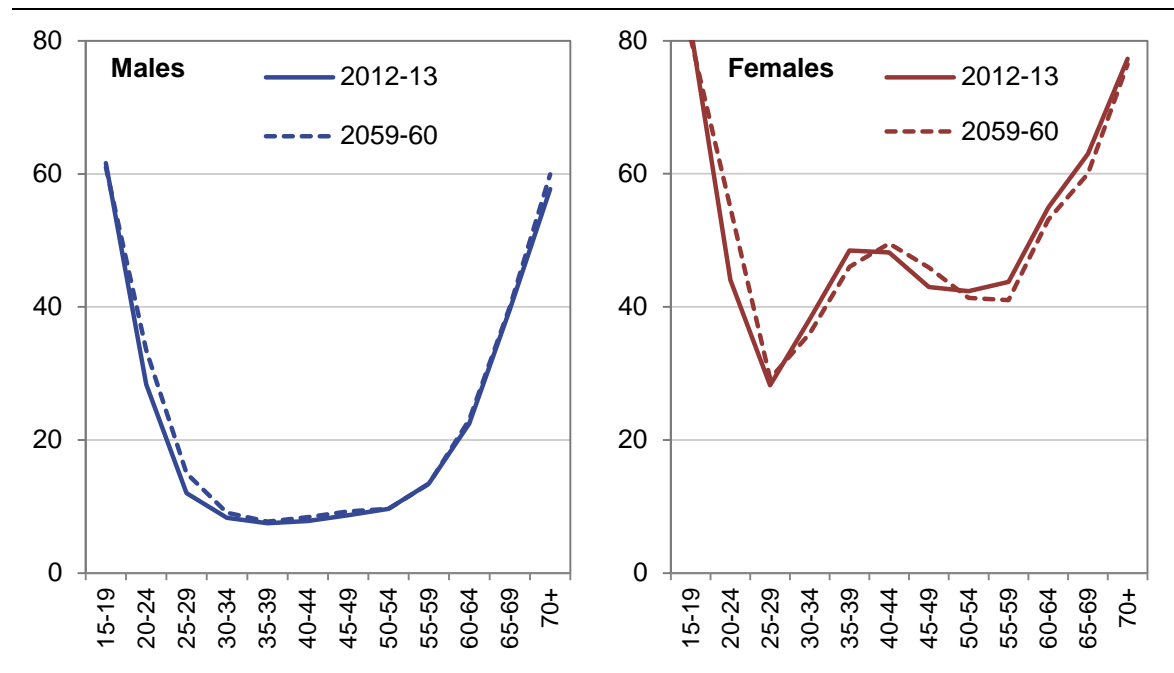


*Data source*: ABS 2013, *Labour Force, Australia* and Commission estimates.

Figure 3.23  **Aggregate part-time employment shares**
1978-79 to 2059-60, per cent



1978-79 to 2012-13

29.9%

31.9%

Projected 2013-14 to 2059-60

15.5%
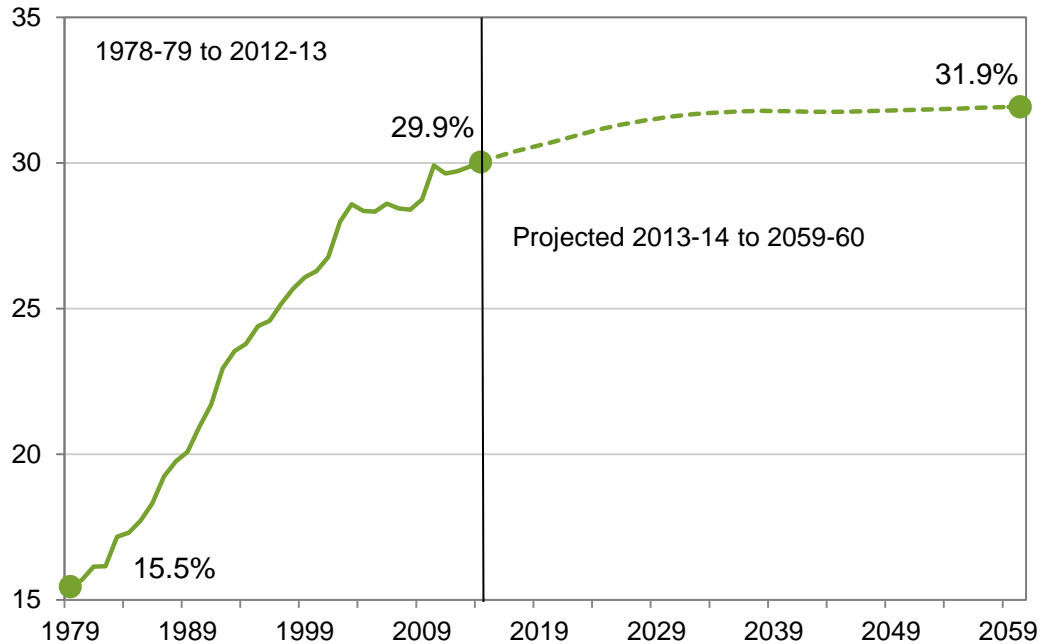
*Data source*: ABS 2013, *Labour Force, Australia* and Commission estimates.

## 3.7  Hours worked

The profiles of average hours worked by age for full-time and part-time workers follow quite contrary patterns (figure 3.24):

- Average hours for part-time workers tend to be lower for older workers than prime-aged workers for both sexes (and both sexes work much the same hours).

- In contrast, average hours for full-time workers are higher for older ages. This is likely to reflect so-called 'selection' effects, in which the workers who retire from full-time jobs or who transition to part-time jobs are different from those who stay in full-time work. There appears to be some evidence of this at the occupational level. The relative importance of managerial occupations with higher average full-time hours tends to rise significantly between ages 45-54 and 65+ years.

Given the patterns prevalent in the data, it is likely that movements in age-sex specific average hours from 2012-13 will be relatively modest, mainly reflecting reversion to trend of current hours worked (figure 3.25).

Figure 3.24 **Average part-time hours per person tend to be lower at older ages, while average full-time hours tend to be higher**
2012-13
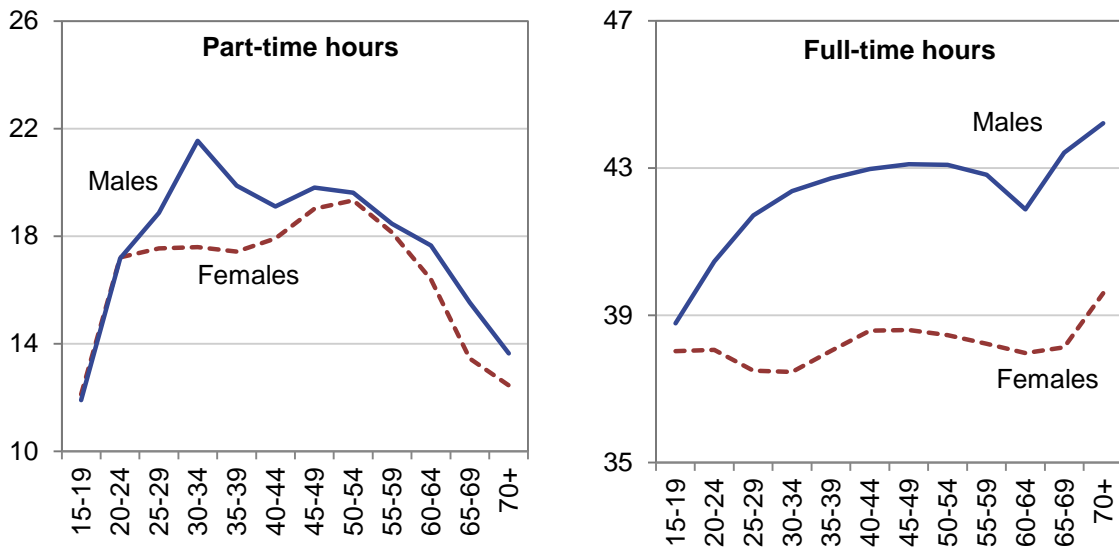


*Data source*: ABS 2013, *Labour Force, July, Australia* and Commission estimates.

Figure 3.25 **Change in hours worked per week**
2012-13 to 2059-60
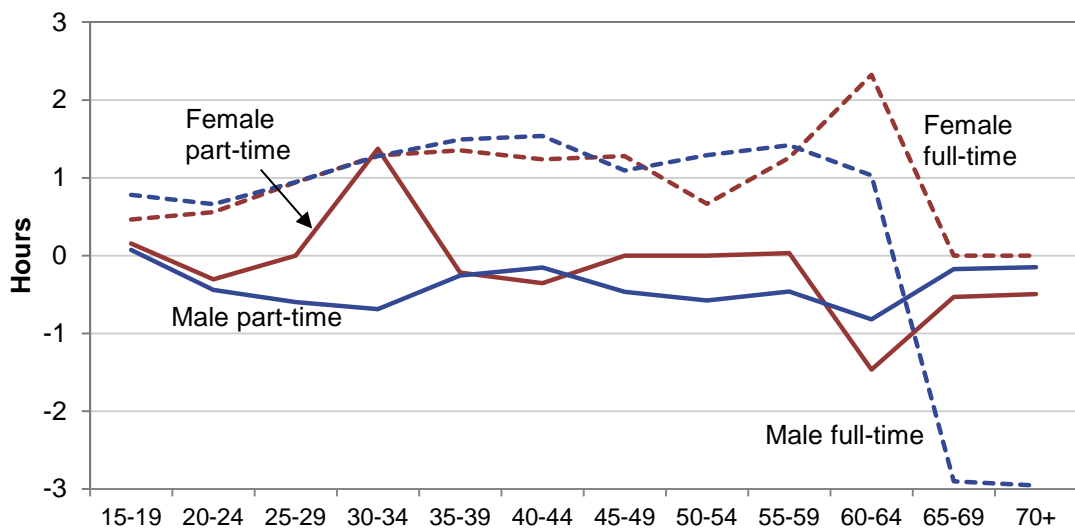


**a** The results are based on estimation of various ARIMA models, most commonly ARIMA(1,0,0).

*Data source*: ABS 2013, *Labour Force, July, Australia* and Commission estimates.

The shift in *aggregate* average hours worked per employed person are also an outcome of population ageing and the increase in the relative importance of part-time versus full-time work. Overall, average part-time and full-time weekly hours worked over the period from 2012-13 to 2059-60 change by -2.5 and 2.7 per cent respectively, with average weekly hours for employees as a whole increasing by 0.4 per cent, or effectively nothing.

## Hours per capita is the best measure of labour input

The last link in the chain of calculations falls out of the above projections. Hours worked per capita in Australia are projected to fall by around 4.5 per cent over the next 50 years (figure 3.26). This is not a radical change using historical benchmarks, taking Australia back to the hours worked per capita apparent in the mid-1990s. Nevertheless, for a given level of labour productivity, it implies that changes in labour supply associated with ageing and trends in age-specific labour market variables will reduce GDP by about 4.5 per cent below its counterfactual level, which is by no means a modest amount.

Figure 3.26    **Hours worked per capita fall**
Annual hours, 1978-79 to 2059-60
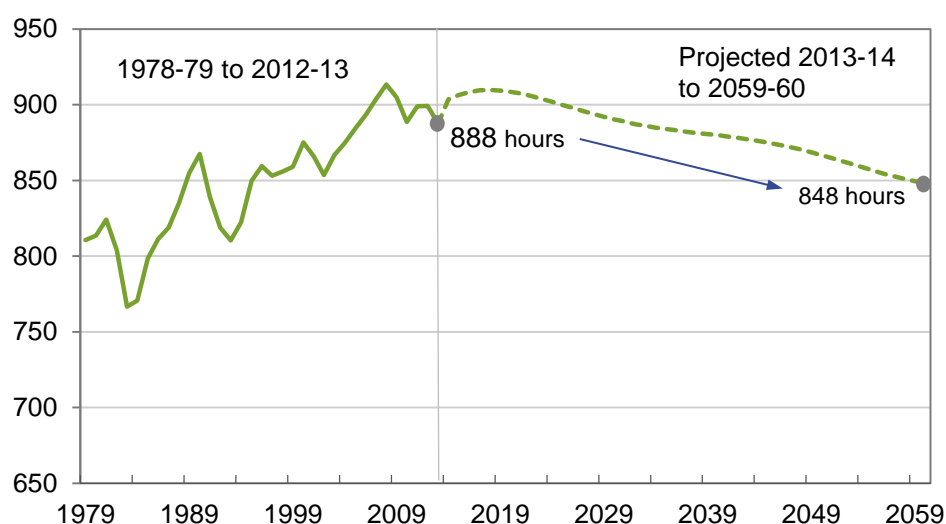


*Data source*: Commission estimates.

The significant reduction in aggregate participation rates is the main contributor to this outcome (figure 3.27 and table 3.4).

Figure 3.27    **Contribution to the reduction in hours worked per capita**
              100 x change in log values, 2012-13 to 2059-60[a]



**a** Hours worked per capita is the multiple of the participation rate, the employment rate, average hours worked per person per year and the share of the population of working age (aged 15+ years). The contribution of each component is calculated as $100 \times (\log(V_{2060}) - \log(V_{2012}))$ where V is the variable of interest. For small changes in V, this is very close to the percentage change in the variable concerned. The reduction in hours is different from that cited in figure 3.26 because of the log approximation in this figure.

*Data source*: Commission estimates.

Table 3.4    **A summary of where labour supply is heading**
            2012-13 to 2059-60

|  | *2012-13* | *2059-60* |
|---|---|---|
| Population (million) | 22.9 | 38.2 |
| Participation rate (%) | 65.2 | 59.9 |
| Employment to labour force (%) | 94.6 | 95.2 |
| Civilian population ratio (%) | 82.0 | 84.4 |
| Employment (million) | 11.6 | 18.4 |
| Part-time employment (million) | 3.5 | 5.9 |
| Full-time employment (million) | 8.1 | 12.5 |
| Average part-time hours per week | 17.0 | 16.6 |
| Average full-time hours per week | 40.9 | 42.0 |
| Average hours per week | 33.7 | 33.9 |
| Total hours per capita per year | 887.6 | 848.0 |

*Source*: Commission estimates.

# 4    Productivity and economic growth

**Key points**

Productivity growth will be the key determinant of economic growth over the next 50 years, having a greater impact than the reduction in labour supply per capita.

Australia's labour and multifactor productivity (MFP) growth has languished in recent years. While some revival can be anticipated, structural changes in the economy will make it difficult to return to the higher growth rates experienced in the 1990s.

- The shift to labour-intensive sectors will continue to occur, including to aged care and healthcare. These industries have tended to have lower than average measured productivity growth, and their greater relative importance will lower the economywide average growth rates.

- Average labour productivity growth is projected to be around 1.5 per cent per year from 2013-14 to 2059-60, considerably below the estimates used in most previous studies of future economic growth. In contrast, prior to the recent slowdown, average peak-to-peak labour productivity growth from 1988-89 to 2003-04 always exceeded 1.8 per cent.

Even modest sustained increases in labour productivity growth rates have a large long-run impact on gross domestic product (GDP) per capita.

- Compared with 'business as usual', a positive sustained productivity shock of 0.3 percentage points a year from 2013-14 to 2059-60:
  – gives people an additional $20 000 of GDP per capita by 2059-60
  – raises the cumulative sum of GDP by $13 trillion over the projection period. This is equivalent to around 8 years of Australia's GDP value in 2012-13.

The source of labour productivity growth matters. Increases resulting from additional MFP growth have bigger effects on the real net disposable income of Australians than that due to increases in the capital to labour ratio. This reflects the need to set aside income to make investments and to fund transfers overseas when foreigners provide financial capital for investment. This is why it is particularly important to stimulate MFP through economic reforms.

Nevertheless, it is crucial to have economic settings conducive to efficient capital investment. It is projected that aggregate fixed capital spending required to underpin capital deepening will be around $38 trillion over the next 50 years, which is around 5 times more in real terms than the sum of investment required from 1959-60 to 2012-13.

The need for higher MFP to improve Australia's GDP and income growth is also accentuated by the likelihood that the recent downturn in the terms of trade will be enduring, so that Australia's economic fortunes will rely more on doing things better.

## 4.1    Putting productivity growth in a context

The material prosperity of a society is determined by its endowments (geography: including location, the abundance of arable land, water and minerals), its pricing advantages (the terms of trade), the choices about where to allocate resources ('allocative efficiency'), and productivity (production or technical efficiency).

Most economies — including Australia — have opportunities to improve their prosperity principally by improving their allocative and production efficiency.[39] Many ongoing improvements are driven by market imperatives, but governments can influence efficiency by crafting the institutions and laws that set the backdrop for people's decisions, and by addressing 'market failures' (such as those that influence investments in innovation, some infrastructure and education).

Governments are largely impotent in shaping other factors. Geography is given and their capacity to influence the terms of trade is weak. Further, from a practical standpoint even in modelling possible outcomes for economic growth and prosperity over the next half-century, the terms of trade does not exhibit long-run trends that would need to be captured in any projection.

In contrast, even in a world of finite resources, productivity can continue to rise because of the accumulation of knowledge and improvements in the allocation of resources, which allows the creation of new products and the capacity to get more out of the same (or fewer) inputs. It is hardly surprising, therefore, that productivity growth — and its main determinants — are a key focus of policy and of prognostication.

## 4.2    A few measurement issues

The starting point for productivity estimation is gross domestic product, which is a useful economic measure of an economy's output — broadly comparable across time and countries (once appropriately price adjusted). Its construction follows an elaborate and now widely agreed set of measurement protocols. It gives a reasonable estimate of a large part of the supply side of an economy, and therefore is a practical indicator of the material wellbeing of a country.

However, there are some important provisos that affect the interpretation of the results and the choice of parameters for a long-run model of economic growth.

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[39] Sometimes 'dynamic efficiency' is added to this inventory, but fundamentally dynamic efficiency is about achieving allocative and production efficiency over time.

One is straightforward in concept — if not in measurement. GDP excludes some important goods and services, like leisure, many of the outputs from volunteering, and household-provided caring services. Population ageing increases the 'production' of these goods (noting that one of the goals of retirement is leisure), but reduces the growth of GDP. The omission from GDP of such goods will tend to understate the real growth in the consumption potential of an ageing society. This is neither a startling or new observation, but should be borne in mind when interpreting the future slowdown in GDP growth found in this study. This report does not attempt to measure these uncounted outputs (though the Commission provided some estimates of volunteering in its 2005 report on ageing), reflecting the significant measurement difficulties. Addressing these is a task too ambitious for this report.

The other proviso is more directly relevant to the task of projecting GDP over the next 50 years, and involves the difficulties in measuring output and productivity in a meaningful way for some important sectors. Under the Australian System of National Accounts, GDP is defined as the sum of the gross value added (GVA) of 21 industry divisions. However, measures of GVA are only well-defined for the so-called market sector, which comprises those industries in the economy where goods and services are traded at observable prices. The Australian Bureau of Statistics (ABS) applies two definitions of the market sector. One comprises 12 industries, accounting for around 70 per cent of aggregate output. The other comprises 16 industries, which currently covers nearly 85 per cent coverage of output (PC 2013e). Well-defined measures of the output of the 16 industry market sector are only available from 1994-95, with prior measures of output for the four added industries derived using input indicators (as discussed below).

However, in some industries, goods and services produced are generally provided at zero price. For example, defence, policing, public administration services, and many educational and health services are not sold in markets. The ABS uses several methods to measure GVA in these industries:

- Estimates of GVA for public administration and safety (division O) are based on the input indicator approach, in which the value of non-market output is derived almost entirely from hours worked. Several other industry divisions include some non-market outputs, and these are also valued using the input indicator approach. As a result, labour productivity growth of any output estimated in this way must be close to zero.

- The ABS uses physical output indicators for some areas of health and education — such as hospital separations and student numbers. At best, these will be imperfect indicators of output, but at least they can be used to derive measures of labour productivity.

The consequences of these different approaches to measurement of output is that there is no consistent set of historical records of output and productivity, which complicates choices of realistic productivity assumptions for projections of GDP.

Some (such as Day and Dowrick 2004) suggest that (the better measured) historical productivity growth rates for the market sector should be used for projections. It may well be that these rates are more realistic descriptions of the unmeasured productivity gains in sectors like public administration. For instance, even casual observation suggests that the productivity of public administration has risen, reflecting higher quality and more sophisticated outputs, and the replacement of entire functions — such as vast typing pools — with new technologies.

Generally, the sectors where productivity measurement appears to be worst are growing in importance (figure 4.1). Given that the real value to people of these industries is likely to exceed the value of inputs into them, standard GDP projections (as used in this study and the Australian Government's Intergenerational Reports) will understate the future underlying output of the economy. Addressing this deficiency requires better measurement of productivity in industries like healthcare and public administration.

Figure 4.1    **Sectors with poorly measured outputs are increasingly important**

Sectoral shares (per cent of economy wide hours), November 1984 to May 2013



Public Administration and Safety (Division O)

Industry divisions with some non-market output (J & M to R)[a]

The non-market sector — health, education and public admin. (O, P, & Q)
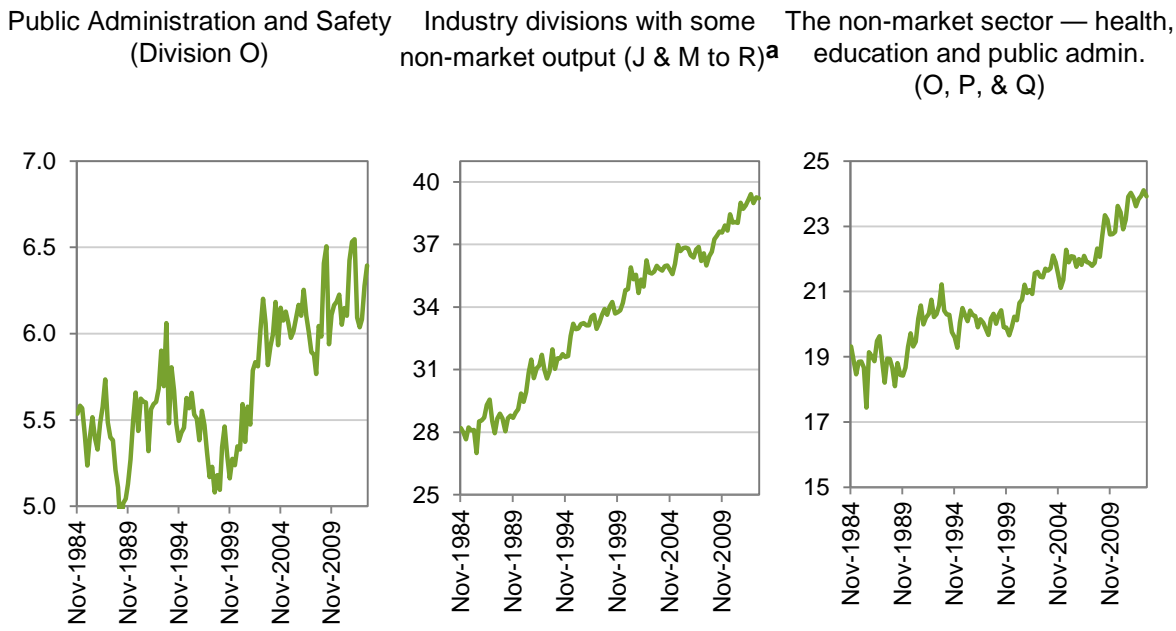
**a**  Industries include: Information, media and telecommunications; Professional, scientific and technical services; Administration and support services; Arts and recreation services; and Other services.

*Source*: ABS, 6291.0.55.003 *Labour Force, Australia, Detailed, Quarterly*.

In the absence of that evidence, projecting the value of outputs in the non-market sector using market sector productivity rates still involves brave assumptions. In any case, the resulting 'GDP' series would no longer be consistent with National Accounts conventions and would not be comparable with past GDP data.

Consequently, the productivity rates used in the GDP projections in this report relate to all industries, and not just the market sector. Nevertheless, the historical experiences in the market sector provide a check on the plausibility of numbers derived for the economy as a whole. If nothing else, the long-run productivity rate used in modelling should be less than that apparent for the market sector.

## 4.3 What are the proximate drivers of labour productivity?

By construction, the 3Ps approach uses labour productivity (defined as output per hour worked). This partial measure of productivity can increase if:

- the amount of capital used per unit of labour rises. When weighted by the capital share of factor income, this is referred to as capital deepening

- there is an increase in multifactor productivity (MFP). MFP measures value added per unit of input, where the input is an appropriately weighted average of capital and labour inputs. MFP will only rise if output increases by more than would have been implied by the rise in inputs. MFP will reflect improvements in the efficiency of the economy achieved, for example, through innovation, improved management, microeconomic reform, better diffusion of new technologies, and economies of scale. It should be noted that since MFP is derived residually, it will also pick up any errors in measures of outputs and inputs (PC 2013e, pp. 11–13). A particular concern when seeking to estimate average performance so that future projections can be made is that movements in the business cycle can lead to biases in MFP measures over short periods. Accordingly, the ABS measures MFP from peak-to-peak in business cycles, an approach this study repeats for a longer historical data series

- the quality of labour inputs increase (as the education and experience of workers rise). Increases in labour quality should raise labour productivity rates (and therefore output) when measured on an hours worked basis. However, it is important not to double count labour quality improvements in any growth accounting exercise. If MFP estimates do not take into account labour quality as an input, then improvements in labour quality would be counted as if they are technical progress in the MFP estimate — rather than being 'lost'. The ABS has estimated quality-adjusted MFP series from 1980-81, but long-run series of MFP

estimates are not adjusted for labour quality. This study has judged the reasonableness of its productivity estimates based on the unadjusted MFP estimates. Therefore, there is no additional need to take into account the impacts on output of likely future improvements in labour quality, unless it is expected that they will be larger (or smaller) than their historical impacts.[40]

Accordingly, labour productivity growth is calculated as MFP growth plus the growth in capital deepening.[41] It should be emphasised that this is an identity and does not, by itself, give rise to direct policy directions or insights — hence the use of the term 'proximate' in the heading above. The real levers for productivity improvement are those that influence the above factors.

## 4.4    What does the past aggregate picture tell us?

Past trends provide some information about Australia's possible productivity future. If nothing else, projections that lie outside the typical performance of the past require some justification.

### Labour productivity: a story of diminished expectations

In the market sector, long-run labour productivity grew by around 2.4 per cent per year from 1964-65 to 2012-13, the maximum period for which an estimate of market sector labour productivity can be consistently estimated (figure 4.2). In comparison, over the same period, labour productivity in the economy as a whole grew by around 1.8 per cent per year. This lower value can be explained by the inclusion of industries with poorly measured outputs. However, there are several reasons not to use 1.8 per cent as the long-run estimate in this study. First, even longer-run productivity data (figure 4.3 and table 4.1), which makes use of a variety of data sources, suggests that the period following the Second World War was a lucky one, and that labour productivity languished for much of the first 50 years of

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[40] Over the period from 1980-81 to 2011-12, the contribution to labour productivity growth of rising human capital was around 0.2 per cent per year compared with 1.5 per cent from capital deepening, and 0.6 per cent per year from (quality-adjusted) MFP growth. These estimates were derived by the Commission from ABS (2012), *Estimates of Industry Multifactor Productivity, Australia*, Cat. No. 5260.0.55.002. Data for 2012-13 were not available at the time that this report was written.

[41] In mathematical terms: $\Delta \log(Y_t/L_t) = \Delta \log MFP_t + \beta \Delta \log (K_t/L_t)$ where $\beta$ is the capital income share of factor income (averaged over the period from t-1 to t). Y denotes gross value added, MFP is an index of multifactor productivity, K denotes capital services and L hours worked.

the 20th century. This suggests that the assumption of persistent buoyant labour productivity growth may be misplaced.

**Figure 4.2**   **Productivity in the market sector**

12 Industry Division basis, 1964-65 to 2012-13. Index base 2012-13
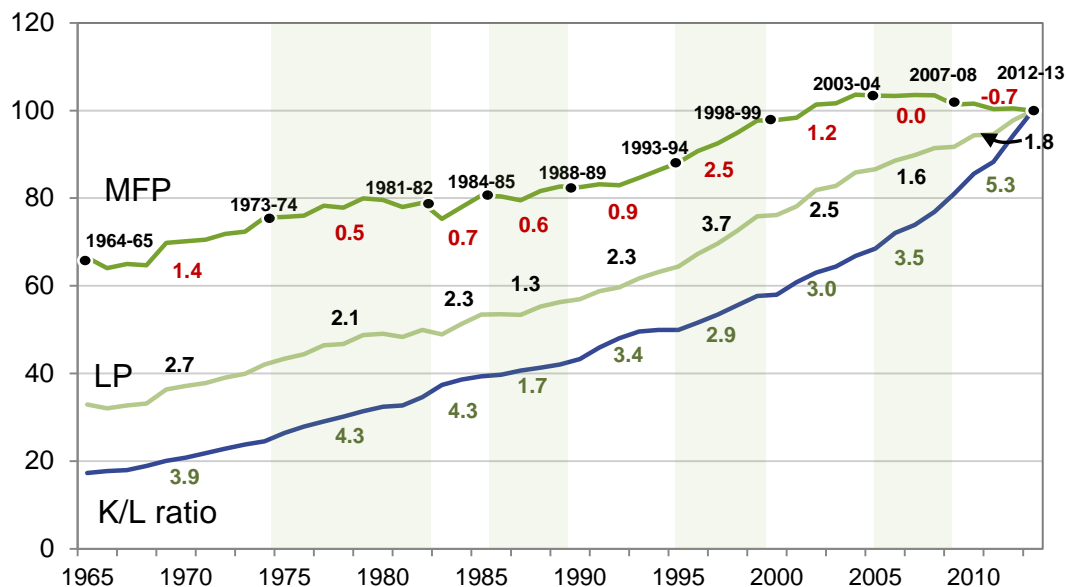


**a** The shaded areas are the growth cycles corresponding to the various productivity rates and the capital/ labour ratio. The growth rates are defined in table 4.1.

*Sources*: PC estimates and ABS 2012, *Estimates of Industry Multifactor Productivity, Australia: Detailed Productivity Estimates*, Table 4, Cat. No. 5260.0.55.002. 7 December.

**Figure 4.3**   **A long view of productivity**

1900-01 to 2011-12, the entire economy. Index base 2012-13
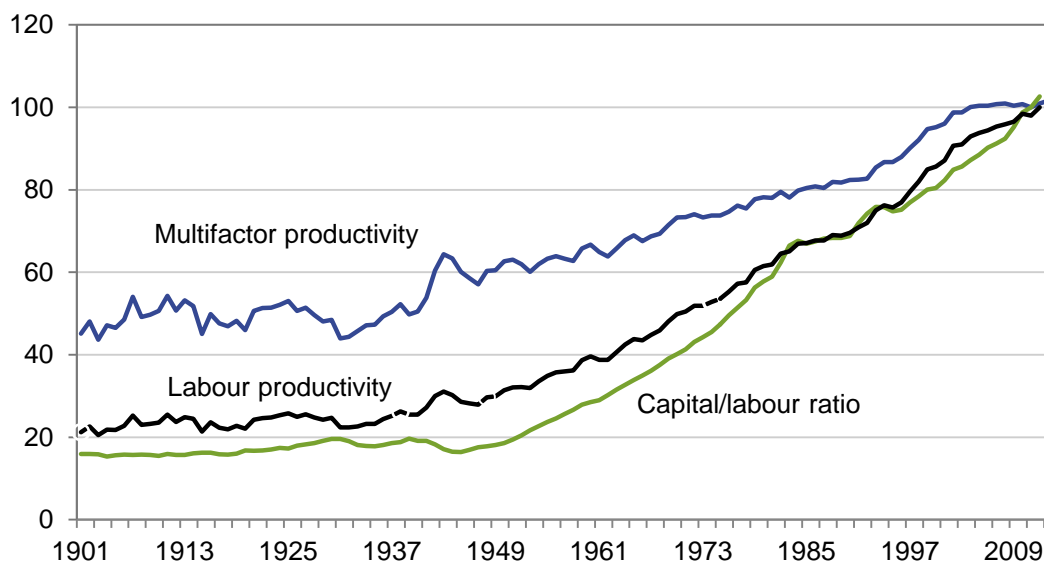


*Source*: Table 4.1 below.

## Table 4.1    **Trend growth rates in productivity and input ratios**
1900-01 to 2012-13

| | Entire economy | | | 12 Industry division market sector | | |
|---|---|---|---|---|---|---|
| Years | LP | MFP | K/L | LP | MFP | K/L |
| 1900-01 to 1937-38 | 0.58 | 0.40 | 0.46 | .. | .. | .. |
| 1937-38 to 1947-48 | 1.22 | 1.44 | -0.55 | .. | .. | .. |
| 1947-48 to 1964-65 | 2.30 | 0.79 | 3.79 | .. | .. | .. |
| 1964-65 to 1973-74 | 2.06 | 0.75 | 3.27 | 2.71 | 1.44 | 3.87 |
| 1973-74 to 1981-82 | 2.51 | 0.93 | 3.94 | 2.14 | 0.54 | 4.29 |
| 1981-82 to 1984-85 | 1.32 | 0.37 | 2.36 | 2.26 | 0.68 | 4.28 |
| 1984-85 to 1988-89 | 0.66 | 0.43 | 0.54 | 1.31 | 0.62 | 1.66 |
| 1988-89 to 1993-94 | 2.01 | 1.18 | 2.06 | 2.29 | 0.89 | 3.44 |
| 1993-94 to 1998-99 | 2.16 | 1.75 | 1.10 | 3.66 | 2.45 | 2.88 |
| 1998-99 to 2003-04 | 1.80 | 1.11 | 1.71 | 2.48 | 1.18 | 2.95 |
| 2003-04 to 2007-08 | 0.79 | 0.20 | 1.45 | 1.57 | -0.03 | 3.51 |
| 2007-08 to 2012-13 | 1.27 | 0.14 | 2.82 | 1.80 | -0.69 | 5.25 |
| 1964-65 to 2012-13 | 1.76 | 0.81 | 2.38 | 2.31 | 0.85 | 3.65 |
| 1900-01 to 2012-13 | 1.40 | 0.73 | 1.70 | .. | .. | .. |

**a** The shaded areas are more reliable than the other estimates. For any given variable, V, the average growth rates are calculated (as by the ABS) as:

$r = 100 \times \{\ln(V_t) - \ln(V_{t-n})\}/n$. The growth rate is the constant exponential rate between the two time periods that will give the end value. The 12 industry data for 2012-13 are imputed from information in the National Accounts release of Cat. No. 5204 in 2013. Data not available are denoted by ..

*Sources*: RBA *Australian Economic Statistics 1949–1950 to 1996–1997,* Occasional paper No. 8.; ABS 2013, *Australian System of National Accounts*, Cat. No. 5204.0; Butlin (1977) and Commission estimates.

In previous projections of Australia's productivity growth, average historical growth rates over shorter periods have been used as the basis for the projections. The choices of the historical period have been based on data availability,[42] estimates of the timing of business cycle peaks, and judgments about the weight to give to recent versus more distant productivity performance. The studies have also made judgments about how to measure trends (for example, using smoothing methods or just calculating growth rates between data points). There is no obviously 'right' approach.

The first intergenerational report (IGR) used a 30 year historical window for estimating a long-term average, and found a rate of 1.75 per cent from 1970-71 to the end of the 1990s (Australian Government 2002). The second IGR also used 1.75 per cent on the basis of a 40 year window (Australian Government 2007). The Productivity Commission's 2005 report used the peak-to-peak historical outcomes

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[42] The data underpinning the longer-term labour productivity results shown in table 4.1 and figures 4.1 and 4.2 are based on splicing various data sets together. There are no ABS estimates of MFP trends at the economywide level. This study has estimated them by combining various historical data sets.

from 1969-70 to 2003-04 as the basis for its projected trend growth, and compared the results from various quantitative approaches to measuring trends. It also used 1.75 per cent as the projected growth rate (PC 2005d).

The assumption of 1.75 per cent productivity growth rates has since been discarded. The 2010 IGR report used 1.6 per cent, based on a 30 year window that eliminated the experiences of the 1970s (Australian Government 2010). And the Commission's most recent productivity projections — drawn from disaggregated analysis of industry productivity performance since 1974–75 — applied a long-term productivity rate of 1.5 per cent, but with a transition to this determined by the relationships in the Monash Multi-Regional Forecasting (MMRF) general equilibrium model (PC 2012b).

Australia's recent poor labour productivity performance has accordingly influenced analysts' perspectives about the likely long-run outlook under a 'business as usual' economic policy.

## Multifactor productivity has gone missing in most examinations of Australia's economic fortunes

As discussed above, labour productivity increases with greater capital deepening and/ or MFP growth. It is worth separating the two when considering possible productivity futures and desirable policy options, as they have distinct implications.

When properly measured, MFP amounts to 'free stuff' — the gains from improving cost efficiency and from the creation of new products. Policies often aim to stimulate MFP — such as by overcoming market failures in innovation, ensuring a good capacity for absorption of knowledge from overseas, investing in complementary human capital, and establishing the framework that encourages businesses (and government agencies) to maximise the efficiency of their enterprises.

In contrast, capital deepening does not come for free. Capital must be financed and it depreciates. Accordingly, the cost of capital resulting from depreciation and any transfers from overseas reduces Australia's real net national disposable income (discussed later). That does not mean capital deepening is devoid of policy significance. Policies are sometimes aimed at addressing unjustified constraints on capital deepening — such as those posed by barriers to finance from overseas, from industrial relations and competition policy settings, taxes and other regulations affecting the availability of capital. Good policies can increase capital deepening and thereby stimulate labour productivity. While sometimes they overlap, the policies that stimulate capital can be quite different from those oriented to improving MFP.

The implication is that policymakers and governments should not be indifferent to how labour productivity growth arises.

Surprisingly, the distinction has not received much attention in the various IGRs. MFP is mentioned in a footnote in the first IGR (justifying its exclusion from consideration), and is not mentioned at all in the subsequent two IGRs.[43] The PC's 2005 report into the implications of ageing has more analysis, but does not measure past MFP or capital accumulation rates, nor consider the quantitative implications of these for labour productivity projections. However, more recently, the spotlight has moved to MFP — most notably in the Commission's MMRF modelling (PC 2012b). A major reason for this is that the extraordinary growth in MFP in the 1990s has since died (figure 4.2 and table 4.1). Trend MFP growth from 2003-04 to 2011-12 has actually been slightly negative in the market sector (PC 2013e), a trend that has continued with the most recent data (table 4.1).

## 4.5 Projecting Australia's future productivity rates and economic growth

In producing a base case estimate of labour productivity growth — the input into the 3Ps model discussed in chapter 3 and appendix E — this study:

- takes account of the increasing importance of labour-intensive, lower productivity industries (figure 4.4). Accordingly, this study estimates the aggregate productivity growth rate by extrapolating trends in the relative importance of industries over the next half-century, assuming reversion of labour productivity trends at the industry level to historical averages, and then weighting the industry-specific labour productivity rates by their labour shares. The method and individual results are in appendix C. The results suggest that structural change in the economy will contribute to a productivity slowdown

- notes that Australia has experienced relatively poor productivity growth in the last five years, and that a shift back to a long-term average is not likely to be immediate. The aggregate productivity estimates take account of the possible time taken for transitions to steady state productivity growth rates at the industry level

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[43] The importance of MFP is acknowledged in the third IGR in a brief mention of innovation policy, but there is no discussion of the possible long-run quantitative outcomes for growth.

Figure 4.4    **Labour continues to move to services**
Per cent of total hours worked 2012-13 and 2059-60
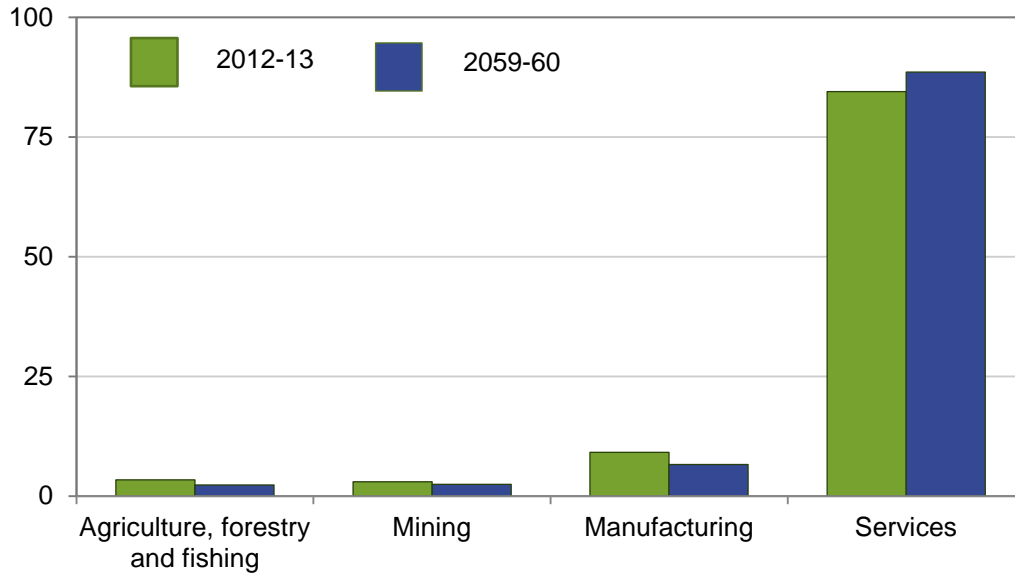


*Source*: Commission estimates drawn from the base case in appendix C.

- assumes MFP growth rates of 0.7 per cent per year, which represents a reversion to a modest positive rate. Given that estimate, it is then possible to infer the capital deepening that would then be necessary to achieve the projected labour productivity growth rate. This is useful for two reasons. First, if the MFP assumption is unrealistic, then the corresponding growth in the capital-labour ratio will lie outside historical norms — providing one test of the MFP assumption. Second, given an estimate of the depreciation rate, this approach allows the calculation of future gross fixed capital expenditure, and depreciation costs, which feed into the calculation of real net national disposable income

- takes account of the volatile nature of aggregate productivity growth rates over the various peak to peak periods shown in figures 4.2 and 4.3 and table 4.1. The data suggest that structural breaks in productivity growth are not unusual. Data at the industry level reinforce this (appendix C). This volatility can be ascribed to a mix of technological change, policy changes, macroeconomic events, measurement error and changes in unmeasured environmental inputs (such as rainfall in agriculture). In that context, the study uses scenario analysis to indicate the consequences of alternative assumptions. These are particularly critical because of all the factors that determine long-run economic growth per capita, productivity growth rates are the most influential because of their compounding effect. Moreover, much of the policy interest of governments now centres on productivity growth — so that it is worthwhile enumerating the benefits they bestow if policies can stimulate this growth (or alternatively, reveal the adverse outcomes if policies undermine productivity).

## The results

While many of the 16 industries analysed in appendix C are projected to return to labour productivity growth rates in excess of 2 per cent per year over the next 50 years, the shift of labour to lower productivity industries offsets this, leading to trend labour productivity growth from 2013-14 to 2059-60 of 1.54 per cent. The situation is slightly worse than this because of the value provided by 'ownership of dwellings'. The services provided by dwellings are an important component of the ABS's measure of GDP — and yet do not have any associated labour input (but do have a large capital input). They therefore contribute to the average level of labour productivity. However, despite continuing to grow, dwelling services are projected to fall slightly as a share of GDP over the projection period, so that they dampen labour productivity growth. This means that at the economywide level, the trend productivity growth rate is projected to be 1.49 per cent per year from 2013-14 to 2059-60.[44]

The implication of this productivity growth and the estimated number of hours worked is that real GDP per capita (in 2011-12 prices) is projected to nearly double from around $67 000 per person in 2012-13 to close to around $128 000 by 2059-60. Given the relatively small changes in labour supply per capita (chapter 3), most of this change reflects productivity growth.

Nevertheless, projected GDP per capita is different from labour productivity growth, with the former slowing from a trend rate of 1.7 per cent per year in the first decade from 2011-12 to 1.3 per cent per year in the decade prior to 2059-60 (table 4.2) — due to slower workforce growth.

As emphasised above, the historical evidence suggests that productivity growth rates over different peak-to-peak periods can vary significantly, so that it is useful to consider the sensitivity of the results to reasonable upper and lower bounds. This study has undertaken two forms of sensitivity analysis.

In the most simple sensitivity analysis, the path of labour productivity growth rates shown in figure 4.5 was shifted by plus or minus 0.3 per cent per year. While the effect on economic growth rates is small over the short run, given compounding, such deviations have major long-run impacts on GDP trends (figure 4.6 and table 4.2).

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[44] While drawing on the historical evidence, this study has adopted conservative assumptions about the growth in dwelling services. MMRF modelling of productivity (PC 2012b) applied a somewhat higher rate (though other offsetting factors meant that the overall rate of productivity growth in that modelling was less than obtained here).

Figure 4.5 **Possible labour productivity growth futures**
Per cent 2011-12 to 2059-60
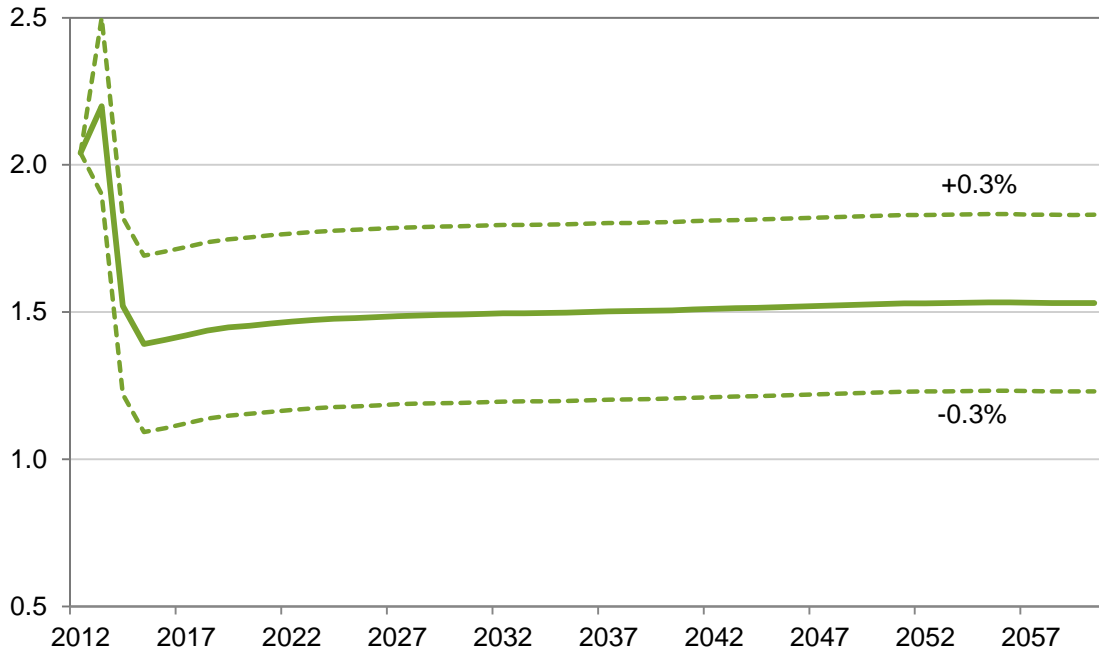


**a** The alternative scenarios are the addition and subtraction of 0.3 percentage points to the base case productivity growth rates, but keeping the transition path fixed.

*Sources*: As for table 4.1; appendix C.

Figure 4.6 **Productivity growth is the decisive factor for economic growth**
GDP per capita $'000s (constant 2011-12 prices)
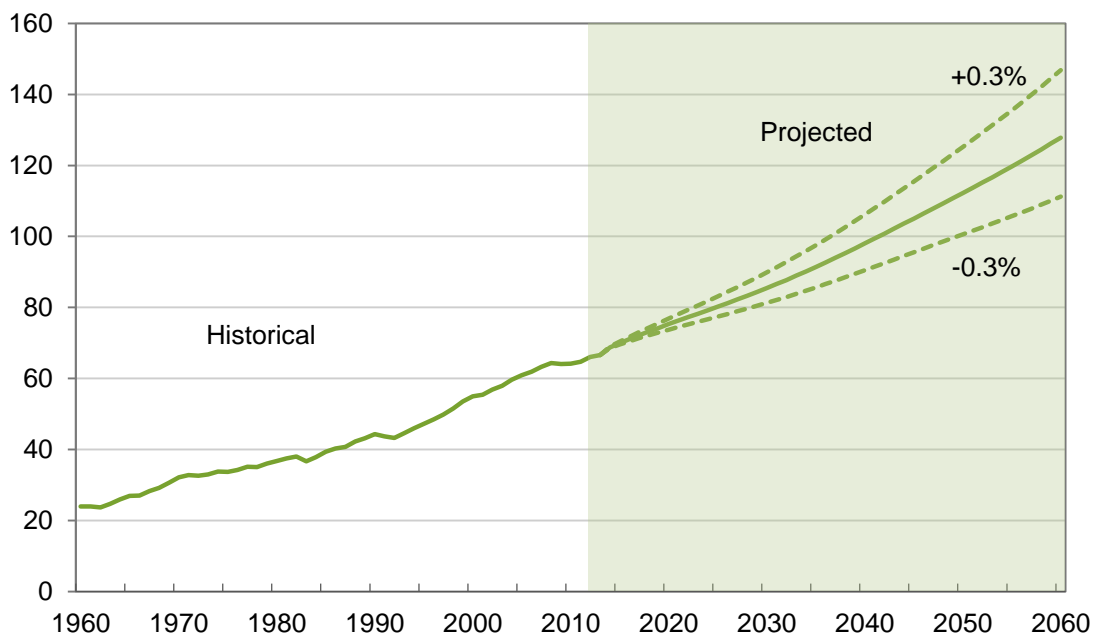


*Source*: Commission estimates.

For example, achieving a sustained 0.3 percentage point increase in productivity above the base case (to a labour productivity level around 1.8 per cent per year), increases trend GDP per capita growth rates for the period from 2012-13 to 2059-60 from just over 1.3 per cent per year to more than 1.6 per cent per year.

The cumulative value of annual GDP values for this period is around $140 trillion under the base case. A positive productivity shock of 0.3 percentage points a year increases the cumulative value by $13 trillion. This is equivalent to more than 8 years of Australia's GDP value in 2012-13. In contrast, a negative productivity shock of 0.3 percentage points decreases the cumulative value by more than $11 trillion. Dividing these cumulative values by the average population between 2012-13 and 2059-60 provides a perspective on what this means for individuals. These alternative outcomes are equivalent to a real gain (loss) of about $400 000 ($370 000) per person over the entire period. To the extent that the productivity shocks reflect underlying shocks to MFP, these values are equivalent to the average additional amount of consumption per person that productivity improvements would permit over the next 50 years. (If the shocks are due to more capital deepening, the story is different because capital must be paid for — as discussed earlier.)

Table 4.2    **The effects of different labour productivity outcomes**
2012-13 to 2059-60, 2011-12 prices

|  | Base case | Base case + 0.3 points | Base case less 0.3 points |
|---|---|---|---|
| *Average GDP per capita growth (%)* | | | |
| 2012-13 to 2019-20 | 1.7 | 2.0 | 1.4 |
| 2019-20 to 2029-30 | 1.3 | 1.6 | 1.0 |
| 2029-30 to 2039-40 | 1.4 | 1.7 | 1.1 |
| 2039-40 to 2049-50 | 1.4 | 1.7 | 1.1 |
| 2049-50 to 2059-60 | 1.3 | 1.6 | 1.0 |
| Real GDP per capita in 2059-60 ($) | 127 848 | 146 871 | 111 243 |
| Increase over real GDP per capita in 2012-13 (%) | 92.1 | 120.7 | 67.1 |
| Increase over real GDP per capita in 2012-13 ($) | 61 287 | 80 310 | 44 682 |
| Accumulated GDP 2013-14 to 2059-60 relative to base case ($ trillion) | | 12.6 | -11.4 |
| Accumulated GDP 2013-14 to 2059-60 per mean population relative to base case ($'000) | | 404 925 | -366 947 |

*Source*: Commission estimates and appendix C.

This study also undertook more complex sensitivity analysis, drawing on the historical record of peak-to-peak productivity growth rates, as shown in table 4.1. This permitted stochastic estimates of the supply outcomes over the next 50 years, with the results shown for different percentiles (table 4.3). This analysis suggested that the choice of +/- 0.3 percentage points in the sensitivity analysis above

represents roughly the 80 per cent confidence interval of possible outcomes. It also shows that even small variations around the median labour productivity growth rate have significant economic impacts.

Table 4.3    **A stochastic approach: outcomes by percentiles of labour productivity growth rates**

| Percentile | Average productivity growth from 2012-13 to 2059-60 | Average per capita GDP growth from 2012-13 to 2059-60 | Accumulated income per capita relative to the median value, 2013-14 to 2059-60 |
|---|---|---|---|
| | % | % | $'000 |
| 10th | 1.29 | 1.17 | -287 |
| 20th | 1.36 | 1.25 | -193 |
| 30th | 1.42 | 1.31 | -121 |
| 40th | 1.47 | 1.35 | -62 |
| 50th | 1.51 | 1.40 | 0 |
| 60th | 1.56 | 1.45 | 58 |
| 70th | 1.61 | 1.49 | 120 |
| 80th | 1.66 | 1.55 | 193 |
| 90th | 1.73 | 1.63 | 297 |

**a** There are many possible ways of testing what might be reasonable upper and lower bounds of productivity growth, beyond assuming the bounds as shown in figure 4.6 and table 4.2. One relatively simple approach is to consider the past historical record of peak-to-peak productivity growth rates, and to use statistical methods to infer the confidence intervals of the deviations around mean productivity values. As the sample size of peak-to-peak productivity growth rates is small, a re-sampling method (the bootstrap) was used to estimate the distribution of deviations from the mean (Diaconis and Efron 1983). These were then applied to the projected average labour productivity growth figures to derive percentiles for the results shown above. One implication of the results is that the choice of plus or minus 0.3 percentage points growth as in figure 4.6 and table 4.2 can be interpreted as an 80 per cent confidence interval — a reasonable choice in sensitivity analysis. This approach embodies several implicit assumptions (such as the equal probability of any peak-to-peak growth rate in the re-sampling analysis), but is still suggestive.

*Source*: Commission estimates.

Increased productivity growth rates also allow workers to more readily fund the needs of older people not in paid employment in future years, while still enjoying a higher standard of living than earlier generations — making intergenerational transfers easier. Alternatively, the greater income acquired during a person's life could be used to build up assets that would help fund consumption during their own old age. In other words, making the pie bigger is an effective way of financing critical social expenditures, while still allowing strong growth in private consumption.

## Capital deepening and investment

With MFP growth projected to be 0.7 per cent per year under the base case, the remaining share of labour productivity is driven by the accumulation of capital. Given assumptions about the capital share of income, this study estimates that the capital/labour ratio would increase by around 1.8 per cent per year over the projection period, only slightly less than the long-run growth rate from 1974-75 to 2012-13 (figure 4.7).

Figure 4.7      **Growth in the capital/labour ratio**
                1975-76 to 2059-60
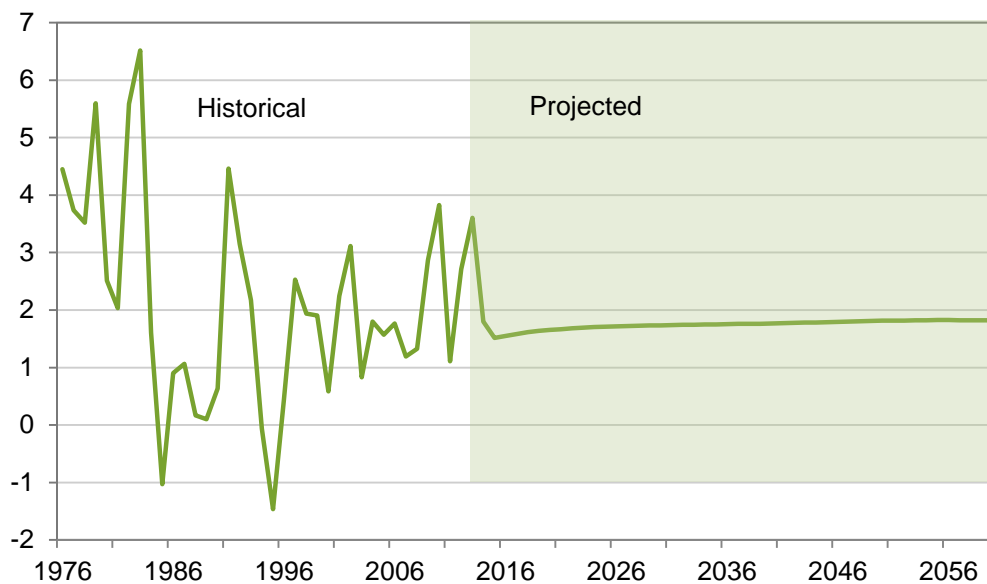


**a** Calculated as 100*∆log(K/L). The capital stock was calculated as a residual, using the identity for labour productivity growth (as discussed in the text), with an assumed capital income share of 0.45. The capital share from the ABS estimates of MFP is 0.457 for the 10 years to 2011-12. However, the MMRF model database uses 0.4. The value of 0.45 should therefore be seen as a rough estimate.

*Source*: ABS 2012, *Australian System of National Accounts*, Cat. No. 5204.0 and Commission estimates.

The implied level of investment to drive such capital accumulation is large — estimated at around $38 trillion dollars over the projection period in constant 2011-12 prices (table 4.4). To put that in context, in the more than fifty years from 1959-60 to 2012-13, *total* investment in Australia has been around $8.2 trillion. While different assumptions about capital income shares, multifactor productivity growth and depreciation affect the projections, they all produce qualitatively similar outcomes: Australia will be buying and building a large amount of physical capital. Without the efficient allocation of that capital, the achievable labour productivity growth rate would be considerably lower. Accordingly, barriers to funding capital or to its importation can undermine labour productivity growth. The large magnitudes also suggest that even small inefficiencies which impede investment, or

make it more costly than necessary, would have large welfare consequences. Taxation, competition and planning policies are likely to be particularly relevant. Investment in electricity networks provide a case study of how regulatory regimes can lead to inefficiencies — with evidence of excessive investment (PC 2013b).

Table 4.4 **Capital investment**
1959-60 to 2059-60

| | Investment ($ trillion) |
|---|---|
| 1959-60 to 2012-13 | 8.2 |
| 2013-14 to 2019-20 | 3.3 |
| 2020-21 to 2029-30 | 5.7 |
| 2030-31 to 2039-40 | 7.4 |
| 2039-40 to 2049-50 | 9.4 |
| 2049-50 to 2059-60 | 11.9 |
| 2013-14 to 2059-60 | 37.7 |

**a** A rough estimate of the value of the net capital stock (K) is $K_t = K_{t-1}(1-d_t) + I_t$, where I is investment and d is the depreciation rate. While the ABS uses a more sophisticated 'vintage' model to calculate depreciation, this approximation works reasonably well on past data. Accordingly, with known capital stocks and an assumed depreciation rate, it is possible to derive investment for the projection period. The ratio of fixed consumption of capital (the ABS term for depreciation) to the lagged net capital stock was 0.0536 in 2011-12, higher than the historical average. The shift to shorter-lived information and communications technologies assets may mean that the rate will stay around this level. This study has used a depreciation rate of 0.055.

*Source*: ABS 2012, *Australian System of National Accounts*, Cat. No. 5204.0 and Commission estimates.

# 4.6    Australia's income

While the supply-side of the economy is clearly critical to Australia's future prospects, a country's standard of living is ultimately dependent on the value of its disposable income. Using real GDP as a starting point, disposable income also depends on:

- the relative prices of exports and imports (that is, the effects of the terms of trade)
- the obligations to replace capital (depreciation)
- the amount of income sent to and received from overseas (box 4.1).

The *level* of Australia's national income has been consistently below the level of real GDP because the obligations to replace capital will always have a negative effect, and the net incomes flowing to or from overseas have historically been net outflows. Terms of trade effects only partly offset these factors.[45]

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[45] The size of that effect is partly dependent on the base years used for calculating the terms of trade (which are in index form).

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Box 4.1    **Calculation of real income**

The ABS uses Real Net National Disposable Income (RNNDI) per capita as its preferred measure of Australia's income. Using real GDP expenditure as a starting point, the calculation simplifies to the following equation:

$$RNNDI = RGDP + RX * (Px/Pm - 1) + RNOS - RDEP$$

Where:

- RGDP = Real Gross Domestic Product
- RX = Real expenditure on exports
- Px = Price index for exports
- Pm = Price index for imports
- RNOS = Real net overseas primary incomes and transfers
- RDEP = Real depreciation of capital
- RX * (Px/Pm — 1) = Net gain/ loss from the terms of trade

One drawback of real net national disposable income is that it is only available as a single national indicator and cannot be broken down for states or industries. It should also be noted that price indices for imports and exports will be set at a base year, and as such, estimates of the net gain from the terms of trade (and of RNNDI itself) are relative to that base year.

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However, *growth* rates in national income can exceed GDP for some time. In the twenty years to 2002-03 both RNNDI and real GDP grew at just over three per cent. However, during the last decade, the growth in income has significantly exceeded GDP growth (figure 4.8). The main driver of this gap has been the terms of trade, which increased substantially in the 2000s.

## How will national income differ from real GDP in the future?

*Projected net gains from the terms of trade*

While Australia's recent real national income has been boosted by a high terms of trade, most studies project the terms of trade will decline (Australian Government 2007, 2010, 2013b; PC 2012b) because the factors behind its rapid improvement in the 2000s (namely, increases in the demand for, and prices of, resources) are unlikely to continue. Recent data supports this, showing that Australia's terms of trade have already begun to decline. In the 2013-14 Australian Government budget, the terms of trade were projected to decline by 20 per cent between 2014-15 and 2029-30, settling into a long term trend close to 2005-06 levels (Australian Government 2013b, p. 2.45). In its reference case projections, the

Commission (PC 2012b) assumed a more rapid decline, and that the long-term trend would revert to 2004-05 levels (broadly reflecting the long-run average). These assumptions result in different projected paths for the terms of trade (figure 4.9).

Figure 4.8    **Difference in growth between real GDP and measures of income, 1999-2000 to 2012-13**
Index (2000 = 100)
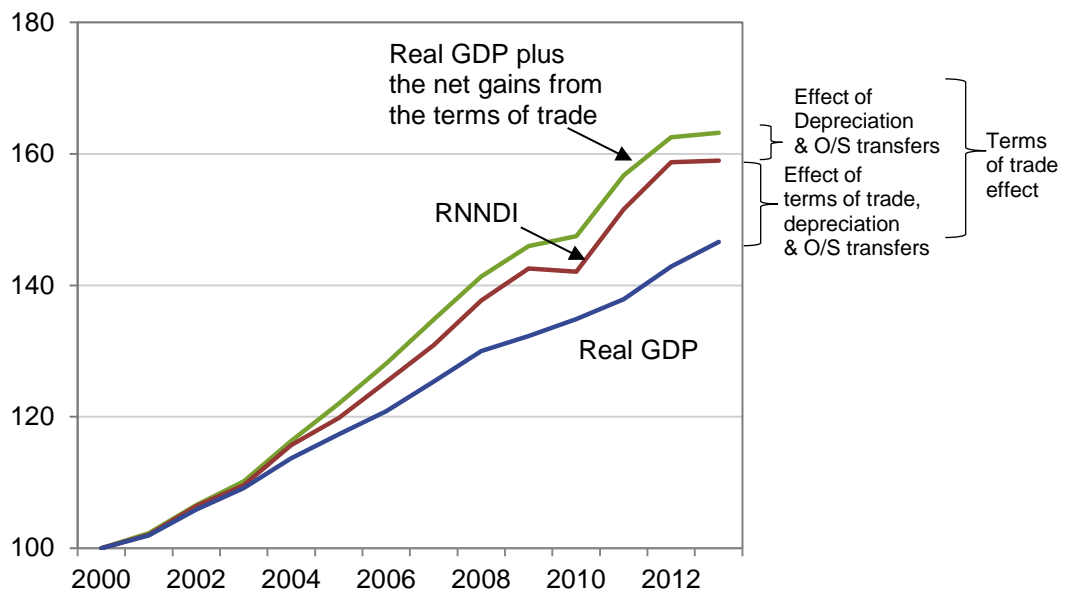


*Source*: ABS 2013, *Australian System of National Accounts*, Cat. no. 5204.0.

Figure 4.9    **Terms of trade projections under different assumptions**
Index (2011-12 = 100)
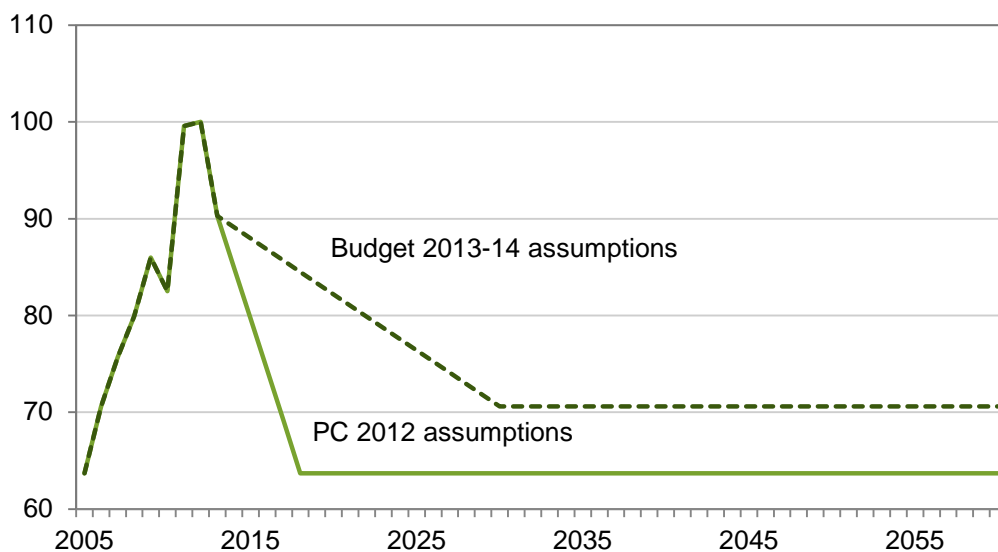


*Sources*: Commission estimates based on Australian Government (2013b) and PC (2012b).

This study draws on the projections of the terms of trade and export expenditure from PC (2012b).[46] Other things equal, the reversion to trend of the terms of trade implies a significant reduction in national income growth relative to 2011-12 levels (figure 4.10).

Figure 4.10    **Projected effect of the terms of trade on national income**[a]

Effect of terms of trade on income relative to 2011-12 levels, $ billion (2011-12 prices)
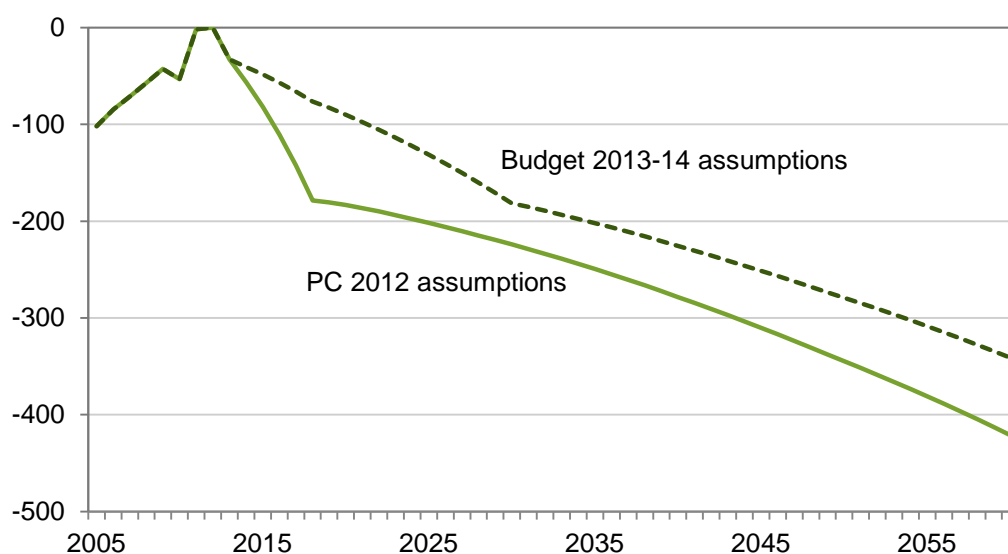


**a** The net gains from the terms of trade are calculated as real export expenditure multiplied by (Px/Pm-1), where Px is the export price deflator and Pm the import price deflator. Px/Pm is the terms of trade. The projection of real expenditure on exports is based on MMRF projections, adjusted to this study's projections of real GDP.

*Source*: Commission estimates based on Australian Government (2013b) and PC (2012b).


*Projected real net national disposable income*

Slower GDP per capita growth and the reversion to trend of the terms of trade imply that growth rates of RNNDI per capita over the next 50 years will be less than half of those of the booming 2000s (figure 4.11) Unlike in recent years, it is likely that real GDP will grow more rapidly than RNNDI (figure 4.12). The gap between the two measures (shown in the right hand panel of figure 4.12) highlights the exceptional nature of the 2000s.

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[46] These were derived from PC (2012b) and additional information from the Commission's MMRF model. This study assumes that exports and net overseas transfers stabilise as a share of GDP over the longer term, and thereby estimates exports and transfers from the projected level of GDP. The terms of trade follow the same transition path as used in PC (2012b), but with updated information from the National Accounts. Movements in the terms of trade (relative prices) and capital depreciation are the main drivers of changes in RNNDI.

## Figure 4.11　There is a major slowdown in income growth

Percentage change in RNNDI per capita
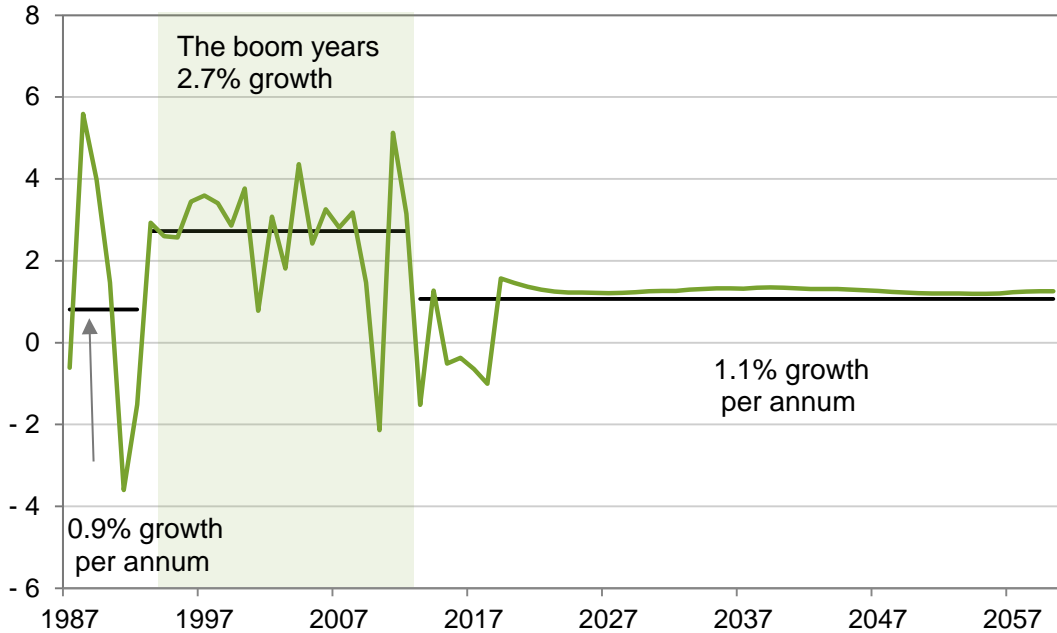


The boom years
2.7% growth

0.9% growth
per annum

1.1% growth
per annum

*Sources*: ABS 2013, *Australian System of National Accounts*, Cat. no. 5204.0 and Commission estimates.

## Figure 4.12　Real GDP and RNNDI per capita

Fiscal year ending 1986 to 2060, $'000 per person in 2011-12 prices
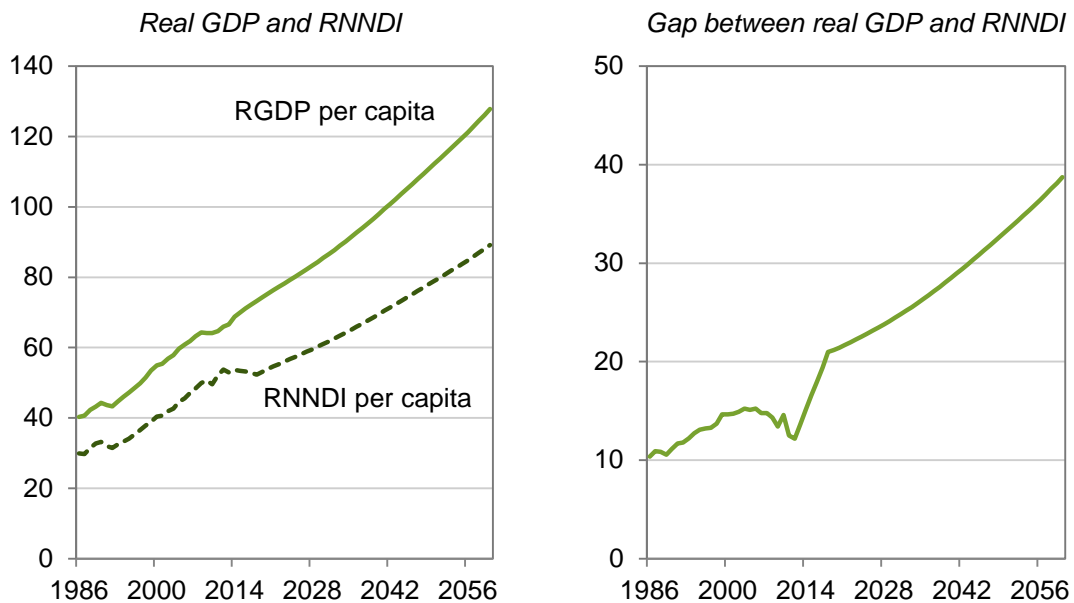


*Real GDP and RNNDI*

RGDP per capita

RNNDI per capita

*Gap between real GDP and RNNDI*

*Sources*: ABS 2013, *Australian System of National Accounts*, Cat. no. 5204.0 and Commission estimates.

## Potential drivers of real national income

The last decade has been a fortunate aberration for Australia. In the absence of booming export prices, strong growth in national income in future will rely strongly on a recovery of MFP. This study assumes some recovery. In part, that is because some of the MFP slowdown reflected investments that did not immediately increase output. There is an expectation that at least some of this capital will be more productive in the future. Moreover, global technical change will continue, with Australia a likely beneficiary.

However, as discussed above, a resurgence of MFP above the assumed 0.7 per cent level would have major beneficial impacts on output and income during a period when population ageing will tend to erode these. Policies that seek to accelerate MFP — of the kind described throughout this chapter — will be critical to that outcome.[47] Conversely, if there is no coherent process for reform, there is a risk that MFP growth will fall below the level used in this study's projections. It cannot be assumed that the inevitable growth in global knowledge necessarily results in strong MFP growth in Australia. Firms must have a capability to absorb new knowledge (through, for example, access to high quality human capital and in some cases their own R&D efforts), a capacity to invest in physical capital that embodies new technologies and, above all, strong incentives to innovate. Governments can stimulate or hinder the capacities of firms in all of these areas.

Nor should the importance of allocative efficiency be lost, especially as large factor movements underpin the changing structure of the economy.

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[47] Other commentators have made much the same point, including Gruen (2012) from the Australian Government Treasury and D'Arcy and Gustafsson (2012) from the Reserve Bank of Australia.

# 5    Revenue and expenses

**Key points**

The combined impacts of ageing and new health care technologies are likely to place major pressures on Australian governments' budgets. By 2059-60, total governments' spending will have risen by 5.8 percentage points of GDP (which, given existing policy settings, will not be offset by additional revenue).

The areas of expenditure most affected by ageing are health, age-related pensions and aged care. Most other areas of expenditure are projected to remain stable as a proportion of GDP.

Health is by far the largest age-related expenditure. From 2011–12 to 2059–60, health expenditure as a proportion of GDP is projected to increase from 4.1 per cent to 7.0 per cent for the Australian Government, and from 2.4 per cent to 3.8 per cent for state and territory governments. However, the results are sensitive to the underlying projection assumptions:

- Small changes in the age-specific expenditure patterns, for example, result in cost differences of 0.7 per cent of GDP in 2059-60. More information on age-specific expenditure patterns and on the costs incurred near death would provide more robust predictions. Administrative data would be one source of such information.

- Assumptions about the non-demographic growth of health costs are also significant.

For age-related pensions, costs are projected to increase from 2.7 per cent in 2011-12 to 3.7 per cent in 2059-60. The growth of compulsory superannuation will somewhat reduce the uptake and cost of the Age Pension. Tax incentives for superannuation also have substantial fiscal impacts in their own right as they forgo tax revenue.

Aged care costs are the third largest fiscal pressure. Costs are projected to increase from 0.8 per cent of GDP in 2011-12 to 2.6 per cent in 2059-60 (taking into account the implementation of recently announced reforms).

Some areas of government expenditure will not result in increased fiscal pressure. While population ageing will reduce relative demand for education, this is offset by growth in sector labour costs — education spending is projected to remain stable. Concessions to the aged will have fiscal impacts for all governments, but due to their complexity, a more elaborate analysis would be needed to estimate their effect.

Fiscal imbalances resulting from population ageing must be addressed through borrowing (which only defers payment), higher user charges, greater taxation and/or lower expenditures. Some policy options — such as increased productivity in health or aged care — would relatively painlessly relieve fiscal pressures. The choice among other measures has to take account of many tradeoffs and uncertainties.

# 5.1 Introduction

This chapter presents several projections of government revenues and expenditures to 2059-60. The projections generally focus on Australian Government expenditures with the exception of health and education, as these two sectors have been previously shown to be sensitive to population ageing and receive significant levels of both state and federal funding (PC 2005d). Available evidence suggests that much of total government spending is related to age, and weighted towards older ages (figure 5.1).

Figure 5.1 **Age-related government spending**a

All governments, $'000 per person, 2011-12
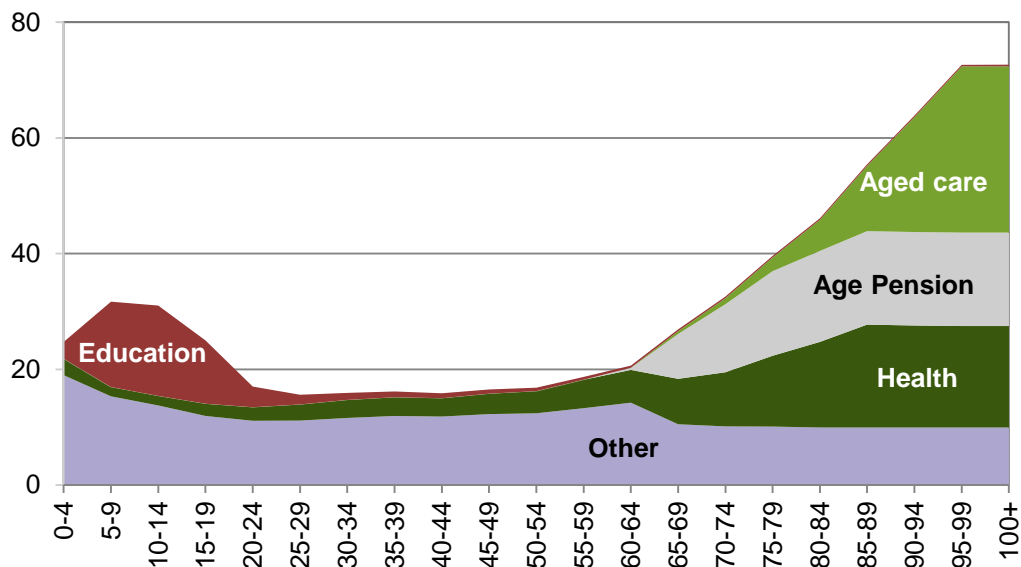


**a** Estimates based on the age profiles of expenditure used in this study's projections. Where costs were not available by age, they were equally apportioned to all age groups. Health and education include both Australian Government and state and territory expenditures. **b** The 'Other' category includes the Disability Support Pension, Parenting Payment, Family Tax Benefit, Disability Support Services (both Australian Government and state and territory), Other social security and welfare payment, Defence and other expenditures and other state and territory expenditures not classified elsewhere.

*Data source*: Commission estimates.

The projections made in this chapter represent the expected costs to taxpayers in the longer run if current trends and policies were to persist. They should not be viewed as definitive forecasts. Moreover, by their nature, they do not take account of the short-run non-demographic factors that underpin the official short-run projections set out in budget forward estimates. Where differences exist, budget and midyear financial outlook statement estimates should be viewed as the more accurate representation of possible costs over the short run.

While the chapter makes projections for the full range of Australian Government expenditures, it focuses on those areas most affected by demographic change. These are:

- health expenditures (section 5.2)

- age-related pensions, such as the Age Pension (section 5.3)

- aged care costs (section 5.4)

- education expenses (section 5.5).

The chapter also makes projections for various other government expenditures that are less likely to be affected by population ageing. These include other social and welfare payments, as well as defence and other spending (section 5.6). Details of the projections are available in the 'Fiscal Implications' spreadsheet on the Commission's website.

This chapter then makes projections of total government revenue, and considers Australia's future fiscal position (sections 5.7 and 5.8 respectively). Some of the policy implications of Australia's fiscal position are then discussed (section 5.9), as well as implications for future research (section 5.10).

## 5.2    Health

Health expenditure already comprises a large share of all governments' spending, costing around $90 billion in 2010-11 (AIHW 2012c). This section covers the future health expenditures of both the Australian Government and by state and territory governments. It first outlines the two main pressures on health costs; ageing related expenses that result from a greater proportion of the population moving into older age brackets; and non-age related cost pressures, resulting largely from advancements in medical technology. It then presents the method used in this study to project health expenditures, including a discussion of the approach used to project expenditure on the Pharmaceutical Benefits Scheme (PBS). Projections of health expenditure to the year 2059–60 are then presented, which includes an alternative model accounting for death-related health costs.

### Spending per person rises with age

Older people tend to consume more health care than others in value terms, reflecting the higher incidence of disease among this group and the complexities associated with comorbidities (figure 5.2). For example, NATSEM (2008) found that people aged 65 years or more used about 55 per cent of PBS scripts and

received 51 per cent of total Government expenditure on the PBS, but represented only 14 per cent of the population. The probability of having four or more chronic conditions was around 2 per cent for the overall Australian population, compared to 8 per cent for those aged 65 years or more (AIHW 2012a, p. 353).

By shifting more people into higher cost groups, population ageing will, other things being equal, raise healthcare costs (PC 2005b and Treasury 2010b).

Figure 5.2    **Age profiles of health expenditures, Medicare and the Pharmaceutical Benefits Scheme**

Ratio to total population expenditure per capita
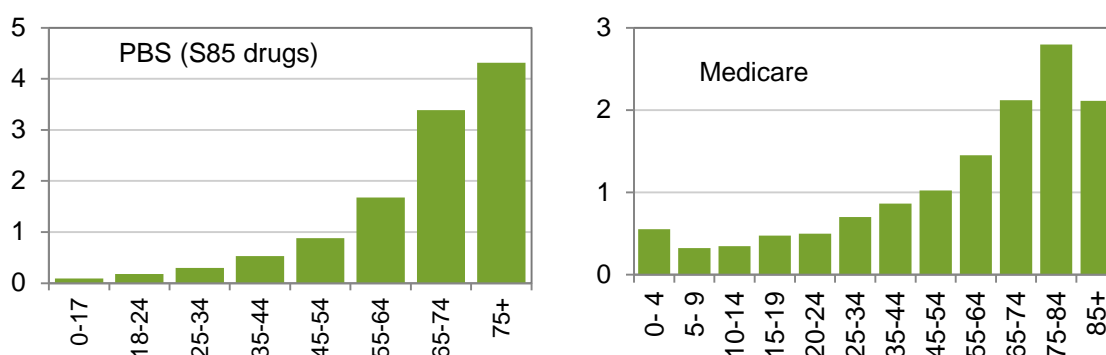


**a** Drugs referred to as 'S85' are general and concessional prescriptions that fall under Section 85 of the Pharmaceutical Benefits Scheme schedule. They comprise the vast majority of drugs in the Pharmaceutical Benefits Scheme.

*Data sources*: DoHA and Medicines Australia (2013); DoHA (2012).


## Non-demographic factors

Health costs have also been increasing independently of age — a pattern across all developed economies. Expenditures on health by younger cohorts have increased in real terms compared with their older peers, meaning that someone who was 50 years old in 1998-99 spent more on health care than a 50 year old would have in 1988-89 or 1993-94 (figure 5.3). In the United States (almost certainly relevant to Australia), an infant born in 1950 could expect to spend around $8000 on medical care over their lifetime (in present value, real 1990 dollars), while the comparable amount in 1990 was around $45 000 (Cutler and Richardson 1999). It appears that non-demographic factors have been the major historical source of cost pressures in Australia and many other developed countries — in part because profound ageing has yet to commence.

Figure 5.3    **Per person average weekly household private and public health expenditure by age cohort, 1988-89 to 2009-10**

2011-12 dollars, age cohorts based on age in 1988-89
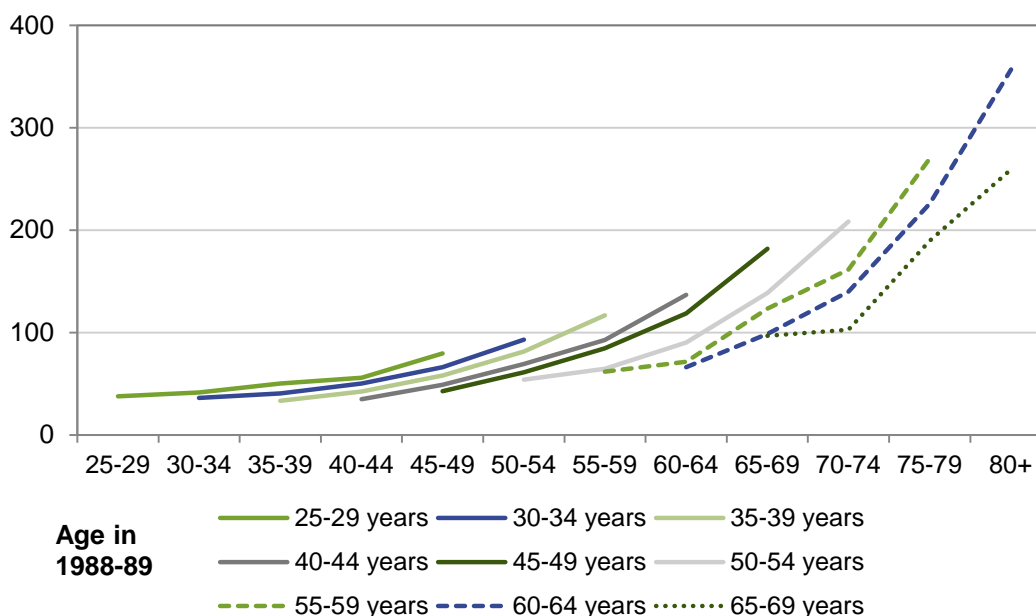


**a** Lines depict the expenditures for different age cohorts as at 1988-89 over a 20 year period. For example, the line for the 25-29 year old cohort depicts their expenditures on health when aged 25-29 in 1988-89, and subsequent expenditures when they were aged 30-34 years in 1993-94, 35-39 years in 1998-99, 40-44 years in 2003-04 and 45-49 years in 2009-10.

*Data source*: ABS (various years), *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

A myriad of non-demographic factors affect health expenditure, including:

- relative health prices — which depend not only on the prices of services and medicines but also on budget constraints, rationing and case mix

- policies and institutions — for example, rationing, private health insurance and co-payments can contain *publicly-funded* service utilisation and costs to some degree, while various policy processes can promote (or frustrate) productivity (as discussed in chapter 8)

- expectations about the quality and nature of health care — itself partly related to rising incomes

- technological change.

The latter appears to be particularly important. New technologies have led to better quality outcomes, and enabled interventions where none would have been available before or where the risks would deter both clinicians and patients. In turn, better medical interventions — surgical or pharmaceutical — can lead to soaring demand (box 5.1). This may be accentuated if the cost of the new technology falls over time.

If the price for a given new technology were to fall, it may displace less effective, lower cost alternatives. This would mean the weighted average cost of health care may still rise.

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**Box 5.1    New technologies lead to burgeoning demands**

The risks of interventions at later ages have declined, while the discomfort associated with treatments has also fallen. Most patients currently having heart bypass surgery are in their 70s, 80s and 90s, and undergo major surgeries lasting up to five hours, yet the risks of death are now around 1–2 per cent (Rocha 2012). No longer does the sternum of the rib cage need to be opened — with far less discomfort and reduced recovery times.

Similarly, coronary artery bypass grafting (CABG) surgery has proven to be a beneficial intervention. In its prototype form, the procedure only suited a minority of patients. Yet by 2009, developments in the technology meant that the use of CABG surgery expanded to patients with acute myocardial infarction, patients with acute cardiogenic shock, elderly people, and patients with multiple comorbidities. In the United States, only 4 per cent of coronary artery disease patients treated with CABG surgery today would have met the eligibility criteria of the trials that established its initial efficacy (Iribarne et al. 2009).

In the case of depression, selective serotonin reuptake inhibitors (SSRIs) appear to be more effective than previous drugs and psychotherapy, and less costly for any given patient (PC 2005e, pp. XXXIX–XL). The experience in the United States was that overall usage doubled — raising costs (Cutler and McClellan 2001). In Australia, annual prescriptions for SSRIs increased from fewer than 250 000 in 1992-93 to almost 7 million in 2003-04, and annual PBS spending from about $12 million to $200 million over the same period. Recent data show that such trends have continued. There was nearly a 60 per cent increase in the dispensing of psychotropic drugs in Australia from 2000 to 2011, driven by major increases in antidepressants, atypical antipsychotics and ADHD medications (Stephenson, Karanges and McGregor 2013).

Perhaps the most stark historical example of the importance of technology to costs are statins — a class of drugs that reduces cholesterol. Annual prescriptions of statins increased from around 2 million to 15 million between 1992-93 and 2000-01. By 2011-12, there were 21 million scripts for the three statins, Atorvastatin, Rosuvastatin and Simvastatin, resulting in around $1.1 billion of government PBS costs.

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*Non-demographic factors and ageing compound costs*

The effects on health costs of non-demographic factors and population ageing are not independent of each other. Simple analyses that attempt to decompose future health costs into ageing and technology effects often ignore their interactions, significantly underestimating the importance of ageing. Instead, ageing and

technological change reinforce each other. For example, Ranibizumab, a drug treatment for age-related macular degeneration, was the third most costly drug listed on the PBS in 2011-12. Despite its rare use (only 145 000 prescriptions in 2011-12), its high per script cost of over $2100 resulted in total government costs of $308 million for the year ending June 2012. By comparison, in 2007-08, the year of its listing, there were less than 23 000 scripts and a cost of $47 million.[48] To the extent that technological development favours diseases that have a higher prevalence in older people, then the cost effects of technology and ageing will reinforce each other.[49]

## Method for projecting health costs

Reflecting the above, this study models future health costs by considering the joint roles of population ageing and non-demographic pressures. The study breaks down expenditure into various components and makes projections for each of those components — a method that is relatively popular in the literature including the IGR (Astolfi, Lorenzoni and Oderkirk 2012).

Projections are made separately for hospitals; medical services (Medicare); the PBS; private health insurance rebates; and other health expenditures.[50] The method used in this study involves three stages:[51]

- Real per capita expenditure is assumed to grow by the rate of *(x+y)* per cent per year, where *x* is the projected growth rate of GDP per capita. The effect of non-demographic factors over and above the rate of GDP per capita growth is represented by *y*, the non-demographic growth rate. In this sense, the growth in non-demographic growth rate is estimated as a 'premium' above GDP per capita growth.

    – Based on empirical analysis of up to 20 years of data, the non-demographic growth rates for hospitals, Medicare and private health insurance rebates

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[48] Data are from the Department of Health (http://www.pbs.gov.au/pbs/home) accessed 14 August 2013.

[49] In the case of macular degeneration, its prevalence among people aged 75 years or more was around 8 per cent, compared with 0.3 per cent for those aged 35-44 years (ABS 2012, *Australian Health Survey, First Results, 2011-12, Australia*, Cat. No. 43640DO003_20112012, 29 October).

[50] This disaggregation is similar to that of IGR 2010, and reflects the largest individual areas of health expenditure for which age-related information was publicly available. Smaller health programs for both state and federal health expenditure are included in 'other' expenditure.

[51] This study's projections of government health costs are based on the methodology used in the Commission's 2005 report into ageing (PC 2005b, pp. 365–375).

ranged from 0.6 to 0.9 per cent per annum, in addition to the effects of population ageing. This study has estimated a non-demographic growth rate for each major area of expenditure using the methodology described in PC (2005b).[52]

- The average costs per person in each age group and each healthcare expenditure class rise by *(x+y)* each year over the projection period (with the assumption that the relative per person costs of each age group to others remains fixed over time).

- The projected age profiles of expenditure are applied to population projections, giving a new estimate of expenditure per age group for each year. From this, total expenditures are then calculated for each year.[53]

In projecting health expenditures, several assumptions were made:

- Changes in morbidity are assumed to be in line with either changes in demography (population ageing) or captured in the non-demographic rates of expenditure growth. This study has not projected levels of various morbidities as in Goss (2008).

- The age profile for hospital expenditure was calculated using the number of hospital patient days per age group.[54]

- For the PBS, an age profile of expenditure was only available for Section 85 drugs. These are the main category of subsidised drugs, and account for almost 90 per cent of all PBS expenditures. Expenditure on the remaining drugs is assumed to be unrelated to age (discussed below). The non-demographic growth rate of PBS expenditure was assumed to decrease over the projection period.

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[52] The non-demographic growth rates (above GDP per capita growth) estimated in this study are: 0.78 per cent for hospital expenditure; -1.25 per cent for PBS Section 85 drugs; 0.92 per cent for private health insurance rebates; and 0.61 per cent for Medicare. The negative rate for PBS Section 85 drugs (discussed later in the chapter) is assumed to become less negative over time. Larger growth rates were estimated for areas of expenditure where ageing effects were not considered, such as 'other' health (2.34 per cent) and non-Section 85 PBS expenditure (8.65 per cent). Further details are available in the 'Fiscal Implications' spreadsheet on the Commission's website.

[53] The formula is $TC_t = \sum_{h=1}^{4} \sum_{a}^{A} C_{a,0,h} \times POP_{a,t} \times (1 + x + y_h)^t$ where h is the health expenditure class (such as PBS drugs); $C_{a,0,h}$ is the cost per person in age group a in the base year (0) for the expenditure group h; $POP_{a,t}$ is the population of each age group at time t; x is GDP growth, $y_h$ is the non-demographic growth rate for each health expenditure class, and t is the number of years after the base year.

[54] Similar results were obtained using the age profile published in IGR 2010 (Australian Government 2010). The difference between projections was equivalent to 0.3 per cent of GDP in 2059–60.

- Government expenditure on private health insurance rebates is highly policy dependent, as changes to the size of the rebate have historically affected take-up of insurance. For this study, expenditure is simply assumed to follow the age profile of the benefits paid by private health insurers to their clients. The non-demographic growth rate is also assumed to decrease over time, following an exponential trend towards zero. This method is similar to that used in the 2010 Intergenerational Report (hereafter IGR 2010) (Australian Government 2010).

- The aggregate of 'other' health expenditures includes various small healthcare delivery programs, as well as health-related research. It is assumed to be affected by both GDP growth (non-demographic) and by population size. However, no age profile for expenditures were available and, as such, any ageing effects have been ignored. The growth rate was assumed to decrease exponentially over the projection period towards zero.

- Short-term health expenditures have not been based on official budgetary forward estimates, and should not be viewed as more accurate than budget and midyear financial outlook statement estimates in the short-run.

For hospital-related expenditure and the 'other' aggregated health expenditures, projections were initially made using the sum of federal and state expenditures. A split between federal and state expenditures is calculated afterwards, using current funding ratios. The ratio of federal and state expenditure on hospitals is adjusted according to the National Agreements on Healthcare, where the federal share of expenditure on public hospitals will rise to 45 per cent in 2014-15 and then to 50 per cent in 2017-18. Around 42 per cent of 'other' expenditure is attributed to the Australian Government.

*The Pharmaceutical Benefits Scheme*

Past reports have projected PBS expenditure by taking account of demographic and non-demographic growth, although some assumptions have differed. The Commission's 2005 report assumed that the non-demographic growth rate would decline over time, partly due to the reduction in price of drugs that were near the end of their patents (2005d, p. 374). In contrast, the IGR 2010 assumed a linear growth trend (Australian Government 2010, p. 136). More recent data show that while prices have fallen for some drugs, the volume of prescriptions has more than made up for that decrease (figure 5.4).

Figure 5.4    **Key drivers and their impact on Pharmaceutical Benefits Scheme expenditure, 2001-02 to 2010-11**

$ million, current prices
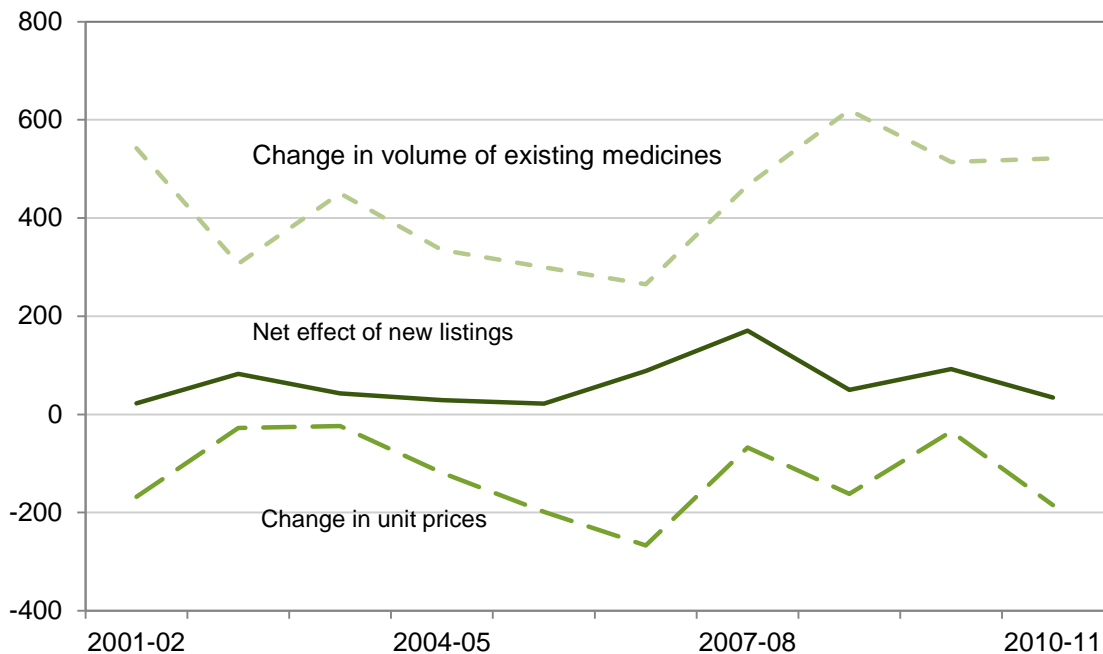


*Data source*: DoHA and Medicines Australia (2013).

In order to refine the approach adopted in PC (2005d), this study uses more detailed information on the PBS and assumes different drivers of growth for section 85 and non-section 85 drugs. Section 85 drugs account for the majority of PBS spending — around 87 per cent in 2010-11. While these drugs have lower unit costs than some others, such as Highly Specialised Drugs[55], they also tend to be used in higher volumes (DoHA and Medicines Australia 2013). Expenditure on Section 85 drugs is strongly age-related (figure 5.5).

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[55] Highly Specialised Drugs are for the treatment of chronic conditions that, because of their clinical use or other special features, are restricted to supply through specialist facilities in hospitals. In 2009–10, the main groups of drugs in this category in value terms were HIV/AIDS antiretroviral agents (19 per cent); haemopoietic agents (16 per cent); malignancy agents (12 per cent); immunosuppressive agents (11 per cent); and hepatitis agents (10 per cent).

Figure 5.5 **Expenditure on Section 85 drugs by age group,
2006-07 to 2010-11**

$ million
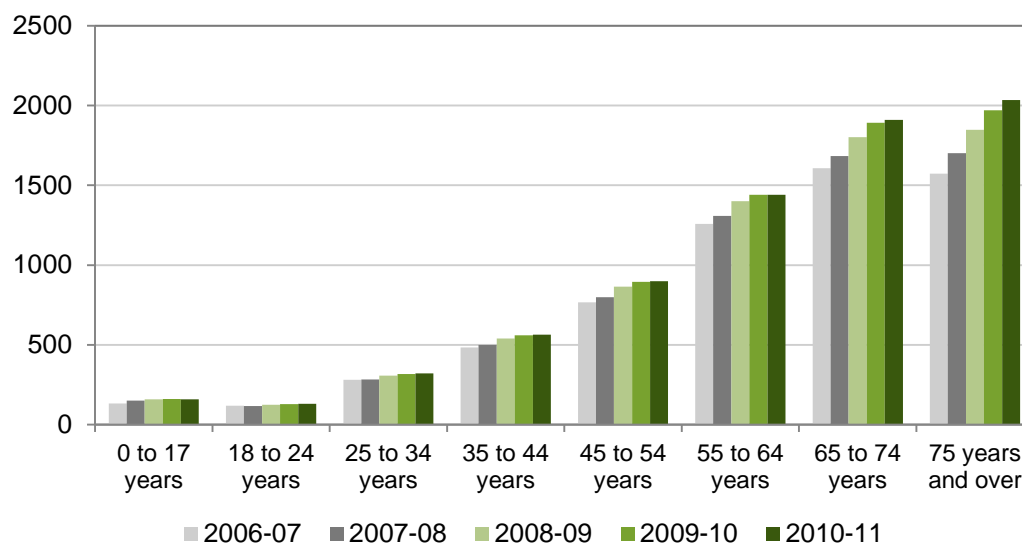


*Data source*: DoHA and Medicines Australia (2013).

Despite the demographic-related growth in Section 85 drug expenditure, per unit prices have been falling over the past ten years. This study assumes that the effect of recent price decreases will plateau over time; hence, the non-demographic rate of growth is assumed to become less negative over the projection period.

Non-Section 85 drugs include such categories as Highly Specialised Drugs; Dr's Bag; and Section 100. For these, no age profile of usage was available. Given this, and given that these types of drugs appear to be relevant to a wide range of ages, this study has not assumed any relationship between these expenditures and age.

While non-Section 85 drugs comprise a relatively small share of PBS expenditure, growth in expenditure for these drugs has been strong in recent years — roughly doubling in real per capita terms over the last six years. Such growth rates do not appear to be in line with any particular demographic change. Rather, the growth is more likely to be some other form of transition, such as changes in treatment strategies or approval processes.

It is beyond the scope of this report to predict the future trajectory of usage of these specialised classes of medicines. However, the long-run persistence of the recent growth rates seems improbable, since it would result in a massive shift in the importance of non-section 85 drugs as a share of total PBS expenditure and, indeed, as a share of health spending more generally. Similar to the Commission's discussion of PBS projections in 2005, this study has assumed that:

… while shares of individual components of health expenditure may gradually change they are unlikely to fundamentally alter their relationship with one another. (PC 2005d, p. 374)

More informed assumptions are likely to be possible with future investigation of Highly Specialised Drugs in subsequent reports (DoHA and Medicines Australia 2013, p. 15).

This study assumes that, by 2017-18, the non-demographic growth rate of this category of drugs (as a premium above GDP growth) will decrease over the projected period, following an exponential trend towards zero. The assumptions mean that Section 85 drugs would still comprise the dominant share of PBS expenditures (figure 5.6).

Figure 5.6    **Projected PBS expenditure**
$ billion
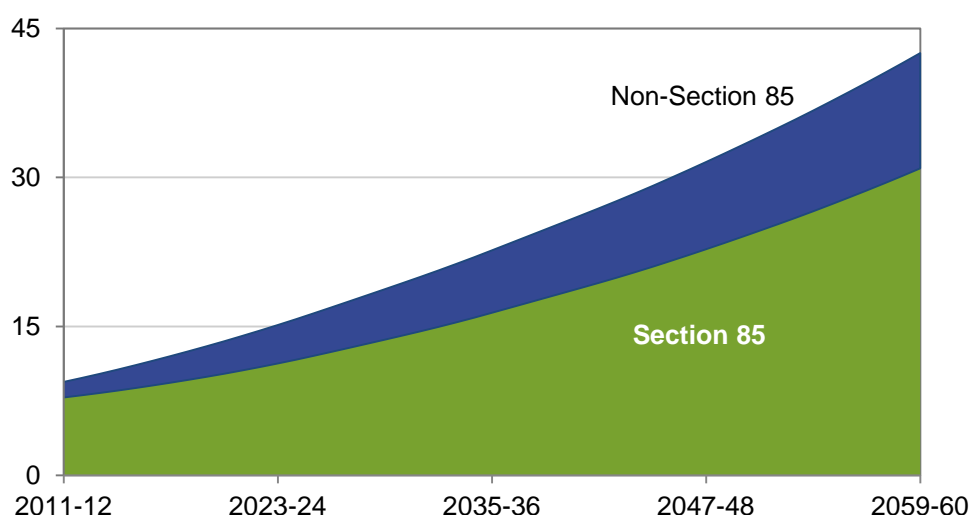


*Data source*: Commission estimates.


## Projected expenditure on health

Health expenditure by the Australian Government is projected to rise from around 4.1 per cent of GDP in 2011-12 to around 7.0 per cent in 2059-60, while state health expenditure will rise from around 2.4 per cent of GDP to 3.8 per cent (figure 5.7). This is projected to be the main source of pressure on the Australian Government's budgets over the next 50 years. Likewise, while the Commission has not made similarly detailed projections of state fiscal balances, the projected growth in state health expenditure would certainly be a significant factor for state budgets.

Given their complexity, health projections are difficult and necessarily uncertain, and even small deviations in the projections of healthcare's share of GDP translate into billions of dollars of difference.[56] That said, other projections of health expenditure have also suggested trends of strong growth (Australian Government 2010; Goss 2008; de la Maisonneuve and Martins 2013; PC 2005d).

Figure 5.7    **Projected health expenditure**
             Per cent of GDP
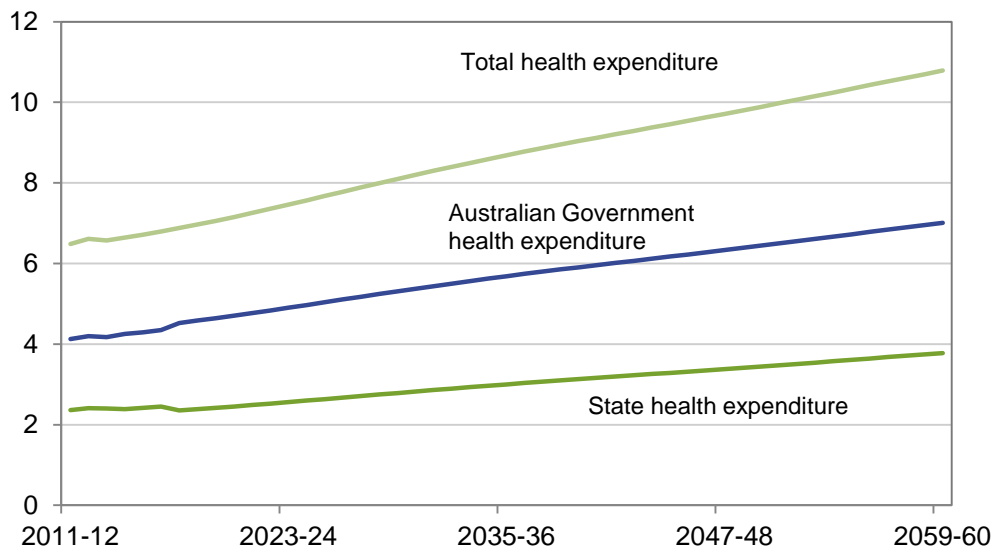


*Data source*: Commission estimates.

The sensitivity of the projection of health expenditures was tested using the same methodology outlined above but using a different age profile of expenditure.[57] The alternative age profiles for expenditure on Medicare, PBS, hospitals and private health insurance were taken from IGR 2010, which relate to 2007-08 data (Australian Government 2010). Changing the age profiles of expenditure not only alters the effects of population ageing, but also affects the estimation of non-demographic growth rates.

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[56] While similar in direction, the trends projected by Goss (2008), Australian Government (2010) and PC (2005d) each differ from the projections made in this study. While methods differ, so too do the projection periods and the base year expenditure data. De la Maisonneuve and Martins (2013) projected two scenarios where health care costs reach 8 and 12 per cent of GDP respectively by 2060. Goss' (2008) projections use an aggregate of health and aged care expenditure. The Australian Government (2010) projected health costs to rise from 4.0 per cent of GDP in 2009–10 to 7.1 per cent in 2049–50.

[57] Some assumptions differed, such as regarding the growth of PBS expenditure.

Projections would also be highly sensitive to the changes to the estimation of non-demographic growth rates. In an extreme example, adding 0.25 percentage points to the non-demographic growth rate of each area of healthcare raises total Australian Government expenditure from 7.0 to 7.7 per cent of GDP by 2059-60. Conversely, reducing the non–demographic growth rates by 0.25 percentage points would reduce Australian Government expenditure to around 6.4 per cent of GDP by 2059–60. The non-demographic drivers of healthcare costs are particularly relevant for policy, as governments may be able to significantly influence them through factors such as institutional and regulatory design. Population ageing, on the other hand, is mostly outside the control of government.

Changes to the age profiles of expenditure have a significant impact on the projection of health expenditure, particularly towards the end of the projection period. For example, projecting Australian Government health expenditure using age profiles published in IGR 2010 resulted in a difference of around 0.7 percentage points of GDP compared to this study's main projections (figure 5.8). Accordingly, if age profiles of health expenditure were to change in the future due to changes in treatment strategies at particular ages or in the age profiles of morbidity, then this may substantially affect projections of total health expenditure.[58]

Better information on age profiles of expenditure would also improve the accuracy of projections. In particular, for several smaller health programs, there is relatively little information or analysis regarding age-specific usage. For this study's projections, these smaller health programs were aggregated with health research, and assumed to grow as a function of GDP and aggregate population growth alone.

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[58] A separate comparison was made using the age profile for total health expenditure reported in AIHW (2010), for 2004–05. The resulting straight-line projection appeared to be unreasonably high compared to other estimates. This is likely to be because the methodology, specifically the application of a linear growth trend, was not suitable for projections of total health expenditure. It is clear from analysing separate aspects of health expenditure that some areas have increased dramatically in the short term due to a particular policy event (such as for private health insurance in the early 2000s), and that growth can be assumed to level off in the future. Such details would need to be considered when making an overall projection of total health expenditure.

Figure 5.8    **Health expenditure projections varied with the age profiles used**

Australian Government expenditure, per cent of GDP
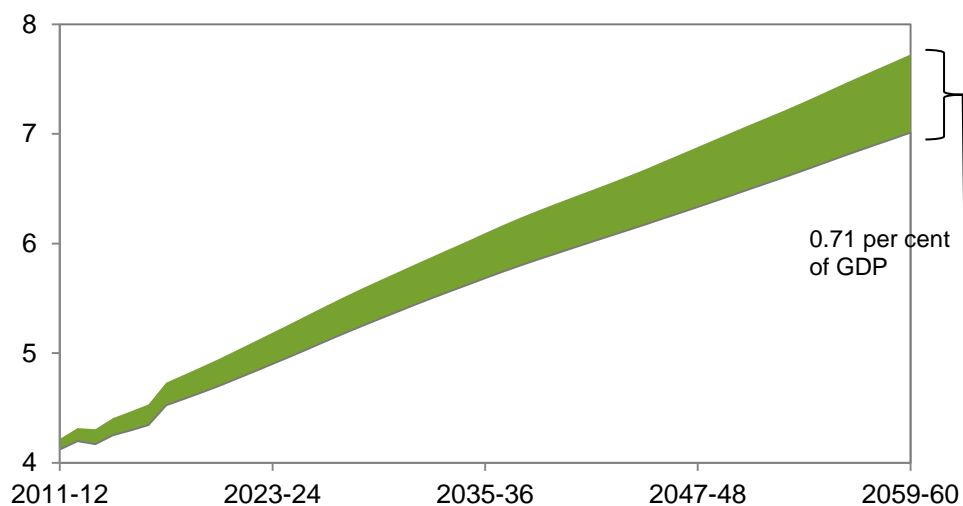


*Data source*: Commission estimates.

## An alternative health projection based on death-related costs

The extent of influence of population ageing on health expenditure is somewhat contested in the international literature. While some researchers assume that each year of added life expectancy would be in good health, others assume the opposite (Astolfi, Lorenzoni and Oderkirk 2012).

Some contend that it is the time before death, not the age structure of the population per se, that is the most important driver of healthcare costs. Under such 'death models', population ageing still increases healthcare costs because the crude death rate rises, but it does so to a lesser extent than orthodox models. This is because increased life expectancies have different implications when costs relate to death. Much of the improvement in future life expectancy is the result of reductions in the age-specific mortality rates of older Australians (chapter 2). The number of deaths therefore rises by less than the numbers of people in any old age group. The former is the basis for death models and the latter for orthodox models, as used in the earlier part of this chapter and in the various IGRs. (None of the IGRs have modelled health care costs using death models.)

Given their diverging results, it is important to review the evidence on death costs and their possible effects on future health costs.

Changes in health and life expectancy provide some indication of the relevance of death costs. If the basic tenets of a death model hold, then increased life expectancy

should also be associated with increases in the number of healthy years of living ('health expectancy'). This seems, in part, to have occurred in Australia (AIHW 2012a; Salomon et al. 2012). Moreover, the age-standardised self-assessed health status of Australians appears to have risen over time. For example, the share of people rating their health status as fair or poor has fallen from 18.2 per cent in 2001 to 14.4 per cent in 2011-12.[59] However, measures of healthy life expectancy often relate to the presence of disability and the need for care rather than the need for medical services, hospital services or medication (discussed in appendix B).[60] It may be the case that people require less care, but take more medications or make more use of medical services, and that this is why their disability rates and self-assessed health status has improved. After all, this is the purpose of health care.

At a more academic level, there is a vast international literature on the relationship between an individual's health costs and their last year of life. While there is relatively consistent empirical evidence that health costs rise prior to death across a number of countries, there are wide ranging estimates of the extent to which they do so (Astolfi, Lorenzoni and Oderkirk 2012; PC 2005d; Raitano 2006).

The Productivity Commission's analysis of death costs in its 2005 report (2005d, p. 357) drew heavily on research from the United Kingdom.[61] The Commission found that models that incorporated death-related costs projected total health expenditures which were around 5 to 10 per cent lower than orthodox models — a significant effect. However, this did not qualitatively alter that report's projections of major budgetary pressures posed by growing health spending.

Since the Commission's 2005 study, some detailed investigations into death-related healthcare costs have been conducted, such as the Western Australian studies by Moorin and Holman (2008) and Moorin et al (2012), based on Medicare Benefits Schedule data. They found that:

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[59] Based on ABS, 2013, *Australian Health Survey: Updated Results, 2011–12 — Australia*, 30 July, Cat. No. 43640DO001_20112012.

[60] An extension of healthy life expectancy may relate to an increase in the number of years that are disability-free. In these years, people may be more likely to participate in the labour force and less likely to need aged care services. However, it may also be the case that during these years, people will continue to increase their use of prescription medication. As such, most measures of healthy life expectancy do not translate directly into reductions in healthcare costs.

[61] In PC (2005d), the quantified relationship between healthcare costs and proximity to death were based on extensive UK research by Gray (2004) and Seshamani and Gray (2004), and then applied to the Australian demographic data.

- hospital expenditure tends to be higher in the final months of life, and tend to be less varied among those in the final year of life[62]

- non-hospital medical services also tended to be affected by proximity to death, although effects differed according to the type of service and the cause of death.

However, the study limited its sample to those who had died of five main medical conditions, representing around 32 per cent of deaths. As such, they may not be sufficiently representative of the patterns applying to death-related healthcare costs generally.

A recent international study used a simplifying assumption that all costs of death are proportional to the average health costs of people aged 95 years and older (OECD 2013b). The OECD assumed that younger people had costs of death four times that of the oldest cohort, with a linear reduction in costs beginning at age 60 years. Some Australian evidence partly supports this, in that costs of hospitalisation in the last year of life are higher for those aged under 20 years than for any other age group (Moorin and Holman 2008). However, the same evidence does not seem to support the hypothesis that the costs of death are always higher for younger age groups. Those above 75 years of age still have higher costs of death than those between 20 and 75 years.

*Applying a death model*

Adjustments to account for the costs of death are most applicable to hospital expenditure. One adjustment would be to assume that a set percentage of health expenditure for a cohort is related to deaths (PC 2005d). This adjustment results in a reduction in the projected costs of hospital expenditure, which becomes more significant towards the end of the projection period (figure 5.9).

Some non-hospital health costs would also be affected by proximity to death, although a more detailed expenditure analysis would be required to model the effects. For instance, Moorin et al. (2012) found that in the last year of life, visits to general practitioners tend to decrease, while the usage of biopsy and analytical services increase. The projections in the current study are based on *total* Medicare expenditure and, as such, would not be able to account for these subtleties.

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[62] Moorin and Homan (2008) measured Gini coefficients of health expenditure for different groups, where a coefficient of zero represents perfect equality within the group, and a coefficient of one represents the maximum level of inequality. They found that the expenditure of those people in the final year of life had followed a Gini coefficient of 0.49, whereas those three years prior to death followed a Gini coefficient of 0.61. By this measure, those in the final year of life have more similar expenditures than those further from death.

Figure 5.9    **Death costs can potentially make a large difference
to projections**

Projected government hospital expenditure, per cent of GDP

*Federal hospital expenditure (per cent of GDP)*    *State hospital expenditure (per cent of GDP)*
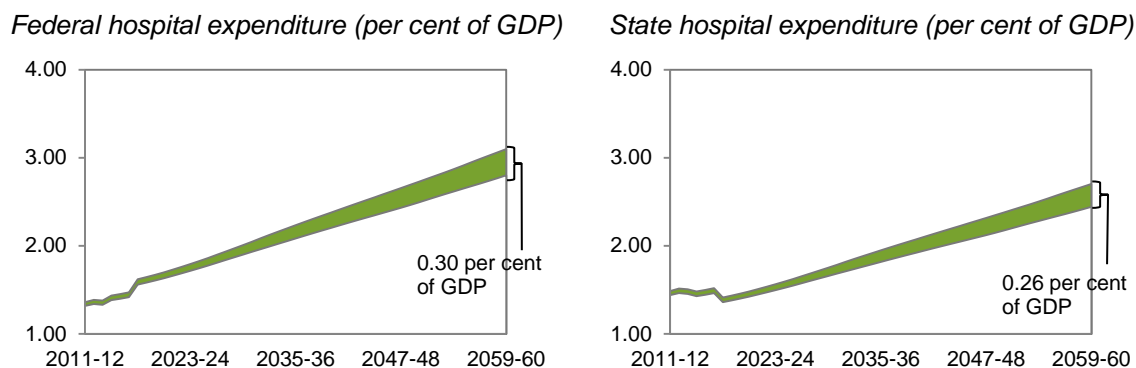


*Data source*: Commission estimates.

## *There are good grounds for better modelling of death costs*

Studies on death-related health costs suggest that the effect of ageing and death on expenditure will differ according to service type and cause of death, and over time. Accordingly, more detailed modelling of health cost scenarios would likely improve expenditure projections, and would be superior to the use of a singular scalar representing all death-related costs.

The accuracy of healthcare expenditure projections is likely to improve if further research is undertaken on a national scale. To be comprehensive, such research would likely involve the use of administrative data from death registries matched to the Medicare Benefits Schedule. In the past, gaining access to such data has proved difficult. Moorin (2007) described significant waiting times to simply obtain the relevant data. This would mean that undertaking research similar to that conducted by Moorin and Holman (2008) would require a lead time of around two years just to obtain access to the relevant data.[63] Improving data availability in this area would thus likely improve future projections of health expenditure — a point discussed more generally with regard to administrative data in PC (2013a).

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[63] Moorin (2007) applied for data from the Medicare Benefits Schedule in June 2005, but did not receive the data until February 2007. State data were received in September and November of 2007.

## 5.3    Age and service pensions

The Age Pension is an income support payment paid to those above the threshold age of eligibility — currently 65 years, but scheduled to increase to 67 years by 1 July 2023. The Age Pension is subject to an income test and an assets test and is paid as either a full or part pension. There are also other age-related pensions such as the service pension and the DVA income support supplement, which are paid to defence veterans and their families. The Age Pension (and its defence equivalents) accounted for around 50 per cent of all social security beneficiaries in 2011, up from around 45 per cent in 2001 (FaHCSIA 2012, p. 2). It will continue to grow in importance, both fiscally and in beneficiary numbers. As the Age Pension is the responsibility of the Australian Government, the fiscal costs projections do not affect state and territory government budgets.

The main driver of increasing pension costs is the increasing share of the population older than the Age Pension eligibility age and the indexation of the Age Pension to real wage growth. In contrast, given that assets and incomes will rise over time, the application of the means test results in a smaller share of people eligible for any pension. The same factors mean that even those people who remain eligible for a pension will tend to receive lower average entitlements (figure 5.10).

A key determinant of these trends in age-related pension payments over the next forty years is the impact of the introduction of mandatory superannuation in 1992, which has increased the likelihood that retirement will be funded privately rather than publicly. The majority of people retiring today have only had superannuation for part of their working lives, and are unlikely to have enough savings to fund their entire retirement. As the superannuation system becomes 'mature' in the 2030s and 2040s, people will retire after having contributed to super for the whole of their working lives.[64] As such, there will be an increase in the number of people with sufficient superannuation assets to be ineligible for the Age Pension at least for some years after their retirement.

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[64] People who entered the workforce in 1992 at ages between 18 and 25 years would be potentially eligible for the Age Pension (67 years old) in the period from 2034 to 2041.

Figure 5.10   **Trends in factors affecting pension costs**[a]

Growth index, 2011-12 base year
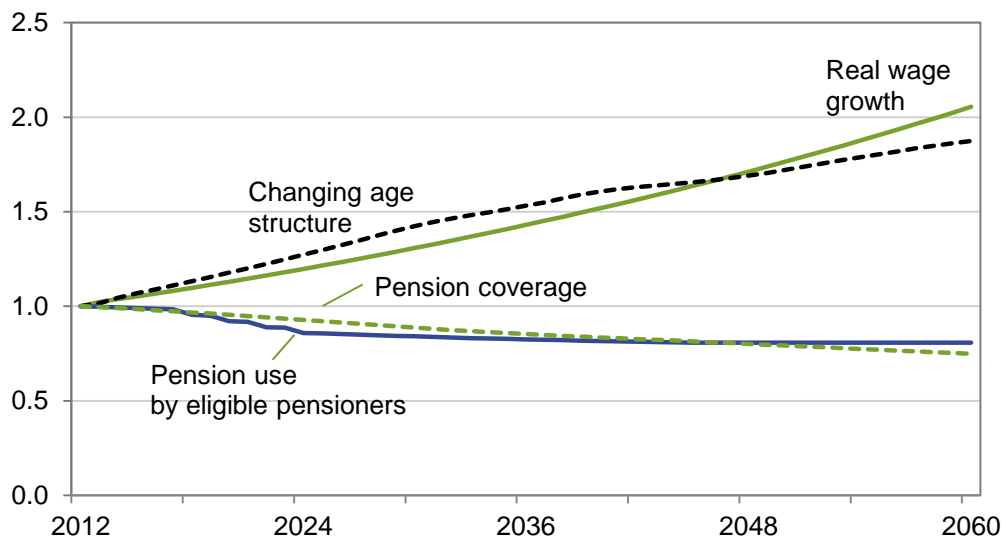


**a** Each index is set to one in 2011-12. The pension cost is in real terms and relates to the pensions provided by the Department of Veterans' Affairs and the Age Pension. The graph shows the four main contributors to growth in real pension cost obligations of the Australian Government. 'Real wage growth' is equivalent to real productivity growth. The 'Changing age structure' is an index of the share of the Australian population aged 67 or more years (noting that the eligible age for the Age Pension will shift to 67 years). 'Pension coverage' is a weighted average of age-specific shares of the population eligible for a pension from age 67 years. The weights are based on the population age shares for 2011-12, so that this factor only takes account of the decreasing capacity for people to access the pension due to mandatory superannuation and other factors. 'Pension use by eligible pensioners' takes account of the fact that even for those people who are eligible for the pension, the application of means tests results in reduced entitlements.

*Data source*: Commission estimates based on modelling described in chapter 6.

However, the compulsory superannuation system is not expected to replace the pension system, nor was it intended to do so. Treasury (2010) projected only a modest increase in the proportion of people above the pension age who would *not* receive the Age Pension (either part or full) between 2010 and 2050. Instead, as people rely more heavily on their superannuation, there would be a trend away from full pensions towards part pensions (Australian Government 2010, p. 146).

Several factors contribute to the continued importance of the Age Pension:

- Increased funds in superannuation accounts largely translate to larger retirement incomes rather than decreased Age Pension payments (discussed further in chapter 6). It has been estimated that by 2050, compulsory superannuation will only reduce Age Pension payments by around 6 per cent (Harmer 2009a, p. 9).

- To some extent, superannuation will crowd out other forms of retirement savings. This suggests that an extra dollar in superannuation will result in a smaller net impact on the net wealth of households. Connolly (2007) estimates that household wealth increases by around 70 cents for each additional dollar in

superannuation, with this effect strongest amongst capital-constrained households.

- Many people, particularly women, have interrupted attachment to the labour market or work in part-time jobs, which reduces the stock of superannuation savings at retirement.[65] Women aged 35-44 years in 2010 (who would have been covered by the requirements of the compulsory superannuation system for all or most of their working lives) have superannuation balances around 45 per cent less than males in the same age group (KELLYresearch 2012, pp. 22–23, based on the HILDA survey). Around 60 per cent of those receiving employer contributions of less than $40 a week were women, while about 65 per cent of those who received employer contributions of more than $100 a week were men.[66]

- Sole traders and partners in a partnership are not obliged to make superannuation contributions, and tend to have lower average superannuation balances than employees (KELLYresearch 2012, p. 24).[67]

- People can still take their superannuation entitlements as lump sums, and avoid asset and income tests for eligibility to the Age Pension by reducing mortgage and other debt obligations. Household debt in the form of mortgages, other property loans and credit card debt has increased markedly for people aged 50 to 64 years over the last decade (KELLYresearch 2012, p. 4). However, it is unclear if this increase in personal debt is a direct response to increasing superannuation accounts.

- The main alternatives to lump sums are account-based products in which the superannuation funds remain in an account, with the earnings and withdrawals from this account comprising retirement income (Chomik and Pigott 2012a, p. 13). The potential to qualify for a future Age Pension creates strong incentives for a more rapid drawdown of these accounts (Bendzulla and The SMSF Review nd). At older ages, the depletion of such accounts will mean many people will be eligible for at least a part pension.

- The global financial crisis reduced the value of superannuation assets by around 30 per cent. The IGR 2010 estimated the value of superannuation assets at 140 per cent of GDP, down from 180 per cent in the previous IGR (Australian

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[65] There is also no obligation for compulsory employer superannuation payments for employees earning less than $450 per month.

[66] Based on ABS 2009, *Employment Arrangements, Retirement and Superannuation, Australia*, Cat. No. 6361.0, 2nd June.

[67] However, ABS data suggests that the margin is lower than that suggested by the HILDA survey (ABS 2011, *Household Wealth and Wealth Distribution, Australia, 2009-10*, Cat. No. 65540DO001_200910, 19 October).

Government 2007, 2010). Consequently, unless people save more in response to the consequences of the Global Financial Crisis, more people will be eligible for the Age Pension.

On the other hand, some other factors will reduce pressures on the Age Pension. Labour force participation by older people has increased by more than most had anticipated, with the various IGRs and the Commission's 2005 report underestimating participation rates. The progressive increase in the pension eligibility age to 67 years is likely to stimulate participation rates further (chapter 6). Greater workforce participation could also lead some people to exceed either the income or assets threshold tests for eligibility to the pension, reducing Australian Government outlays. The planned increase in the mandatory superannuation contribution rate to 12 per cent will also increase accumulated super assets, while government contributions for low-income earners may shift some people from full pensions to part pensions.

Given these offsetting factors, forecasting the long run level of Age Pension costs for the Australian Government is fraught. The Australian Government Treasury has developed a sophisticated model (RIMGROUP) to analyse such costs for its various IGRs (Rothman and Tellis 2008).

However, the results depend on many assumptions about participation rates, retirement ages, future wage growth, expected returns on superannuation funds and the level of voluntary contributions. It is notable that an alternative model from Rice Warner estimated aggregate superannuation assets for 2020 almost 50 per cent higher than the Treasury model (Rothman and Tellis 2008, p. 22). The Treasury has also undertaken stochastic analysis of superannuation accumulation and pension entitlements, indicating the significant uncertainty in any estimates (Price and Suryadi 2011).

Most importantly, the RIMGROUP model is not able to systematically take account of people's behaviour in the context of changes to these variables or to policy settings. For example, although superannuation balances will increase over time, some people may draw down their superannuation more quickly in order to increase their investment in the family home (which is exempted from the Age Pension assets test), for the purpose of increasing their pension entitlement. Ding (2013, p. 15) suggests that this may result in Age Pension costs being underestimated by around 13 per cent.

Against that background, this study only makes tentative projections for the Age Pension, drawing strongly on existing Treasury and other modellers' results.

## Projecting government expenditure on age related pensions

Given the complexity of influences on future pension payments, the Commission has not been able to conduct an original forecasting exercise in this area.[68] Instead, it has relied primarily on the figures produced in the 2010 IGR, which indicated that pension costs as a percentage of GDP rise to 3.9 per cent of GDP by 2050. The starting point of the projection has been adjusted to match the latest reported budget cost — this is the main cause of difference between this study's projection and that of the IGR 2010.

There have also been small adjustments made to update these figures for changes to the superannuation guarantee, from 9 to 12 per cent. This increase in the superannuation guarantee will result in increased superannuation balances at retirement, which will reduce the level of Age Pensions paid in the future. However, the size of this effect is not clear and its estimation is subject to the many of the methodological difficulties described above. Nevertheless, the effect of this policy change has been estimated by a number of parties:

- Kurdna and Woodland (2010) developed a computable general equilibrium model with overlapping generations to analyse a number of age pension policy changes. They find that age pension payments decrease by 0.88 per cent in the long run (projected to the year 2150), with decreases of 0.40 per cent in 2030 and 0.52 per cent in 2040.

- Ding (2013) estimated the level of age pension payments using a life cycle utility model that attempts to capture the response to incentives to invest in different asset classes. The paper estimated that, in 2035, the increased superannuation guarantee will reduce pension payments by $1.2 billion (in 2011 dollars), equivalent to around 1.2 per cent of pension costs.

- The Association of Superannuation Funds of Australia (2011) estimated the reduction in pension costs in 2035 as a result of the increase in the superannuation guarantee to be $3.8 billion.

Based on these studies, the Commission has adjusted the IGR 2010 pension estimates downwards. The effect of the superannuation guarantee was estimated to reach 1.5 per cent of Age Pension expenditure by 2041 (the average of the above studies' estimates after 22 years). The longer term trend is estimated based on Kurdna and Woodland (2010).

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[68] It has, however, updated a model used for PC (2005) in order to examine how the cost of Age Pensions responds to different policies. This model is described in chapter 6 and in the 'Fiscal Implications' spreadsheet on the Commission's website.

These estimates could also be adjusted in other areas. For instance, the Commission has forecast stronger growth in life expectancy and workforce participation rates than was assumed in the IGR 2010. Both of these factors will influence the pension forecasts. However, as these factors will work in opposing directions, and it is difficult to isolate the impact of each factor, it has been assumed that the net effect of these two factors would be negligible. The projections also assume that there will not be any policy changes, although there are a range of policy options that should be considered as people live longer, healthier lives (discussed in chapter 6). The final projections are shown in figure 5.11.

Figure 5.11    **Age Pension projections**
          Per cent of GDP
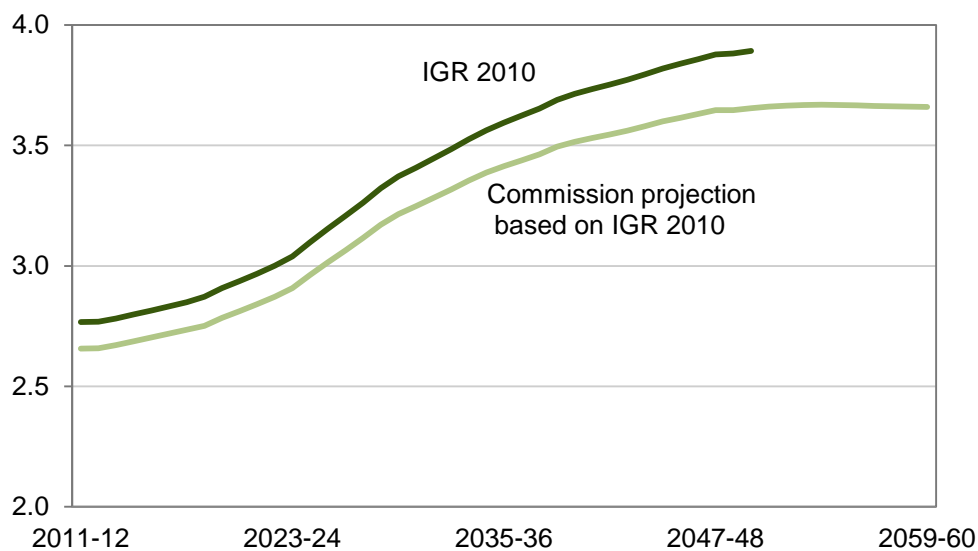


*Data source*: IGR 2010 and Commission estimates.


# 5.4    Aged care

Aged care services range from residential care (such as nursing homes) to services provided to individuals within their own homes (such as the Home and Community Care Program and Home Care Packages). These services are used predominately by those aged over 80 years. The public costs of aged care are now funded by the Australian Government.

Population ageing is projected to lead to a sharp rise in the cost to the Australian Government of providing aged care services. In 2010, Treasury projected that aged care costs, under existing policy settings, were likely to rise from around 0.8 per cent of GDP in 2009-10 to 1.8 per cent in 2049-50 (Australian

Government 2010, p. 56). Of this, residential care costs represented the largest share — accounting for nearly 85 per cent of all public aged care expenditure at close to 1.4 per cent of GDP in 2049-50. Similar projections of aged care costs have also been put forward by the OECD (2013b).

However, several recent reforms (box 5.2) are likely to increase the number of aged care services available, and address significant amounts of unmet demand in the system (Butler 2013). While these reforms were based on the Commission's recommendations (PC 2011a), the proposed funding model differs from that recommended by the Commission. At this stage, the increased costs are expected to be met largely by the Australian Government.

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**Box 5.2      Recently announced reforms to aged care**

On 26 June 2013, the federal parliament passed a number of reforms to aged care. The reforms included:

- Consumer Directed Care packages, rolled out nationwide to provide people with more control over the care they receive.
- Almost $1 billion in new funding for home care, which will see the number of home support packages almost double from 60 000 to 100 000 over five years.
- Tailored care packages to people with dementia receiving home care, and new funding to boost dementia care.
- Increased funding to residential aged care, with 30 000 new places over the next five years and $480 million for aged care homes to significantly upgrade their facilities.
- $1.1 billion to deliver higher wages, better conditions and more rewarding careers for the nation's 350 000 aged care workers.
- A single gateway to all aged care services, to make them easier to access and navigate.

*Source*: Butler (2013).

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## Projecting aged care costs

This study has made projections of aged care costs based on current unit costs of care packages and estimates of aged care usage rates under the new policy settings.

Usage rates were estimated based on earlier modelling undertaken during the Commission's inquiry into aged care (PC 2011a). For that report, the Commission modelled scenarios where recommended reforms would lead to increases in usage rates (PC 2011a, p. E.3–E.33). These modelling scenarios are assumed to approximate the likely outcomes of recent reforms.

A major simplifying assumption relates to the shares of funding between individuals and governments. These funding shares are inherently uncertain over long periods. Future policy shifts could easily change the extent to which individuals contribute to the cost of their own aged care services.

The differences in projected costs under alternative funding scenarios are potentially significant. Under similar funding assumptions to those used in the IGR 2010, the Commission estimated that, on average, the Australian Government would be responsible for around three-quarters of total aged care costs between 2010-11 and 2049-50 (PC 2011a). On the other hand, under the Commission's proposed suite of reforms, co-contributions were intended to be greater, with the Australian Government's share of total costs around 5 percentage points lower (on average).

This study has assumed that funding shares for aged care are in line with IGR 2010 assumptions. These funding shares are used in conjunction with the estimates of per unit cost and usage rates (by age group), along with updated population modelling (chapter 2).

*Projections of Australian Government expenditure on aged care*

The results suggest that government aged care costs as a share of GDP will be higher than projected in the IGR 2010. Costs are projected to rise to 2.6 per cent of GDP by 2059-60 (figure 5.12). To help ease this pressure, governments could consider options to share these costs with service users (chapter 7 and PC 2011a).

Figure 5.12 **Projected real Australian Government aged-care costs, 2011-12 to 2059-60**

Per cent of GDP
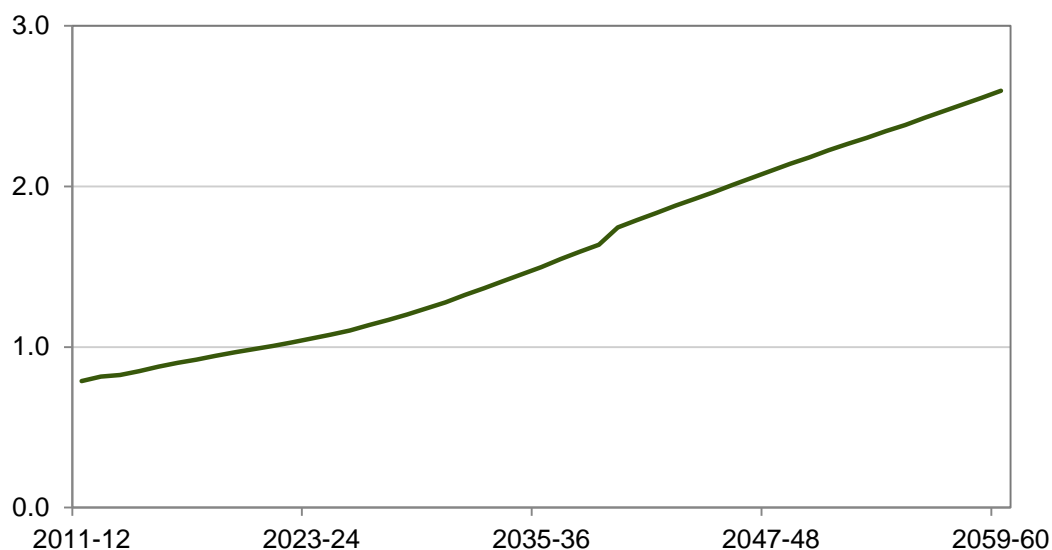


*Data source*: Commission estimates.

## The role of labour costs

Labour costs represent around three-quarters of total costs in the aged care industry (Australian Government 2010, p. 145). Improvements in labour productivity in aged care, therefore, have the potential to reduce costs significantly. For example, if reforms were to increase labour productivity in aged care by around 0.3 percentage points per year, then outlays in 2059-60 would be 10 per cent lower than otherwise projected.

This highlights a number of important workforce issues in determining sector costs. The Commission has previously pointed to possible reforms that may help in this area:

> Reforms aimed at increasing competition between providers and innovations in models of care and scopes of practice, together with team-based health care, have the potential to offer further improvements in delivering safe, quality care, as well as enhancing the productivity of the workforce. (PC 2011a, p. 352)

However, it should also be noted that, in many instances, improved labour productivity would be translated into higher quality care, and not necessarily lower aggregate costs. If this is the case, while such changes will no doubt improve outcomes for the sector and generate benefits, they may not lessen governments' fiscal costs.

*Reduced disability rates may lower aged care costs*

Reducing disability rates may also have an effect on aged care costs. Reduced disability rates could see greater use of lower cost services (such as care provided in the home) and less use of more expensive residential care. However, reductions in disability rates will not occur by themselves, and in many instances are a result of better outcomes from the health system — an area where most costs are met by governments (discussed above). Therefore, as with productivity changes, while such improvements will undoubtedly lead to benefits, they may not alleviate government fiscal pressures.

# 5.5 Education

Education is funded through a variety of sources, with state and territory governments, the Australian Government and private contributions all playing a role (table 5.1). State and territory governments are primarily responsible for public schools, pre-schools and technical education (including TAFE colleges). The Australian Government is the principal funder of private schools and universities. This section covers projections of education expenditure from both the Australian Government and state and territory governments.

Table 5.1    **Education funding in 2011-12**[a]
$ millions

|  | *Australian Government* | *State and territory* |
|---|---|---|
| Pre-schools [b] | 358 | 4 373 |
| Primary and secondary schools | 13 849 | 39 968 |
| University | 8 743 | 291 |
| Technical and further education | 1 993 | 5 318 |
| Transportation of students | 0 | 1 522 |
| Education not elsewhere classified | 3 794 | 292 |
| Total | 28 738 | 51 762 |

**a** Numbers may not add to totals due to rounding. **b** Also includes funding for education not definable by level.
*Sources*: ABS (2013), *Government Finance Statistics, Education, Australia, 2011-12*, Cat. no. 5518.0.55.001.

Education is primarily consumed by the young. Even when universities and technical institutions are included, more than 90 per cent of government spending on education is attributed to those aged 19 years or younger (figure 5.13). As the population ages, the proportion of the population in younger age groups will decrease, reducing fiscal pressure in this area.

Figure 5.13 **Education is primarily consumed by the young, 2011-12**
Expenditure by age group ($ million)
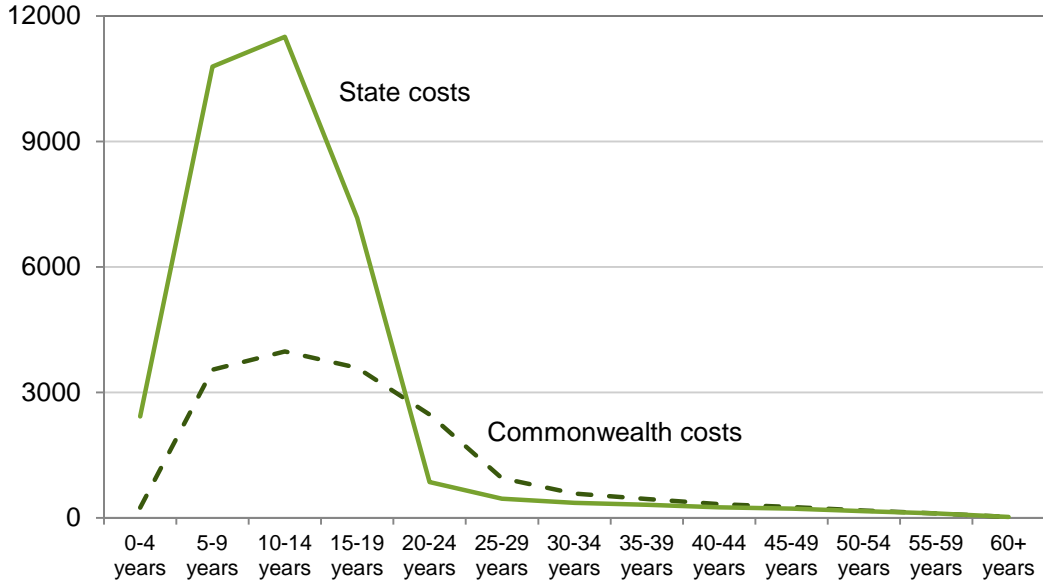


*Data source*: 2011 census and Commission estimates.

## Projections of government expenditure on education

This study's projections of education spending assumed that the age profile of expenditure retained its shape over time, but that the unit cost of delivering education increased in line with an economy wide rate of productivity growth, approximated by average weekly earnings. Since average weekly earnings are expected to increase faster than GDP, this growth partially offsets the effect of population ageing on education expenditure. The resulting projection is relatively constant with respect to GDP (figure 5.14).

Figure 5.14  **Projection of education expenditure, 2011-12 to 2059-60**
Per cent of GDP
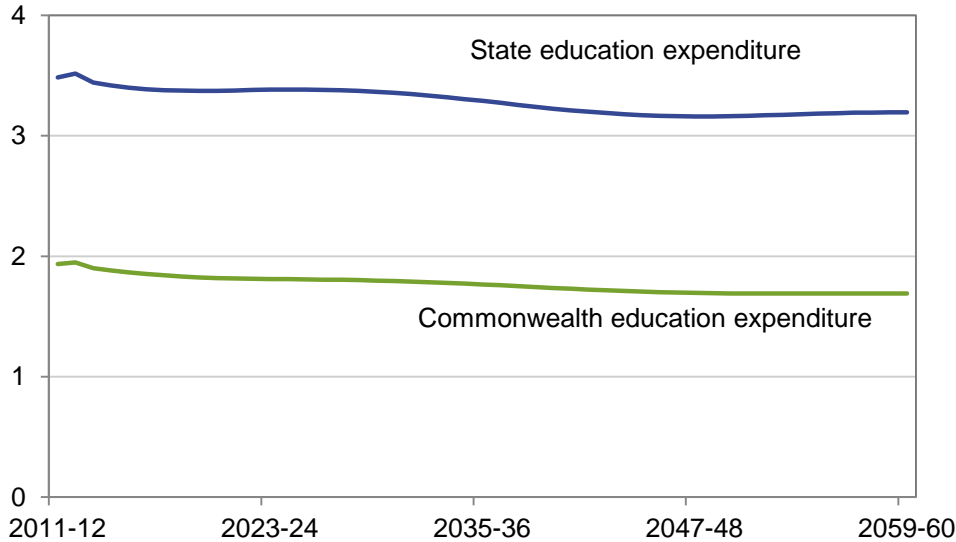


*Data source*: Commission estimates.

## Changes to education policy and trends in coverage rates

The assumptions made in projecting education expenditure are likely to obscure some important factors.

- Shifts in education policy could affect the level of education funding or the funding arrangements between levels of government. Changes to education funding were agreed between the Australian Government and several states and territories in 2013 under the National Education Reform Agreement. This may affect projections of education funding, particularly in the near term.

- Changes could occur to either the age profile of students, or the number of students relative to the population. Such changes are less predictable with regard to tertiary education than to primary or secondary education, given that the latter two are compulsory. Historically, the number of university students has risen significantly relative to the population — increasing by 182 per cent since 1980, while Australia's population had only increased by 52 per cent.[69]

- The proportion of students attending non–government schools may also increase in the future, as it has historically (Australian Government 2010, p. 151). This would result in more private financing of education relative to public financing.

[69] University student numbers rose from 330 000 in 1980 to 932 000 in 2011 (ABS 2013a; Department of Education, Training and Youth Affairs 2000).

It would also increase the share of funding from the Australian Government relative to state and territory governments.

Projections of education expenditure could be improved in time as data on the above factors becomes available.

## 5.6 Other Australian Government expenditures

There are several other significant areas of Australian Government expenditure, although they are not expected to have as strong a relationship with population ageing as those discussed above. These include several social security and welfare payments (other than the age and service pensions), as well as defence and other spending. Other state and territory government expenditures have not been examined in this paper.

### Other social security and welfare payments

There are several social security and welfare payments (aside from the Age Pension and service pensions) that comprise a significant amount of government expenditure. These include unemployment benefits; allowances, concessions and services for seniors; family tax benefits; child care and parental leave payments; and income support for carers. Expenditure on these payments was projected assuming that the historical costs per person will increase in real terms in line with real wage growth (that is, at the same rate as labour productivity growth) (chapter 4).[70] The exception to this is the family tax benefit payment, which was assumed to increase in line with the CPI as in the Commission's 2005 report and the 2010 IGR (Australian Government 2010, p. 150; PC 2005d, pp. 198–200).

While the expenditure on each welfare payment is likely to be affected by demographic changes in differing ways, the projected aggregate of these payments falls relative to GDP over time (figure 5.15).[71] There are projected to be reductions

[70] For unemployment benefits this represents a shift from current policy settings. Increases were assumed to match real wage growth in the longer term such that the relative difference between unemployment benefits and disability support payments was maintained.

[71] For unemployment benefits, the total number of unemployed individuals (chapter 3) was used as the population base. For allowances, concessions and services for seniors, total costs were based on changes in the over 65 year old age group, with child care and parental leave costs based on changes in the 0 to 5 year old population. For income support for carers, age-specific carer rates were determined using information from the 2009-10 Household Expenditure Survey (ABS 2012c). Projections were formed by assuming these rates remained constant over time — effectively assuming disability rates remained stable over time.

in government expenditure shares of family tax benefit payments and, to a lesser extent, unemployment, childcare and parental leave benefits. These reductions offset increases in carer payments and concessions for seniors.

Figure 5.15    **Projected real combined other social security and welfare costs, 2011-12 to 2059-60**[a]
Per cent of GDP
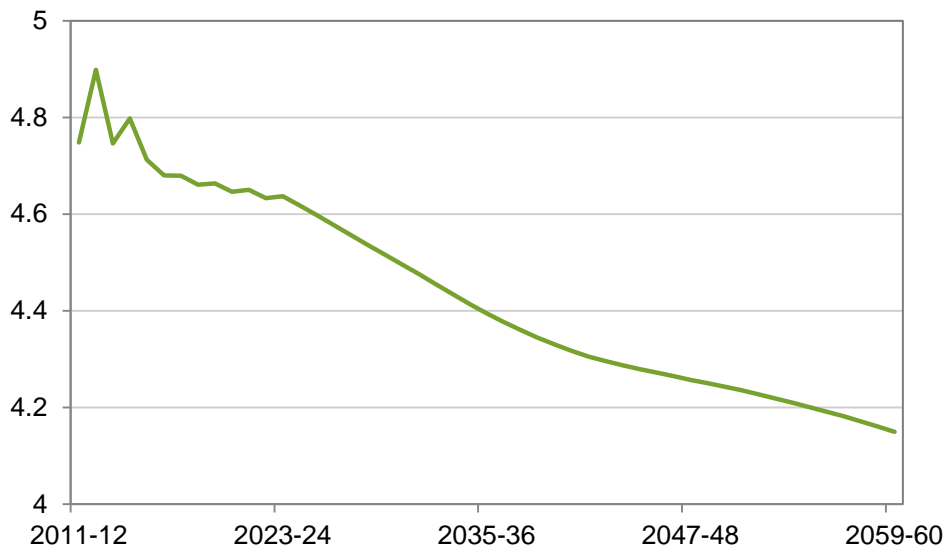


**a** Includes unemployment benefits; allowances, concession and services for seniors (not included in previous sections); child care and parental leave payments; income support for carers; family tax benefits A and B; disability support pension; parenting payment.

*Data source*: Commission estimates.


*A variety of other concessions may also influence the costs of ageing*

Government concessions are available on a wide range of goods and services, including pharmaceuticals; optical, dental and hearing services; local government rates; electricity, water and gas charges; motor vehicle registration; and recreational services such as public zoos, art galleries and national parks. While eligibility conditions vary, in most cases discounts are conditional on the person accessing an Australian Government payment. Recipients of the Age Pension, the Disability Support Pension, the Newstart Allowance and the Parenting Payment (single) are the largest recipient groups for government concessions.

The cost of the concession program is difficult to estimate, as it is delivered and funded through different levels of government.

- FaHCSIA (2008, p. 9) estimate that the value of the Pension Concession Card is around $1600 per year for each recipient, while the Commonwealth Seniors Card is worth around $1200 per year for each recipient.

- The Henry Tax Review reported that, in 2009, 5.2 million Australians held a concession card (Treasury 2010, p. 621).

- In its 2005 report on population ageing, the Commission estimated that around 45 per cent of concession card holders were older people who held either the Pensioner Concession Card, the Commonwealth Senior Health Card or the Department of Veterans Affairs Gold Card (PC 2005d, p. 250).

These estimates suggest that the total budgetary cost of government concessions for older persons alone would total several billion dollars per year (including pharmaceutical benefits). However, given that pharmaceutical concessions account for a large amount of government expenditure (discussed above), it is unlikely that the remaining concessions would comprise a significant amount for the purposes of this study's fiscal projections.

A more general concern is that the complexity of the current system of concessions makes it difficult to estimate whether this area of expenditure provides good value to governments and achieves its social goals effectively — an issue raised by other reports (Treasury 2010, p. 624).

## Disability services

State, territory and federal governments provide specialist support services for Australians with a disability. These services include personal care; aids and appliances; respite care; specialist accommodation; and transport, therapies and emergency support. The Australian Government also funds disability employment services.

The funding and provision of disability services in Australia is currently in a major transition, which will see a significant increase in the quality and coverage of disability services. In July 2013, the National Disability Insurance Agency (previously named DisabilityCare Australia) accepted clients in a number of trial regions around Australia. This program will be progressively expanded until all eligible residents are covered by July 2019 .

Given that the scheme is still being rolled out, it is not possible to use historical estimates of service delivery to predict future costs. Therefore, this study has relied on Commission estimates prepared as part of its previous report into disability support services (PC 2011c), and on the 2013-14 federal budget, which estimated a

total level of expenditure of $22.2 billion once the scheme is fully rolled out in 2019-20.

To project the costs of this scheme to 2059-60, the estimated costs were attributed to age groups based on the prevalence of severe and profound disability amongst people below the age of 65 (figure 5.16, left panel). The costs were also increased slightly based on the expected withdrawal of informal support (PC 2005d, p. 644). Overall, the reforms to disability services were estimated to increase the projected government expenditures significantly in the short to medium term (figure 5.16, right panel).

Figure 5.16    **Costs of disability services**[a]

Prevalence of disability (per cent of population); Costs as percentage of GDP
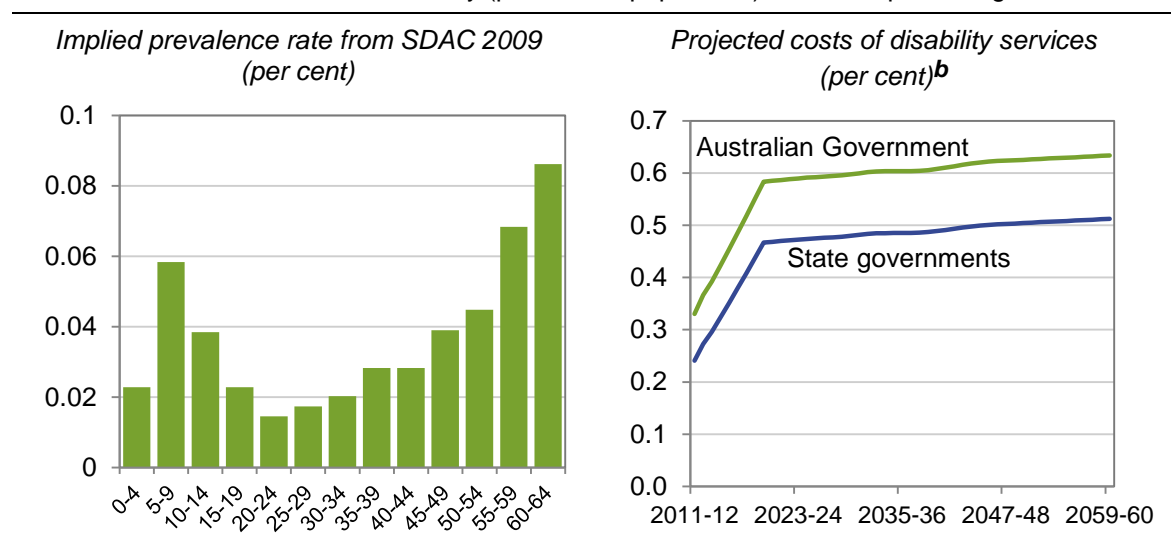


**a** Following the methodology of (PC 2011c), disability services for those over the age of 65 were considered to be aged care, although in practice there is significant overlap between the two systems. **b** Projected costs of disability services are not based on official budget estimates, although the timing of the rollout for Disabilitycare is based on official forecasts. Costs do not take account of the Disabilitycare levy.

*Data sources*: ABS (2012), *Microdata: Disability, Ageing and Carers 2009*, Cat. no. 4430.0.30.002; Commission calculations.

## Defence and other expenditures

Australian Government expenditure on Defence and other items[72] have been projected using a simple approach. For each of these, beyond forward estimates, expenditures have been assumed to account for a fixed share of GDP (figure 5.17).

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[72] Other expenditures include general public services; public order and safety; housing and community amenities; recreation and culture; fuel and energy; agriculture, forestry and fishing; mining, manufacturing and construction; transport and communications; and other economic affairs.

Following the approach of the IGR 2010, the largest single item — defence expenditure — was assumed to account of 1.8 per cent of GDP from 2029-30 onwards (Australian Government 2010, pp. 68–9).

Figure 5.17 **Projected real defence and other expenditures, 2011-12 to 2059-60**[a]

Per cent of GDP
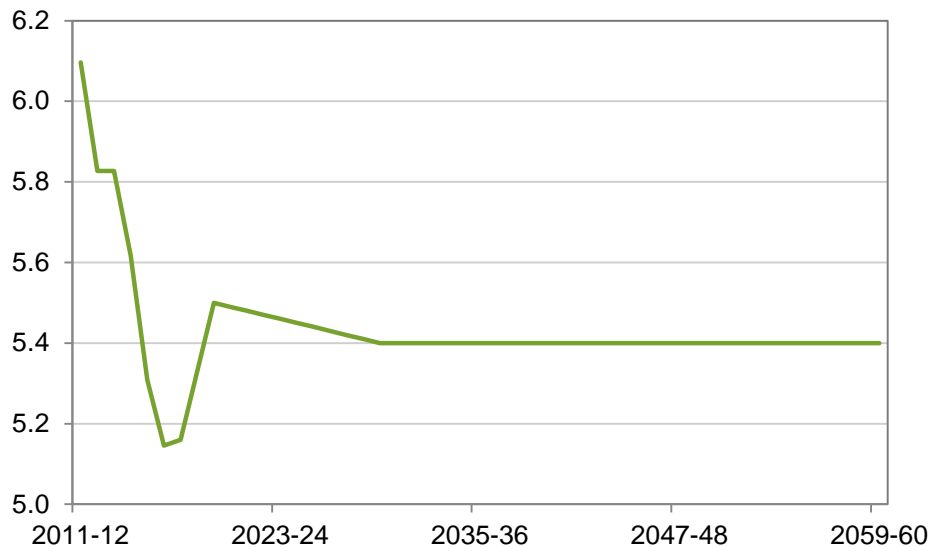


**a** Other expenditures include general public services; public order and safety; housing and community amenities; recreation and culture; fuel and energy; agriculture, forestry and fishing; mining, manufacturing and construction; transport and communications; and other economic affairs.

*Data source*: Commission estimates.

For other expenditures, recent budget and forward estimates project increases in expenditure compared to levels seen in recent years. However, these are primarily due to 'one-off' assistance expenditures related to the Global Financial Crisis. As such, this study has assumed that these expenditures will return to pre-crisis levels — approximately 3.6 per cent of GDP.

## 5.7 Revenue

The tax base of both federal and state governments is less dependent on the age structure of the population than is government expenditure. This result arises because the factors that drive GDP are also the primary drivers of taxation revenue.

In its previous report into ageing (PC 2005d), the Commission found that some tax bases are influenced by the age profile of the population. For instance:

- GST revenue may decline modestly as a proportion of GDP as tax exempt consumption, particularly health services, is expected to grow. The Commission estimated that the ratio of GST revenue to GDP would fall by 0.3 percentage points (2005d, p. 264).

- Revenue from gambling taxes is zero for people under 18 years of age, highest for working age people and then decreases for older Australians. In the future, the decreased share of young people is likely to result in relatively more gambling revenue, while the increase share of older people implies less gambling revenue. These effects are expected to be roughly equivalent and thus have no overall impact on gambling tax revenue (2005d, p. 269).

- Older people are less likely to move residences, which, with an ageing population, could result in a fall in revenue from conveyancing duties as a proportion of GDP. However, house prices, particularly for established homes in bigger cities, are likely to rise due to population and household pressures over time. Examining these effects, the Commission found that with long-term real house prices growth (of around 2 per cent per year), the house price effect would dominate, meaning conveyancing duties were projected to rise moderately over time (2005d, pp. 275–6).

Overall, after modelling the influence of a changing age profile on government revenues, the report found that the net effect was quite modest, and likely to be significantly smaller than other influences on government revenue such as government policy and the impact of the business cycle. Importantly, any decrease in government revenue due to ageing could be reversed by a relatively small increase to the income tax rate.

This study has assumed that the ratio between real Australian Government tax receipts and GDP will remain constant at 23.5 per cent from 2018 onwards, and the ratio of state and territory tax receipts to GDP will remain at 4.5 per cent of GDP.[73] This was calculated as the five year average over the period from 2002–2007, and

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[73] The Australian Government provides various taxation concessions and exemptions — termed 'tax expenditures' — as they reduce revenue in a similar way to direct expenditures. Tax expenditures represented $111 billion in forgone revenue in 2011-12 (Treasury 2013), of which tax concessions on housing and superannuation are the most important. Tax concessions on the private health insurance rebate are included in health expenditure projections for this study following the practice of previous reports (Australian Government 2010; Goss 2008; PC 2005d). Aside from private health insurance rebates, the projections of revenue in this study and of successive IGRs ignore all other tax concessions and exemptions — with the implicit assumption that any ageing or other demographic induced increase in revenue forgone as a share of GDP are offset by greater revenue collection from other sources. A more accurate measure of fiscal pressure would take tax concessions and exemptions into account and would likely be higher than the measure used in this study.

was selected to avoid the cyclical effect associated with the global financial crisis (in a similar way to budget forward estimates).

## 5.8   Fiscal pressures created by population ageing

### For the Australian Government

Fiscal pressure refers to the extent to which increases in government spending outpace revenue growth. Some expenditures are unlikely to change significantly as a share of GDP (table 5.2). Further, under the 'business as usual' assumption, changes in overall tax revenue do not themselves exert fiscal pressure. However, several age-related expenditures, most notably Australian Government expenditures on health, the age-related pensions and aged care, are likely to be major sources of fiscal pressures (table 5.2).

This study finds similar fiscal pressures for health and the Age Pension to the IGR 2010, but greater pressures for aged care.[74] Higher aged care costs reflect the recent reforms that address unmet need. Recent disability reforms also contribute to higher Australian Government expenditures. However, despite higher projected government expenditures per person, the share of these costs as a per cent of GDP is lower than projected in IGR 2010 due to higher GDP projections — primarily related to differences in labour supply projections (chapter 3). As with the IGR, this study has not made projections of the costs of servicing debt.

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[74] The IGR 2010 projected that by 2049-50, health outlays would be around $7600 per person (Australian Government 2010, p. 119). By comparison, this study projects per person health costs to be around $7202. Projected aged care costs in 2049-50 in this study are around $2438 per person compared with $1940 in the 2010 IGR (Australian Government 2010, p. 119). This study did not undertake new Age Pension projections, instead, it adjusted the IGR 2010 projections to account for some recent reforms to superannuation. All dollar figures are expressed in 2011-12 dollar terms (the CPI has been used to convert the 2010 IGR estimates in 2011-12 dollars).

Table 5.2    **Australian Government spending pressures by expenditure area**[a]

Per cent of GDP

| | 2011-12 | 2049-50 | 2059-60 | Difference between 2011-12 and 2059-60 (fiscal pressure) |
|---|---|---|---|---|
| | % | % | % | Percentage points |
| Health | 4.1 | 6.4 | 7.0 | 2.9 |
| Age Pension[b] | 2.7 | 3.7 | 3.7 | 1.0 |
| Aged care | 0.8 | 2.2 | 2.6 | 1.8 |
| Education | 1.9 | 1.7 | 1.7 | -0.2 |
| Disability support services | 0.3 | 0.6 | 0.6 | 0.3 |
| Disability support pension | 1.0 | 1.0 | 1.0 | 0.1 |
| Family Tax Benefit (A & B) | 1.4 | 0.7 | 0.6 | -0.7 |
| Parenting Payment | 0.3 | 0.3 | 0.3 | 0.0 |
| Other social security & welfare payments | 2.1 | 2.2 | 2.2 | 0.1 |
| Defence & other expenditures | 6.1 | 5.4 | 5.4 | -0.7 |
| Total | 20.7 | 24.2 | 25.1 | 4.4 |

**a** Numbers may not add to totals due to rounding. **b** Includes Age Pension, Service Pension and Widows Pension.

*Source*: Commission estimates.

Of the identified fiscal pressures, health is the most significant source and is projected to increase from around 4.1 per cent of GDP in 2019-20 to 7.0 per cent by 2059-60.

Fiscal pressures are projected to build gradually as the population ages. All else being equal, these will lead to a gradual deterioration in the fiscal position over time, requiring governments to run increasing deficits in order to fund such expenditure.

## For the states and territories

State and territory governments are not immune to these pressures. While the Age Pension and aged care responsibilities fall largely on the Australian Government, health receives significant funding from both the Australian Government and state and territory governments (as discussed above). The Commission's earlier ageing study found that health expenditures were the main source of ageing-related fiscal pressures faced by the states, with aged care also playing a role (PC 2005d, p. 308). However, the recent reforms to aged care have seen the Australian Government assume expenditure responsibility in this area.

Health therefore represents the main source of ageing-related fiscal pressures faced by the states. And with revenues unlikely to rise with an ageing population (as discussed above), health expenditures will put pressure on state government fiscal positions.

In line with the pressures faced by the Australian Government, state health expenditure will also increase in response to population ageing and is projected to rise from around 2.4 per cent of GDP in 2019-20 to 3.8 per cent by 2059-60. This takes total health expenditure pressures faced by all levels of government from 6.5 per cent of GDP in 2011-12 to around 10.8 per cent in 2059-60 (table 5.3). However, like for the Australian Government, state expenditures on education are projected to fall as a proportion of GDP, providing some fiscal relief.

Table 5.3    **State spending pressures by expenditure area**
Per cent of GDP

|  | 2011-12 | 2049-50 | 2059-60 | Difference between 2011-12 and 2059-60 (fiscal pressure) |
|---|---|---|---|---|
|  | % | % | % | Percentage points |
| Health | 2.4 | 3.4 | 3.8 | 1.4 |
| Education | 3.5 | 3.2 | 3.2 | -0.3 |
| Disability support | 0.2 | 0.5 | 0.5 | 0.3 |
| Sum total | 6.1 | 7.1 | 7.5 | 1.4 |

**a** Numbers may not add to totals due to rounding. Sum total refers to the sum of the state and territory expenditures analysed in this study and is not representative of all state and territory expenditures.

*Source*: Commission estimates.

## Uncertainties in the projected fiscal outcomes

There are uncertainties about demographic projections (chapter 2), as well as the extent of non-demographic increases in costs. In making projections, the non-demographic growth factors are subject to several simplifying assumptions.

- Assumptions about the rate of labour productivity growth underlie this study's projections of expenditure on various welfare payments, education, and aged care. Should this rate differ considerably from the series projected in this study, it would make a significant difference to the projected fiscal costs.

- Similarly for aged care, assumptions are made regarding the shares of funding between governments and individuals. If self-funding were to increase to levels projected by the Commission in its Aged Care report, this would mean costs as a share of GDP would be 0.2 percentage points lower in 2059-60. (Alternative funding arrangements are discussed in chapter 7.)

- For health, non-demographic changes were assumed to decline in magnitude over the projection period, trending towards the growth rate of GDP per capita. In addition, small variations in the age profiles of expenditures (figure 5.8) can generate differences in Australian Government health care expenditures by close to 0.7 percentage points of GDP by 2059-60.

However, all the sensitivity analysis in this report still finds significant fiscal pressure on governments under a 'business as usual' assumption over the next 50 years.

Another significant complicating factor in understanding the nature of ageing-related fiscal pressures is the influence of the economic cycle. Projections of government expenditures and revenues (such as those contained in this report and in the Intergenerational Reports (Australian Government 2002, 2007, 2010)) generally assume stable economic conditions. However, as history illustrates, this is unlikely to be the case. Depending on their timing and magnitude, upturns and downturns may significantly affect Australian government's fiscal outcomes. As noted in chapter 3, fiscal projections would ideally assess these uncertainties through stochastic forecasts. The value of such forecasts is that governments may wish to reduce the risks of adverse fiscal outcomes through greater savings in good years.

## The projected Australian Government fiscal balance

Without significant increases in government revenues or cuts to expenditures, the fiscal pressures identified above will create a permanent ('structural') and growing fiscal gap.[75] However, there is uncertainty about the timing and magnitude of such deficits, reflecting the inherent uncertainty in spending forecasts, assumptions about future policy settings, and the starting point for any analysis. Not surprisingly, there are diverging estimates of the future 'do nothing' fiscal balance.

In this study, the starting estimates have been based on the fiscal position in 2011-12, which already entailed a significant gap. Based on the expenditure and revenue assumptions outlined earlier in this chapter, the fiscal gap is projected to reach 3.1 per cent of GDP by 2049-50, increasing to 4.0 per cent of GDP by 2059-60 (figure 5.18).

In contrast, the IGR 2010 projected that a positive primary balance of 1.5 per cent of GDP in 2019-20. A fiscal gap first opens up in 2031-32, and rises to around

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[75] The fiscal gap is defined as the primary balance, which is the difference between government revenues and expenditures in any given year excluding interest payments on debt.

2.75 per cent of GDP by 2049-50 (Australian Government 2010, p. 40).[76] A major reason for the difference between these results and those of this study is that the IGR assumes that short-term fiscal strategies can constrain expenditures in the shorter run (box 5.3).

Most recently, Price Waterhouse Coopers (PwC) projected a gap of around 3.2 per cent by 2049-50, with fiscal gaps first emerging in 2026-27 (PwC 2013, p. 21).

Figure 5.18    **Projected fiscal gap, 2011-12 to 2059-60**
          Per cent of GDP
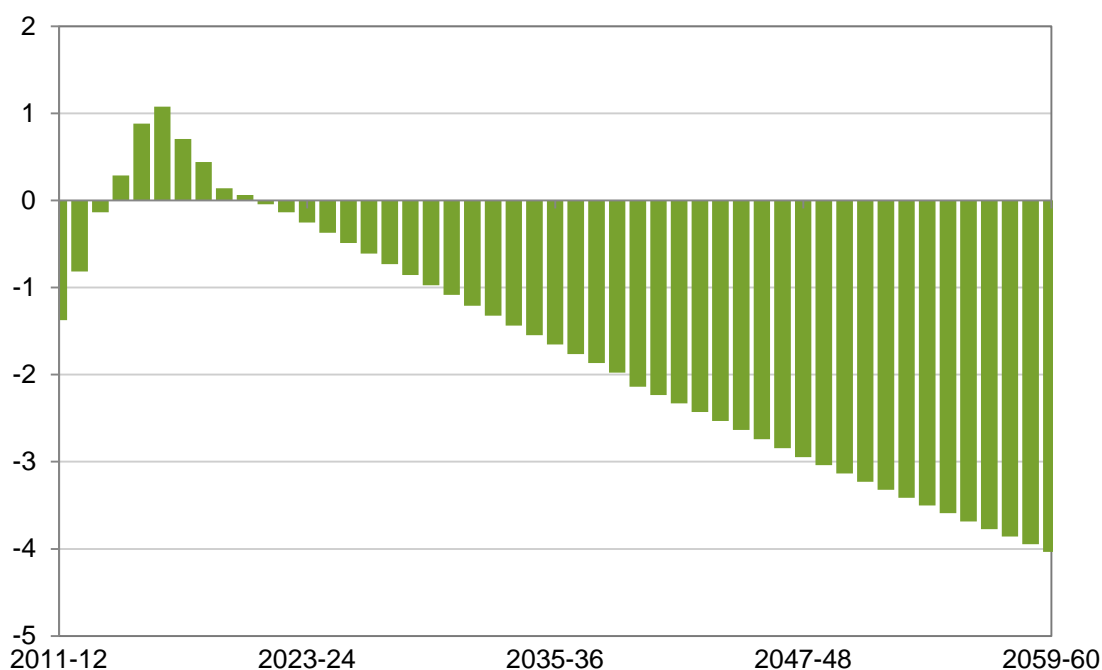


*Data source*: Commission estimates.

It should also be noted that the analysis of the Australian Government's fiscal balance assumes that state and territory governments fund any shortfalls they face. However, it is possible that given the limited taxation options available to the states and territories, much of their fiscal pressure could be 'passed on' to the Australian Government in the form of greater demands on Australian Government collected taxes. If this were to arise, the Australian Government's fiscal gap could be up to 1.4 percentage points of GDP higher (table 5.3).

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[76] Both the 2002 and 2007 IGRs projected a larger fiscal gap that emerged earlier (Australian Government 2007, p. xiii).

| Box 5.3 | **Short-term fiscal strategies influence longer term expenditures** |

The IGR 2010 assumes a fiscal strategy that caps expenditure growth to 2 per cent until 2015-16. Without this assumption, the IGR 2010 would project a much larger fiscal gap — about a further 1 per cent of GDP by 2059-60. This demonstrates the significance of early action on the possible longer run path of government expenditures.

However, for these savings to generate longer-term reductions in fiscal pressures on governments, they must represent genuine savings and not deferred expenditures. If expenditures are simply deferred, by 2059-60 fiscal pressures would be virtually unaffected.

As with the IGR modelling, the influence of short to medium-term limits to expenditure growth have a significant impact on this study's projections of future fiscal gaps. Capping real aggregate expenditure growth to 2 per cent between 2014-15 and 2016-17 delays when expenditures are likely to exceed revenues and reduces the fiscal gap in 2059-60 by around 0.4 percentage points of GDP (as shown in the chart below). In this instance, caps have been applied to expenditures in total. However, in practice, individual expenditure items would need to be reduced while others are allowed to increase. The choice of where cuts can be made requires careful consideration as different areas will present different opportunity costs in terms of the forgone spending.

This simple sensitivity analysis also highlights the scale of expenditure cuts required to alleviate even short-term pressures. Capping real expenditure growth to 2 per cent by 2016-17 would require reductions of $13 billion in government expenditures over the 3 years between 2014-15 and 2016-17. The desirability and feasibility of any such reductions would need to take account of where the savings were achieved, any impacts on service delivery, and alternatives, such as revenue increases and user charges.
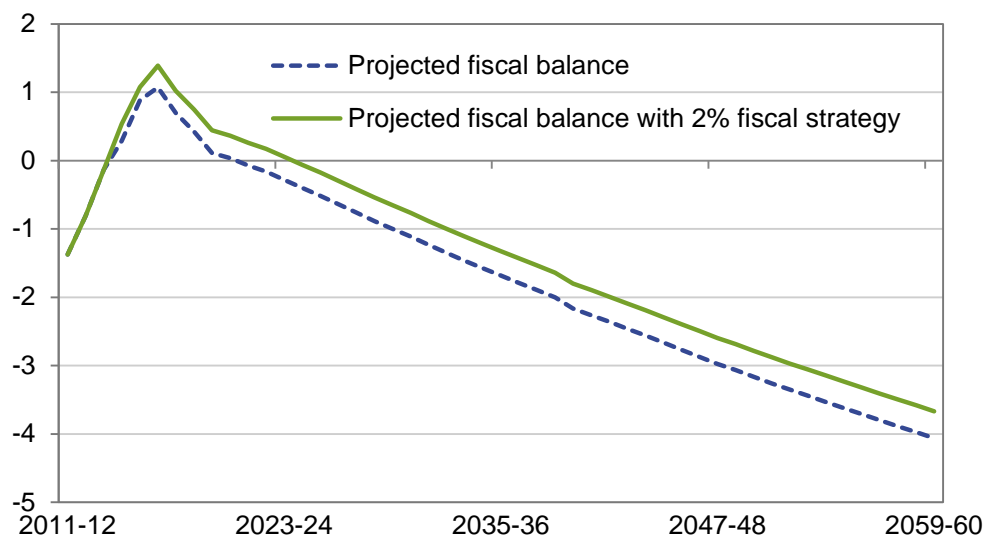
## 5.9 What does the fiscal gap tell us?

The fiscal gap presents a challenge for governments as they must find some means of funding it. The main options for governments include some mix of:

- funding fiscal deficits through borrowing

- selling assets

- increasing tax revenue

- cutting outlays by reducing the provision of government services, improving their efficiency or by seeking greater payments from end users of government services.

However, not all of these represent long-term solutions to addressing the expenditure/revenue imbalance. In this respect, a number of reports have flagged areas where solutions may be found and others where they are likely to not. For example, recent work by PwC (2013) suggests that tax reform represents the most comprehensive way of addressing the fiscal issues posed by population ageing. It suggests:

> … by ensuring we lift only taxes that have the least effect on economic growth, reduce or reliance on taxes that are damaging, and direct any compensation measures to the most vulnerable — then tax reform can also help us drive productivity growth and lift real incomes per person. (PwC 2013, p. 6)

Similar sentiments have been expressed by the Business Council of Australia in its analysis of the pressures from demographic and economic change facing Australian over the next 50 years (BCA 2013).

Past work by the Commission on ageing also canvassed a number of options, highlighting the need for both taxation and expenditure reforms to be considered as part of any government response (PC 2005d, p. 303ff). The main options raised above are discussed in the sections below.

### Borrowing and asset sales

Borrowing is better suited to smoothing out consumption over the economic cycle, or to provide infrastructure for which the net benefits are relatively certain. It does not provide a sustainable antidote for fiscal pressures arising from population ageing, as the pressures are ongoing and increasing over time. Borrowing to fund these shortfalls builds up debt levels quickly (with their associated interest payments) and only delays the implementation of longer-term solutions.

Asset sales are also limited in their ability to fill fiscal gaps, ultimately because the asset base is exhaustible. While the proceeds of asset sales may ease fiscal imbalances in the short term, governments would not be able to sell assets continuously and indefinitely. In addition, where public assets (such as buildings or capital assets) are inputs to the delivery of public services, the sale of such assets would require governments to rent the inputs back from the new owners at an ongoing cost.

## Tax revenues

Governments can obtain greater tax revenues as a share of GDP if:

- they raise tax rates

- the real value of the taxed activity expands compared with other components of GDP

- the prices of more highly taxed activities rise by more than lower taxed activities.

The third of these options lies mainly outside the scope of government. The second option is attractive if such an expansion is the result of microeconomic reforms — a 'win-win' option for fiscal balances and prosperity.

The first option is the most obvious, but involves choices between alternative taxes, which have varying (and sometimes opposing) impacts on income distribution and economic efficiency. For example, as shown by modelling by KPMG Econtech (2010, 2011) for the Henry Tax Review (Treasury 2010) and the CPA Australia, some taxes have large distorting effects, which frustrates economic growth and prosperity.

State and territory governments, in particular, have limited efficient options to raise additional revenue to fund increasing age-related spending. Many of their taxes (such as those on payrolls, insurance, motor vehicles and property transfers) impose high inefficiency costs and distort investment and labour supply decisions (table 5.4). For example, the most recent estimates suggest that for every dollar of revenue from property transfer taxes, 74 to 85 cents is lost in inefficiencies. While land taxes and rates are more efficient taxes, it is unlikely that these can wholly bridge the fiscal gaps emerging for state and territory governments.

Table 5.4    **Some taxes are much more inefficient than others**

| State collected taxes | Share of state taxes in 2011-12 | Excess burden (study 1) | Excess burden (study 2) |
|---|---|---|---|
| | % | % | % |
| Payroll taxes | 33.1 | 41 | 35 |
| Land taxes | 10.2 | 8 | 9 |
| Municipal rates | 0.4 | 2 | na |
| Conveyancing stamp duties | 19.5 | 34 | 74-85 |
| Motor vehicle taxes | 13.2 | 37-38 | 31-33 |
| Insurance taxes | 18.2 | 67 | 65 |
| Total of state taxes | 94.6 | na | na |
| *Australian Government collected taxes* | *Share of Australian Government taxes in 2011-12* | *Excess burden (study 1)* | *Excess burden (study 2)* |
| Goods and Services Tax | 15.4 | 8 | 12 |
| Company income tax | 21.4 | 40 | 37 |
| Personal income tax | 47.1 | 24 | 24 |
| Fuel excise | 5.3 | 15 | na |
| Total of above taxes | 89.2 | na | na |

**a** na denotes 'not available'. The excess burdens are the marginal excess burdens, which measure the percentage of any dollar raised lost in inefficiency.

*Sources*: ABS 2013, *Taxation Revenue, Australia, 2011-12*, Cat. no. 55060DO001_201112; KPMG-Econtech (2010, 2011), which denote study 1 and study 2 respectively.

The Australian Government has more efficient options to increase its revenue. However, theory suggests the inefficiency of a tax increases with the square of the tax rate. Accordingly, the costs associated with increased personal income taxes, already the mainstay of Australian Government tax revenue, would rise steeply were this the main vehicle for meeting the emerging fiscal gap. Some other revenue raising options, such as the Goods and Service Tax and fuel excise, would be more efficient, and are currently set at relatively low levels by international standards (as also noted by the Commission in its exploration of options to fund a national disability scheme (PC 2011c)). For example, Australia's GST is around half the average OECD consumption tax rate, with only three of the 33 countries having lower rates (OECD 2013a).

However, changes to the GST remain a contentious option for funding future ageing-related services, mainly because of perceptions about its distributional impacts. An important question is whether the transfer system might mitigate relevant impacts. Moreover, inadequate funding of government-provided ageing-related services may also have undesirable distributional effects.

This study cannot address the question of the optimal tax choice beyond commenting that, even with other policy measures, the size of the incipient fiscal gap will almost certainly require some tax increases.

**Reducing outlays**

Rationing services would mitigate the fiscal implications of ageing. However, this might risk another, less transparent, deficit — the provision of services below the level valued by Australian citizens. Should this occur, poorer outcomes for service users could also have flow-on effects on economic activity, such as the capacity for workforce participation.

This suggests that although ageing-related pressures might be the main source of fiscal gaps, their closure through expenditure restraint should consider all types of government expenditure.

Moreover, there are several promising areas for reducing ageing-related outlays while avoiding the costs of rationing.

- Alternative financing arrangements — the policy scope for capturing other sources of income is in its infancy and worth more exploration (chapter 7). Greater individual contributions may also make the relevant services more responsive to consumer needs, leading to a better range and quality of products.

- Measures to increase efficiency (in the various senses described in PC (2013d)) — there is scope to improve the efficiency of the delivery of age-related service such as health. This might include reduced costs of therapies of a given clinical efficacy (such as revealed through cost effectiveness studies); improved productive efficiency (such as re-aligning inputs into the least cost mix to achieve a given output); and prevention of costly outcomes (such as avoidance of adverse outcomes in hospitals or preventative public health initiatives that save lifetime health resources). There appears to be substantial promise that governments could achieve given health outcomes at lower cost (chapter 8).

## 5.10   There are benefits from improving the analysis of fiscal outcomes

The uncertainty and complexity associated with long-run projections/forecasts of Australia's fiscal position are common threads in the analysis in this study, those of the various IGRs, the Commission's 2005 report into ageing implications and several reports by private consultancies. As discussed throughout this report, no single study has fully addressed:

- the inadequacies in the data for some central questions, such as the relevance of the costs of death. More administrative data analysis is required

- behavioural responses to policy changes and exogenous events, such as wage responses to the labour scarcity created by higher dependency rates

- the inherent unpredictability of many factors, such as the rate of technological innovation and associated costs in health care, and the impacts of the timing and severity of any business cycles on the fiscal gap and the stock of debt

- a full economic analysis of the options to close any gap. Projections serve a purpose in that they highlight the consequences of 'business as usual'. But in reality, business as usual is an artifice. Fiscal gaps *must* be met, if nothing else through borrowing. In doing so, there are flow-on consequences that should be compared with alternative policies for addressing the gaps. This raises the question of an appropriate benchmark set of policies against which to compare alternative policy settings. The benchmark might be income tax increases, borrowing, expenditure cuts, or other initiatives. One of the advantages of general equilibrium models is that they take account of behavioural responses to policy initiatives and that they cannot dodge the requirement to set a policy in a reference case that closes the gap. Such models will simply not work without that 'closure'. As such, there are strong grounds for developing models that allow the comparison of the economic welfare and other consequences of alternative policies. The Commission's Monash Multi-Regional Forecasting model (chapter 1 and appendix F) would be well placed to conduct this type of analysis.

There is therefore a requirement for a culture of continuous improvement in examining Australia's long-term fiscal outlook, drawing on better models and data, and exploiting any global developments in analysis in this area. Reporting vehicles such as the IGR provide a longer term fiscal perspective that is vital to ongoing policy making.

# 6   Encouraging workforce participation

**Key points**

There are several major obstacles to the employment of older people, of which the financial incentives of (and the social norms established by) the tax, superannuation and pension systems figure prominently.

People are living longer, yet for the last hundred years there has been little change in:

- the age at which people are eligible for the Age Pension
- the period spent working. While life expectancy at birth has increased by an estimated 33 years for males born in 2013 compared with those born in 1901, based on past trends only 7 of these additional years will be spent in the labour force. If time in full-time equivalent work is examined, the 2013 male birth cohort will potentially work *fewer* years than their 1901 brethren.

The Age Pension eligibility age influences some people's retirement decisions, while the long-run impact of wage-indexation of the pension increases its costs to taxpayers.

Many OECD countries, including Australia, have recognised that older people have a greater capacity to work, and have increased the pensionable age. Moreover, many OECD countries have linked their pensions automatically to life expectancy — either by lowering the <u>value</u> of pensions as life expectancy rises or (more rarely) by explicitly linking the pensionable <u>age</u> to average life expectancy.

Of these options, the latter would automatically recognise the increasing capacities of older people to be active in the labour market, and is more compatible with the underlying rationales for Australia's Age Pension than the former.

As an illustration of the impacts, gradually increasing the pensionable age from 67 to 70 years would:

- yield ongoing fiscal savings of between 0.1 and 0.15 per cent of GDP per annum from 2035 (after accounting for some increase in Disability Support Pension recipients)
- increase participation rates for people in the relevant ages by around 3–10 per cent.

There are several complexities in implementing a link between the pensionable age and life expectancy, but these are surmountable (as suggested by the operation of such links in some countries). Shifts in attitudes and expectations amongst employers and the labour force will be important to the effectiveness of any policies in this area.

Aspects of the superannuation system, particularly the preservation age and taxation arrangements, also have incentive effects on labour supply and entail taxpayer costs of a similar magnitude to those posed by the Age Pension eligibility age. The issues raised by growing longevity should be considered for the whole retirement income system.

## 6.1 What is (and isn't) the problem?

While people often enjoy their work, they value leisure, retirement, informal caring roles, volunteering and education, notwithstanding that doing so decreases their capacity for immediate consumption of market traded goods and services.[77] Indeed, out of necessity, people in the poorest societies often have the highest labour force participation rates from young ages until close to their death. In this light, at least some of the steady increase in the retirement period enjoyed by Australians over the last century is testimony to prosperity.

Moreover, while population ageing reduces aggregate labour force participation and economic growth in future years (chapters 3 and 4), this need not have any marked effects on the *lifetime* earnings of individuals, which are what matter for their material wellbeing.[78]

The real problem is that some policies distort people's choices and attitudes — both as employers and employees — about participating in the labour market and have wider fiscal and other impacts on the wellbeing of Australians. In the main, these policies encourage the premature exit of people from the workforce. An historical example was the provision for mandatory retirement — since removed — which precluded the involvement of many Australians in work even if they were highly productive and wished to continue working.

Currently, the design of the retirement income system is a major driver of exits from the workforce, though there are other important policy-relevant obstacles to the employment of older Australians. In addition, funding the retirement income system is one of the important drivers of the fiscal gap looming over the coming decades. Australian Government outlays on the Age Pension alone are projected to increase from 2.7 per cent of GDP today to 3.7 per cent of GDP in 2059-60 (chapter 5). Various budgetary outlays associated with parallel superannuation concessions are also substantial. These concessions currently are around $31.8 billion and are projected to increase to around 0.7 per cent of GDP at a time when there are many other fiscal consequences associated with population ageing (Charter Group 2013, p. 11).

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[77] And many of these activities have high economic benefits, if not officially enumerated (PC 2005d, 2007, pp. 1–24).

[78] A simple illustration of this is to imagine two societies in which every person has the same lifetime labour supply and earnings, but where one society is older than the other. Given lower labour force participation rates at older ages, the GDP of the older society will be lower than the younger society, but by definition lifetime earnings are the same. Ideally, people's wellbeing would be considered using the same cohort approach adopted in chapter 2 for longevity and in chapter 3 for labour force participation. (PC 2005d, 2007, pp. 1–24).

In this context, this chapter examines various policy-relevant obstacles to labour force participation. The Age Pension will remain a central source of retirement income for many Australians, and has a major bearing on people's retirement choices. Accordingly, while this chapter acknowledges the importance of a broad range of policy-relevant factors affecting labour force participation (section 6.2), it focuses on the issues raised by the design of the Age Pension and complementary retirement income policies (sections 6.3 to 6.8).

## 6.2 The broader policy context

There are many policy-relevant obstacles to workforce participation and the employment of Australians — as recognised by successive Australian governments. A plethora of policies aim to address these barriers. They are set out in four categories in figure 6.1, broadly drawn from PC (2007).

While the projected reduction in aggregate labour force participation rates can be attributed to population ageing, it does not follow that the efforts to minimise workforce barriers should be oriented only towards older workers. Many policies may usefully increase labour force participation at younger ages, including:

- effective training, education and childcare

- measures to reduce long-term dependence on income support

- policies that lower the entry costs of hiring workers at the periphery of the labour market

- the design of the tax and transfer system generally.

Moreover, as noted in chapter 3, being in the labour force builds job experience, which in turn affects labour force participation rates at older ages. Therefore, policies that stimulate early labour force participation may produce enduring dividends (although investigating their extent is complex — box 6.1).

Some policy-relevant factors that might not seem obviously connected to labour supply may also be important in raising long-term workforce attachment. For example, inefficiencies in childcare provision resulting from regulation or payment systems may raise the price of childcare, reducing (mainly) female labour supply (although childcare subsidies can have the opposite effect). Similarly, inadequate formal caring provisions for people with disabilities can reduce the market labour supply of informal carers (PC 2011c). Policy barriers to geographic mobility, such as housing stamp duties, may affect the capacity of people who lose their jobs due to regional structural change to move to better labour markets (PC 2013c; Sánchez and Andrews 2011).

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| Box 6.1 | **The value of ongoing employment** |

Labour market policies that improve workforce participation in the short term are also likely to have long-term impacts, reflecting the skills and experience that people gain while working. For instance, those with spells away from the workforce forego learning on the job and may not be familiar with contemporary workplace practices. Moreover, protracted absences from the workforce may mean that employers have little information about the capabilities of a job applicant, increasing the employer's risks of hiring such a person.

Measuring the size of such ongoing effects is confounded by selection biases. People who enter the workforce today are more likely to be working in the future, but the characteristics that make them more likely to work today, such as innate ability and health, are also likely to persist. It is therefore difficult to determine whether it is the workforce attachment or other characteristics that improve workforce outcomes (Heckman 1981). This measurement problem can be approached through:

- random control trials. An assessment of a job placement program in France found that the benefits to those assigned to the program were transitory (Crépon et al. 2012). Similarly, the Canadian Self Sufficiency Program resulted in a 10 percentage point increase in employment rates compared to the control group during the program period, but a six year follow up showed that this difference had fallen to 2.6 percentage points (Ford et al. 2003, p. ES.10).

- econometric techniques. Cai (2010) found that the experience gained in a job affected future participation rates, but otherwise it was individual traits, not prior labour market states, that were the most important determinant of future labour force participation. Using different datasets and methods, many other authors find positive effects of prior participation in the labour force (Blasco and Rosholm 2010; Booth, Jenkins and Serrano 1997; Heckman and Willis 1975; Prowse 2010).

- considering major historical economic shocks. For instance, when a generation reaches working age during a depression, they not only have poor labour market outcomes in the short term but this disadvantages persists over time (Oreopoulos, von Wachter and Heisz 2012).

Overall, the evidence suggests that labour market policies are likely to have some long-term impacts, but these will be smaller than the short-term impacts and may vary significantly depending on the target group of the policy.

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Accordingly, policies that seek to address the labour participation consequences of population ageing should consider the full canvas of direct and indirect options, since some measures oriented to younger people might be more cost-effective and efficient than those aimed at older people.

This report, however, covers only those policies that impinge on the labour force participation of older workers (flagged in figure 6.1). Its focus is on policies that affect people's retirement decisions and that may also have significant *fiscal* impacts (covered by items 1a and 1b). The labour supply effects of policies aimed at increasing older people's participation rates will also become increasingly important

as the share of the population in the relevant age groups increase. (The themes raised by figure 6.1 may be a useful framework for the broader analysis of labour supply policy options in future Intergenerational Reports.)

## Several policies aim to make labour markets more receptive to older workers

As has been apparent in various economic downturns, unemployed older workers sometimes find it more difficult to find work than others because their skills do not match contemporary employer needs or due to stigmatising perceptions. Often such people will exit the labour market altogether and rely on income support, with the Disability Support Pension (DSP) being a significant and costly destination (Lattimore 2007a). Changes in participation rates and unemployment rates for 60-64 and 55-59 year olds over the period from 1978 to 2013 are consistent with this pattern (ABS 2013b).

Recognising this issue, there are various policies to increase training and employer demand for such workers, and to discourage age discrimination. For instance:

- The Experience+ Program provides advice and financial support to employers to assist them in the recruitment of mature age workers, as well as providing career advice and job preparation services for mature age job seekers (DEEWR 2013).

- The Skills Connect program provides co-funding support to businesses to address whole-of-workforce training needs, including support of up to $4400 for training of mature age workers (aged 50 years and over) (Australian Government 2012b).

There have been several further proposals to remove regulatory barriers to workforce participation by older workers. These include:

- amending the National Employment Standards to allow people aged 55 years and over the right to request flexible work hours (APEPSA 2011, pp. 22–28)

- removing the age limit, currently set at 75 years, for voluntary concessionary contributions into superannuation accounts (AHRC 2012, p. 19)

- removing the age limit on income replacement paid through statutory workers' compensation schemes (AHRC 2012, p. 10).

## Figure 6.1 Removing barriers to labour supply

**Policy instruments for increasing labour force participation**

| (1) Improving incentives | (2) Improving capacity to work | (3) Increasing employer demand | (4) Institutional arrangements |
|---|---|---|---|
| (1a) Taper rates, actuarial biases and eligibility tests for the Age Pension | (2a) Education & training | (3a) Macroeconomic management | (4a) Appropriate industrial relations systems |
| (1b) Design of the Superannuation system | (2b) Effective health & disability systems | (3b) Labour market employer incentives | (4b) Age-related regulations |
| (1c) Older worker tax offsets and Pension bonuses | (2c) Job matching & support | (3c) Anti-discrimination provisions | (4c) Barriers to occupational entry |
| (1d) Tax rates & thresholds | (2d) Skilled migration | | (4d) Childcare regulations |
| (1e) Design of the Disability Support Pension | (2e) Childcare availability | | |
| (1f) Design of family income support measures | (2f) Formal disability & aged care availability | | |
| (1g) Mobility taxes | | | |

Flagged categories are the focus of this chapter

However, the effectiveness and efficiency of these measures are uncertain, and they may sometimes have unintended impacts on employment of older people if they increase risks and costs to employers (Heywood and Siebert 2009). As for other policy measures that bear on labour force participation, there can be tradeoffs

between the various objectives of the policies — most particularly between fairness, income re-distribution and labour supply incentives for would-be workers and employers.

## The tax and transfer system for older workers

Governments also influence mature age workforce participation through the tax and transfer system. A large body of domestic and international evidence shows that the financial incentives provided by the pension and superannuation system strongly influence retirement timing.[79] One key finding from this research is that older workers are more responsive to changes in wages or effective tax rates than the general working population.[80] Along with the design of the Age Pension and superannuation system, which is discussed below, financial incentives to encourage workforce participation include:

- the Mature Age Worker Tax offset, which reduces the amount of tax payable for some Australians who are 55 years and older (ATO 2013)

- the Senior Australians and Pensioners Tax Offset, which increases the amount of money that workers can earn before tax is payable, once they have reached the pension age (ATO 2013)

- the Age Pension Bonus Scheme (incorporating the Pension Bonus Top-Up), which is a lump sum incentive for people who qualified for the Age Pension before 20 September 2009 and remain in the workforce (and therefore defer claiming the Age Pension). However, there will be no new registrations taken in the Pension Bonus Scheme from 1 March 2014 (Department of Human Services 2013a). This followed an evaluation of the scheme in the Pension Review Report (Harmer 2009b)

- the Work Bonus, which allows Age Pension recipients to earn up to $250 a fortnight (capped at $6500) without the additional income being assessed under the pension income test (Department of Human Services 2013c).

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[79] For instance, Headey et. al. (2007) for Australia, Gruber and Wise (1999), Duval (2003) and Blondal and Scarpetta (1999) for OECD countries, and French (2005) and Schmidt and Sevak (2006) for the US. Given these influences, some countries, most notably New Zealand, have addressed the work disincentives posed by retirement income support payments by having no means testing (and have higher participation rates among older people).

[80] For instance, French (2005) estimates that the elasticity of hours worked in response to wages is between 0.2 and 0.4 for 40-year-old male primary household income earners and between 1.0 and 1.3 for 60-year-old male primary household income earners.

These payments interact with the already complex pension and superannuation systems to create a complex set of incentives for older workers. This can be difficult for people who are trying to navigate the system. It can also be difficult for policymakers to assess the value of a particular aspect of the system. For instance, it complicates efforts to assess whether the $1.1 billion in foregone revenue (Treasury 2013) resulting from the Mature Age Worker Tax Offset and the Senior Australian and Pensioner Tax Offset in 2012-13 represent an efficient way of encouraging continued employment against a background of a system that discourages employment in other ways. This may also be worthy of further research as part of a holistic consideration of an ageing workforce.

## 6.3 The role of the Age Pension eligibility age

The Age Pension's basic features — a non-contributory, means-tested scheme, with payments unrelated to a person's previous wages — have been remarkably resilient since its introduction in 1909 (FaCSIA 1983; Herscovitch and Andrews 2008). The age of eligibility (sometimes also called the 'pensionable age') has also remained relatively constant since its inception. For most of its history, the eligibility age was 65 years for men and 60 years for women. This remained the case until 1995, when the eligibility age for women started to increase gradually until it equalled the eligibility age for men in July 2013. The Australian Government has announced that the eligibility age for both sexes will increase from 65 years to 67 years by 2023 (Swan 2009). Some have suggested raising the pension age further, or to link it to trends in life expectancy as occurs in many other countries (CEDA 2007; Daley, McGannon and Ginnivan 2012, p. 54).

In order to examine this issue in an Australian context, it is important to examine:

- what is happening to people's *lifetime* working behaviour (section 6.4)
- the goals of the pension system (section 6.5)
- how the pension age influences people's decisions to participate in the workforce (section 6.6)
- issues regarding linking the pensionable age with people's average life expectancy, including lessons from overseas experiences (section 6.7)
- the analogous issues for other parts of the publicly-subsidised retirement income system (section 6.8).

## 6.4    Participation, work and life expectancy over the life cycle

Australians have enjoyed large increases in life expectancy over the last century (chapter 2), and policies and technological developments are aimed at continuing that trend over the next. Yet over this period, there has been very little change in the estimated number of years spent in the workforce (table 6.1 and 6.2, and figures 6.2 to 6.4), while leisure (or 'labour force inactivity') has increased significantly.

It should not automatically be presumed that shifts of this sort from work to leisure are 'bad'. Indeed, greater opportunities for leisure are normally seen as one of the benefits provided by rising incomes.

At issue is whether the pace of shifts from work to leisure are sustainable. This analysis aims to assist future consideration of policy responses — should they arise — to changing patterns of work and leisure, with data that scope the size of shifts.

The shifts have been significant. For example, comparing the projected lifetime experiences of males born in 1900-01 with those born in 2012-13 suggests:

- an increase in life expectancy at birth of 33 years and at age 15 years of around 24 years

- a rather smaller increase in the expected number of years in the labour force ('labour force expectancy') at birth of nearly 7 years.

  – The change in labour force expectancy for those people who reach age 15 years is even smaller — less than one year — reflecting that much of the gain in labour force expectancy at birth noted above is due to fewer deaths in childhood

- while there has been a small increase in the estimated lifetime years of workforce involvement from age 15 years, the actual full-time equivalent years in work has fallen significantly (by nearly 8 years) despite greater longevity. This difference is explained by an increase in part-time work, as well as a decline in the average number of hours worked by both full- and part-time workers.

- a dramatic increase in the share of life spent outside the labour force. The gap between lifetime expected workforce participation and life expectancy ('labour force inactivity') has increased by around 23 years for those who reach 15 years of age. While some of this growing gap reflects greater involvement in education, it mostly reflects more leisure at older ages.

At the generational level, these results mean that the so-called 'Oldest Generation' of men (born before 1925), spent around 75 per cent of their remaining life after 15 years of age in full-time equivalent work, while the comparable figure for the Baby Boomers (1946–65) is projected to be around 60 per cent. The newest generations — the so-called iGeneration (1986–2005) and the GenWhats (2006–2060) — are projected to spend only around half of their lives after age 15 years in full-time equivalent years of work.

Table 6.1    **Life gets longer … but lifetime work barely changes**

Projected outcomes for males born between 1900-01 to 2059-60[a]

| From males born in: | to males born in: | Change in life expectancy | Change in labour force participation | Change in labour force inactivity | Change in working expectancy |
|---|---|---|---|---|---|
| | | years | years | years | years |
| | | **Changing expectancy from birth** | | | |
| 1901 | 1925 | 9.0 | 0.1 | 8.9 | -2.4 |
| 1925 | 1960 | 13.6 | 4.5 | 9.0 | 0.8 |
| 1960 | 1995 | 8.8 | 1.7 | 7.2 | 0.0 |
| 1995 | 2013 | 1.9 | 0.6 | 1.3 | 0.5 |
| 2013 | 2060 | 1.7 | 0.5 | 1.2 | 0.4 |
| 1901 | 2013 | 33.2 | 6.9 | 26.3 | -1.0 |
| 1901 | 2060 | 34.9 | 7.4 | 27.5 | -0.6 |
| | | **Changing expectancy from age 15 years** | | | |
| 1901 | 1925 | 5.6 | -2.3 | 7.9 | -5.3 |
| 1925 | 1960 | 9.2 | 2.0 | 7.1 | -1.9 |
| 1960 | 1995 | 7.1 | 0.7 | 6.4 | -0.9 |
| 1995 | 2013 | 1.6 | 0.5 | 1.1 | 0.4 |
| 2013 | 2060 | 1.3 | 0.3 | 1.0 | 0.2 |
| 1901 | 2013 | 23.5 | 0.9 | 22.5 | -7.7 |
| 1901 | 2060 | 24.8 | 1.2 | 23.6 | -7.5 |

**a** Life expectancy at age 15 years is the average number of years a person can expect to live once they have already reached age 15 years. Labour force expectancy is the number of projected lifetime years in the labour force — regardless of whether a person is unemployed or working part-time or full-time. Expected labour force inactivity is the difference between life expectancy and labour force expectancy. Working expectancy (as opposed to labour participation) is the expected number of full-time equivalent lifetime working years. It takes account of projected workforce participation, unemployment rates, part-time and full-time shares of people working, and their average hours of work. A full-time equivalent job amounted to 40 hours of work per week. The data shows the differences in the experiences of different birth cohorts. To illustrate the interpretation of the table, the labour force expectancy from 15 for the 1901 cohort is the expected number of years in the labour force from 1916 of a person born in 1901 (who survives to at least 15 years of age). Similarly, the labour force expectancy from 15 for the 1925 cohort is the expected number of years in the labour force from 1941 of a person born in 1925. As shown in the table, the difference in between the two cohorts is -2.3 years. The other year ranges and measures of expectancy can be interpreted in a similar way.

*Source*: Commission estimates based on the data and methodology described in Lattimore (2007a) and using the projections described in chapters 2 and 3.

## Table 6.2 More recent male generations spend a lot more time outside the labour force

Males[a]

| Born between years | Oldest Gen | Silent Gen | Baby Boomers | Gen X&Y | iGen | GenWhats |
|---|---|---|---|---|---|---|
| | 1901–1925 | 1926–1945 | 1946–1964 | 1965–1985 | 1986–2005 | 2006-2060 |
| **At birth** | | | | | | |
| Average life expectancy (yrs) | 62.6 | 72.7 | 79.7 | 85.3 | 89.7 | 92.6 |
| ***Workforce participation*** | | | | | | |
| Average labour force expectancy (yrs) | 38.0 | 40.0 | 40.1 | 40.3 | 40.4 | 40.5 |
| Average expected years outside the labour force (yrs) | 24.6 | 32.7 | 39.6 | 45.1 | 49.3 | 52.1 |
| Share of life outside the labour force (%) | 39.3 | 45.0 | 49.7 | 52.8 | 55.0 | 56.2 |
| ***Full-time equivalent hours*** | | | | | | |
| Expected years working | 38.2 | 38.4 | 38.5 | 38.6 | 38.6 | 38.7 |
| Expected years not working | 24.4 | 34.3 | 41.3 | 46.8 | 51.1 | 53.9 |
| Share of life not working (%) | 38.9 | 47.2 | 51.8 | 54.8 | 56.9 | 58.2 |
| **At 15 years** | | | | | | |
| Average life expectancy (yrs) | 56.4 | 62.7 | 67.7 | 72.2 | 75.6 | 77.9 |
| ***Workforce participation*** | | | | | | |
| Average labour force expectancy (yrs) | 43.2 | 42.6 | 43.8 | 44.4 | 44.9 | 45.4 |
| Average expected years outside the labour force (yrs) | 13.2 | 20.0 | 23.9 | 27.7 | 30.7 | 32.6 |
| Share of remaining life outside the labour force (%) | 23.4 | 32.0 | 35.3 | 38.4 | 40.7 | 41.8 |
| ***Full-time equivalent hours*** | | | | | | |
| Expected years working | 43.6 | 41.0 | 40.2 | 38.8 | 38.8 | 39.2 |
| Expected years not working | 12.7 | 21.6 | 27.5 | 33.4 | 36.8 | 38.7 |
| Share of remaining life not working (%) | 22.6 | 34.5 | 40.7 | 46.2 | 48.6 | 49.6 |

**a** The results for each generation are the averages over the relevant birth cohort years. The names given to successive generations and the years concerned varies according to the source. The names above and the related years are broadly drawn from ABS 2009, *A Picture of the Nation: the Statistician's Report on the 2006 Census*, Cat. No. 2070.0 and ABS 2012, '100 years of Australian lives – Population', in *Reflecting a Nation: Stories from the 2011 Census, 2012–2013*, Cat. No. 2071.0, 21 June. However, the ABS had overlapping start and end years, which were removed, and did not give any names to generations following the iGeneration, and given the open name 'GenWhat'.

*Source*: As in table 6.1.

Figure 6.2    **Expected lifetime engagement with the labour force**
Males, by year-of-birth cohorts, 1900-01 to 2060-61

Number of projected years of expected lifetime labour force participation[a]

Number of projected years of expected lifetime outside the labour force[b]
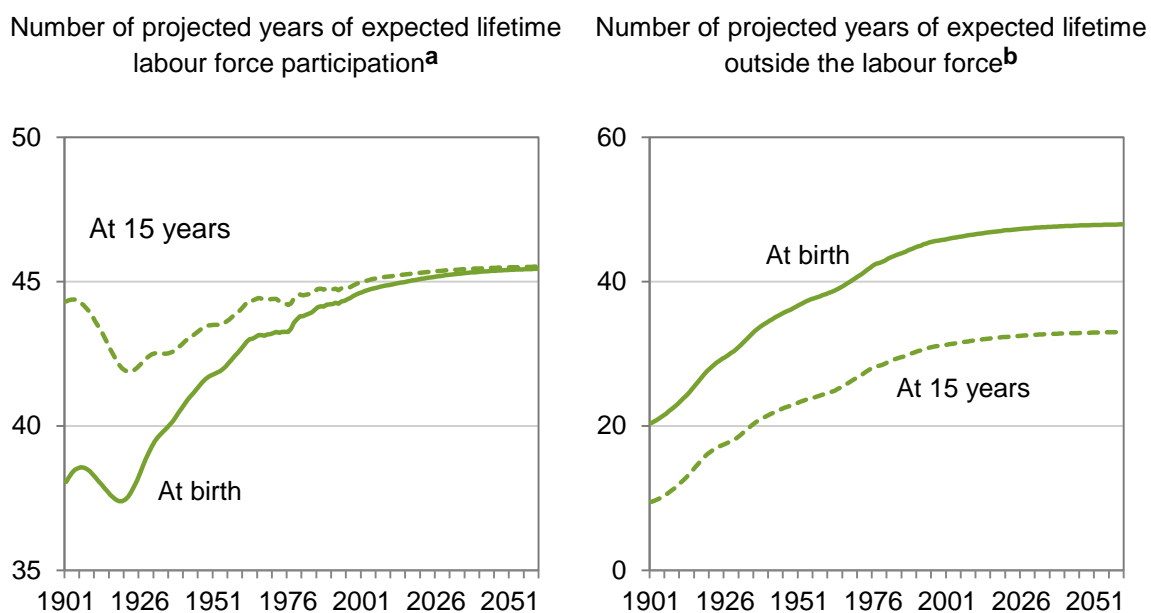


**a** Data for each year relate to the labour force experiences of the cohort born in that year. Some of the waves in the data may be a reflection of interpolation of data between years and in deriving participation rates for single years of age. In particular, the reduction in participation rates that was revealed for 15-19 year olds in the 1933 Census may have had led to downwardly biased estimates for the intercensal period to 1947. This would tend to understate the lifetime participation rates of earlier cohorts. The underlying participation rate data from 1966 to 2013 are likely to be more accurate than earlier series, which were mainly drawn from irregular population census data. The chart is most suited to considering long-run trends. The data shows a slightly higher level of longer-run workforce expectancy than in Lattimore (2007a) because labour force participation projections are higher. The large gap in 1901 between lifetime workforce participation at birth and at 15 years old reflects high infant mortality rates at that time. **b** This is calculated as cohort life expectancy less labour force participation expectancy.

*Source*: As in table 6.1.

The parallel figures for females have not been calculated because much of the data for doing so has not been compiled.[81] That said, qualitatively the story is clear. Female participation rates have increased markedly over time. As an illustration, in 1911 and 1921, female participation rates for 35-44 year olds were 16.7 and 15.4 per cent respectively, yet by 2012-13 were more than 75 per cent.[82]

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[81] It would be possible to construct comparable data for females, but the analysis required is significant given the need to gather data from various censuses and economic history data sets, and the complex interpolations to fill missing years and ages. In contrast, much of the data required for males was already available from Lattimore (2007a) and only needed updating.

[82] Withers et al. (1985) and ABS 2013, *Labour Force, Australia, Detailed* — Electronic Delivery, Cat. No. 6291.0.55.001, table LM2.

Figure 6.3     **Share of life outside the labour force**

Males, by year-of-birth cohorts, 1900-01 to 2060-61 (per cent)[a]
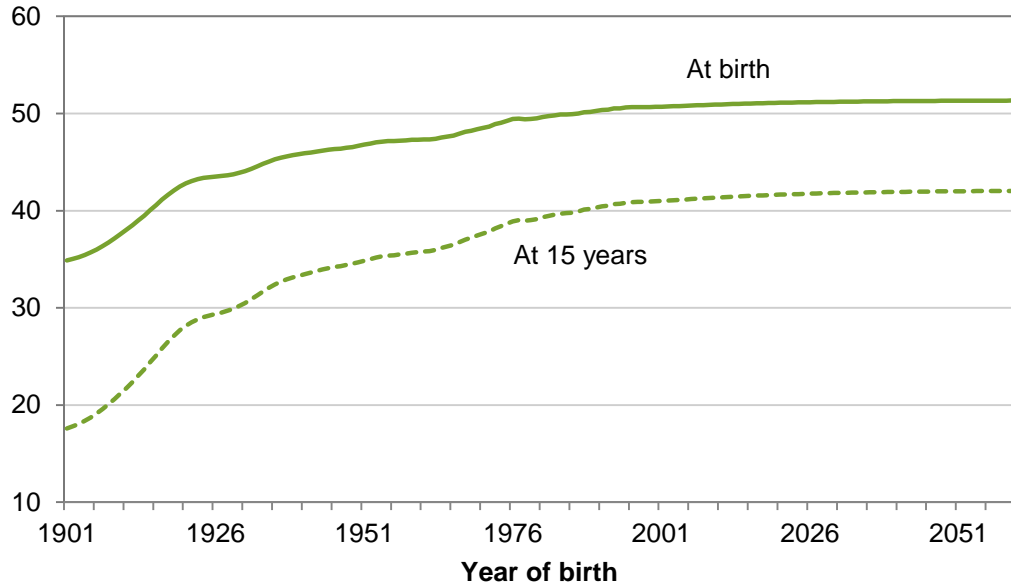


**a** This is calculated as the ratio of expected inactive years to cohort life expectancy of males

*Source*: As in table 6.1.

Figure 6.4     **Expected full-time equivalent years of work**

Males, by year-of-birth cohorts, 1900-01 to 2060-61 (per cent)[a]
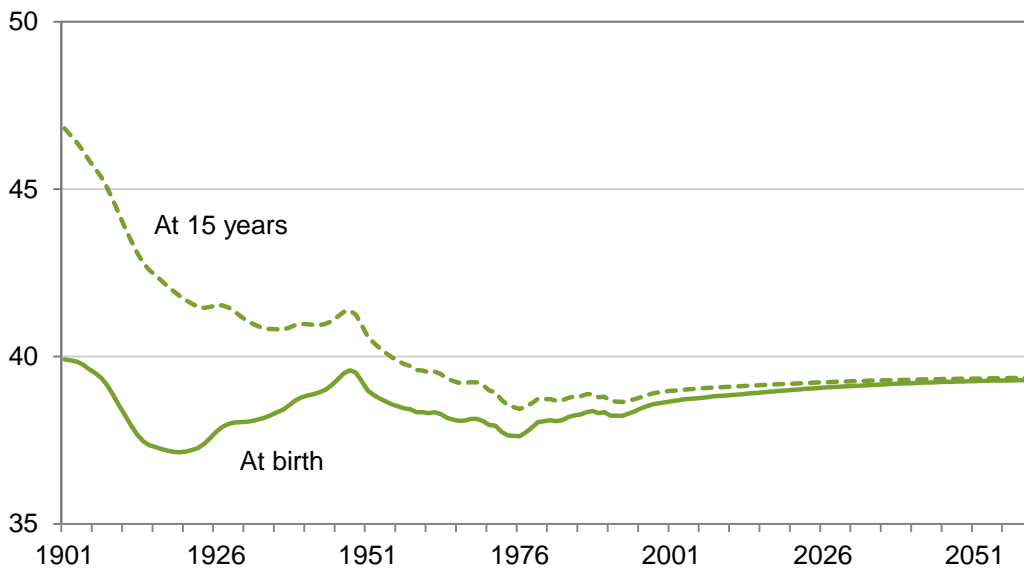


**a** This chart takes account of workforce participation, unemployment rates, part-time and full-time shares of people working, and their average hours of work. A full-time equivalent job amounted to 40 hours of work per week.

*Source*: As in table 6.1.

The sustained growth of female participation in the labour force means that there will have been a steep upwards growth in labour force 'expectancy' with successive birth cohorts. Nevertheless, females have higher cohort life expectancy and lower labour force participation rates at nearly all ages and for all periods than males (chapters 2 and 3). Accordingly, while labour force expectancy is projected to rise strongly, it will remain considerably below that of males, testimony to the roles of younger women in caring for children, and their comparatively low labour force participation rates at older ages, often also in caring roles.[83]

The fundamental story emerging from the long-run historical data is that the lifetime labour force engagement of Australians has responded very little to increasing longevity. This pattern is likely to reflect the economic incentives posed by the retirement income system, the norms of a wealthier society, and potentially myopia about the (fungible) resources needed for increasingly lengthy retirements.

## 6.5    What are the goals of the Age Pension?

The Age Pension appears to serve three main functions. It acts as:

- *a safety net*: where money is transferred from taxpayers to alleviate poverty among the elderly, and to ensure that all Australians, regardless of lifetime income, have a capacity for retirement at a minimum living standard deemed reasonable by the community (Barr 2001b)

- *a form of social insurance against risk*: such as market, price, longevity and myopia risks (Whitehouse 2007). Longevity risk arises because the age of death is unpredictable, and so people living longer than the average would find average superannuation savings in defined contribution schemes insufficient for their needs. Similarly, retirement assets are exposed to market risks if dividend streams or asset values fall (as occurred during the global financial crisis). Price risks arise if the cost of living rises above expectations, while myopia risks occur if people underestimate the savings required to meet their retirement needs adequately. Most current privately-funded superannuation products do not pool such risks among members (in part because the incentives to purchase such products are weakened by the existence of the Age Pension)

- *an intergenerational compact:* where workers in each generation fund the retirement of the preceding generation.

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[83] In 2009, around one in four females aged 55–64 years old were carers and around one in five aged 65–74 years (ABS 2012, *Disability, Ageing and Carers, Australia: Summary of Findings, 2009*, Cat. No. 44300DO001_2009).

As the level of funds in compulsory superannuation accounts increases, the Age Pension will act more as a safety net and insurance, and less as an intergenerational compact. Nevertheless, in the foreseeable future, the majority of people over the pension eligibility age will receive an Age Pension benefit at some time in their lives (a fact that underlines its fiscal impacts discussed in chapter 5).[84] The main reasons for this are that many people are only periodically engaged in the labour force throughout their working lives, the capacity to receive a part pension if income and asset tests are met, the depletion of superannuation assets as people age and the substantial financial incentives to obtain even a small part pension in order to access various concessions.

Given these core functions, any design of the Age Pension has to trade off its distributional, savings and insurance goals against its fiscal costs and its incentive effects for self-funded retirement and workforce participation. The age, income, and assets eligibility criteria are the key mechanisms for achieving that tradeoff. The criteria that achieve the appropriate tradeoff between objectives may evolve with lengthening retirement durations and the fiscal costs of the Age Pension.

## 6.6 The impacts of the pension age on workforce participation

The Age Pension creates a financial incentive for some people to exit the workforce. As the population and workforce ages, such incentives will affect more people and have larger fiscal impacts. For those who are above the eligibility age and who pass the assets test, choosing to work may forfeit access to the pension (due to the income test). This creates relatively high effective marginal tax rates on labour income for this group of workers.

The Age Pension also conditions the expectations of employers and employees about the normal age at which workers 'should' be retiring. As CEDA (2007, p. 7) notes:

> A movement in the pension age would represent an important psychological change within the Australian community.[85]

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[84] The Intergenerational Report (Australian Government 2010, p. 146) estimates that the major influence of the superannuation system is a transition from full to part pension with the proportion of those over the age of 65 receiving no pension staying relatively constant at around 20 per cent.

[85] The International Longevity Centre (2013) in the United Kingdom has also emphasised the importance of reinforcing the direct economic incentives created by an increase in the pensionable age with other approaches that challenge early retirement.

Even those with significant personal finances who are ineligible for the Age Pension may see the pensionable age as the normal age to retire. In addition, the increased presence of older workers may help to improve perceptions of the ability of older workers, and thereby help to reduce discrimination against older workers.

Increasing the eligibility age for the Age Pension would therefore increase the likelihood that older workers would remain in the workforce. However, this impact would not be uniform.

People who fail the assets and income tests of the Age Pension are likely to be the least responsive to changes in the current pensionable age. Currently an estimated 45 per cent of males and 35 per cent of females who are between 65 and 69 years do not receive any entitlement to the Age Pension as they exceed the assets or income thresholds of the means test — in some cases because they have continued to work anyway.[86] (The shares of people ineligible for the pension in this age group is predicted to increase as the asset and income levels of those around this age increase.[87]) For this group, the impact on retirement decisions of increases in the current pensionable age is likely to be confined largely to the effects of changing social norms about the usual age of retirement.[88]

A change in the Age Pension age would also have a negligible impact on those who were receiving the DSP at the current pensionable age — currently around fifteen per cent of this age group. Were the pensionable age to increase, the vast majority of this group would continue to stay on the DSP, which provides a payment equivalent to the Age Pension.[89]

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[86] In 2012, 54.1 per cent of men and 64.4 per cent of women in the 65-69 year age group received a full or part-rate Age Pension payment (AIHW 2013a and ABS 2013, Australian Demographic Statistics, Cat. No. 3101.0). In addition, around 3 per cent of the population received other forms of age-based pensions, primarily Service Pensions and Veterans Disability Pensions.

[87] This is supported by previous modelling undertaken by the Commission (2005d). The fact that over time a greater share people aged 65-70 years will become ineligible for the Age Pension may seem at odds with the prediction that the share of those over the age of 65 receiving the pension will remain nearly constant over time. However, amongst those over the age of 65, there is an increasing share of the 'oldest old' who are more likely to receive the pension. So while the likelihood of receiving the pension at any given age decreases, the overall proportion of recipients stay roughly constant.

[88] Moreover, ex ante, those who privately fund their retirement still face market risk. Increases in the pension eligibility age reduce the capacity of the Age Pension to provide insurance for this risk. Accordingly, some people could be expected to 'self-insure' by retiring later and accumulating more assets.

[89] Exit rates from the DSP to jobs are low altogether, but particularly low for older people ((Cai, Vu and Wilkins 2005; Appendix K of PC 2011c).

Changes to the pensionable age would have a larger impact on the retirement decisions of those who pass the asset and income tests for eligibility to the Age Pension.

- The ABS retirement intentions survey finds that around 44 per cent of people retire due to eligibility for a pension of some kind. (However, this figure includes private pensions, some of which create stronger incentives to retire than the Age Pension.)

- Headley et al. (2010) estimated that increasing the pension age from 65 to 67 years would increase the workforce participation rates for 65 year olds from 29 per cent to 37 per cent and for 66 year olds from 25 per cent to 28 per cent.[90]

- Exploiting the natural experiment associated with the increase in the pension eligibility age for women (which commenced in 1993), Atalay and Barrett (2012) found that an increase in the eligibility age of one year induced a decline in the probability of retirement by approximately eight per cent.

- Population census data show marked discontinuities in labour supply behaviour around the pension eligibility age (figures 6.5 and 6.6). The data relate to 2011, when the pension eligibility age was 64.5 years for women and 65 years for men. The participation rates for both men and women fall by around 20 per cent (not percentage points) close to these eligibility age thresholds.

- The reduction in the numbers of people working is least for those working relatively short hours (1-15 hours). People in this category are more likely to be able to continue working without triggering the Age Pension income test. This implies that an increase in the pensionable age may sometimes raise people's hours of work, rather than alter their retirement decision — an important labour supply effect in its own right.

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[90] This study was based on the first eight waves of HILDA. The longitudinal nature of this survey makes it ideally suited to analysis of this kind, and increases the credibility of its findings.

Figure 6.5    **Change in participation rates by single year of age**

Percentage change in labour force participation rate[a]
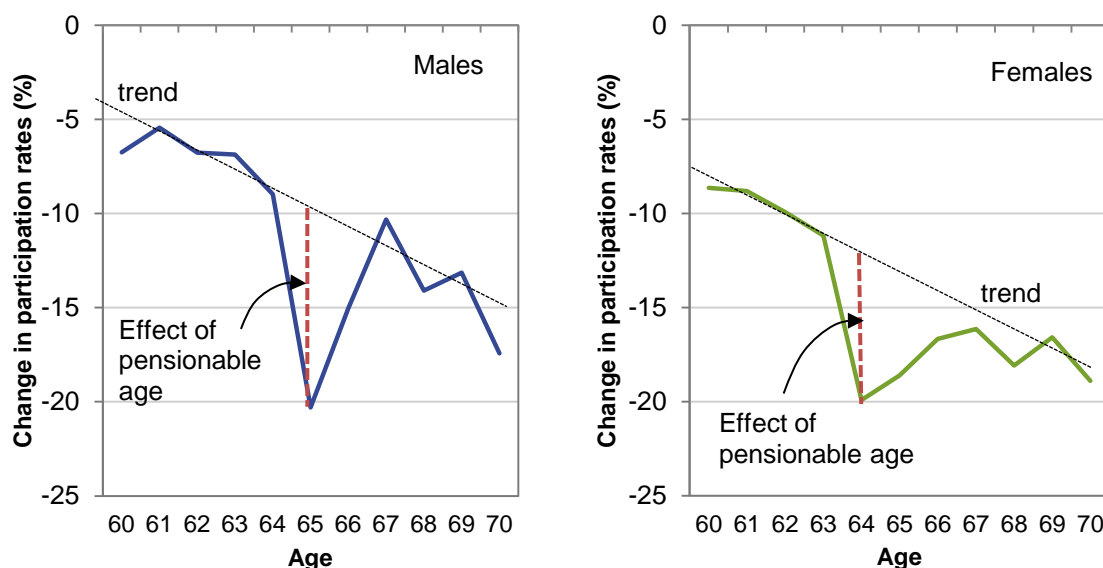


**a** That is: 100*(PR$_t$/PR$_{t-1}$-1), where PR is the participation rate. Participation rates are falling in every year after 60 years, but the reduction is much greater at the pensionable age. The *difference* between this reduction and the reductions around this age provide one measure of the effect of retirement on participation rates. This represents a 'difference in difference' approach to measuring the impact of a policy.

*Source*: ABS Table Builder, *Census of Population and Housing 2011*.

# 6.7    Aspects of linking the eligibility age to changes in life expectancy

Most OECD countries (including Australia) have raised the ages at which people can access pensions, or they are planning to do so (CEDA 2007, pp. 4–6; OECD 2012, p. 26). They have done so against a background of ageing-related pressures on their budgets and labour markets, an awareness of growing intergenerational transfers, and the recognition that greater longevity gives many people the capability to work longer. When the Australian Government introduced the Age Pension in 1909, a man aged 65 years could expect to live around 14 years more, whereas a man born 100 years later could expect to live around 29 years after age 65 years. Many OECD countries have also preserved pensionable ages at around 60–65 years despite experiencing similar trends in life expectancy (figure 6.7).

Figure 6.6    **Working hours changes at the pension eligibility age**

Percentage change in the number of people working by hours working categories[a]



Females

25-34

16-24

1-5

40+

35-39

Males

16-24

25-34

40

1-5

35-39
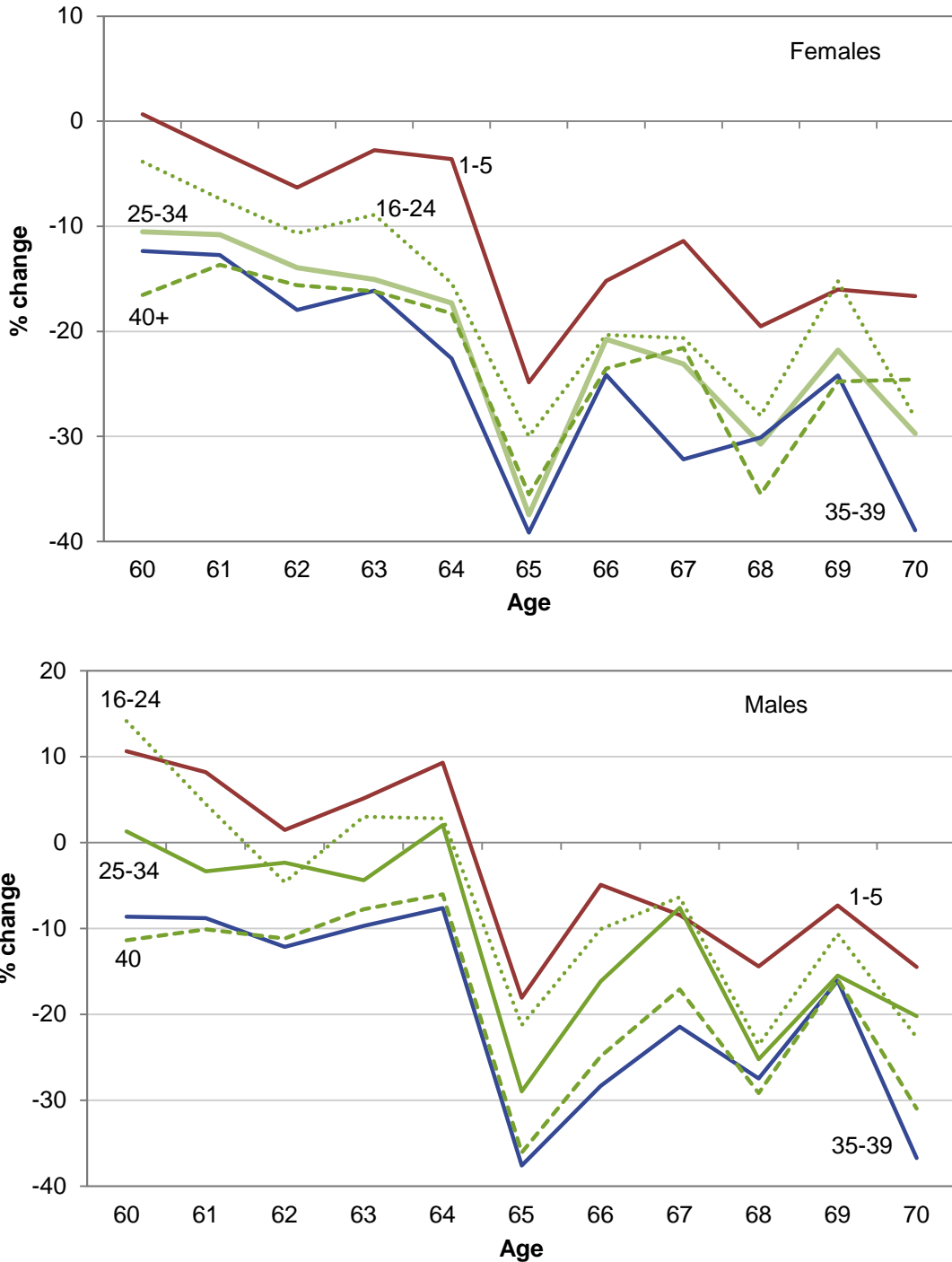
[a] The ABS categorises weekly hours worked into several groups. The chart shows the percentage change by year of age of the number of people in these hours worked groups.

*Source*: ABS Table Builder, Census of Population and Housing 2011.

Figure 6.7    **Pension age in OECD countries**
2010
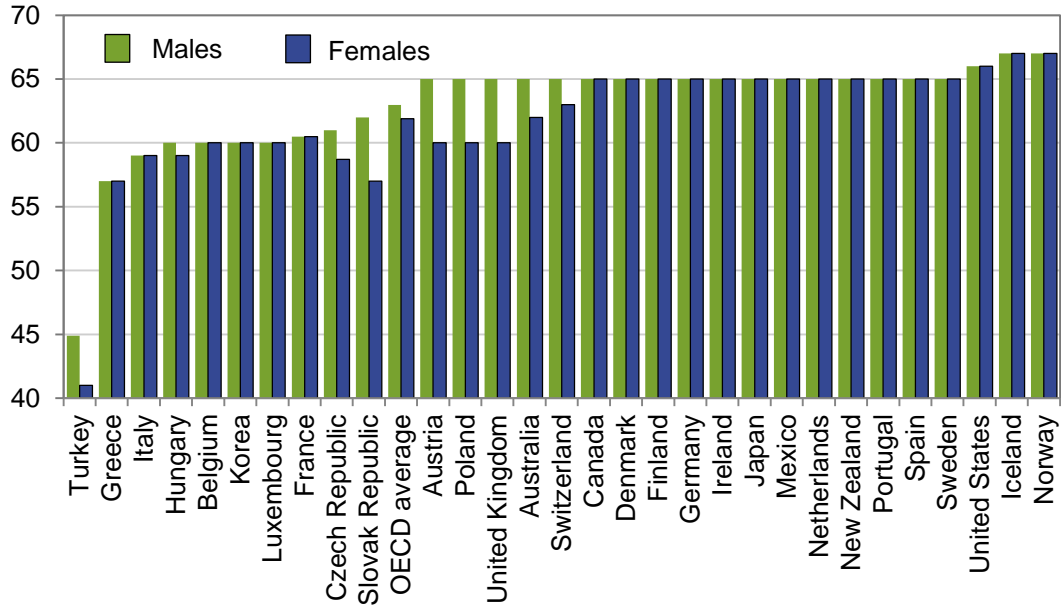


*Source*: OECD (2011, p. 25).

To the extent that people live longer and have healthier lives, some linkage between pensions and life expectancy appears to be conceptually well founded. In a review of pension arrangements across OECD countries, the OECD remarked:

> It is hard to see why people approaching retirement should not bear some of the cost of their generation living longer than previous generations. After all, living longer is desirable. A longer lifetime and a larger lifetime pension payout due to life expectancy confers a double advantage. Some link between pensions and life expectancy is therefore optimal. (OECD 2011, p. 98)

Many countries have now linked aspects of their pension schemes to changes in life expectancy (and other factors underpinning the sustainability of pension schemes) — sometimes referred to as putting their systems on 'auto-pilot' (OECD 2011, p. 45ff). The solutions these countries have adopted provide interesting practical insights for any such move in Australia.

The adoption of the most explicit linkage — that between the pensionable age and life expectancy — is comparatively rare among OECD countries. Denmark links the pensionable age directly to life expectancy (but the actual change requires parliamentary approval), as will be the case in Italy and Greece in 2013 and 2021 respectively. The Czech Republic will increase the pensionable age by two months per year of birth — a 'rule of thumb' approach to link pension liabilities and life expectancy.

In France, the number of working years required to access a full pension has been linked to life expectancy.

Finland and Portugal have retained their defined-benefit, public plans (the equivalent to Australia's Age Pension), but will reduce future benefits by a factor directly related to life expectancy.

The most common form of linkage in many OECD pension systems is through mandatory defined contribution plans, in which the benefits payable are funded through past contributions to the scheme. Consequently, as life expectancy increases, people's retirement earnings per year fall unless they stay at work for longer. The OECD categorises Australia in this group given its mandatory superannuation requirements. However, this categorisation of Australia is problematic and underlines the problems of simple international comparisons. In particular, it ignores the fact that, unlike most other OECD countries, Australia has two interacting pension systems:

- The annual benefits in the publicly-funded defined benefit scheme — the Age Pension — are not systematically linked to life expectancy. Indeed, the present Age Pension has automatic adjustment for real wage growth (based on Male Total Average Weekly Earnings or MTAWE).[91] Accordingly, increasing longevity requires increasingly large transfers from taxpayers.

- The annual benefits in defined contribution plans (the bulk of plans under mandatory superannuation) are a function of life expectancy, but people nevertheless face various incentives to retire at relatively young ages (as discussed below), undermining that linkage. Moreover, people can use both systems, and have financial incentives to do so.

Given Australia's hybrid system, any policy changes to address the biases for premature retirement would need to consider jointly the age-related rules of the Age Pension and the associated taxation and superannuation provisions (discussed further in section 6.8). As the OECD has remarked more generally about pension policy:

> The key message … is that analysis of pension policy should not adopt a piecemeal approach. A comprehensive approach, covering all the different parts of the system is essential. (2012, p. 70)

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[91] The Age Pension is indexed to the higher of Consumer Price Index and the Pensioner and Beneficiary Living Cost Index, but legislation specifies that it must always be equal to at least 41.76 per cent of MTAWE. As this generally increases faster than the two indices, it is the primary determinant of pension increases.

Regardless, one of the advantages of an explicit formulistic link between the pension eligibility age and life expectancy is that it puts in place a system that automatically recognises the growing capacities of older people to be active in the labour market. This overcomes the problems created by potentially arbitrary adjustments.

An alternative would be to re-design the Age Pension as an entitlement to a stock of funds rather than a flow — as in the mandatory defined contribution schemes discussed above. Under such a system, at a certain qualifying age, a person would get access to a savings account from which they could withdraw an annual income over the rest of their life. If they deferred withdrawals, then this would allow the person to have a higher level of annual income (discouraging early retirement). As successive generations lived longer, the savings account would have to cover more years of life, reducing its annual value below that which would apply under the current Age Pension. This would, in effect, automatically adjust for life expectancy. However, such an approach would involve many complexities (such as the design of any income and asset tests). Above all, it would not be consistent with the rationales underpinning the Australian Age Pension system, most particularly its insurance and safety net functions. Accordingly, this report does not investigate it further. Overall, the OECD (2012, p. 70) considered that linking pension age to life expectancy was the preferred option.

*Practical considerations of directly linking the Age Pension eligibility age to life expectancy*

One practical issue is how life expectancy could be linked to pensionable ages given incomplete information about future mortality rates (chapter 2).

- The method adopted by the Czech Republic simply assumes a steady progression in life expectancy, but this form of auto-pilot has an unknown destination as it may not correspond sufficiently to expectancy.

- Using changes in *period* life expectancies has the advantage that they are observable (and impartially estimated) in the life tables routinely calculated by the ABS (and, for different purposes, also by the Australian Government Actuary). While historically the relationship between cohort and period life expectancies has not been stable, the proportional difference between them is likely to narrow if the growth rate in life expectancy slows, as appears likely (figure 6.8).

- There would be little point in setting pensionable ages based on life expectancies at birth, since people's capacity to change their savings behaviour only commences when they can work. Linking the pension to life expectancy at the

point where entry into the workforce is most common (say 20 years) would provide greater certainty in the future, and be meaningful to individuals. Forecasts would be shorter and potentially better.[92]

**Figure 6.8    Period versus cohort life expectancies**

At age 65 years, 1920-21 to 2059-60
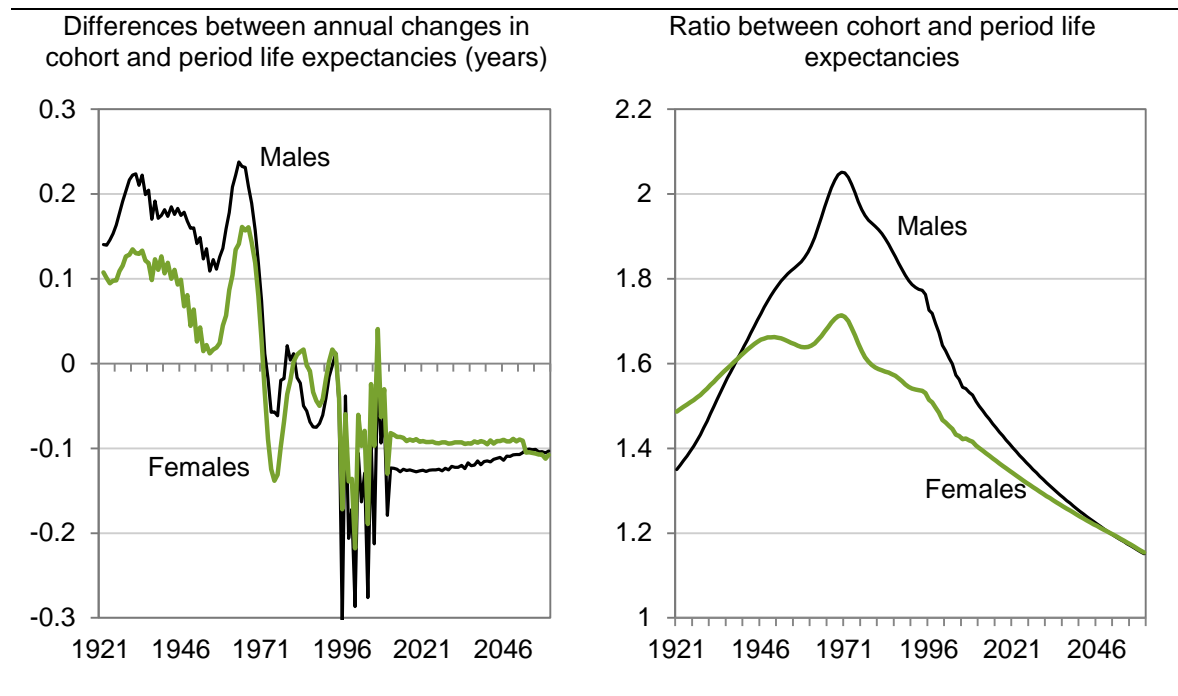


*Source*: Commission estimates using the demographic model described in chapter 2.

As there are short-term variations in life expectancies associated with successive life tables, some smoothing of rates over time would be required. In Sweden, adjustments to pension values for mortality improvements use data from the previous five years (OECD 2012, p. 56). Variants on this approach could be used in determining the pensionable age, which would reduce uncertainty and ensure a relatively smooth advancement in the pensionable age. In Italy, reviews of the mortality adjustments are undertaken every three years.

Another important practical question is the consequences of errors and how these might be addressed. Setting pension ages too high (too low) because life expectancies are overestimated (underestimated) would result in reduced (increased) fiscal pressures.

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[92] The presumption in this chapter is also that the relevant life expectancy relates to the population as a whole, and would not vary across sub-groups of the population (such as by sex or education) that have different average life expectancies.

## How much does age weary us?

The extent to which automatically linking the pensionable age to life expectancy will increase the workforce participation of older workers depends on several factors. Employer attitudes have been noted earlier as one significant unknown. Another is the risk that people are unable to work because of disability and ill-health. If gains in life expectancy are not matched by improved health outcomes, then people may simply access disability benefits during the period between the former and any new pensionable age.

Most of the readily available evidence about the extent to which greater life expectancy is also associated with better health does not specifically relate to this issue. Rather, statisticians measure so-called health expectancy, which is the number of years spent in good health. Several Australian and international burden of disease studies have examined this issue (Begg et al. 2007; IHME 2012b). The Global Burden of Disease Study (IHME 2012b) estimated that between 1990 and 2010, life expectancy at birth increased 4.6 years in Australia while 'health-adjusted life expectancy', a measure of the years of life spent in good health, increased by 3.7 years.

How this translates into a reduction in the probability of disability at given ages is not very clear, despite this being the most important factor for estimating a person's additional capacity to work as the pensionable age increases.

It is plausible that there would be significant gains in capacity. For example, the prevalence of cerebrovascular disease has fallen over time proportionately more among 65-69 year olds (those aged around the threshold age where decisions about pension access would initially focus) than older groups (IHME 2013a). More generally, this study projects that mortality rates will fall by more among the 'younger old' than the 'older old' — consistent with likely gains in health expectancy around pensionable ages (chapter 2). The ABS survey of Disability Ageing and Carers also found that age-specific prevalence rates of severe and profound disability decreased across all age groups between 2003 and 2009. The reductions were greater for the 65-69 year age group than for 60-64 and 70-74 age groups, but less than those for the oldest old. On the other hand, as observed in chapter 3, it appears that disability is increasing as a source of labour market disengagement over time.

In theory, in the future, the pensionable age could be based on some measure of gains in health expectancy, rather than life expectancy, as some have suggested (appendix B). However, the burden of disease studies that provide estimates of health expectancy are not performed routinely in Australia. Were they, issues

around the consistency of methodology would need to be addressed before health expectancy could be directly linked to the Age Pension eligibility age. This suggests that such an approach is some way off, if indeed it is practical. More information about health expectancy can be found in appendix B.

The presence of some substitutability between the Age Pension and other forms of income support is desirable. Recent increases in the qualifying age for the Age Pension for women led to a substantial shift of people to the DSP (box 6.2). While that reduced fiscal savings, it nevertheless meant that those people who could not genuinely engage in the workforce were given support, an important feature that promotes flexibility in the retirement income system.

## Life expectancy and the indexation of the Age Pension

Given its status as a publicly funded defined benefit scheme, increases in longevity raise the net present value of the Age Pension for the average beneficiary, and funding this requires an increase in taxpayers' payments. The degree to which this occurs depends on how the payment is indexed. As an example, suppose that life expectancy from age 65 years increased from 15 to 20 years. Using the payment rate for a single person's full pension in 2013, the lump sum equivalent at age 65 years of the pension value[93] of the additional five years of increased longevity would be:

- $40 000 were the pension unindexed

- $61 000 were it indexed to a CPI growth rate of 2.5 per cent per annum

- $78 000 were it indexed to wage growth (which in turn reflected the combined influence of productivity growth of 1.5 per cent per annum and inflation of 2.5 per cent).

In principle, such costs could in part be addressed by varying indexation arrangements. There is certainly no clearly appropriate indexation method, as shown in the Harmer Pension Review, which proposed another indexation approach based on the growth in net median full time earnings as a better basis for pension indexation (2009a, p. xv).[94]

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[93] The calculation assumes a discount rate of 6 per cent.

[94] From December 1998 to December 2012, male full time earnings and median weekly earnings grew at much the same rate, so that a change to this indexation approach does not appear to make much difference. ABS 2013, *Average Weekly Earnings*, Cat. No. 6302.0 and ABS 2013, *Employee Earnings, Benefits and Trade Union Membership, Australia – Median Weekly Earnings,* Cat. No. 63100TS0003.

Linking the pension age to longevity will lead to some diversion of people to other income support payments.

This diversion was apparent when the pensionable age for women was gradually shifted from 60 years in 1995 to 65 years (as for men) in 2013. This has resulted in 79 872 (15.4 per cent) women aged 60-64 receiving the Disability Support Pension (DSP) and 18 063 women aged 60-64 (3.5 per cent) receiving a Newstart allowance (FaHCSIA 2011, 2012). The DSP has the same payment rate as the Age Pension and Newstart considerably less. The transition between payment types is examined in more detail by Gregory (2013) and Ryan and Whelan (2011). The latter uses HILDA data to examine the impact of the increase in the female Age Pension age and finds that when the pensionable age increased by six months, the total number of welfare recipients drops by around 30 per cent in the age group that has lost pension eligibility (p. 48). However, while significant substitution is likely were the pensionable age to rise, past experiences do not take account of the fact that the affected group would be different (males as well as females), and that the arrangements for recipiency of the DSP have become more rigorous.

The chart below shows a rough estimate of the percentage of people expected to migrate to the DSP were the pension eligibility age to be increased. The chart shows that the likelihood of receiving the DSP increases with age, and a linear projection to the 65-69 age group suggests that around 19 per cent of those in the 65-70 age group would receive the DSP if they were unable to receive the Age Pension (a similar effect can be observed with other government payments, but on a much smaller scale).
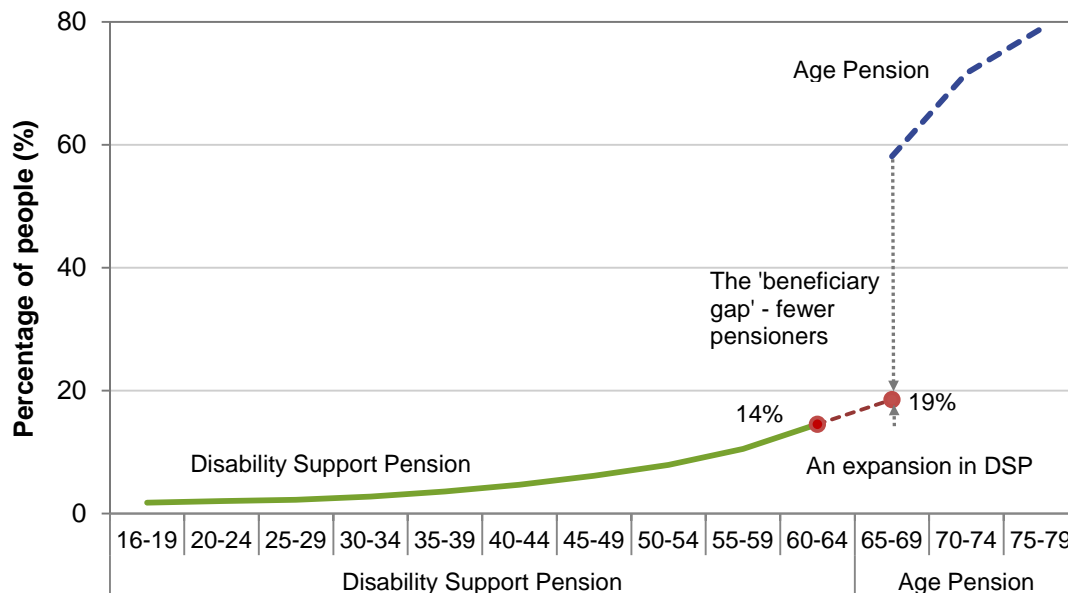


Note: Gender specific rates are combined using population weights. A straight line projection is used to calculate the DSP recipient rate for those aged 65-69. Age Pension recipient rates were calculated using AIHW (2013a) and ABS 2013, *Australian Demographic* Statistics, Cat. No. 3101.0. DSP rates were taken from FaHCSIA (2011).

The Henry Tax Review recommended that indexation arrangements be regularly reviewed by governments (Treasury 2010, Recommendation 84), testimony to the uncertainty surrounding the appropriate indexation approach. There is no single agreed indexation approach across different payments, with some other income support payments, such as Newstart and Carer payments indexed to the CPI. This report does not consider the issue of indexation further.

## The fiscal impacts of changing the pensionable age

Graduated increases in the pension age can achieve large savings in absolute terms (figure 6.9). As an illustration of the impacts, gradually increasing the pensionable age from 67 to 70 years between 2023 and 2035 would yield increasingly larger fiscal savings, rising to up to around 0.15 per cent of GDP in the later 2030s (but then falling to around 0.1 per cent in the long run). This represents around $4.5 billion in 2035-36 in constant 2011-12 prices or around $150 per capita in that year. Over the full period from 2025-26 to 2059-60, the accumulated (undiscounted) savings are around $150 billion in constant 2011-12 prices. This estimate accounts for the offsetting fiscal impacts of the movement of some people to the DSP.

These calculations only consider the direct fiscal benefits of extending the pensionable age. Thus, they do not consider other economic and social benefits of the more active involvement of older people in labour markets, or the increased taxation receipts from people who continue to work because of the increased pension eligibility age.[95] The calculations also assume that the pension eligibility age has no impact on the likelihood of receiving a pension later in life. However, an increase in the pensionable age would encourage people to work longer and save more. (Indeed, to the extent that they stay in the workforce, it would compel them to save more through Australia's mandated superannuation contributions.) Accordingly, in some cases, people may exceed the asset threshold when they reached the pensionable age (unless the threshold was adjusted for later qualifying ages).

On the other hand, some of those who were unable to access the Age Pension due to the extension of the pensionable age would not have regular income and may need to run down their other assets prior to reaching the new pension age. This may increase their pension payment rate in future periods. Calculating the net outcomes would require a sophisticated parameter-based model of the labour, asset accumulation and consumption choices of people who are potential Age Pension

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[95] Nor do they include any fiscal savings associated with reduced access to the Pension Concession Card (chapter 5).

beneficiaries. The outcomes would also depend on the interactions of the Age Pension with the broader superannuation system, which is briefly examined next.

**Figure 6.9**   **Budget savings from increasing the pension age from 67 to 70 years from 2023 to 2035**

Percentage of GDP



The fiscal costs of the Age Pension fall

The fiscal costs of the DSP rise

There is an overall net budget saving on pension costs
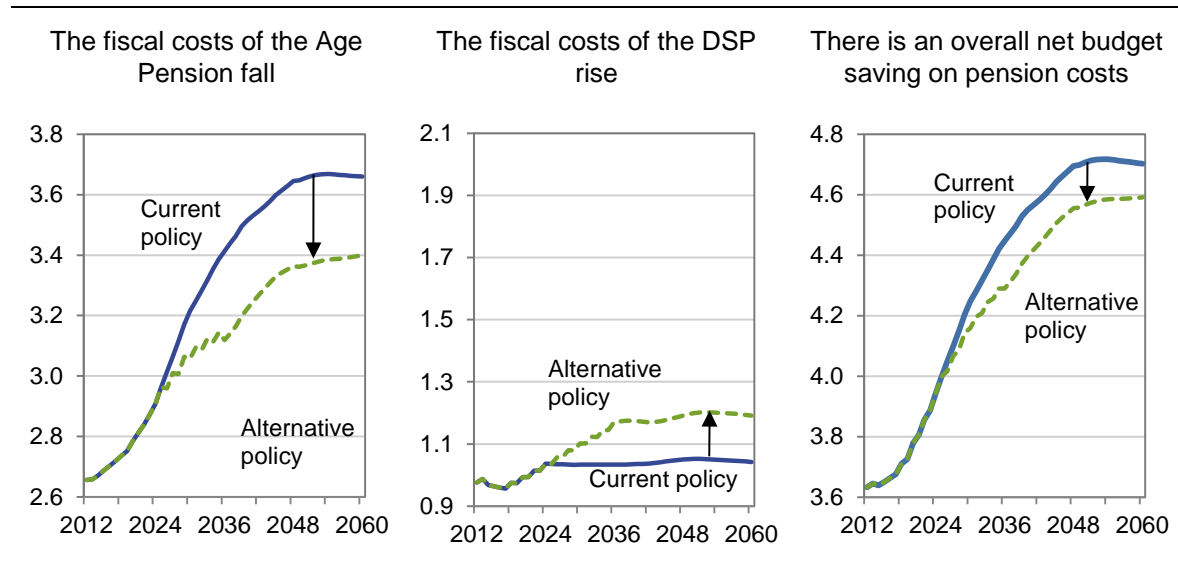
**a** The chart shows the fiscal outcomes of progressively increasing the pension age from 67 to 70 years in half yearly increments after 2023, compared with the fiscal outcomes of current policy (which has the pensionable age rising from 65 years to 67 years by 2023). Panel 1 shows the gross budget savings in the Age Pension budget from the increase in the pensionable from 67 to 70. Panel 2 shows the increased spending on the Disability Support Pension as some people substitute between the two income support measures. The net budgetary savings — the one that matters for policy — is shown in panel three. These indicative calculations drew on the 2010 IGR and Treasury calculations provided to the Commission in its earlier report on ageing (PC 2005d). They have been adapted to account for changes in policy since those times. The scenarios were estimated using recipient rates from box 6.2.

# 6.8   The links between the Age Pension and the rest of the retirement income system

The Age Pension and the superannuation system (and its associated taxation arrangements) are inextricably linked. In some instances, they act as complements (such as where the Age Pension provides longevity insurance). In other instances, they act as substitutes, with means testing determining which system people access. The strong links between the two parts of Australia's retirement income system mean that decisions in one part can have large budgetary implications in the other. It also suggests that decisions concerning these two systems should be jointly considered.

In that context, it is unsurprising that the issues raised by growing longevity have ramifications for the superannuation system that mirror those applying to the Age Pension.

The most important parallels are that the superannuation system:

- is also supported by taxpayers in the form of tax concessions (box 6.3), which entail net fiscal impacts, even after accounting for the benefits of a reduced uptake of the Age Pension. Given that the superannuation system is partly publicly funded, it is relevant to factor this into long-run government budget management (a major policy issue, but not one discussed in this study), and to consider whether the design of this system should take into account life expectancy improvements. Under existing arrangements, increased life expectancy would entail more taxpayer transfers

- has various age triggers — currently unrelated to life expectancy — that may encourage premature retirement. Of these the most important is the preservation age, currently 55 years, which is the age at which a person can retire and access his or her superannuation benefits. This will also influence the likelihood that a person will receive the Age Pension later in life, as people who access their super earlier are more likely to run down their assets and pass the Age Pension means test. The preservation age is scheduled to increase to 60 years by 2024.

In principle, the preservation age should consider life expectancy and the Age Pension eligibility age as relevant factors. A preservation age linked to life expectancy would provide a financial incentive to stay in work for longer, and as noted earlier for the Age Pension, provide a shift in expectations about the age to retire. The retirement income paper attached to the Henry Tax Review suggested the superannuation preservation age be gradually increased to align with the Age Pension eligibility age (Treasury 2009, p. 16), which would suggest the arguments to automatically link the Age Pension eligibility age to life expectancy apply equally to the superannuation preservation age.

Increasing the preservation age for superannuation has also been proposed by Chomik and Pigott (2012b, p. 11), the Australian Council of Social Service (2009, Recommendation 10) and the Actuaries Institute (2012, p. 3). The Grattan Institute recommends increasing both the Age Pension and the superannuation preservation age to 70 years (Daley, McGannon and Ginnivan 2012, pp. 53–55; Daley 2013, p. 15). In theory, changes to such age thresholds would be likely to increase superannuation account balances, reduce age pension outlays and stimulate labour supply (Kurdna and Woodland 2010).

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| Box 6.3 | **The fiscal costs of the superannuation system** |

Like the Age Pension, the superannuation system is partly a creature of government because it is mandatory and supported through taxpayer transfers. The Australian Government provides a range of tax concessions to superannuation accounts. These have several features. They allow for:

- contributions, both compulsory and mandatory, to be taxed at the flat rate of 15 per cent
- the concessional taxation of earnings on superannuation accounts and on income when it is withdrawn.

These aspects of the system encourage people to save for their retirement. In doing so, they reduce the number of people who rely solely on the Age Pension for income during retirement. However, this displacement benefit is likely to be least for higher income households (who get the biggest tax advantages) because such people are unlikely to access the Age Pension under the counterfactual of no concessional treatment. The Australian Treasury has observed that 'these concessions come at a cost, indeed a very significant cost' and has suggested that the concessions may benefit a minority (Parkinson 2012, p. 7), a view echoed by the Grattan Institute (Daley 2013, p. 14). Treasury (2012) has also estimated that around 50 per cent of tax concessions accrue to the top 20 per cent of income earners.

Against this background, there is some concern that reductions in Australian Government outlays on the Age Pension achieved through concessions are more than offset by the revenue forgone in funding these concessions, resulting in a net negative effect on the Australian Government's fiscal position. The Treasury estimates that the concessionary treatment of superannuation cost $31.8 billion in 2012-13 in forgone revenue, making it the Australian Government's largest tax concession (Treasury 2013). The cost is projected to grow to $45 billion by 2014-15 — an amount greater than the cost of the Age Pension. However, costing of superannuation concessions depends on the counterfactual. The 'revenue forgone' method used by the Treasury assumes that the alternative would be full marginal tax rates on the relevant income. However, the removal of concessions for superannuation would probably cause high-income earners to seek other tax effective investments, such as investments in negatively-geared property. The Treasury has estimated that, after taking account of such behavioural responses, the cost of superannuation concessions would be around 30 per cent less than the usual revenue forgone approach (Charter Group 2013, p. 9). In this instance, the Age Pension would still remain the Australian Government's largest retirement income expenditure.

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Another associated issue is the way in which people can tap their superannuation accounts after the preservation age and, in particular, their capacity to take all of their superannuation benefits as a lump sum.[96] The Australian Prudential

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[96] This issue has been raised by KELLYresearch (2012); the Actuaries Institute (2012, p. 2), the OECD (2012, p. 13) and Dunsford and Wickham (2009).

Regulation Authority (2012, p. 27) estimated that in 2011-12, around $24.7 billion was withdrawn as a lump sum, compared with $15.5 billion withdrawn as a pension.

Lump sum benefits give people the option to pay off other debts (such as mortgages). It also allows strategies to access both pension systems, such as to increase holdings in assets exempt from the pension assets test and to increase short-run consumption. Aligning the preservation age with a pensionable age calibrated to life expectancy would somewhat constrain the use of the latter option.

Addressing the other two options would require changes to asset exemption and other eligibility conditions. Examining these issues is beyond the ambition of this report, reflecting the difficulties in modelling the interactions between superannuation arrangements, the Age Pension, and the tax-transfer system more broadly. However, even the analysis above reveals the importance of establishing the right counterfactuals and taking into account the behavioural responses to policies intended to ease the economic and fiscal consequences of ageing.

# 7    Income poor, asset rich: overcoming rationing and financing constraints

**Key points**

As households and individuals age, their consumption patterns change. Heath services account for a greater share of total consumption — close to 45 per cent for those aged over 75 years compared with around 8 per cent for those aged 40–44 years.

Governments meet the majority of the costs of these services. So, as these costs grow the community will need to consider choices such as increased taxes, greater rationing of age-related services, cuts to other government spending, and/or requirements for larger contributions from service users.

Among other concerns, affordability has been an obstacle to co-contributions playing a greater role. But many people may be able to tap certain assets in innovative ways without compromising their current living standards. Any future policy debate about this possibility should be informed by facts and analysis.

Most households and individuals already save for their retirement — consistently building wealth over their working lives and then using it to fund their retirement.

But retirees tend not to use the wealth in their home, which represents a significant share of their total wealth. Older households have high home ownership (over 80 per cent) and equity rates (almost 100 per cent).

- Evidence on bequests over the past 10 years — which most commonly relate to the family home — suggests this trend is continuing.

Policy measures that overcome the barriers that individuals and households face in accessing the equity in the home may play a future role in freeing up resources for greater contributions to age-related expenses such as health and aged care, without affecting older people's other consumption.

If such policies work, service delivery could become increasingly consumer directed, improving quality and reducing rationing (a major concern for ageing Australians).

One option, which is already in use to help households pay their council rates, is a government equity release scheme targeted at older households.

Having individuals contribute even half the annual *real increase* in their home values towards aged care services could reduce government expenditures by around 30 per cent (a conservative estimate).

An equity release scheme could leave older households with an appreciating asset base and significantly reduce government fiscal pressures over the longer term.

The viability of any such scheme depends on many other matters, but the evidence on wealth suggests that further investigation is warranted.

As the population ages, its consumption patterns change. Services such as health care, for example, account for a greater share of total consumption — close to 45 per cent for those aged over 75 years (figure 7.1). And while private health expenditure increases with age, it does so only to a small extent — increasing from 3 per cent of total expenditures for someone aged 45–49 years to 5 per cent for someone aged 70-74 years. Public health care expenditure by the same age cohorts increases from 6 per cent to 39 per cent. As a result, taxpayer funded health care is likely to rise significantly with future demographic change (chapter 5).

Figure 7.1    **Per person household consumption by household age, 2009-10**
2011-12 dollars
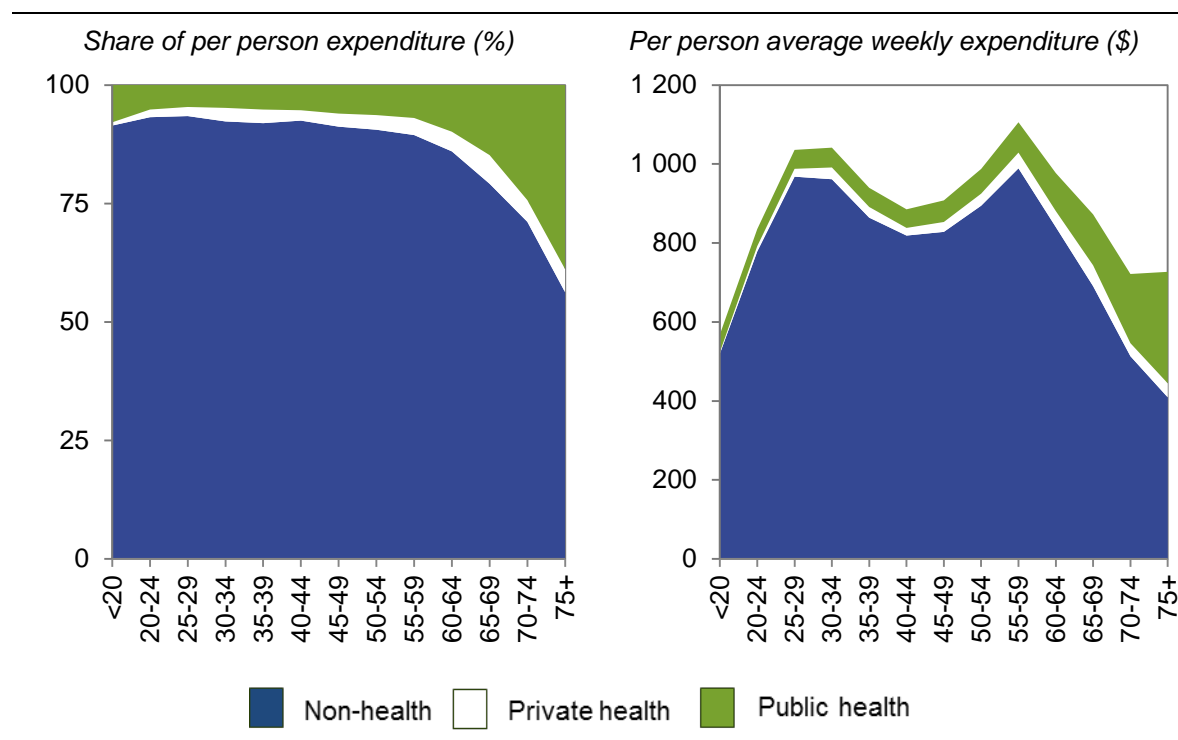


*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

The community must meet the costs of growth in age-related expenses, and can do so in only a limited number of ways:[97]

- greater productivity in the provision of age-related services (chapter 8)

- higher taxes

- rationing of age-related services

- cuts to other government spending

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[97] Debt financing may be seen as another option, but it must be re-paid so it only shifts responsibilities over time.

- requirements for larger contributions from those who seek to use age-related taxpayer funded services.

All options involve major questions about feasibility, efficiency and equity. While this chapter does not recommend the adoption of any particular option, it looks at the evidence on the viability of one possible avenue for funding age-related costs — tapping the otherwise inactive wealth held in the housing assets of older Australians. While the adoption of such a policy approach is currently over-the-horizon, it is nevertheless worth deeper consideration.

User contributions to taxpayer subsidised health and aged care are already well established, but flow through only a few channels. In health care, for example, many individuals pay 'gaps' in consultation fees, pay for dental and ancillary services, and have financial incentives to take out private health insurance. However, despite relatively high (and rising) levels of private health insurance (figure 7.2), publicly funded health expenses still account for the majority of health services consumed by individuals. On average, private health insurance coverage rates increase until age 55–64, with around 50 per cent of people aged over 15 years old holding some form of private health insurance (hospital, ancillary or both).[98] However, coverage rates then fall as the population ages, with the lowest rates among the oldest age groups.

Other co-contributions for publicly funded services, such as aged care, are usually determined by an individual's capacity to pay, which is based on a narrow interpretation of income and wealth that reflects pension eligibility status. The differential treatment applied to asset classes only partly reflects the practical aspects of assessment. Access to the Age Pension, for example, is limited by the value of any residential investment property that an individual or couple may own, but not by the value of the residential asset in which they live.

Primarily, the alternative funding approaches explored in this chapter relate to broadening what is assessed as the wealth of an individual or couple, and thus their ability to contribute to the costs of the services they use. However, the scope for any co-contribution approach rests on how assets, income and broader wealth are distributed among the population, particularly among different age cohorts.

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[98] Based on 2007-08 from ABS (2010) *National Health Survey: Summary of Results 2007-08*, Cat. no. 4364.0. Recent changes to the taxation arrangements surrounding private health insurance may have influenced coverage rates.

Figure 7.2 **Private health insurance coverage by age, 2001 to 2007-08**

Per cent of individuals
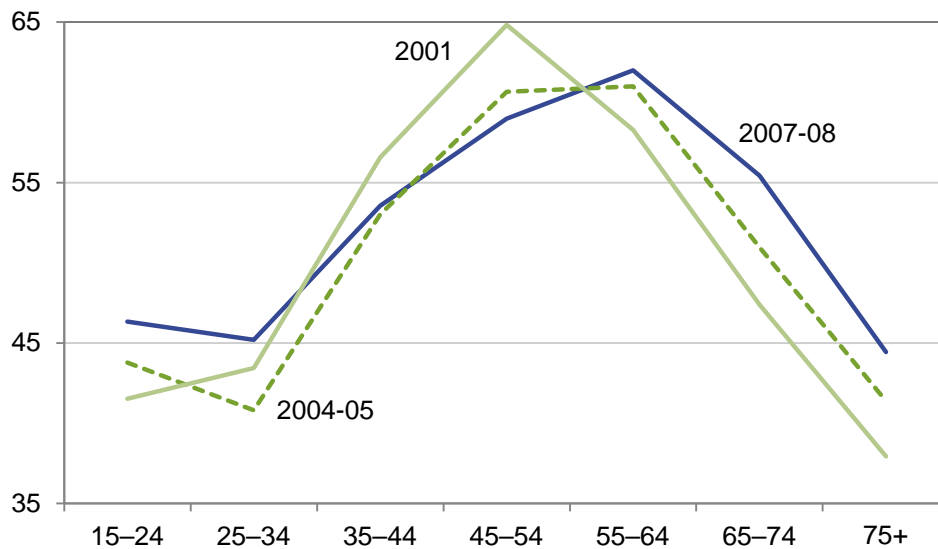


*Source*: ABS 2010 *National Health Survey: Summary of Results 2007-08*, Cat. no. 4364.0.

The chapter concentrates on the potential usefulness of alternative funding arrangements for health and aged care, though in principle, the arrangements might have wider application. Whether such approaches prove workable or desirable depends on many other issues, but it is worth establishing an evidence base to stimulate policy discussion.

# 7.1 Wealth and income by age

Between 1988-89 and 2009-10, Australian households experienced significant income growth, across all age groups and income deciles (Greenville, Pobke and Rogers 2013). This growth reflects that more Australians are working, doing so for longer hours and being paid higher real wages.

However, while income rose, age-related patterns of income and wealth remained relatively stable over the past 20 years. By age 30, most Australian households are purchasing or own their home (figure 7.3, left panel) — with rates of close to 80 per cent of those aged over 65 years. This high ownership rate is also true of those on the Age Pension, but not for younger households whose main income source is a government pension (figure 7.3, right panel).

Figure 7.3 **Home ownership rates of pension recipients 1988-89 to 2009-10**

Per cent of households
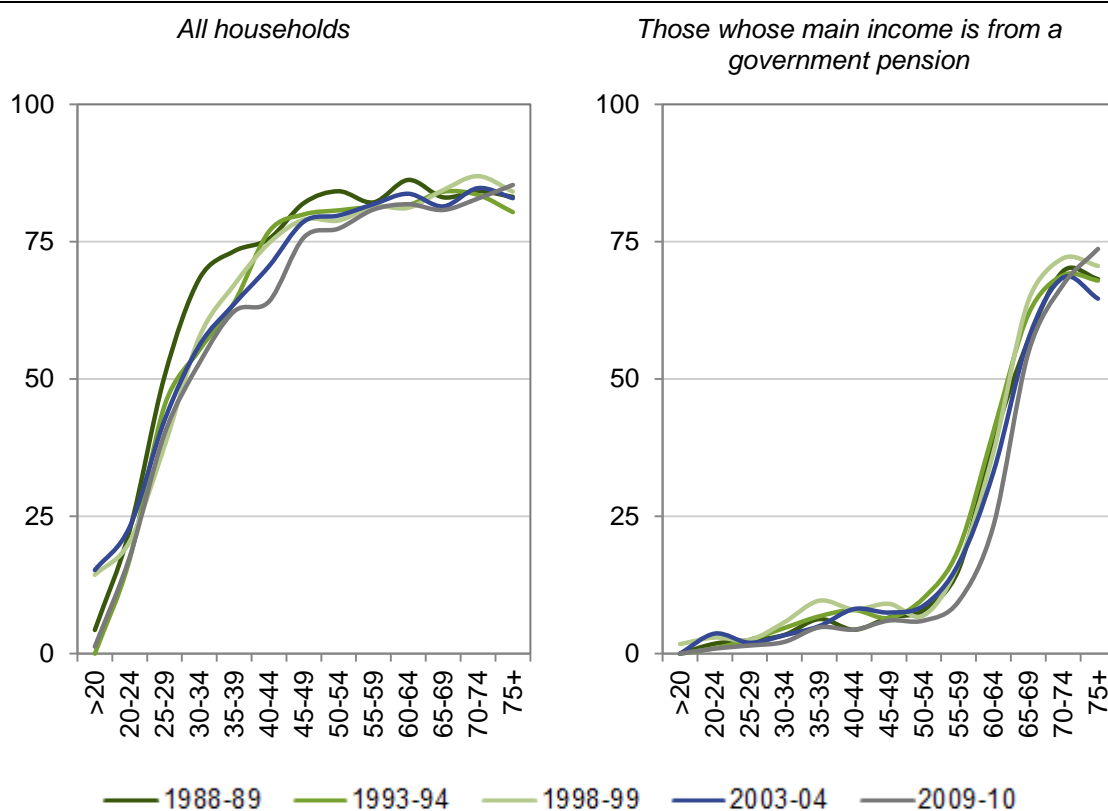
*All households*

*Those whose main income is from a government pension*



Legend: 1988-89 | 1993-94 | 1998-99 | 2003-04 | 2009-10

*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

Across Australian households, average incomes peak for those aged 40–50 years,[99] and then start to decrease around retirement (figure 7.4). People use earnings during their high-income years to pay off the mortgage on their homes. Most households have paid off their homes by the time they are aged 60–64 years. And while for cohorts approaching retirement over the medium-term it is likely this behaviour will continue to apply, for younger cohorts it is not as clear. Since the late 1970s, housing debt to house value ratios have increased significantly — from around 9 per cent in 1977 to 30 per cent in 2013 (RBA 2013). Over the same period, the ratio interest payments to disposable income increase from around 4 per cent to 8 per cent.

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[99] Age is based on the reported age of the household reference person. The ABS defines the reference person as the person most likely to be representative of the household (ABS 2012c).

Figure 7.4 **Income, equity and home value, by age groups, 2009-10**

$'000 in constant 2011-12 prices $'000, all households
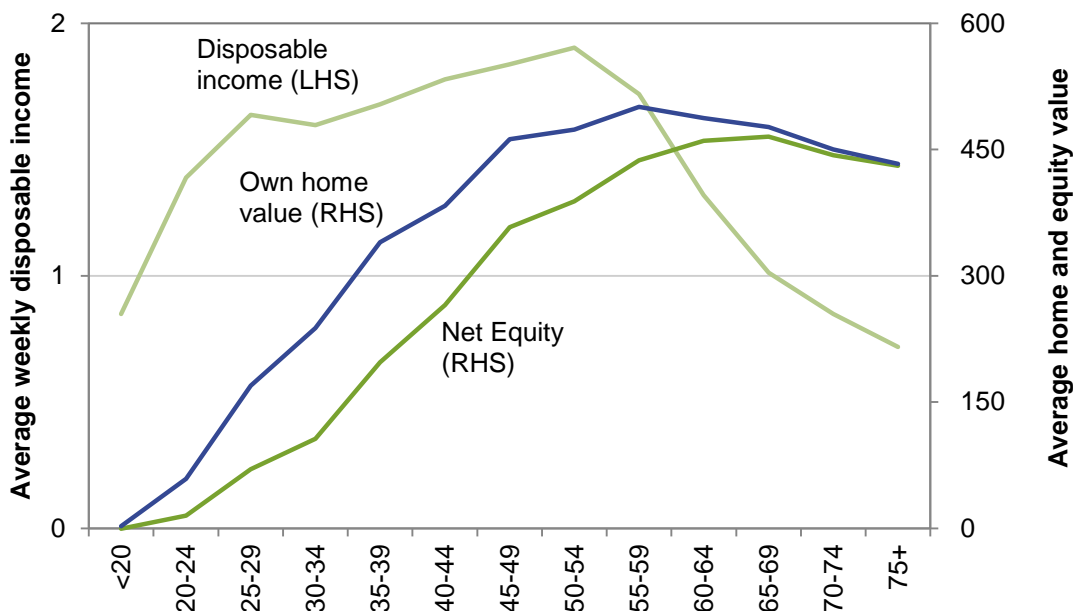


*Source*: ABS 2012 *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record file.

As households age, they also save and accumulate assets and wealth outside the home. After retirement, households then use their savings to help fund their expenses, gradually running down their net worth (figure 7.5). In 2003-04, household wealth was at its peak for households aged 60-64 years. In 2009-10, while real average net wealth levels for the 60-64 age group remained stable (close to $1.1 million in 2011-12 dollars), younger cohorts were relatively richer. The highest average net wealth was for 50-54 year old households, at close to $1.3 million. Reflecting the skewed nature of the wealth distribution, median wealth levels for all age groups were lower than average wealth levels.

For households aged over 65 years, net wealth consistently falls, but the wealth in their home does not. A household's home value and net equity position remain strong throughout retirement — a result found in other studies (for example, Bradbury 2010). The treatment of home assets in pension eligibility tests and the barriers to accessing home equity (particularly transactions costs, such as stamp duty on property) are likely to play a major role in this pattern. Attitudinal factors are also at play, with many households not viewing their housing wealth as a form of retirement savings — an attitude that appears to be changing (discussed below). These factors mean that as people age, they become less likely to move. Only 2 per cent of over 60 year old households move each year, compared with 7 per cent of all households (Bradbury 2010, p. vi).

Figure 7.5 **Households tend to 'run-down' assets to fund retirement, yet retain equity in the home**

$'000, constant 2011-12 prices
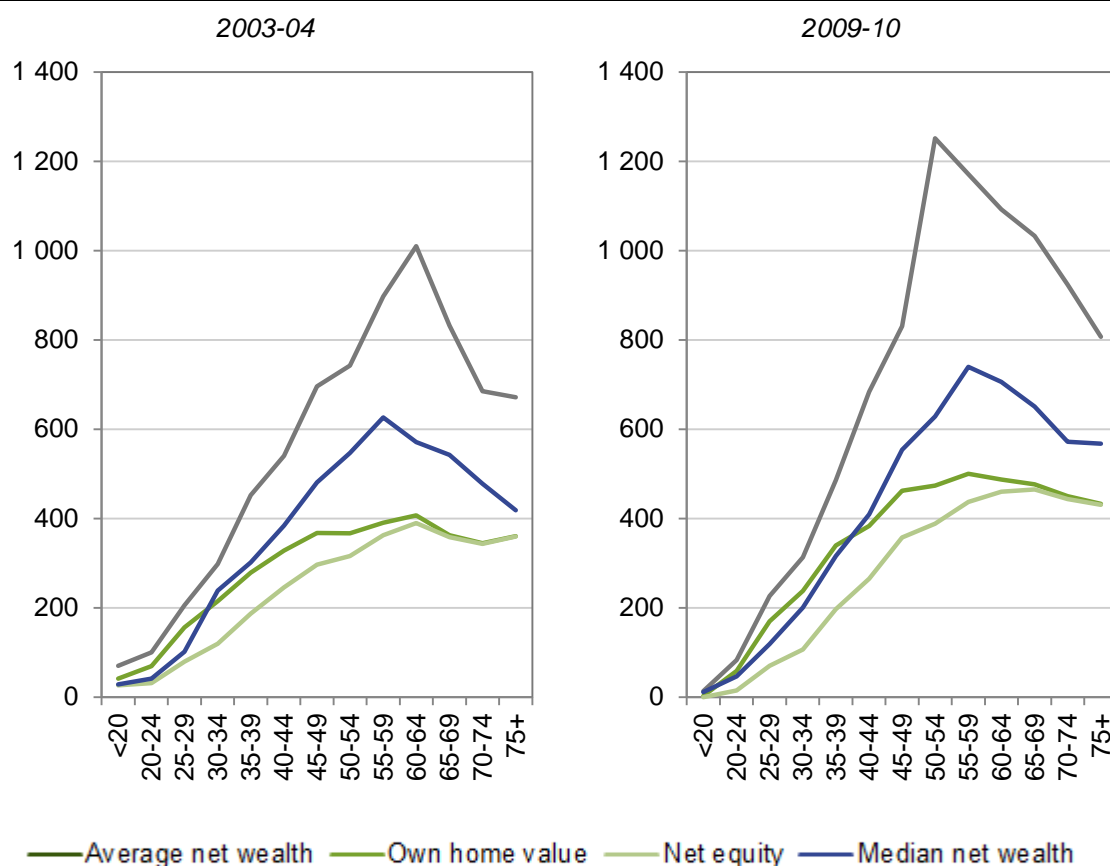


*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

Both Age Pension households and self-funded retirees have high equity positions in their homes. In 2009-10, both household types held an average 99 per cent equity stake in their own home. The high equity levels for over 65 year old households have been consistent over time (the same equity stake was also held in both 1998-99 and 2003-04).

## Evidence on bequests suggests households are not taking full advantage of their housing wealth during their lifetimes

Individuals may save over their lifetime with the aim of leaving a bequest to family or others (box 7.1). However, recent survey evidence from Australia suggests the importance of bequests in saving decisions is changing. While the motivations for savings have been unchanged for many with younger children (Harris, Loundes and Webster 2002; Lawrence and Goodnow 2011; Olsberg and Winters 2005), the

largest changes in attitude are among those aged over 50 years. For the latter group, National Seniors Australia and Challenger (2013) found the bequest motive is less important than other financial concerns in retirement, such as being able to afford aged care and medical costs, having money that lasts a lifetime, having a regular constant income that covers the bare essentials, and having an income that adjusts to rising prices over time.

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**Box 7.1    Motives underpinning bequests**

The motives that underpin bequests can be broadly grouped into three categories.

- *Altruism* — Donors may be directly interested in increasing the wellbeing of bequest recipients, such as charities and people who have been important in the donor's life This motive is particularly relevant to people with children or grandchildren.

- *Strategic or compensatory actions* — Bequests involve payment for services that the recipient delivers to the donor. An elderly person, for example, may leave a bequest to a neighbour who devoted time and effort in caring for them. Or a parent may use the prospect of bequests to induce children to help them when they are old.

- *Accidental* or *unplanned* — Although not a 'motive', bequests may be a by-product of saving for other reasons (such as a precautionary savings given uncertainties over life expectancy or to guard against possible health expenditures). Persons who plan to finance their expenditure from their own savings may die with some savings unspent, and that amount then constitutes a bequest.

*Sources*: Hurd and Smith (2002); Kopczuk (2010).

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Other Australian surveys also highlight the importance of funding retirement via savings decisions. Harris, Loundes and Webster (2002), for example, found:

- The top three motives for saving were retirement (34 per cent), holidays (31 per cent) and 'rainy day' unexpected costs (29 per cent). The bequest motive for saving was relatively unimportant (9 per cent) (pp. 208–9).

- Although the bequest motive was relatively unimportant:

  – it was slightly higher for older age cohorts than for younger cohorts. For example, 6 per cent of the 18–24 age cohort said that providing a bequest was the main reason for saving, compared with 8 per cent of the over 65 cohort (p. 209).

  – it was almost double for people with children (close to 13 per cent) compared with those without children (6 per cent) (p. 209).

Some evidence shows the bequest motive for saving is falling in importance. A large national study found 38 per cent of respondents stated they would leave

everything to their children, but 28 per cent of respondents expected to use all their assets while they were alive. More than one third of baby boomers (33 per cent) expected that to be the case (Olsberg and Winters 2005, pp. xii, 92–3).

The Henry Tax Review (Treasury 2010) also noted that bequests are likely to be less important for those who receive them. With longer life spans, children are inheriting from their parents much later in life, when they are often already well-established financially (Treasury 2010, p. 142).

However, despite changing attitudes towards bequests, data on the amount and number being made suggests bequests are becoming increasingly common and of higher value. Bequests are also more likely to be in the form of the family home. And while this may partly result from higher precautionary savings by households, it suggests households are not fully accessing their wealth during retirement.

In 2003, an estimated 1.4 per cent of the population received an inheritance, with the median and mean amounts received at around \$24 000 and \$82 000 (in 2010 dollars). The total amount inherited was estimated to be \$17.7 billion (in 2010 dollars) (Kelly and Harding 2006). By 2010, the total had increased to over \$20 billion,[100] and it was projected to increase to around \$89 billion by 2030 (in 2010 dollars) (Treasury 2010, p. 142).

Whether the bequests were 'accidental' or 'planned' is not clear from the aggregate data. Further, these aggregates do not provide insights into the form of the bequests (for example, a house or other form of wealth).

Probate data provide useful insights, although the non-electronic and non-searchable nature of these records limit their use. Despite this, from what evidence does exist, researchers found most bequests involve the family home and most go to the children of the deceased (Baker and Gilding 2011; O'Dwyer 2001).

The importance of housing in bequests is expected to increase. A study by Bankwest (2010) found the following changing patterns in inherited housing stock:[101]

- Housing inheritance was an estimated \$16 billion in 2009, but is projected to increase to \$31 billion in 2025.

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[100] Commission estimates from HILDA wave 10, questions 54a and 54b.

[101] The study did not draw on survey evidence of bequest behaviour, but on data on life expectancy rates, homeownership and median housing prices. It did not adjust for various factors that may reduce the size of bequests such as greater equity withdrawal; older people selling their properties to pay for residential aged care; life expectancy changes; variation in housing prices; and housing debt. Nevertheless, the study provides insights into the possible future level of housing inheritance.

- The number of inheritable estates with housing assets is projected to increase from 35 000 in 2009 to 68 000 in 2025 (whereas deaths are expected to increase by considerably less from around 110 000 in 2009 to a projected 150 000 in 2025).

- The total value of housing assets to be inherited between 2010 and 2025 is expected to be more than $400 billion.

- Households in New South Wales are expected to inherit the most housing wealth between 2009 and 2025, at 38 per cent of the national total (or $155 billion). This assumes that housing wealth is passed down to households within the State. New South Wales is followed by Victoria (25 per cent) and Queensland (17 per cent).

- Compared with other states, the Northern Territory, the ACT and Western Australia are expected to experience the fastest growth in inherited housing wealth between 2009 and 2025.

*Increasing house prices play a role in keeping housing wealth levels high*

Both self-funded retirees and those whose main income is the Age Pension have seen significant increases in the real value of their own home, in line with increases in property prices between 1993-94 and 2009-10 (figure 7.6). Over time, the gap between average house values for government pension and non-pension households has increased considerably.

Figure 7.6    **Home asset values of over 65 households, 1993-94 to 2009-10**
2011-12 dollars
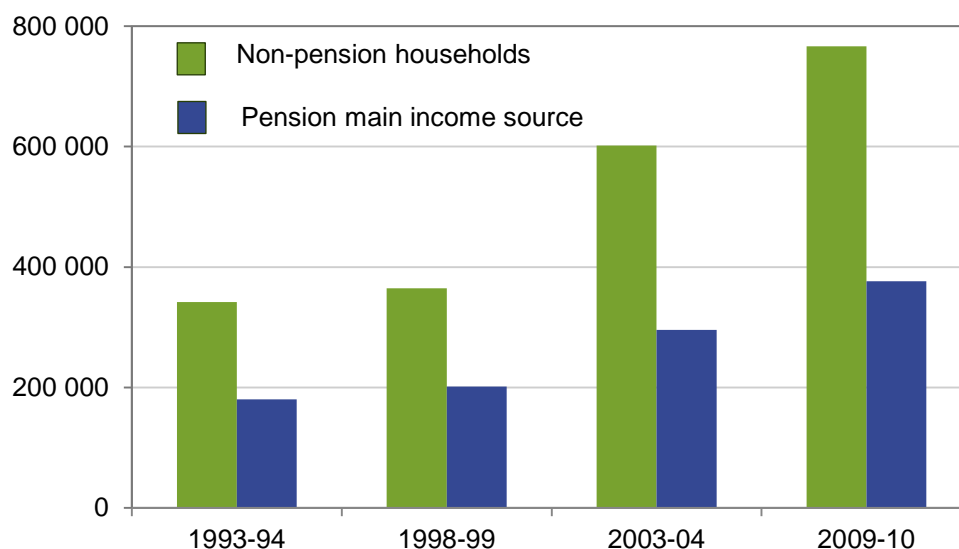


*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

## Many older Australians are asset rich but cash poor

While many older households have experienced growth in their net wealth (particularly in their own home), many have low incomes. People aged over 65 years have incomes that predominately place them in the bottom income deciles. In terms of disposable household income, these households are 'over' represented in the bottom four deciles — in 2009-10 over 75 per cent of all over 65 year old households had disposable incomes that placed them in the bottom 40 per cent of all households.

So, while many older households have significant assets (such as their home), they are cash poor. For households aged over 65 years and in the bottom two income deciles, average disposable incomes in 2009-10 were around $320 and $500 a week respectively (figure 7.7).

**Figure 7.7** **Home value and disposable income of pension-age households, 2009-10**

2011-12 dollars
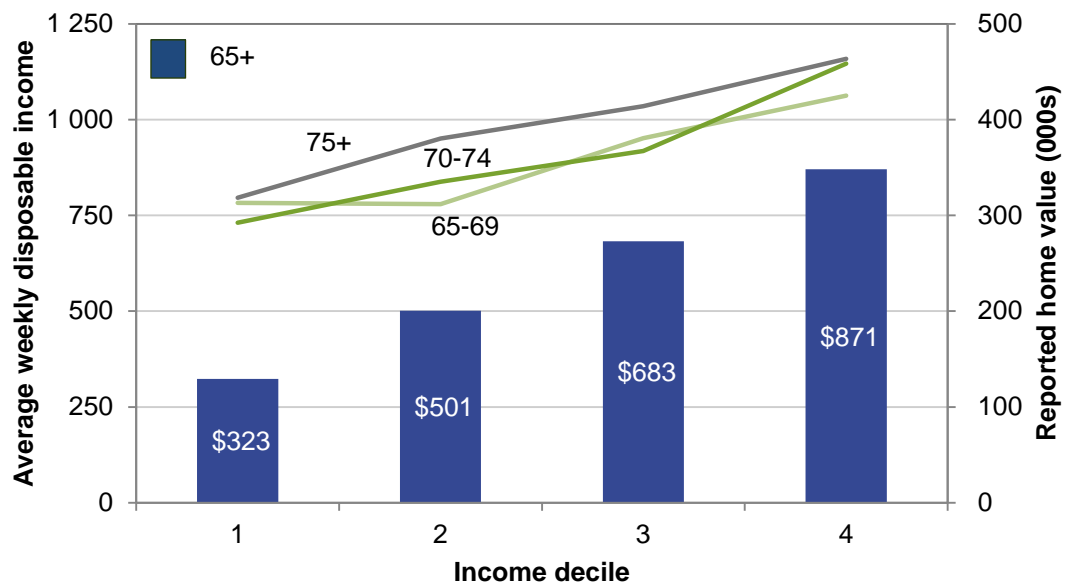


*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

## Younger cohorts have more invested in their own home

Younger cohorts have slightly lower home ownership rates compared with their older peers. However, the average values of homes for those do own their homes are higher than that of their older peers when they were the same age. Rising house

prices are likely to partly drive this trend. As the value of the housing stock has increased, even for a similar home, younger cohorts would need to invest more to purchase the property.

Across different cohorts, households aged 40–44 years in 1988-89 had the highest levels of wealth tied up in their home, on average (figure 7.8). The average home value for this group was $500 000 in 2009-10, when they were aged 60–64 years. So, future households will likely have higher wealth tied up in their own home than current older generations.

Figure 7.8    **Changes in average home value by age cohort**a

Age cohorts based on age in 1988-89, $'000, constant 2011-12 prices,
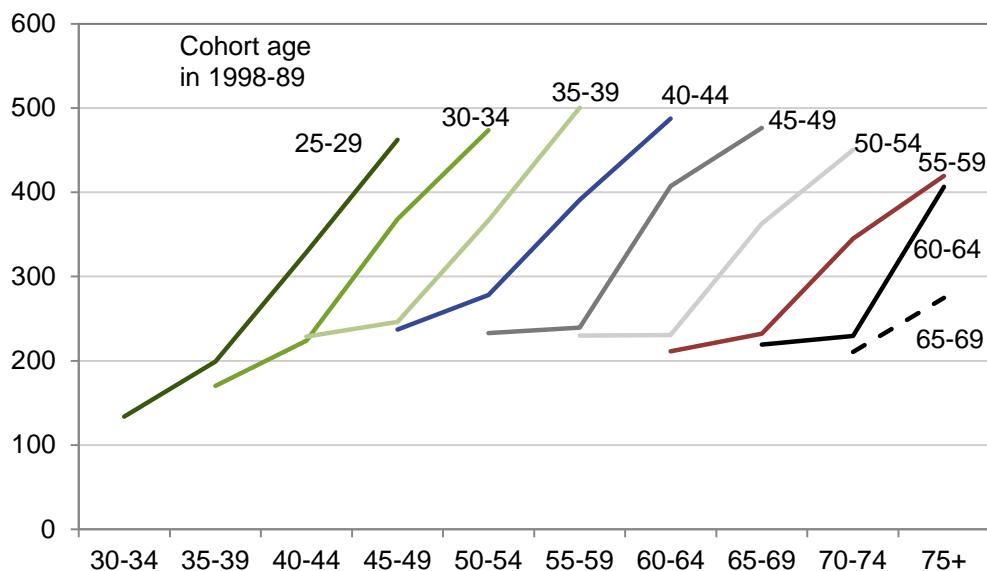


**a** No comparable information on own home values was collected in the 1988-89 survey. Lines depict reported own home values for different age cohorts as at 1988-89 over a 20 year period. For example, the line for the 25-29 year old cohort depicts reported home value when aged 30-34 in 1993-94, and subsequent values when they were aged  35-39 in 1998-99, 40-44 in 2003-04 and (approx.) 45-49 in 2009-10.

*Source*: ABS (various issues) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

# 7.2    Possible financing options to enable user co-contributions

For a range of age related expenses, a number of reviews and stakeholders have highlighted the scope for greater co-contributions from individuals to maintain and improve current service levels. In a recent Commission inquiry into aged care (PC 2011a), many participants argued greater co-contributions are needed to fund better services and provide a mechanism for greater choice. National Seniors

Australia (2010), for example, provided survey evidence to the inquiry suggesting older Australians are willing to make more co-contributions to the cost of aged care services:

> The survey results demonstrate a general willingness by Australians to pay for their own aged care in a more direct way than occurs in current arrangements through general tax revenue. People seem to accept the necessity for alternative and more direct funding options to finance the provision of aged care services and to be willing to do so if it results in greater choice of services, programs, and facilities for the individual.

> NSA [National Seniors Australia] believes that aged care funding options where the individual makes direct contributions towards his/her own aged care costs should be further investigated and seriously considered. (p. 14)

High and stable equity levels in the home as individuals age (discussed above) suggest many could use this equity to fund co-contributions to age-related, taxpayer-funded services. Further, as a savings instrument to help cover the costs of medical expenses, investment in the home appears, prima facie, to have some positive features. While health cost inflation has outstripped the CPI, it remains below the growth in house prices over the past 10 years (figure 7.9).

Figure 7.9 **Rising house prices have outstripped health cost increases, 2002–2013**
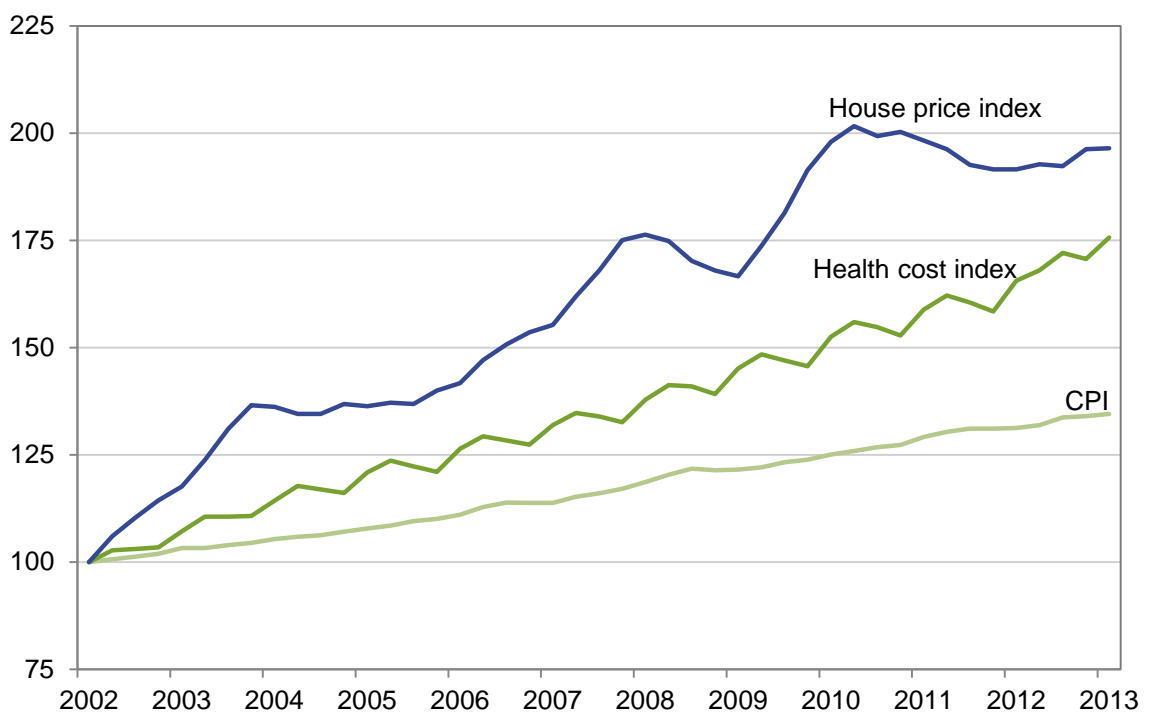


*Sources*: ABS 2013 *House Price Indexes: Eight Capital Cities*, Cat. no. 6416.0; ABS 2013 *Consumer Price Index, Australia*, Cat. no. 6401.0.

Given the size and growth of housing equity, the Commission's aged care report recommended a government-backed housing equity release scheme (PC 2011a, p. 101). The Commission considered this would help people contribute to their aged care and would overcome some distortions created by the different treatment of forms of wealth for determining Age Pension eligibility.

Both privately and government provided equity release schemes are already in operation. These vary from the general (used to provide funds for any purpose) to the specific (used to fund specific expenses, such as local government rates).

## Several market-based options are available

While private equity release products are available in Australia, the market is still in its infancy. To overcome some negative attitudes about equity release schemes, several lenders formed the Senior Australians Equity Release Association of Lenders (SEQUAL). The primary objective of the association is to develop an ethical and successful equity release market in Australia (SEQUAL 2013b).

In a study commissioned by SEQUAL, Deloitte found the equity release market in Australia consisted of just over 42 000 loans at December 2009 (SEQUAL 2013a), compared to less than half this amount in 2005 (16 500) (PC 2011a, p. 106). Total loans in 2009 amounted to over $3.3 billion, with an average loan of close to $80 000.

Private equity release schemes can be broadly classed into three groups:

- *Reverse mortgages* — households borrow money against the existing equity in their home, with interest also accruing against the equity. Repayment occurs on the sale of the property. Borrowings can be as a lump sum, a regular income stream or a line of credit.

- *Accommodation bond loans* — households borrow money against the equity in their home to meet the cost of an aged care accommodation bond. Borrowings are usually time limited (three to five years) and for up to 50 per cent of existing equity.

- *Home reversion schemes* — households sell a proportion of the equity in their home in exchange for a lump sum payment. The financier is then entitled to a fixed proportion of the future value of the property (on sale) and as such shares in any capital gains made.

## Some equity release schemes are government backed

Governments in Australia and some other countries have begun to offer equity release schemes to help households fund the cost of traditionally provided government services or to more generally provide households with additional income. These schemes extend beyond those targeted at covering age-related expenses. Below is a brief summary of some existing schemes.

### *Pension Loans Scheme*

Under the Australian Government pension loans scheme, people of Age Pension age (or their partners) whose income or assets mean they are not eligible for a pension, or people who receive only a part pension, can access capital tied up in their real estate assets (Department of Human Services 2013b). Introduced in 1996 and administered by Centrelink, the scheme allows older Australians to borrow against their housing equity so they can top up their part pension to a full pension rate or, if they are not eligible for the pension, receive a fortnightly income stream equivalent to the full pension rate. It does not include provision for one-off large payments. Compound interest is charged on the balance of the loan and calculated fortnightly. A loan under the scheme must be secured by real estate owned in Australia. It can be for a short time or an indefinite period. The scheme is currently not available for people to finance incomes in excess of the full Age Pension.

The scheme's key features include:

- a 'No Negative Equity Guarantee' (a guarantee that no matter how long the loan runs, the borrower can never owe more than the value of the security)
- a minimum age of 65 years
- annual loans capped at the maximum Age Pension plus pension supplement and rent assistance
- loans underwritten by the Australian Government
- availability Australia-wide
- availability as an income stream only
- an interest rate fixed by the relevant Minister.

The uptake of pension loans is low. In 2010, there were only 710 loans outstanding under the scheme (Medicare Australia 2011, p. 20), representing around 0.04 per cent of Age Pension age households in Australia in 2009-10.[102]

While the scheme provides an option to help fund retirement expenses, it has some unusual features that limit its effectiveness in helping those with the most constrained income levels to access the equity in their home. These features may partly explain why take up is so low.

First, the scheme is not available to those on the full pension rate. This group would be the most income constrained because they have limited, if any, other sources of income. Instead, it provides a means for those with non-home assets or other income sources to access equity held in real estate assets.

Second, it allows payments only up to the full Age Pension amount to be withdrawn from equity. So, its potential usefulness in helping fund co-contributions for health, aged care or other expenses is likely to be limited because such expenses are often lumpy and could be much larger than Age Pension amounts.

Nevertheless, the scheme demonstrates it is practical to develop models in which governments provide loans secured against housing equity for social welfare purposes.

### New Zealand's rates postponement scheme

Reforms to New Zealand's laws covering local government rates led to the development of a 'rates postponement' scheme by the Western Bay of Plenty District Council in 2003 (RP Scheme Managers 2013). Subsequently expanded to include 14 local councils, the scheme is now managed by a consortium of member councils.

The scheme allows those aged over 65 years to postpone the payment of their rates by agreeing to the postponed rates being paid on the sale of the dwelling or, at death, from the estate. It works as a reverse mortgage scheme. Rate payers essentially take equity from their property to pay their rates. Borrowing costs are competitive and set at the council's borrowing rate, plus a margin to cover administration costs so other rate payers do not cross-subsidise the scheme (box 7.2). By adopting a consortium approach, councils collectively have enough assets to pool their interests, from which securities can be issued to the market.

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[102] Based on the number of households whose reference person is aged 65 years or over in ABS (2012) *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record files.

They thus have another means, apart from their own borrowings, to raise the revenues to fund the rates shortfall.

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**Box 7.2    New Zealand's rates postponement scheme**

The rates postponement scheme is available to those aged over 65 years and allows rates to be postponed until the sale of the property or the death of the rate payers. Borrowings are limited to 80 per cent of the existing equity in the property and can be repaid whenever the household decides to do so. The following are key features of the scheme:

- Interest costs are set at the council's borrowing rate (between 5 and 5.75 per cent in mid-2013).

- A 1 per cent management levy and annual administrative fee is imposed to ensure other rate payers do not cross-subsidise the scheme

- A 0.25 per cent levy is charged, with revenue going to a reserve fund to cover for any unrecoverable money.

The council involved registers a charge against the property title for the outstanding amounts. Properties must also be insured.

To ensure households are fully informed about the scheme and its implications, all applicants must first seek independent financial advice.

*Source*: RP Scheme Managers (2013).

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However, uptake of the scheme has been limited. An independent inquiry into local government rates in New Zealand in 2007 found only a 'very small number of ratepayers have postponed rates through the optional rates postponement scheme' (Local Government Rates Inquiry 2007, p. 13). Despite the low uptake, an independent review of the scheme by the New Zealand Auditor General found the scheme is well designed (Office of the Auditor-General 2006). Further, the New Zealand Productivity Commission suggested the scheme has relieved some of the housing cost pressures faced by older New Zealanders (New Zealand Productivity Commission 2012, p. 99).

*UK aged care deferred payment schemes*

In the United Kingdom, the requirement to self-fund aged care expenses is based on a means test that includes the value of the home (with certain exemptions). An estimated 35 000 of the 55 000 people who entered aged care in 2012 were assessed as being over the means test due to the value of their home (Department of Health (United Kingdom) 2013, p. 4).

Many households were forced to sell their properties to meet aged care costs because they are unable to draw on their housing wealth in other ways. .Such 'forced' sales appear to create additional anxiety and stress for aged people, and therefore were perceived as far from ideal. In 2001 the UK Government provided local aged care authorities with the power to adopt deferred payment schemes (Department of Health (United Kingdom) 2013). These schemes are similar to New Zealand's rates deferment scheme, in that they help individuals access the equity in their home under a reverse mortgage arrangement. Interest, however, is not generally paid on the deferred debt.

The control of eligibility and rules rests with local aged care authorities and has led to an inconsistent approach. Some local aged care authorities have also had low uptake. Scheme rules vary considerably across local authorities, in terms of who can access the arrangements, conditions placed on the property (whether it is to be occupied), and the maximum amount that can be withdrawn. In 2012, only 4000 of the 55 000 self-funded aged care residents used a deferred payment scheme.

To address these issues, the UK Department of Health proposed a universal deferment scheme, which would replace the existing variable local authority schemes (Department of Health (United Kingdom) 2013). The universal scheme is still in development. The government also proposed to charge interest on deferred amounts, suggested to be around the local authorities' borrowing costs.

*South Australia's Seniors Rate Postponement Scheme*

In 2007, South Australia introduced the Seniors Rate Postponement Scheme. The scheme allows a ratepayer aged over 60 years who has a Seniors Card to postpone all but the minimum payment amount of their rates. Like the New Zealand scheme, the postponed amount acts as a reverse mortgage, with the deferred amount plus interest due on the sale or transfer of the property. The interest rate is favourable, set at 1 per cent plus the current cash advance rate (currently 6 per cent) (Department of the Premier and Cabinet (South Australia) 2013). Households can choose how much of their rates they wish to postpone over the minimum repayment, and can repay outstanding amounts at any time. Debt (postponed rates plus any other mortgages) is capped at 50 per cent of the value of the property.

*ACT's rates deferment*

In 2013, the ACT Government expanded its rates deferment arrangements to cover income poor, asset rich people aged over 65 years (Barr 2013). With taxation reforms in place to replace a number of taxes with higher land rates, the ACT

Government introduced an effective reverse mortgage mechanism to allow older residents to stay in their homes by accessing their equity levels. The arrangement is available to residents aged over 65 years whose gross income is less than $80 770 and whose property is worth more than $390 000 (ACT Revenue Office 2013). A low simple rate of interest is charged on deferred rates amounts.

*Schemes of other Australian local governments*

Some Australian councils have similar rates postponement schemes. But these schemes apply significantly higher interest rates to withdrawn funds than do the schemes in South Australia, the ACT and New Zealand.

Gympie Regional Council in Queensland, for example, has a rates postponement scheme for those aged over 65 years who hold a pensioner concession card (Gympie Regional Council 2013). The scheme acts as a reverse mortgage as per other postponement schemes, but it is expensive, with outstanding amounts attracting the same interest rate as overdue rates — 11 per cent per year compounded daily.

## What are the rationales for a government-backed equity release scheme?

Current means testing for access to aged care and for concessions for other age-related expenses exempt the family home. One rationale for such an exemption is that people have few market-based mechanisms to access their housing equity.

However, this environment is changing as private financial institutions develop products for equity withdrawal (discussed above). In effect, new financial instruments have substantially increased the potential household consumption of formerly low-income households.

With greater access to wealth tied up in a broader range of assets, one option to broaden the means testing of age-related government services would be to change the concessional treatment of owner-occupied dwellings, and to leave households to fund co-contributions by entering private arrangements with private equity withdrawal businesses.

However, as discussed in the Commission's report on aged care (PC 2011a), such private equity arrangements face several obstacles:

- *Information asymmetries* — significant information gaps may exist between market providers and potential market participants. The Commission has

previously cited evidence that older Australians lack the information necessary to make fully informed decisions on equity release products (PC 2011a, p. 107).

- *Vulnerable populations* — some older Australians may be vulnerable to exploitation in terms of new financial products, such as equity release schemes. Further, those who need to access equity in their homes may be making decisions in a time of crisis, such as an unexpected health issue. Those individuals may focus on the immediate crisis and, be less willing and able to focus adequately on longer-term financial matters. Such crises can also constrain the time for making informed decisions. Additional regulatory safeguards may be required to ameliorate such issues. However, regulatory responses impose costs, and the resulting transaction costs involved may exclude part of the population from private markets.

Moreover, how the private equity withdrawal market will develop is not yet clear. It has increased rapidly from a small base, but still represents a relatively niche product and may not be available for all households with equity. For example, considerable uncertainty may surround future housing values in some regional areas and those with particular purchasing arrangements, such as homes within retirement village settings (PC 2011a, p. 111).

Accordingly, if policy were to change so a certain threshold of private housing equity triggered co-contributions for taxpayer funded services, some households may not be able to access private equity withdrawal arrangements. In that instance, government would have to step in and waive any co-contribution. The cost to other taxpayers of waiving co-contributions would typically far exceed the costs of governments providing a scheme for households to access the equity in their home. If this holds, it provides a case for government to provide equity withdrawal products hypothecated to services that taxpayers would otherwise have to fully subsidise. On these grounds, there may be arguments for governments to offer equity withdrawal arrangements at concessional rates of interest. A government-backed equity release scheme may also have the advantage of allowing greater co-contributions by asset rich, income poor aged Australians, without adversely affecting their private consumption.

*Equity release schemes could rise in importance if the tax base is broadened*

The Henry Tax Review (Treasury 2010) and other analyses suggested municipal rates are an efficient tax that could displace other less efficient taxes such as stamp duties. However, a barrier to the expansion of rates as a funding mechanism is the burden they place on asset rich, income poor households. Given this, the wider application of equity release schemes may assist tax reform.

## Equity withdrawal arrangements appear to identify those with a capacity to pay

Notwithstanding high homeownership rates among older Australians, a significant minority do not own a home, so would not have to make co-contributions if assets tests underpinning co-contribution requirements were changed to include the home. In 2009-10, close to 17 per cent of over 65 year old households did not own their own home.[103] However, as expected, this proportion was not evenly distributed among income groups, with the highest rates of non-home ownership among households aged over 65 years in the bottom three deciles (figure 7.10). For example, 26 per cent of over 65 year old households in the first decile did not own their own home — for almost all of these households, their main income source was the Age Pension. The scope of any equity release scheme may also be limited by some housing types for which equity release products are unsuitable, such as low value flats and other homes.

Figure 7.10 **Proportion of over 65 households who did not own their own home, by disposable income decile, 2009-10**[a]

Per cent of households
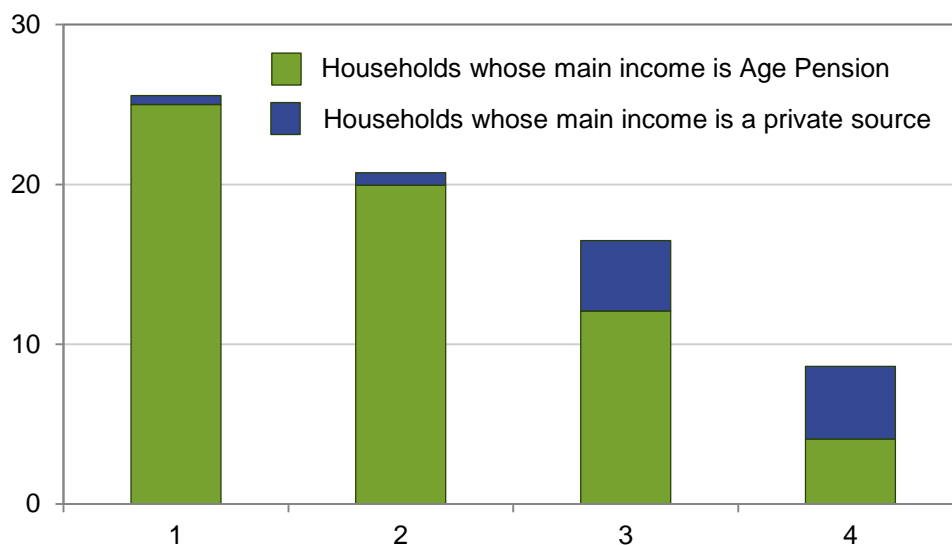


**a** 1–4 are the four lowest disposable income deciles, with 1 being the lowest (based in income in 2011-12 dollars).

*Source*: ABS 2012 *Household Expenditure Survey*, Cat. no. 6503.0, confidentialised unit record file.

The exemption of such households from making co contributions is consistent with 'an ability to pay' criterion and would ensure that disadvantaged individuals and households would maintain access to services that met their main needs.

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103 This figure does not include individuals who lived in residential aged care facilities.

## Are there disadvantages?

As highlighted in submissions to the Commission's aged care inquiry, there is some opposition to any use of home equity to help fund co-contributions to aged care related expenses. National Seniors Australia (2012), while supporting greater co-contributions, said:

> In regard to financing, the sting in the tail is the inclusion of the family home in the assets test … Seventy per cent of seniors surveyed flatly rejected this proposal.

> This doesn't mean they're unwilling to contribute. In fact, three quarters had no problem with paying something towards their aged care. But when it comes to the family home, the message to government is: 'hands off'. (2012, p. 1)

Some concerns reflect the current private market for equity withdrawal (as discussed above). Others reflect that a house may need to be sold to meet aged care or other related costs if accessible financing options are not available. As discussed above, this can occur in the United Kingdom, where the aged care means test includes the home as an assessable asset and where many local aged care authorities have not offered access to deferred payment schemes (Department of Health (United Kingdom) 2013). However, caps can be set on equity withdrawal amounts and any sale of a dwelling can be barred until its usual occupants have died. Inevitably, any arrangement that involves relative winners (working age younger taxpayers) and losers (asset rich, income poor aged households) will invoke major debates about the desirability and nature of those transfers. For this reason, this issue is worth careful consideration and community debate, which should take place before ageing costs start to have substantial fiscal implications.

Aside from the above concerns, any government equity release scheme would impose costs and raise implementation issues.

Once there is provision for co-contributions from housing equity, people may have weaker incentives to acquire, preserve and increase the value of housing assets. That outcome may lead to:

- greater consumption at younger ages and lower home ownership rates

- the greater and earlier use of private equity withdrawal arrangements so the residual assets do not trigger any requirement for co-contributions

- earlier downsizing, and either greater consumption or early transfers of wealth to would-be inheritors.

However, despite the possibility of such responses, governments can use anti-avoidance measures to reduce the risks of such behaviours at older ages (as it does already with gifting provisions). And responses by the young to possible asset

tests when they are old are likely to be relatively weak, reflecting discounting of the future, myopia and the fact that caps would apply to any government-backed equity withdrawal.

The introduction of a government scheme would also likely have some effect on private suppliers of equity release schemes. Industry participants have raised concerns about the potential crowding out of market activity. Some argue a specific government scheme is not needed, unless it only 'filled the gaps':

> The Australian Equity Release market is both efficient and ethical. Older Australians have access to well-designed products both in the form of Reverse Mortgages and Home Reversion Schemes. A degree of competition between major banks and non-bank specialist providers delivers a robust environment for consumer benefit. It is therefore not necessary for a Government-back equity release scheme to be developed.

> … There may also be a limited place for government operated schemes which fill the 'gaps' that are less attractive to private providers (i.e. small and gradual draw down of equity via the Centrelink Pension Loans Scheme or similar). (SEQUAL 2011, p. 13)

Scheme design would be important in determining the extent of crowding out. Eligibility requirements that narrow the scope of any scheme — say, only to health and aged care expenses, and for individuals and households of a certain age and asset position — may largely eliminate any crowding out if such individuals or households are unlikely to otherwise use market supplied products.

Further, even if crowding out were to occur, a government scheme may still be warranted from an overall efficiency and welfare perspective. Its desirability would depend on the net community-wide benefits, which would need to account for the likelihood of securing co-contributions through market-based schemes, the respective costs and benefits of each scheme, and the costs involved in governments using alternatives to fund age-related expenditures (such as higher taxes and their associated costs). Given these considerations, some crowding out through a government backed scheme may still represent an efficient outcome. However, the need for ongoing government participation should be reviewed over time to see whether private sector offerings had sufficiently matured.

## Are there alternatives?

Enabling individuals and households to make co-contributions to help fund government services can be achieved through other means. Both compulsory savings accounts and insurance may be used to fund age-related expenditures.

*Compulsory savings*

Several countries have implemented compulsory savings accounts to allow individuals to contribute to the cost of some government services. Singapore, China, the United States and South Africa have developed savings accounts hypothecated to health care costs (so-called medical savings accounts) (Hsu 2010).

Singapore's compulsory medical savings account operates in conjunction with other compulsory savings and insurance products (Barr 2001a). It is funded by levies on income, with rates varying by age and with contributions shared between employees and employers. To ensure funds are not run down too quickly, a complex array of expenses is allowed, and varying amounts can be withdrawn to fund specific health expenditures. Medical savings accounts have several advantages. They can:

- slowly accumulate during a person's healthier years

- reduce the problems associated with fiscal gaps as a population ages

- expose people to the full costs of various services, discouraging overuse and providing incentives for people to use services that have genuine value for them (Hsu 2010). Whether these gains are realised depends on whether people are well-informed and can choose from competing services — an area of ongoing controversy.

Compulsory savings were raised as a means to help fund aged care services in the Commission's aged care report (PC 2011a). However, the Commission pointed out medical savings accounts do not pool risk, so are most relevant for relatively moderate and predictable costs, such as a short-duration stay in a nursing home. In contrast, high cost, low probability events are better suited to some form of insurance or stop loss arrangement. Such events include intensive long-term care and the medical costs associated with chronic diseases.

Consequently, any efficient funding mechanism for age-related costs would need to involve some risk pooling (achieved in Australia through claims on consolidated revenue at the time of use). That said, private savings may be a useful adjunct to risk pooling. However, any distinction between the forms of such saving is arbitrary. As long as individuals and households do save, government would have little rationale to mandate a specific savings instrument.

Australia already has compulsory retirement savings through superannuation, and most households already save through a number of instruments for retirement (particularly via real estate, with close to 80 per cent of households aged over 65 years owning their home). While a separate savings account to fund predictable age-related expenses should not be rejected without further analysis, a stronger case

seems to exist for overcoming barriers to the use of pre-existing savings (barriers such as those posed by real estate transfer taxes and pension means test arrangements). These areas would benefit from further analysis.

*Compulsory insurance*

Compulsory insurance, either privately operated or publically administered through hypothecated taxation measures, provides another means for private funding of age-related expenses. Yet, for age-related expenses such as aged care, compulsory insurance arrangements do not exist.

The Commission's aged care report concluded compulsory insurance was not warranted:

> After weighing up the pros and cons, the Commission does not consider that a compulsory insurance scheme, in the context of aged care, represents an improvement over the pay-as-you-go tax financed system supplemented by higher co-payments by those with the financial capacity to make them and a lifetime stoploss mechanism (to achieve risk pooling) for the high costs of care. (PC 2011a, p. 128)

*Reducing the transaction costs from downsizing*

Another means for an individual or household to better access the wealth tied up in their home is to reduce the transaction costs of doing so. Of these costs, stamp duty on real estate transactions and the interaction of the home's sale with the Age Pension means test represent two of the largest barriers to allowing access to home equity. These arrangements also pose a barrier to better housing decisions as people age, as it makes them reluctant to downsize or move into more age appropriate housing.

The debate around stamp duty on residential transactions is long standing. The Henry Tax review found stamp duties were particularly inefficient taxes and should be replaced by other taxation measures (Treasury 2010). Doing so would lessen disincentives for people to downsize their housing as they age. One jurisdiction — the ACT — has begun to eliminate stamp duties as a source of funds and to move to municipal rates as an alternative (ACT Government 2013). As discussed in the Henry Tax review and the Commission's disability inquiry (PC 2011c), rates are highly efficient taxes. Capital gains tax is another area of tax that may create similar disincentives for older households to downsize, particularly for those with higher home values.

On the issue of Age Pension eligibility, one option would be to quarantine any surplus funds acquired from selling the home from the means test. In its aged care

report, the Commission recommended the establishment of a savings scheme to address this issue:

> One option, favoured by the Commission, is to establish a pensioners savings scheme, provided or backed by the Government, that would be available for age pensioners selling their homes. Under this arrangement any surplus funds from the sale of the home could be invested in the Government scheme. It would offer an alternative (or supplement) to an accommodation bond and be exempt from the Age Pension assets test. Older Australians using this facility could draw upon it to fund their day-to-day living expenses, their aged care costs or any other expenses. The scheme would be free of entry, exit and management fees. The Government could guarantee the capital and maintain its real value through indexation at the consumer price index (CPI) rate to make it more attractive than an accommodation bond which does not pay interest. (PC 2011a, pp. 50–52)

The Australian Government recently announced a trial of the Commission's proposed scheme, set to begin 1 July 2014 (Australian Government 2013c, p. 152). The trial will be open to those who have owned their home for at least 25 years, and will allow them to deposit at least 80 per cent of the sale proceeds (up to $200 000). These proceeds will be exempt from the Age Pension means test. The trial will close to new customers from 1 July 2017. The critical issue is not just whether this trial works, but government's willingness to experiment with novel funding approaches, given the fiscal realities noted in chapter 5.

## 7.3    How a government equity release scheme could work to help fund age-related public expenses

Existing equity release schemes focus on helping fund a predictable set of household expenses, such as council rates. These expenses are of a known quantum and are incurred every year, making schemes simpler to set up and administer. Further, they help meet expenses for which the common practice is user pays.

Extending such schemes to other areas of government service delivery, particularly when the costs are almost entirely funded by governments, poses challenges. In the area of health, for example, costs associated with public hospitals are bulk billed. Individuals do not usually receive a bill requiring them to contribute to the costs of the service. Similar arrangements exist for other bulk billed services such as general practitioners. And, many aged care services too are directly government funded.

The area of health is further complicated by the existing market structure. Service providers are heavily regulated (often for good reason), and the supply of service providers is restricted (both by teaching institutions and medical colleges). So, a

risk exists that a higher capacity to pay for health services may simply translate into higher prices.

Given these issues, it is important to explore the scope of equity release schemes to fund age-related expenses. Are the schemes of limited effectiveness in some areas, such as health? Or can they be flexibly used to fund a range of age-related expenses?

## Aged care provides a starting point

The Commission's aged care report proposed an equity release scheme to improve individuals' access to aged care services (PC 2011a, pp. 113–15). This scheme could provide a starting point for developing a more comprehensive scheme for individuals and households to contribute to a broader set of age-related costs.

The Commission's proposed scheme would provide concessional access (compared with access under market instruments) to the equity tied up in the home (box 7.3). It would operate alongside instruments provided by the market and focus on care recipients who have low income, but hold assets that could contribute to the costs of their care. The scheme would allow individuals to draw down small regular sums of money.

Once such a scheme were established, it would be possible to expand the scope of allowable expenses. These expenses could include any relevant user pay costs for government service delivery — for example, council rates for those using in-home aged care services. The scope of the scheme could also be expanded to cover some health-related costs (discussed below).

### *Some health-related expenses could be brought under the scheme*

Co-contributions to health-related expenses could also be funded through an expanded government aged care equity release scheme. One option is to allow the scheme to cover certain private health expenditures to address falling private health insurance coverage among older age groups (figure 7.2). This approach could include:

- allowing the equity release scheme to fund private health insurance premiums, and/or

- allowing equity withdrawals to fund 'out-of-pocket' gaps paid under private care arrangements.

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> **Box 7.3    Features of the equity release scheme proposed in the Commission's aged care report**
>
> - Eligible individuals accessing a government-backed line of credit secured against their principal residence (or their share, which would generally be 50 per cent, if a couple is living in the home).
> - Flexibility in the rate at which individuals can draw on the line of credit, up to a specified limit (assessed at the time of the loan), so long as it is applied to aged care services (including residential aged care accommodation charges).
> - Relatively low upfront charges.
> - Preferential interest charges (equivalent to the consumer price index), calculated on a daily basis and accrued on the loan outstanding (not the undrawn portion of the maximum amount).
> - Payment of the loan from the person's estate on death (unless a partner, carer or child still lives in the house). In the latter situation, the outstanding balance of the line of credit would be repayable when the spouse, partner or dependent child ceases to permanently reside in that home or ceases to be a dependant.
> - Once the loan amount is drawn down (together with interest charges), and reaches the maximum allowable amount, no further equity can be drawn, and there is no application of further interest charges — in effect, a no negative equity guarantee, with a minimum guaranteed level of remaining equity.
> - No treatment of funds accessed through the scheme as an income stream (so no adverse effect any pension benefits), so long as the funds are used for approved expenses and not accumulated.
> - A design that makes the scheme work alongside the existing and potential private market rather than as a competitor.
> - A set cap on the amount of equity that could be withdrawn.
>
> In response to the Commission's report, the Australian Government did not support the recommended scheme at that time (Australian Government 2012a, p. 12). This response was due to a decision to not extend the Age Pension means test to include a person's principal residence.
>
> *Sources*: Australian Government (2012a, p. 12); PC (2011a, pp. 113–15).

Including private health insurance costs in the scheme may overcome the reduction in private health insurance coverage among older Australians, thereby leading to less use of publically provided health care services. However, for it to be successful in reducing government health expenditures, treatment coverage by private insurance would need to increase. As discussed above, despite the relatively high private insurance coverage in Australia, government still bears most health costs.

The effect of allowing the scheme to cover payment 'gaps' is unclear and warrants investigation. On one hand, this coverage could increase the capacity of many to

pay for private services; however, given the restricted market, higher prices might result. On the other hand, making private insurance more accessible might expand the depth of the private market, spurring competition between providers. In any event, other reforms to health workforce and service delivery more broadly to improve productivity and competition are issues that Australian governments will have to confront over the next 40 years (see chapter 8). If these reforms go ahead, they then may address some market imperfections and improve the potential benefits of a more co-funded health system.

## 7.4 Possible effects of using equity release to fund co-contributions

For age-related expenses such as aged care (and, to a lesser extent, health care), greater individual funding of such services could lead to significant gains from greater consumer directed care — that is, higher quality and better suited services (PC 2011b, p. XXVIII, 2011c, pp. 150–2).[104] It also may help to reduce the risk that governments use further rationing to manage the fiscal pressures from age-related costs.

The impact of such schemes on governments' exposure to age-related fiscal pressures will depend on several factors:

- the extent of older households' wealth tied up in the home (discussed above)

- the level of contributions made and by whom (that is, whether those who account for the greatest share of costs under current policy settings also have the capacity to contribute to funding their care)

- the nature of policy and scheme design

- the broader political and consumer acceptance of using wealth tied up in the home.

Considerable uncertainty surrounds many of these factors, which the development of any large-scale arrangements would need to consider.

Robust modelling of the potential effects of equity release schemes would require in-depth data on service use, including the income and asset levels of consumers.

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[104] Greater individual funding, if coupled with reforms that allow service providers to offer a range of services can provide a means for consumers to influence what services are offered. Further, individual funding will help ensure that those services that provide the greatest value to consumers also receive the greatest funding.

Nonetheless, it is useful to highlight the potential of such schemes to enable greater individual co-contributions to government provided services.

House prices have risen over time in real terms, a trend that is likely to continue. Against this backdrop, even under conservative assumptions (box 7.4), allowing households aged over 65 years to easily access their home equity to help fund health and aged care costs could have a significant impact on reducing fiscal gaps.

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**Box 7.4    Stylised approach to projecting wealth levels in the home**

Stylised projections of the home wealth can be made using data on ownership rates, net equity levels and average house value by age from the ABS Household Expenditure Survey (see section 5.1). Based on self-reported values, estimates from the Household Expenditure Survey suggested the housing stock represented by a household's home (thus excluding residential investment properties) was around $3.24 trillion in 2009-10. This value, combined with real housing price growth (assumed to be 2 per cent over the longer term) can be used to project home wealth for those aged over 65 years.

The estimates involve significant uncertainty because they are based on self-reported house values. There may also be concerns over the representativeness of home-types and values of those households within Household Expenditure Survey, compared with the entire housing stock. Nevertheless, the results accord with other, independent estimates. Bankwest, for example, used real estate transaction data to estimate the value of Australia's housing stock in 2009 at around $3.5 trillion (Bankwest 2010, p. 3). Other estimates are higher. RP Data estimated the residential housing market in 2013 to be worth around $4.86 trillion (RP Data 2013, p. 1).

Considerable uncertainties also exist regarding the real growth in the value of housing assets. Between 1960 and 2012, real annual housing asset value growth has been on average around 2 per cent. Between 2002 and 2012 it was 4 per cent. However, over a more recent time horizon post the global financial crisis, real house prices have fallen between 2010 and 2012 by 0.4 per cent. Asset value growth will depend on both future economic conditions (economic growth, interest rates, changes to housing supply for example) and demographic changes (primarily population growth).

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If, for example, contributions by households aged over 75 years were capped so only half of the real increase in the equity value of the home is used to contribute to the cost of government services, then there is potentially $5 billion available to help fund health and aged care services in 2020. By 2060, such households would potentially be able to contribute around $38 billion (in 2011-12 dollars), which would represent around 32 per cent of the projected public cost of these services given current policy settings.

This simple illustration highlights the scope of such schemes to help ease the fiscal burden on governments from an ageing population. The greater use of equity withdrawal to partially fund government-subsidised age-related services may therefore have a twin economic effect by reducing the fiscal costs to government, while stimulating the labour force participation rates of potential estate beneficiaries (chapter 3). It also suggests equity release schemes might underpin greater consumer directed service provision.

# 8   Improving health care productivity to alleviate fiscal pressures

**Key points**

Improving productivity in health care is a desirable way of offsetting cost increases from ageing.

- Productivity gains can allow future health needs to be met at a lower cost.
- A caveat is that some worthwhile productivity-enhancing reforms, for example from advanced technology, may lead to higher total costs through greater levels of use.

Measuring health productivity is complex and estimates need careful interpretation.

There is considerable scope to improve Australia's health productivity (although devising and implementing appropriate policies in the health field is complicated). Areas where reform could be investigated include:

- *Financial incentives and regulation*: health regulation and differentiated funding can distort choices between procedures, and between providers (such as emergency departments and general practitioners). The split in funding responsibilities between levels of government can contribute to this issue.
- *Organisational efficiencies:* adoption of 'lean' management principles and superior care models by hospitals could lower costs.
- *Diffusing medical research:* could help reduce over-diagnosis and over-treatment.
- *Workforce demarcation and regulation*: current arrangements could inhibit more efficient skill mixes and create unnecessary regulatory burdens.
- *The cost effective use of technology and pharmaceuticals*: could directly reduce costs and facilitate other reforms (such as telehealth in concert with modified scopes of practice).
- *Procurement*: hospitals, in particular, could leverage purchasing power by aggregating some purchases, and seek efficiencies in the purchasing process itself.
- *Preventative health measures:* could improve the overall health of the population, but the impacts and cost effectiveness of some preventative measures, including on overall (long-term) government expenditures, are marginal or unclear.

Further reform could bring significant benefits and help to alleviate fiscal pressures. A 5 per cent improvement in health sector productivity could reduce the projected fiscal pressure from rising health costs by 0.5 percentage points of GDP in 2059-60.

Health systems in many OECD countries, including Australia, are placing increasing fiscal pressure on governments. Not only has the demand for health care been rising, so too have the costs of service delivery, including as more 'high tech' medicine has come on stream. These pressures seem destined to intensify over time as populations age, as the complexity of needs increases with the prevalence of multiple chronic diseases, and as peoples' expectations for access to high quality health care continue to rise. As discussed in chapter 5, the Commission's projections are that health care expenditures by Australian governments will increase significantly over coming years (from around 6.5 per cent of GDP in 2011-12 to nearly 11 per cent of GDP in 2059-60) contributing to the higher fiscal costs associated with ageing generally.

In response, the OECD and others have been evaluating several possible policy approaches that governments can adopt to contain health costs (Moreno-Serra 2013). As noted later, the Australian Government's Intergenerational Reports have also highlighted the benefits of reform. Policies can be categorised as focussing on provider behaviour, consumer behaviour or overall administration costs.

Some of the policies work by constraining the quantity (and/or quality) of health services provided. This may be warranted in cases where, for instance, market distortions contribute to 'over-servicing' or 'gold-plating'. However, there is also a risk that some measures to constrain the use of services will unduly worsen health outcomes (and, at times, increase overall costs to governments). Governments should seek to avoid this. Indeed, even in a climate of fiscal stringency, it can be economically justifiable to bring new (and higher cost) treatments on line, or to expand health services, provided the benefits to society are sufficient to justify incurring the extra costs. Of course, this in turn may necessitate reductions in other forms of government spending, tax increases or other measures to ensure fiscal sustainability.

Improving the productivity of health services is a fiscally and economically superior way of meeting health needs while containing costs than simply adjusting the quantity or quality of services provided. Many productivity improvements would enable future health needs to be met at a lower cost, thereby alleviating fiscal pressures. The benefits of this approach, where it is feasible, are self-evident.

This chapter examines the scope for productivity improvements in health care, and the extent to which these might offset the future cost increases associated with ageing. In doing so, it:

- explains the meaning of productivity in a health care context, its relationship to costs and health outcomes, and some aspects of its measurement (section 8.1)

- reports past estimates of the scope for productivity gains in Australia's health sector (section 8.2)

- discusses potential sources of future productivity improvements (section 8.3)

- calculates estimates of the fiscal savings that might result (section 8.4).

The chapter does not aim to be comprehensive, but highlights some complexities in increasing the level of productivity, while giving a sense of savings available from further gains.

It should be recognised that there is another way governments might trim their health care expenditures. They might reduce prices paid (per unit) for medical products or services, without altering productivity or the quantity or quality demanded or supplied. This may be possible where market characteristics or distortions allow suppliers to extract 'monopoly rents', due for example to insufficient competition and/or government policies and regulations. While governments should take such opportunities where possible, this chapter focuses mainly on the productivity path to containing costs and improving health sector efficiency.

## 8.1    Health sector productivity: rationale, concepts and some measurement traps

*The promise of productivity*

Productivity is about getting the most value from a set of resources. In health care, productivity improvements allow more health services to be delivered, or additional future demands to be met, from existing resources — doctors, nurses and allied health workers, hospitals and clinics, pharmaceuticals and medical devices, and so on. Alternatively, in principle, productivity improvements can allow health services to be maintained while using fewer or cheaper resources.

Productivity encompasses the concept of productive efficiency[105] and is related to the concept of *cost effectiveness* (which assesses whether a specific outcome is

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[105] The health economics and policy literature contains several, sometimes conflicting, definitions of 'efficiency' and related concepts (Papanicolas and Smith 2013, pp. 23–24). The definitions used in this chapter are the standard economic definitions as set out in PC (2013d). Productive efficiency is a subset of the requirements for overall economic efficiency. The relationship between productive efficiency and cost effectiveness is also discussed in PC (2006a) and Gabbitas and Jeffs (2008). Importantly, an increase in 'productivity' does not necessarily entail an increase in 'production' or the volume of services provided.

produced for the minimum cost, including by examining the costs of alternative ways to achieve the outcome). By reducing the inputs needed for a given level of output, improvements in productivity can lead to greater cost effectiveness, and assist with cost containment in the health sector. This is a key attraction of productivity improvements in a fiscally constrained environment.

The need to obtain 'value for money' from the health system, especially in the context of increasing costs due to ageing, was recognised in the 2010 Intergenerational Report (IGR) (although not explicitly included in its projections):

> Reforms aimed at improving efficiency also could aid fiscal sustainability in the face of increasing demands on the health system. It will be important to encourage improvements in efficiency and quality, while being flexible enough to enable care to be provided by the most appropriate professionals in the most appropriate places. (Australian Government 2010, p. 54)

Some broad areas where productivity improvements may be feasible that would alleviate budget pressures are: the use of the health workforce and existing technology; hospital management; procurement practices; and the way that elements of the health system interact in order to achieve cost effective treatments and a cost effective sector overall. Financial incentives and regulations that influence behaviour in the health system, and the institutional arrangements associated with them, often underpin potential improvements in the sector. (Section 8.3 explores in more detail the scope for such improvements.)

*Some productivity improvements may not reduce costs*

While higher health productivity offers a means of ameliorating cost pressures, it is important to recognise that not all productivity improvements automatically reduce overall costs. In particular, introducing new medical technology can improve productivity but have mixed effects on health care costs, as the Commission noted in its 2005 report (PC 2005d, p. 150):

- Like the impact of technology in most other industries, it may make existing treatments cheaper. For example, for people aged over 65 years, technology is likely to have been one of the factors contributing to a significant reduction in the average length of stay in public and private hospitals, with concomitant savings for the hospital system.

- On the other hand, technology can *increase* the total cost of health care by opening up new avenues for treating serious conditions.

- And even in cases where technology improvements make individual treatments or processes cheaper, a rise in the use of those treatments can lead to an overall

increase in cost, albeit with those receiving these treatments often gaining improved quality of life.

Of course, as alluded to earlier, in cases where the introduction of new technology leads to an expansion in treatments, including for previously untreatable conditions, the additional health benefits may well be worth having, notwithstanding the additional fiscal costs entailed. In principle though, were a government solely concerned with fiscal costs, it should be able to introduce new productivity-enhancing technology as a means of reducing the costs of existing treatments, and thereby improve its budgetary position. In practice, the likely increases in costs due to new medical technology, including pharmaceuticals (discussed in chapter 4), are widely recognised, and incorporated into existing projections through the use of a 'technology growth factor'(Australian Government 2010).

*Measuring genuine, rather than faux, 'productivity'*

Policy interventions should be selected to deliver the greatest net benefit for the community as a whole. However, in health, determining the 'best' policy is further complicated by measurement difficulties. Even measuring productivity in health care is difficult, as pinpointing causes and measuring outputs and outcomes in health care is inherently fraught (box 8.1).

If productivity is mismeasured, say because partial or potentially misleading indicators of productivity are used, there is a risk that policies based on such measures will not generate genuine gains. In particular, worse health outcomes could result from failing to consider quality and simply pursuing increases in quantity (using the same resources). For example, if a general practitioner's productivity were judged solely based on the number of patients seen per day, the practitioner could improve such 'productivity' by reducing the average consulting time per patient. Such 'drive-through' servicing could reduce health outcomes by risking a less than appropriate examination of patients' individual needs, particularly in complex cases. In such cases, an apparent productivity improvement may have led to cost reductions (at least in the short term), but could worsen health outcomes and overall productivity.[106] These risks highlight the importance of measuring productivity in health care carefully and applying appropriate caution when using such measures.

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[106] Conversely, failing to account for quality improvements can result in a decline in observed productivity. For example, additional inputs could be used to achieve a better quality, but unchanged quantity, of outputs. Unless the measure of output is adjusted to reflect the increased quality, the use of additional inputs would be incorrectly reflected as a drop in productivity (Gabbitas and Jeffs 2008, p. 7).

Box 8.1      **Measuring health productivity**

The health care sector can be thought of as using inputs (including the overall number and level of skill of the health workforce, medical and office technology, pharmaceuticals and capital) to produce outputs (including GP consultations, hip replacements, heart surgeries and cancer treatments) using a variety of processes. The health care sector's inputs, processes and outputs — along with broader factors such as income levels, social norms and general population health — contribute to the health outcomes for individuals and society.

Using this framework, the *productivity* of the health care sector can be examined as the quantity of outputs produced per unit of input at a point in time — for example, consultations per GP per day (quality is also important, as discussed below, as is safety).

However, productivity in health, as in other 'non-market' sectors, is more complicated to measure than in industries in the market sector, such as manufacturing. The 'outcomes' of the health sector are difficult to measure, and to aggregate in common units, and in some cases proxies or subjective measures (such as 'pain on a scale of 1 to 10') must be used. Such proxies can be used as inputs to other measures such as 'quality-adjusted life years' or 'disability-adjusted life years' (QALY and DALY). Even for those outcomes that can be measured (such as life expectancy, stroke recovery times, reduced numbers of heart attacks), it is rarely realistic to attribute improvements in outcomes to a single health sector input and procedure, due to the range of health and non-health (clean water, housing, education etc.) factors that contribute to an individual's (and society's) overall level of health over long periods of time. Given this, studies of health productivity have tended to focus on the simpler to measure, and more directly attributable, outputs from health procedures.[107]

Another complication in the health sector relates to quality. Ideally, measures of output (and therefore productivity) would incorporate elements of service quality, not just quantity. In some areas of the economy, the ABS uses so-called hedonic (or utility) measures to measure quality improvements, so that the value of an 'output', say a personal computer, increases over time to reflect its greater functionality, even if it is still just one physical unit. A significant share of the increase in the 'output' of electronic products over the last few decades reflects quality improvement.

The existing ABS measure of productivity improvement in health care uses relatively simple measures of output such as 'hospital separations by procedure type' that are subject to these deficiencies (ABS 2012a). Under such measures, the 'separation' is a proxy for the improvement in health that occurred as a consequence of a treatment. Many studies attempt to control for this by using QALYs to measure both the quantity and quality of life attained through the treatment. While the weighting applied can be subjective, and the data requirements are intensive, as long as methodology is consistent it can allow for reasonably robust comparisons between treatments and service providers, including on the basis of cost effectiveness (NICE 2010).

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[107] There may also be issues with aggregating output measures, particularly where use is made of prices that do not reflect the 'true' value to consumers.

Where these risks are adequately accounted for, measures of productivity in the health sector can usefully inform policy. In this study, comparisons of productivity in different parts of health sectors, and between different health systems, are used to gain a sense of the potential gains available from productivity improvements in the Australian system.

## 8.2 Estimates of Australia's health sector productivity gap

The Commission has looked previously at the scope for productivity gains in health care in various studies, including in focused studies of, for example, the performance of public and private hospitals (Gabbitas and Jeffs 2008; PC 2010), as well as in studies of broader reform agendas (PC 2006b, 2012). This section draws mainly on research and estimates reported in those studies.

Internationally, studies of the health sectors in the United Kingdom, the United States and Scandinavian countries have found significant variations in efficiency. For the public hospital sector, these studies indicate a productivity gap from best practice, on average, of around 15–20 per cent (PC 2006b, p. 171). In addition, a detailed literature review of efficiency measurement in overseas (Europe and the United States) health sectors (Hollingsworth 2003) found measured productivity gaps of:[108]

- 5–29 per cent for hospitals (average inefficiency scores grouped by type of hospitals)

- 18–35 per cent in primary care (average inefficiency scores of primary care providers in the European Union and United States)

- about 25 per cent for nursing homes (average inefficiency scores for nursing homes in the European Union and United States).

In Australia, a Commission assessment in 2008 of empirical studies of the efficiency of public and private hospitals relative to that of observed best practice found a wide variation in efficiency (Gabbitas and Jeffs 2008, p. 29). While the

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[108] These measures used 'data envelopment analysis', a linear programming technique used to identify the 'best-practice' frontiers of producers, such as hospitals, and thereby construct a relative efficiency score as a means of benchmarking hospitals (PC 2010).

studies are not definitive,[109] for public hospitals they suggest an implied productivity gap from best practice of 3–89 per cent. For private hospitals, the limited data suggested a productivity gap of 22–37 per cent.

Data on Australian public hospital costs for some 650 categories of procedures[110] also imply a significant productivity gap compared to 'best practice' (this refers to the best observed practice within the data set, rather than a theoretically attainable best practice). As shown in figure 8.1, below, the data suggest that there is a large number of procedures for which significant improvement may be possible. For example, there are around 200 procedures where the cost can vary from half to around one-and-a-half times the average cost depending on the hospital undertaking the procedure.

More recent Commission modelling, incorporating additional data and various methodological developments, suggests a productivity gap (or 'inefficiency'[111]) of 10 per cent, on average, across the hospital subsector (figure 8.2), though this varies by the size of the hospital (PC 2010).

In addition to these indicators of productivity in the hospital subsector, various international studies provide estimates of the inefficiency of Australia's total health sector (table 8.1). The studies noted above suggested a productivity gap for Australia's health system that could be up to 20 per cent on average.

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[109] Most such studies acknowledge that there could be good reasons for a degree of variation. Especially in the case of public hospitals, the variation could reflect heterogeneity that is not controlled for in the studies. For example, while studies may include refined categories of treatment or condition, they may not properly reflect differences in the degree of a given condition. It is possible that an increased cost might to some extent an reflect (average) increase in complexity or severity, rather than inefficiency.

[110] Procedures were based on the Australian Refined Diagnosis Related Group (AR-DRG) medical treatment category obtained from the Department of Health and Ageing National Hospital Cost Data Collection.

[111] The Commission's work reported two measures, both of which gave technical efficiency scores in the order of 90 per cent. An *output-oriented* efficiency score (a mean of 90 per cent across all hospitals) refers to the percentage of a hospital's production measured against the full output potential of its fixed current inputs. An *input-oriented* efficiency score (a mean of 89.8 per cent across all hospitals) measures the percentage by which a hospital exceeds the minimum inputs required to produce its fixed current outputs. This score is inverted to allow comparison with the output-oriented score. So, an input-oriented score of 90 per cent means a hospital should be able to reduce its input use by 10 per cent and still produce the same level of outputs (PC 2010, pp. 93–4).

Figure 8.1 **Variation in average relative cost [a] of public hospital outputs by procedure and state, ranked by decreasing variation in average costs, 2003-04[b]**

New South Wales, Victoria, Queensland, South Australia and Western Australia



**AR-DRG category[a]**
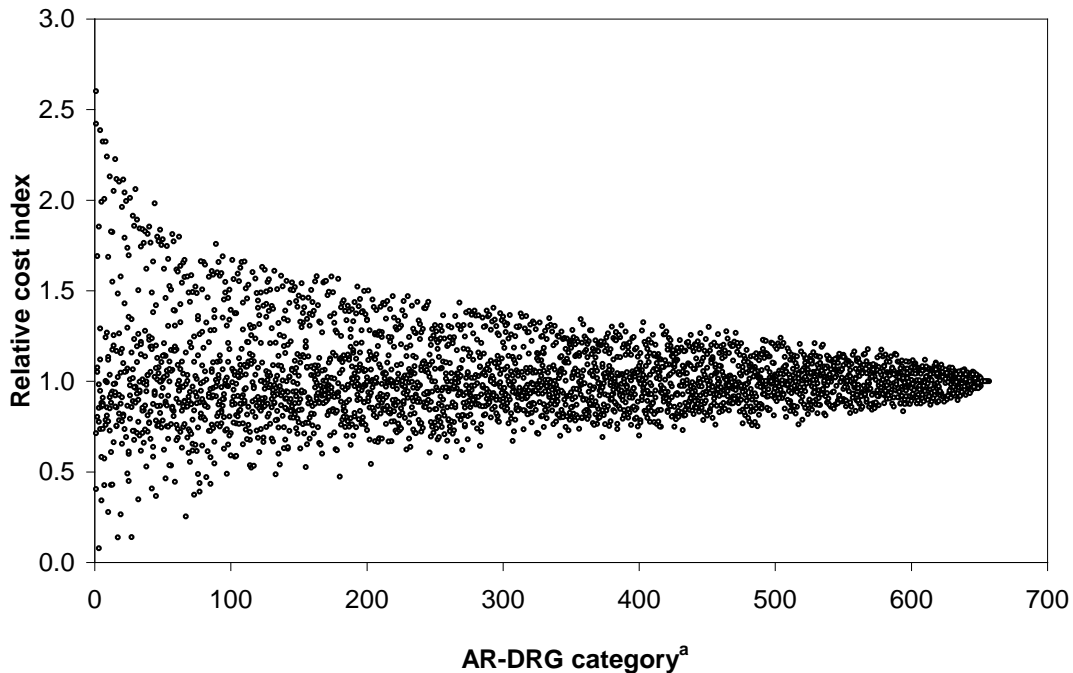
[a] A relative cost index was constructed for each category of treatment by dividing the average total cost of treatment for a given category in each state by the national average total cost for that category. Thus, a score of 1 in the figure indicates that the state average equalled the national average, a score of 2 indicates average costs that are double the national average and so on). The wide range of scores in the figure suggests that there are a large number of procedures for which significant improvement may be possible.

[b] Medical treatment categories are sorted in descending order of the total variation in the relative cost index of each Australian Refined Diagnosis Related Group (AR-DRG). Excludes 10 DRGs for which cost data were not available for two or more jurisdictions.

*Source*: PC (2006b, p. 179).

## 8.3    Potential sources of future health productivity gains

Since the Commission's analysis of the National Reform Agenda (PC 2007), there have been many reforms instituted in the health sector. Examples of two reforms — activity based funding and national registration and accreditation of health professionals — illustrate the magnitude of gains that could be on offer from pursuing further reform in the health sector (box 8.2).

Figure 8.2    **Hospital efficiency varies by size**[a]
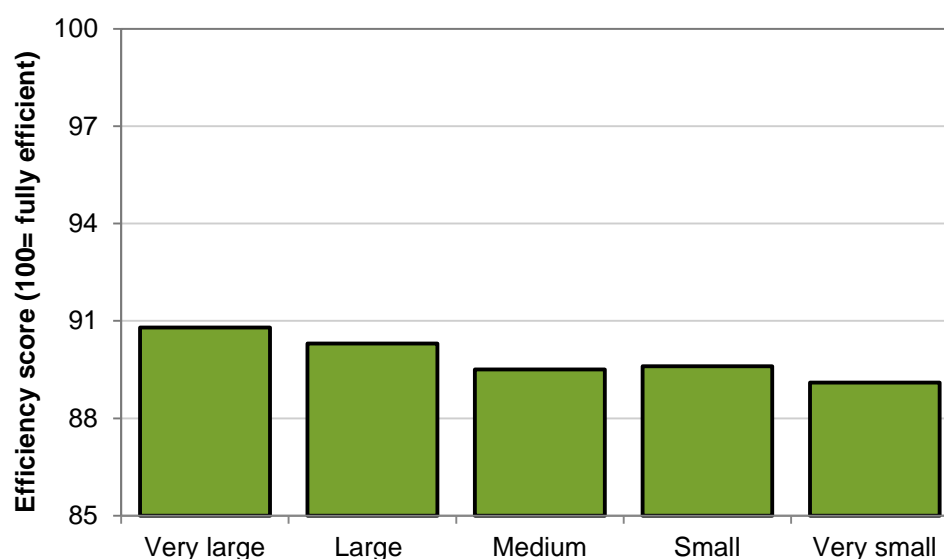


**a** Based on data from 2003-04 to 2006-07. The input-oriented measure is shown.
*Source*: Data are from PC (2010).

Table 8.1    **Estimates of inefficiency in Australia's health system**

| Study | Estimation method[a] | Efficiency score of Australia | Inferred inefficiency |
|---|---|---|---|
| | | | % |
| WHO (2000) | Global rankings based on composite index | Overall index of 0.88 | 12 |
| Evans et al. (2001) | Regression estimation | Less than 0.94 | 6 |
| Gravelle et al. (2003) | SFA | Around 0.91 | 9 |
| Greene (2003) | SFA | 0.99 | .. |
| Afonso and Aubyn (2005) | FDH and DEA | 0.92 | 12 |
| Kumbhakar (2004) | SFA | 0.94 | 6 |
| Vasanthakumar (2005) | DEA | 0.75 | 25 |

**..** Less than one. **a** The estimation methods referred to in this table refer to data envelopment analysis (DEA), stochastic frontier analysis (SFA) and free disposal hull (FDH).
*Source*: PC (2006b, p. 174).

There are a numerous additional sources of productivity improvement that, through changes in institutional structures, embedded practices and incentives, might offset future growth in health expenditure. Achieving some may require government action, such as modifying regulation or funding for particular activities. Others are likely to require action principally by physicians (or their professional associations), hospital managers or others working within health organisations. There is even scope for policies that are outside of the direct health sphere to affect expenditures on health care.

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Box 8.2    **Estimated returns from some recent reforms**

*Activity based funding*

Activity based funding benchmarks hospital services according to complexity, and then assigns an 'efficient' price per service. Hospitals that can deliver services for less than these prices benefit, providing an incentive to improve efficiency.

Under the National Health Reform Agreement, activity based funding for public hospitals has recently been applied to:

- acute admitted public patient services
- acute admitted private patient services
- non-admitted services
- emergency department services (National Health Funding Body nd).[112]

Some estimates suggest significant benefits from these reforms. For activity based funding, the National Health and Hospitals Reform Commission (NHHRC 2009) estimated that, for public hospitals, annual savings could be in the order of $400-$900 million for inpatient services and $170–$430 million for non-admitted public patient services. Some have suggested that activity based funding could also be extended to other areas of the health sector, realising additional savings for the sector overall (Duckett 2013).

Others, however, consider that difficulties in setting ex ante efficient prices, including states' translating national prices into their own state prices, will add complexity to the model, and inhibit cross-state comparisons (Howes and Engele 2013, p. 93). They therefore consider that the gains from activity-based funding are uncertain, but likely to be much less than the NHHRC estimates suggest. With pure activity based funding, there is also a risk of 'cherry picking', wherein hospitals attempt to select the lower cost patients, leaving more complex and costly cases to other providers.

*National registration and accreditation*

The national system of registration and accreditation, which includes 14 health professions,[113] replaced eight separate regulatory systems, 65 pieces of legislation, 85 health practitioner registration boards and 38 regulatory organisations with one nationally consistent law and one national registration agency (AHPRA 2011).

The Commission estimated that, by improving the mobility of workers, this reform should improve the productivity of the health sector and result in long-run savings of around $160 million per year (PC 2012a, p. 225).

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[112] Block funding remains for small rural hospitals, mental health services, sub-acute services and for teaching, training and research.

[113] The national system of registration and accreditation initially included chiropractors, dental practitioners, medical practitioners, nurses and midwives, optometrists, osteopaths, pharmacists, physiotherapists, podiatrists and psychologists. In 2012, the system was expanded to include Aboriginal and Torres Strait Islander health practitioners, Chinese medicine practitioners, medical radiation practitioners and occupational therapists.

Some of the areas where productivity gains are possible are well understood, but the gains have not been realised due to implementation issues (such as the responsibility for, and structure of, associated funding) or because fiscal imperatives have to date seemed insufficient to warrant the effort of reform.

In some other areas, while significant inefficiency is evident, how best to address it is presently unclear. In this context, the complexities in health systems need to be recognised. Government intervention in health systems is pervasive, there can be multiple and sometimes conflicting objectives, price signals are often muted, and health consumers face difficulties in making well-founded choices. Professional norms and regulation often play a role in treatment choices and the allocation of health care resources. There can also be incentives for cost-shifting between different parts of the broader health and social welfare systems (in part due to different governments having responsibility for different parts). Accordingly, changing a policy to fix one problem in the health system will often risk creating problems elsewhere. This all means that, for some problems in the health system, careful and detailed analysis (and possibly some experimentation) would be required before a particular reform solution could be confidently prescribed.

With these caveats recognised, the following sub-sections identify an array of areas where productivity gains should be attainable.

## Financial incentives and regulation

At an overarching level, improving financial incentives and regulation (and the institutional arrangements that govern them) is a key for improving productivity in health system. The peculiarities of both demand and supply within the health sector mean that a fully competitive market for health services is not feasible. Government regulation and funding decisions therefore play a central role in the choices of procedures and providers made in the health sector.

Government funding provides incentives at various levels of the health sector. At the individual procedure level, funding under the Medicare Benefits Scheme (MBS) can affect a practitioner's (and patient's) choice of procedure. While MBS decisions are guided by cost considerations (particularly since the introduction of the MBS quality framework in 2010), relativities between subsidies for different services can distort choice, and attempts to constrain spending in individual areas may ultimately result in higher levels of overall health spending. The provision of subsidies on a per procedure basis (known as fee-for-service), which is prevalent in many parts of the health system, may also provide incentives for over-servicing, relative to a capitation system or alternative funding models. More broadly, the remuneration of health workers and organisations (such as hospitals or GP clinics) and the split of

responsibilities between Commonwealth and state and territory governments could result in less than efficient organisational structures and choices of procedures.

Regulation also affects the health sector in a number of ways, particularly in delineating workforce scopes of practice and activities (for example in restricting referrals to particular providers). The regulation of private health insurers also affects the behaviour of consumers and sometimes providers.

Reforms to financial and/or regulatory incentives can work directly or indirectly. For example, changing medical payment models might not only discourage over-servicing, but could also lead to the formation of different health delivery structures, such as integrated practice units, to more efficiently address patient needs.

Of course, as with other reforms, care needs to be taken when examining financial incentives in the health sector to ensure that changes to funding levels or structures do not unduly affect achievement of other objectives, particularly equitable access to health care. Likewise, regulatory reforms should not aim simply to reduce costs without regard to any impact they may have on other objectives. It also needs to be recognised that there are many productivity-enhancing reforms that can be undertaken within present incentive structures.

## Organisational-level efficiencies

Many measures to improve productivity require change at an individual organisation level. Hospitals could adopt new organisational models or specialisations where doing so suits their resources and patient bases. Methods to identify reforms could include analyses of structures and processes to identify 'bottlenecks' and to realise savings through reorganisation of existing practices. For example, if an MRI machine is approaching maximum use during normal working hours, rather than purchase a second machine, some health facilities have extended the hours when the machine is in use, providing imaging appointments in the evening and night (which may suit some patients better than normal working hours). More broadly, where they have not already done so, hospitals could adopt simple 'lean' care models — as in parts of the United States (box 8.3) — to help improve patient experiences and health outcomes, while also reducing costs. Hospital managers could also examine the adoption of more effective models of care for delivery by the health workers that they employ. For example, a recent Australian study (Tracy et al. 2013) found that, compared to standard hospital maternity care, 'case load midwifery' delivered equivalent neonatal outcomes, in terms of safety and effectiveness, but at much lower cost.

Box 8.3    **The 'Lean' care model — analysing hospital processes**

Improving productivity in health care does not necessarily involve new technologies or skill mixes. How organisations and processes are managed can also contribute to greater productivity by, for example, addressing 'bottlenecks' to speed up overall treatment times without reducing patient outcomes.

This occurred at the Lucile Packard Children's Hospital in the Stanford University medical centre in the United States, which applied an adapted version of the car manufacturer Toyota's 'Lean' business strategy.

The hospital identified that delays or cancellation of surgeries were principally caused by a bottleneck in the post-anaesthesia (and surgery) care unit, as there were too many patients entering the care unit from across the hospital at a given time. Rather than supplying additional beds and staff, the hospital addressed the issue of coordination between various parts of the hospital:

> And so we started to say how can we fix that. … we need to level the flow, we need to find a way so that patients are coming out of areas of anaesthesia, the operating rooms, MRI in paediatric patients, they often need to be sedated, or ambulatory procedures such as when they are getting a catheter placed. We need to have a flow such that every 20 minutes a patient is coming out, so that we always can have a nurse available to take them and we don't shut down our operating theatres, and so patients don't get told 'you have to wait' or 'you have to go home'. (Platchek 2013)

The baseline in the United States for anaesthesia recovery beds is three beds per area providing anaesthesia. At Stanford they were able to reduce this to a one-to-one ratio, and are examining reducing it further.

Applying the same 'Lean' methods also identified other savings:

> … [the hospital] also found ways to cut down on patient wait time for operating rooms. The hospital entirely eliminated its pre-operation holding area for ambulatory patients; this cut about 45 minutes from the pre-operative process … Additionally, the hospital changed the way anesthesiologists bring patients into the operating room. It used … a "one-piece flow model" where the anesthesiologist brought young patients back directly along with a parent who could be present for the induction.

> By implementing a Lean care model and identifying and correcting wasteful processes, the hospital was able to reduce wait times for operating rooms from two hours to 60 minutes in a span of two weeks. (Spoerl 2012)

## Diffusing research to clinicians and health organisations

Some international studies suggest that over-diagnosis and over-treatment in medicine is rife (Moynihan, Doust and Henry 2012). This suggests that the collation, analysis and diffusion of data on procedures that have been proven to not be either effective or cost effective could help reduce costs as well as improve patient outcomes.

One process along these lines is formally underway in the United Kingdom (box 8.4). Researchers aim to learn from past experience (including failures) to help identify the best use of (relatively decreasing) health funding by first identifying 'what not to do'. Similar exercises are underway in the United States and Australia (Cassel and Guest 2012; Elshaug et al. 2012). 'What not to do' lists are then disseminated to clinicians and health organisations.

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Box 8.4     **The 'do not do' list**

Faced with budget restrictions, primary care trusts in the United Kingdom (UK) have recently been examining methods of 'disinvestment' (reducing resources from existing health care practices that deliver marginal health gains relative to their costs).

One approach has been the use of 'do not do' (DND) lists of treatments that have been found to be of low net value. Since 2007, the UK's National Institute for Clinical Evidence (NICE) has been collating the DND lists into a database of practices that they recommend be discontinued, or at least not used routinely. Each recommendation is:

> … formed from a debate by the independent guideline development group, who were guided by evidence presented to them by the technical team from one of the national guideline centres, which identifies specific practices as not on balance beneficial, as unsafe, or with insufficient evidence to support its continued use. These practices are then placed on the online DND [do not do] database. (Flynn and Gericke 2012)

While the database provides an evidence-based approach for minimising costs, its practical effect has been limited by issues in implementation. In particular, as the DND database is not mandatory, various primary care trusts have developed their own approaches, creating a series of 'black lists' across the UK.

Work is underway to develop a single evidence-based methodology (including costs) for disinvestment, to improve the adoption of national DND recommendations (Flynn and Gericke 2012). Between 2007 and 2012, a study identified 209 DND topics for use and, after clinical consultation, selected 30 procedures for a pilot disinvestment program in the southwest peninsula of the UK.

An example of one of the selected procedures is an arthroscopic knee washout to treat cases of osteoarthritis (Gericke 2012):

- **NICE DND recommendation:** washout alone should not be used as a treatment for osteoarthritis because it cannot demonstrate clinically useful benefit in the short or long term.
- **Evidence:** Cochrane review, including 7 randomised controlled trials (Reichenbach et al. 2010)
- **Local clinician feedback:** Agreed with recommendation, high local impact
- **Unit cost of arthroscopy:** £801 (2010-11)
- **Usage in South West Peninsula:** 1077 admissions (2011-12)

**Potential local savings if discontinued (annual)**: £862 677

In designing further policy responses to address issues such as over-diagnosis and over-treatment in medicine, it will also be important to understand the incentives that have lead practitioners to deliver such outcomes (for example, whether they are driven by attempts to avoid malpractice litigation, a desire to earn additional incomes, or whether there are professional or institutional barriers to, or a lack of incentives for, the uptake of new knowledge).

## Workforce demarcation and regulation

As the Commission (2006a) has previously noted, re-examining the scopes of practice of particular health professions, and the appropriate skills mix required for a particular treatment, could yield productivity gains. Indeed, ensuring that tasks are performed by appropriately skilled (not over-skilled) workers frees up valuable resources that could be used elsewhere in the health system. However, it can also sometimes lead to unintended consequences. For example, analysis of nurse practitioners in the United States found that greater involvement of nurse practitioners can generally reduce costs, but can also increase costs if prescribing rights are expanded:[114]

> … liberal scope of practice laws are associated with a reduction in retail clinic health care cost per patient. The greatest reduction (15.8%, p<.001) … occurs when nurse practitioners have full independence in diagnosing and non-prescription treatment. No cost reductions are associated with patients seen (-0.22%, p=.911) … when physicians are required by law to supervise nurse practitioners. When nurse practitioners are allowed to write prescriptions for controlled substance such as pain medication Oxycontin, health care cost are 17.2% higher (p<.001) (Spetz 2013)

In Australia, some nurse practitioners (and midwives) have had access to Medicare rebatable services, the ability to refer to specialists, and request diagnostic and pathology services since November 2010. They have also been able to prescribe certain medicines under the Pharmaceutical Benefits Scheme. However, scope of practice change is an ongoing process that requires continued analysis of appropriate roles in line with changes in models of care, training and technology (including pharmaceuticals). Further, 'cultural' impediments to change within the sector cannot be ignored and it is likely that accepted practices will evolve over time.

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[114] As noted above, this increase in cost is not necessarily undesirable. It is likely to lead to a reduction in the patients' pain levels, and thus a benefit to society. Depending on the relative merits of existing treatments, it may also be a productivity improvement (provided health outcomes in this case can be properly measured).

Meanwhile, national registration and accreditation arrangements have been developed with the aim of reducing regulatory burdens on the health sector while maintaining minimum standards for practitioners. Even so, there remains scope to ensure that existing regulation is no more onerous than necessary to meet its stated objectives (such as patient safety). Further, care needs to be taken to ensure that the introduction of new initiatives — such as the Personally Controlled Electronic Health Record (PCEHR) — do not inadvertently lead to disproportionate (and adverse) burdens upon health practitioners or patients.

Education and training affects the numbers, distribution (both geographically and between professions), and quality of the workforce and roles of health workers. While this could contribute to the productivity of the health workforce itself, changes to the coordination and structure of training, and the accreditation of courses, could assist other reforms — for example, a greater emphasis on inter-professional and team-based learning could support future changes to models of care.

## The cost effective use of technology and pharmaceuticals

As noted above, some technologies can increase costs through meeting previously unmet demand (by providing treatments for previously untreatable conditions) or by increasing the effectiveness of existing treatments and hence their uptake.

Other technologies could reduce overall costs. In particular, the take up of non-medical technology could drive organisational and system-wide reductions. For example, the improvement of databases in concert with the introduction of the PCEHR could allow for improved data analysis, and an evidence-based approach to the selection of cost effective treatments (similar to the 'do not do' list, above). Better patient data on the PCEHR could also reduce excessive or duplicative testing of patients.[115] More simply, improved technology (such as notes taken on a tablet computer directly uploading to a central database) could reduce the administrative burden on health practitioners, freeing them to conduct more of their 'core' business.

The use of technology could also enable reforms to the scope of practice, and improve other outcomes, such as equity of access to health services for rural and remote patients. For example, the increased uptake of telehealth could allow more training for on-site rural and remote practitioners, and provide them with the ability to video conference with more experienced or specialised practitioners in larger

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[115] In 2008, 12 per cent of Australian patients surveyed reported that their doctor had ordered a medical test that the patient felt unnecessarily duplicated another test that had been done in the last two years (NHHRC 2009, p. 55).

urban centres. Doing so could be a low cost way of providing specialised care to distant populations, without reducing the standard of care, but existing evidence on the cost effectiveness of telehealth is mixed (box 8.5).

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Box 8.5    **The cost effectiveness of telehealth programs**

As with many health programs there are clear examples of *beneficial* telehealth programs, but not all are necessarily *cost effective.*

One example is the 'Whole System Demonstrator programme' in the UK (United Kingdom Department of Health 2011). Launched across three sites (Newham, Kent and Cornwall) in 2008, the trial provided telehealth services to 3030 people with one of three chronic conditions (diabetes, heart failure and chronic obstructive pulmonary disease). Initial findings from the trial indicated that telehealth could deliver:

> … a 15% reduction in [accident and emergency] visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and … a 45% reduction in mortality rates. (United Kingdom Department of Health 2011, p. 3)

More recent analysis (Henderson et al. 2013) of the data available from the Whole System Demonstrator programme suggests that the trial was not cost effective. Based on a net benefit analysis of data from 965 patients (534 receiving telehealth and 431 in standard care), the research found that the incremental costs per quality-adjusted life year (QALY) of telehealth added to standard care was £92 000 (the cost effectiveness threshold recommended by NICE in the UK is £30 000). The study concluded that:

> The QALY gain by patients using telehealth in addition to usual care was similar to that by patients receiving usual care only, and total costs associated with the telehealth intervention were higher. Telehealth does not seem to be a cost effective addition to standard support and treatment. (Henderson et al. 2013, p. 2)

While limited, available evidence in the Australian context (Bywood, Raven and Butler 2013) suggests that some telehealth programs can be cost effective, but that this depends on a range of factors including:

- the location and characteristics of the patients (relating to the distance they would otherwise have to travel, and the suitability of telehealth to particular health conditions such as monitoring chronic disease, or consultation for telpsychiatry)
- the technology involved (costs of upgrading, including training staff in its use, and the portability and ease of use for patients and practitioners)
- the manner in which telehealth is incorporated into existing health care, including the involvement of the appropriate level of health professional at various stages of the program (such as a telehealth coordinator).

The authors concluded that telehealth had:

… the capacity to increase of the cost effectiveness of healthcare delivery. However, cost effectiveness is influenced by many factors … so it cannot be taken for granted and needs to be evaluated on a case-by-case basis. (Bywood, Raven and Butler 2013, p. 22)

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Of particular importance is consideration of how telehealth technology is implemented. Simply adding telehealth on top of existing services is unlikely to deliver benefits in a cost effective manner. However, where telehealth is properly incorporated as part of a health system, it may allow savings by reducing costs to patients (travel and waiting times), allowing for more targeted interventions (only involving more skilled practitioners when necessary), and reducing costs to practitioners (reduced travel, better and cheaper access for rural and remote practitioners to continued professional development).

Another opportunity to improve cost effectiveness is through the choice of pharmaceuticals listed under the Pharmaceutical Benefits Scheme, the manner in which the Australian Government determines their price,[116] and the timing of the entry of generic versions of off-patent medicines. Together, they could result in an improved choice of more cost effective treatments, as well as reduce the costs of individual treatments.[117] There may also be merit in the wider use of prescribing protocols, based on principles of clinical and cost effectiveness, for certain conditions. Similarly, examination of the direct costs to the government (and indirect costs to end consumers) of the Community Pharmacy Agreements could improve the overall cost effectiveness of the health sector (the current 5th agreement involves funding of $15.4 billion over five years).[118]

## Procurement in the health sector

While there is limited or no competition in some parts of Australia's health sector, the sector itself purchases supplies and equipment from many providers operating in competitive markets (such as general office or information technology supplies). However, in some cases, such as extremely specialised or new medical equipment or pharmaceuticals, there may be limited, or no, choice of providers. Beyond countering the market power of such providers, there could be scope to improve procurement practices to take advantage of scale purchases, and also improve the

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[116] Some (Duckett et al. 2013) have argued that the current price negotiation process could benefit from adopting elements of the New Zealand system of independent negotiations, subject to an overall budget.

[117] For example, while under patent, the price per tablet of simvastatin (40 mg in Australia) was $A2.00, and in England it was almost $A3.00. After the patent expired, the Australian price gradually decreased to around $A1.00 per tablet (four years after expiry). But in England, the rate of price decrease was much faster, such that four years after the expiry the Australian price was some four times higher than the English price (Clarke and Fitzgerald 2010).

[118] An audit of the administration of the 5th Community Pharmacy Agreement by the Australian National Audit Office is underway and is due to be tabled in winter 2014 (ANAO 2013)

efficiency of the purchasing process itself (for example, by greater coordination and sharing of information on the quality of a range of products and providers).

This may be particularly beneficial for hospitals, given their size and the magnitude of their expenditure. As with other reforms, the precise form of implementation can affect the degree of cost-reductions (and overall benefits available). Specifically there may be a tradeoff between centralising decisions (which maximises the bargaining power of a hospital purchasing 'bloc') and allowing flexibility in purchasing decisions between hospitals, which may enable purchases to be more tailored to individual hospital circumstances. The model of 'aggregated purchasing' could provide the appropriate balance, by leveraging the buying power of groups of hospitals on expenditures that they determine themselves.

## Prevention and early intervention

As an alternative (or adjunct) to trying to control the costs of health services or ration their supply, some reforms could manage the demand (or need) for those services.

The most common example of this is preventative health and early intervention campaigns to avoid or reduce health risks. Preventive health measures often include information (or social marketing) campaigns, regulation, and taxes. There are many examples where such measures have successfully reduced health risks in Australia. These include providing information to parents about the sleeping position of infants to reduce the incidence of sudden infant death syndrome, the HIV/AIDS campaign, safety belt regulation, random breath testing/drink driving penalties, smoking bans in workplaces, restaurants and other public spaces, and taxes on tobacco.

In recent years, the Australian National Preventive Health Agency (ANPHA) has identified curbing alcohol use, tobacco use and obesity as the top three priority areas in preventive health. ANPHA considered these health risks accounted for 40 per cent of potentially preventable hospitalisations (ANPHA 2013).

While many strategies may be effective and justified, there are several important issues that affect that judgment.

First, as in many other interventions, there are short-term known costs associated with the interventions, which need to be balanced against their long-term uncertain benefits. This is often a concern in screening measures, where the goal is to identify the early onset of a disease and to treat it at a stage when it is most amenable to interventions. However, a test may not be cost effective if, among other things, it

has a low true positive rate (failing to identify many people who have the disease) or has a high false positive rate (incorrectly classifying people as having the disease, which then requires more costly diagnostic tests to confirm that this is not correct, or unnecessary treatment on the basis of the initial diagnosis).

Second, and more subtly, gauging the effectiveness and efficiency of preventative measures on a disease-by-disease basis can miss the reality that people live to die another day (Bonneux et al. 1998). Dollars saved on avoiding (or minimising the costs) of one disease opens the possibility of people experiencing another costly disease. Ideally, assessments of particular interventions should adopt a longitudinal approach that takes into account the timing and costs of disease and quality of life under the counterfactual that no preventative action is taken.

Indeed, the impact of a preventive health measure on future government health and other expenditures can be ambiguous. As noted in box 8.6, some studies have found that various anti-obesity measures appear to have limited effectiveness, or are unlikely to yield cost savings and may even increase costs overall.

The foregoing factors highlight the importance of undertaking a comprehensive analysis of the long-term costs and benefits of any given preventative health measure (box 8.7). Such comprehensive analysis of individual health measures provides more surety that they are effective in addressing the health problem and are beneficial and cost effective for society as a whole.

## 8.4 Exploratory estimates of the fiscal benefits of future gains in health care productivity

The foregoing sections illustrate several areas of health care where there appears to be scope for productivity gains, although the exact reforms necessary to deliver such gains have not been specified. How large might such productivity gains be? And to what extent could they ameliorate the fiscal pressures associated with ageing?

Box 8.6　　**Obesity prevention**

Several studies have examined the efficacy and/or cost-effectiveness of measures to prevent obesity. In some cases, measures appear to have had benefits, although information gaps make it difficult to be definitive. Other studies suggest that the cost-effectiveness of many obesity prevention measures is marginal and that there may not be major fiscal savings from such measures.

- A study from the Netherlands (van Bale et al. 2008) found that at all ages, obese people and smokers incurred more annual health care costs than do healthy people. However, they found that healthy people lived longer and incurred greater lifetime costs. The greatest differences in health care costs were not due to smoking and obesity-related diseases, but to other, unrelated diseases that occurred as life-years were gained. The authors concluded that prevention of obesity and smoking may be an important and cost-effective way of improving public health, but it is 'not a cure for increasing expenditures' on heath (2008, p. 0248).

- Drawing on Australian Institute of Health and Welfare work for the National Health and Hospital Reform Commission (AIHW 2009, p. 4), health expenditure (government and private) was projected to increase by 179 per cent between 2002-03 and 2032-33. In contrast, if growth in obesity rates was constrained, health expenditure was projected to increase by 176 per cent — a drop of 3 percentage points. However, the impact of obesity was projected only on the direct costs of diabetes; not on other areas of government spending.

- Productivity Commission researchers (Crowle and Turner 2010, pp. 89–90) found that many measures to address childhood obesity — including public education on obesity, and dietary and physical activity education for children — had not been effective in preventing weight gain to any significant degree, although they may have improved lifestyle behaviours generating other benefits (such as a healthier diet and increased physical activity). Other measures — such as mandatory labelling for restaurant and takeaway meals, taxes on energy-dense nutrient poor foods and bans on television advertising of certain foods — were found to impose relatively high costs on society compared with their (limited) benefits.

- A 2011 Cochrane review of 55 studies of childhood obesity measures including dietary and physical activity education for children found that they had beneficial effects on body mass index in a meta-analysis, but there was substantial unexplained heterogeneity and the likelihood of publication bias. It also noted that there was a lack of knowledge of which specific intervention components were most effective and what is affordable and cost-effective (Waters et al. 2011, pp. 35, 34)

- In an 2012 evidence update for the NSW Ministry of Health on various obesity prevention measures addressing all ages, Hector (2012, p. 9) noted that, despite the large volume of publications reviewing the evidence, there were many gaps in information on target groups, settings and behaviours addressed. Many of the reported programs had short implementation periods with limited follow up.

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Box 8.7 **Factors to consider when assessing health interventions**

The merits of any proposed policy change in the health sector should be carefully examined, ideally in a holistic sense.

A holistic approach entails considering the effect not only on a patient's short-term health, but also their long-term health, wellbeing and participation in the economy, and the benefits these have for others. It means considering the impact beyond the current provider of a particular treatment (for example, a policy change may reduce the expenditure on hospitals, but could lead to long term increases in public expenditure on GPs, or increased costs for the public and the individual through greater reliance on pharmaceuticals). It also means considering the impact on the finances of all levels of government and private costs, and on other objectives for health policy — most notably equitable access to health care.

For example, in the context of preventative health, the types of *costs* that ideally should be considered include:

- the direct costs of the intervention (both in dollars and the cost of time of not only the practitioner but the patient in treatments, recovery and lost time at work or as a carer)
- health costs arising from any side effects from the intervention, or increased predisposition to other diseases/conditions arising from the intervention
- pension and other government support costs that can arise from increased life spans.

Some of these costs may be disregarded in making a final policy choice, but their enumeration is nevertheless important.

Equally, a broad and long-term view of the *benefits* ideally should be taken, including better health (in quality-adjusted life years) for the patient; the subjective value of their health and life to themselves and others; any improvement in employment outcomes (and the resulting incomes earned/taxes paid) both for the patients and carers as a result of improved patient health; and any co-morbidity costs avoided from resulting decreases in likelihood of suffering related conditions and/or avoiding treatment costs later in life.

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In its earlier study on the National Reform Agenda (PC 2006b), the Commission used an estimate of potential productivity gains of 4 to 5 per cent. That estimate drew on estimates of productivity gaps (section 8.2) as well as feedback from participants to the study, and reflected a conservative view of what could be attained from pursuing health services-related policies within the then National Reform Agenda. In arriving at its estimate of 4 to 5 per cent, the Commission assumed that NRA-consistent reforms could bridge one-fifth of the (then) assumed productivity gap in the hospitals subsector and one-tenth of the then assumed productivity gap in other subsectors.

While some reforms have been instituted since 2007, thus reducing the scope for further gains from those sources, it is also possible that the full potential gains available from improvements to health productivity are significantly larger than those presented in the NRA study. However, the Commission has not sought to judge the full magnitude of the gains available.

Rather, to illustrate the potential for productivity gains to alleviate fiscal pressures, the current study has explored the fiscal effects of a 5 per cent productivity gain in Australian and state and territory governments' total health spending, commencing in 2018-19. The estimates are based on the government expenditure projections set out in chapter 5. For simplicity, the productivity gain has been modelled as a one-off, step reduction of 5 per cent in health government expenditures in 2018-19. Following this, expenditures grow at the rate determined by demographic and technological changes as depicted in chapter 5.

The resultant estimates are that health expenditures (both Australian Government and state) are projected to account for less than 10.2 per cent of GDP in 2059-60, rather than 10.8 per cent without the productivity gain. Accordingly, fiscal pressure from rising health costs would be reduced by around 0.5 percentage points by 2059-60 (or around 10 per cent of the total fiscal pressure).

# A   Modelling mortality trends

## A.1   Introduction

Over the long run, the age structure of a population is determined principally by mortality patterns by age group. Accordingly, varying assumptions about mortality trends can have substantial influences on projections of the age structure of a population. This is particularly true for the share of the very old in the population (people aged 80 or more years).

There are multiple methods for projecting mortality rates. As in its projections for net migration and fertility, the Australian Bureau of Statistics uses a quasi-statistical approach (sometimes referred to as a 'deterministic' approach since it excludes any stochastic elements). This approach takes into account historical trends (a statistical approach), but on the other hand, it buttresses these with subjective judgements based on expert advice.

> Assumptions have been formulated on the basis of demographic trends over the past decade and longer, both in Australia and overseas, in conjunction with consultation with various individuals and government departments at the national and state/territory level. They do not attempt to allow for non-demographic factors (such as major government policy decisions, economic factors, catastrophes, wars) which may affect future demographic behaviour. (ABS 2008, p. 8)

As the ABS notes, this approach also ignores the possibility of major adverse events, such as major pandemics or wars, though historically these have sometimes been important. Some of these events would be difficult to estimate given their rarity in historical data, and at best, could be treated separately as low probability, high impact events with assumed statistical distributions. For example, the European Actuarial Consultative Group (2006) assesses that there is a high risk of a major global pandemic over a decade, but that events with significant excess population mortality are unlikely. Others doubt that it is possible to make 'any scientifically based prediction about the emergence of future pandemics' (Taubenberger and Morens 2009). Given this, it is more reasonable to take account of other significant risks — such as the possible adverse impacts on longevity of lifestyle factors (growing obesity) and antibiotic resistant bacteria, which would have a gradual effect and could be modelled as a lower-life expectancy scenario in mortality projections.

In some other countries, official agencies have included mortality trends based on purely statistical approaches for at least one of their sets of demographic projections (such as Statistics New Zealand, Statistics Canada, the United States Census Bureau, the US Congressional Budget Office, the United Nations and Japan).[119] These have the advantage that they do not rely on subjective judgments and can produce estimates of the variance of the mortality forecasts, which can be employed for stochastic population models.

Nevertheless, despite their apparent rigour, existing statistical forecasting models of mortality:

- generally use only historical data on age-specific mortality rates by gender (and sometimes ethnicity and region). They ignore other factors, such as economic growth, expenditure on healthcare, developments in drugs or medical procedures, and future risks not yet captured in the historical data (such as the long-run effects of obesity)

- often can involve unrealistic long-run outcomes in age-specific death rates, which then may need to be adjusted using judgment anyway

- estimation of forecasting errors can sometimes grossly underestimate the true underlying uncertainty in the projections (Pedroza 2006)

- are tested for their forecast accuracy using relatively small out-of-sample periods. Their long-run accuracy is much less certain

- can be hard to interpret by non-experts given the complexity of some models.

Accordingly, there remains a strong basis for judgment-based scenarios of the kind historically employed by the ABS, even if these are a supplement to purely statistical approaches. The ABS will use its current deterministic approach in its 2014 demographic projections, but stochastic modelling may be considered in future releases.

There is also a basis for stochastic modelling using reasonable priors about the distribution of forecast errors, without these distributions being drawn from the fitting of statistical models to historical data. The United Kingdom Office of National Statistics (2009) has used this approach.

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[119] Based on Lee (2004), Bascand (2012a) and the US Congressional Budget Office (2005). In addition, the New Zealand Treasury undertook early stochastic modelling (Creedy and Scobie 2012).

Against this background, this report:

- applies one of the most common statistical models — the Lee-Carter (LC) model — to produce long-run forecasts of mortality rates by age, and examines the consequences of forecast errors

- uses more deterministic models, based on scaling of previous projections of mortality rates by the ABS.

There is scope for the ABS and the IGR to use sophisticated techniques that relax some of the assumptions of the basic LC model. These could include:

- Bayesian approaches (for example, Pedroza (2006) and Raftery et al. (2012))

- functional time series models (for example, Hyndman et al. (2013))

- variants of the LC model that eliminates the potential for long-term divergence in mortality rates between males and females (Li and Lee 2005)

- cohort models that take account of the different mortality trends for different cohorts, and not just related to age and time (Haberman and Renshaw 2011)

- methods that place limits on the long-run reduction of mortality rates or/and ensure that the general pattern of rising mortality rates by age is preserved over the longer run. This is not guaranteed under the Lee-Carter method because it has invariant age-specific rates of mortality reduction. Historically, such rates have been greater for some older age groups — reflecting technological advances in healthcare for such people. Over a sufficiently long time frame, the Lee-Carter method would project lower mortality rates for many older age groups than younger people, which is improbable (as shown below in box A.1).

## A.2    The Lee-Carter model

The technical aspects of the Lee-Carter model have been documented elsewhere (Girosi and King 2007; Lee and Carter 1992; Rodriguez 2009), but in summary, the objective is to estimate the equation:

$$\ln\left(m_{x,t}\right) = a_x + b_x k_t + \epsilon_{x,t}$$

where m is the central death rate, x denotes individual ages and t, time and:

$$a_x = 1/(T-1) \times \sum_{t=1}^{t=T} \ln(m_{x,t})$$

or the average of the logged values of the death rates over the period of data available (from 1 to T). It is usually assumed that $k_t$ evolves as a random walk with drift, which has been found to fit most data well (although in theory more complex ARIMA models could be used):

$\hat{k}_t = \theta + \hat{k}_{t-1} + \mu_t$ with $\hat{\theta} = (\hat{k}_T - \hat{k}_1)/\text{(T-1)}$ and $\mu_t$ as the error term (assumed to be normally distributed with variance $\sigma_\mu^2$).

The critical feature of the LC model is that the $a$ and $b$ values do not vary over time, and the $k$ values do not vary over age. With the usual identifiability restrictions, the model's parameters can be estimated using a singular value decomposition of the matrix $Z_{xt} = \ln(m_{x,t}) - a_x$ (undertaken in the RATS statistical package in our case). It is common to re-estimate the k values in a second stage so that the predicted number of deaths in the model are equal to the actual deaths. However, this stage is not necessary, and can sometimes be problematic (Girosi and King 2007, p. 28ff). Empirically, models with no second stage estimation produce more accurate mortality rates than the alternative, but tend to underestimate life expectancy (Shang, Booth and Hyndman 2011).

The forecasts of $\ln(m_{x,t})$ where t is V years in advance of the jump-off year of T (in this case 2010) are:

$$\ln(\hat{m}_{x,t}) = \hat{a}_x + \hat{b}_x \hat{k}_t = \hat{a}_x + \hat{b}_x(\hat{k}_T + V\hat{\theta}) = \ln(m_{x,T}) + V\hat{b}_x\hat{\theta}$$

For example, the forecast log death rate in 2050 for a person aged 45 years would be:

$$\ln(\hat{m}_{45,2050}) = 40\,\hat{b}_{45}\hat{\theta} + \ln(m_{45,2010})$$

The actual death rate is derived by taking the exponent, and the relevant populations by age determined using the standard cohort-component model.

The variance of $\mu_t$ (or $\sigma_\mu^2$) can be calculated from the residuals of the random walk with drift over the sample period. Accordingly, the variance of $k_V$ is $V\,\sigma_\mu^2$. and increases with the forecast horizon. Given the assumed normality of $\mu_t$, the 95 per cent confidence intervals on $k_V$ is $k_V \pm 1.96\sqrt{V\sigma_\mu^2}$, so that the 95 per cent confidence interval on $\ln(\hat{m}_{x,V}) = \ln(m_{x,T}) + V\,\hat{b}_x\hat{\theta} + 1.96\,\hat{b}_x\hat{\sigma}\sqrt{V}$. This can be used for stochastic population forecasts.

Box A.1    **A proviso**

While the LC model has performed very well in forecasts for many countries (Lee and Miller 2001), it has several limitations, which need to be considered for risk analysis. In particular, it can lead to improbable mortality profiles by age over the very long run. Consider the forecast log death rate for some years after 2010 (V) for a person aged 70 years and the difference between it and the forecast for the 45 year old:

$$\ln\left(\hat{m}_{70,V}/\hat{m}_{45,V}\right) = V(\hat{b}_{70}\text{-}\hat{b}_{45})\,\hat{\theta} + \ln\left(m_{70,2010}/m_{45,2010}\right)$$

In Australian male life tables, $\ln\left(m_{70,2010}/m_{45,2010}\right)$ is roughly equal to 2.2 while $(\hat{b}_{70}\text{-}\hat{b}_{45})>0$ and $\theta <0$, so that as V increases, the gap between mortality rates between men aged 45 and 70 closes. Using estimates of $b$ and $\theta$, the annual mortality rate for men aged 70 years would actually fall below that of men aged 45 years by around 2100. While it is possible for mortality rates for older people to be lower than younger people, empirically this appears to be true only in the early years of life. Accordingly, either LC models should not be used to forecast mortality rates over very long periods, or there should be adjustments to the method to avoid such reversal of age-related mortality patterns.

## Estimating the Lee-Carter model for Australia

While the LC model is typically applied to age-specific central death rates ($m_{x,t}$), there are practical advantages in using death probabilities ($Q_{x,t}$), which are probabilities that someone aged x in year t will die over the next year (PC 2005d, pp. T1.2–T1.3), and are very close to $m_{x,t}$ anyway.[120]. This enables direct calculation of life expectancies and also direct comparison with projected measures of $Q_{x,t}$ provided by the ABS. The only implication for the above formulas are that $Q_{x,t}$ replaces $m_{x,t}$.

*The key results*

The period life expectancy at birth in 2059-60 implied by the estimated LC model was 89.2 years for males and 91.2 years for females.

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[120] This is not novel. Notably, de Beer's various approaches to estimating mortality uses age-specific probabilities of death, rather than central death rates (2012), while Doray and Tang (2011) use probabilities of death instead of death rates in estimating the LC model.

Figure A.1    **Life expectancy estimates**

Lee-Carter method, 2009-10 to 2059-60
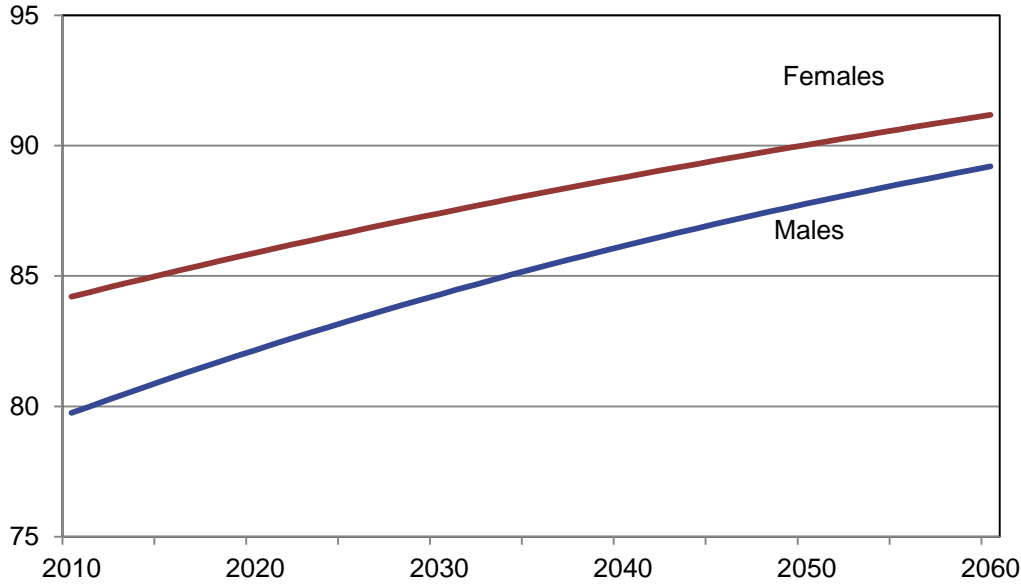
*Data source*: PC estimates.

## *Confidence intervals*

While it is possible to estimate closed form solutions to confidence intervals for death probabilities, most interest centres on life expectancies and dependency ratios, for which there is no easily derived solution for confidence intervals. Monte Carlo simulation can be used to estimate these recursively. Starting with first forecast year (2011):

$$\ln(Q_{x,2011}) = \hat{a}_x + \hat{b}_x k_{2011} + \epsilon_{x,2011}$$

$$= \hat{a}_x + \hat{b}_x(k_{2010} + \hat{\theta} + \mu_{2011}) + \epsilon_{x,2011}$$

$$= \ln(Q_{x,2010}) + \hat{b}_x(\hat{\theta} + \mu_{2011}) + \epsilon_{x,2011}$$

More generally,

$$\ln(Q_{x,t}) = \ln(Q_{x,t-1}) + \hat{b}_x(\hat{\theta} + \mu_t) + \epsilon_{x,t},$$ which is the basis for recursion.

It can also be shown that at some future year (V) in advance of 2010:

$$\ln(Q_{x,V}) = \ln(Q_{x,2010}) + \hat{b}_x\hat{\theta}(V - 2010) + \sum_{t=2011}^{V} \mu_t + \epsilon_{x,V}$$

It is common in stochastic modelling of mortality to ignore $\epsilon_{x,t}$ as it becomes increasingly unimportant compared with the accumulating influence of $\mu_t$. However, while that may be true over the long-run, it is not so over the shorter-run, and may considerably understate the true variance of the forecasts.

The Commission estimated the variances, but the resulting confidence intervals for the LC life expectancy estimates were very narrow. It is doubtful that the narrow confidence intervals given by the LC method and many other approaches (Shang, Booth and Hyndman 2011, p. 206) are plausible given the underlying assumption that the future patterns of mortality change will be the same as those present over the last 30 years. Long historical data of mortality show that there are structural breaks in the series, which do not show up in the shorter historical data used for estimation of the LC model.

In that case, there are grounds when undertaking stochastic analysis for complementing the outcomes from a purely statistical approach with *assumptions about* realistic confidence intervals, rather than just relying on the bounds provided by a purely statistical approach. Chapter 2 describes the approach taken to do this in this report.

### Modifications to the long-run LC estimates of mortality rates

There are also concerns about two other facets of the LC method.

- The long-run LC estimates of $Q_x$ for some ages implied lower mortality rates for males than females. This is inconsistent with the historical pattern of mortality by gender.

- The LC method implies that mortality rates decline forever and never stabilise — the consequence of any model that involves a random walk with drift.

Accordingly, while the LC estimates were the key results on which PCPOP life expectancies were based, several adaptations were made to address the above concerns. Life expectancies were modelled by:

- calculating the value of $Q_x$ for males and females for 2011-12 (the start year for the projection model) using the results from the LC estimation

- forming the ratio of the male and female mortality rates by age for 2011-12

- projecting the ratio of the male to female mortality ratio for each age up to 40 years after 2012 based on the historical trend growth rates in that ratio from 1981 to 2010. The 40 year period is the assumed length of time for the male to female $Q_x$ values to stabilise at a given value for each x. Where the ratio fell below one at the 40 year horizon (that is, implying lower mortality rates for males than

females), the long-run ratio was truncated to one, and the associated growth rate that would lead to that outcome was calculated.

- for any year up to the 40 year horizon, calculating the male $Q_x$ values using the LC results, and the female $Q_x$ values using the estimated mortality ratio. At some time, mortality reductions are likely to cease. Accordingly, for those years after the 40 year horizon (2050-51 in the model), it was assumed that the male mortality rates fell by a decreasingly smaller amount, and accordingly, life expectancy values were less than those given by the LC model (as that model implies forever decreasing mortality rates). A generalised logistic curve was used to provide a smooth path to the long-run, with users of the model able to change its parameters. At the default parameter values used in PCPOP, life expectancy in 2059-60 was 89.1 and 91.4 years for males and females respectively — close to the projected LC results.

# B    Health expectancy

## B.1    Introduction

With increases in life expectancies in Australia being driven by people living to older ages, an issue is whether people are spending these extra years of life in good or poor health.

> … increases in life expectancy alone are not important. What is important is that people live longer lives in better health. (AIHW 2013c)

> Improvement of population health means more than simply delaying death or increasing life expectancy at birth. People and societies are also concerned about the presence of disease and about degrees of functioning. (Salomon et al. 2012, p. 2144)

> Knowing whether and to what extent quality of life is being traded off for quantity of life is fundamentally important information for governments, health services, health practitioners and the public. (Banham, Woollacott and Lynch 2011, p. 1)

This issue has implications for government policies on health, income support and other services designed to assist older Australians. If people are living longer, but their remaining years of life are spent in poor health, this could increase the costs of providing services to older people in the future. If the health of older people does not significantly deteriorate until after a certain age, then some policies such as the eligibility age for the Age Pension may need revision to avoid providing incentives for individuals to retire earlier than they may otherwise given their improved health status at older ages.

This appendix details some of the approaches that have been used to estimate health expectancy and presents some of their findings.

## B.2    Estimating health expectancy

Estimating 'health expectancy' for a population can shed light on whether people are living longer, but in poorer health. Health expectancy is an extension of the concept of life expectancy and combines mortality and morbidity information in a single measure. As Mathers (2002, p. 177) put it, health expectancy is:

> … a generic term for all population indicators that estimate the average time (in years) that a person could expect to live in various states of health.

Building on earlier work in the 1960s, health expectancies were first estimated empirically in the 1970s. The original method — which is still commonly used — was to combine mortality information from a period life table with cross-sectional information on the prevalence of morbidity (SA Health 2003, p. 2; Salomon et al. 2012, p. 2145) (box B.1).

There are many different measures of health expectancies. They largely differ in how morbidity is defined, categorised and evaluated (Salomon et al. 2012, p. 2145). Three typical health expectancy measures currently used include:

- *Health-adjusted life expectancy (HALE).* This measure, sometimes referred to as *healthy life expectancy*, has tended to be used by Australian government agencies such as the Australian Institute of Health and Welfare (AIHW) and SA Health for monitoring population health (box B.2). HALE measures the number of healthy years (free from disability or disease) that a person of a particular age can expect to live based on current trends in deaths and disease patterns (AIHW 2013c; Mathers 2002, p. 177).

- *Healthy life years.* This measure is used by the European Commission as one of its core set of European Union structural indicators for yearly monitoring of outcomes related to health care and retirement policies (EC 2013b; Salomon et al. 2012, p. 2145).[121] It is based on limitations in daily activities and has thus been described as a disability-free life expectancy (Jagger 2007, p. 1) — see next.

- *Disability-free life expectancy.* The AIHW recently produced disability-free life expectancies for Australia (AIHW 2012b). This is based on limitations in daily activities. It measures the number of remaining years that a person of a particular age can expect to live without disability (Mathers 2002, p. 177).

- *Active life expectancy* or *healthy active life expectancy.* This seeks to estimate how long people live or can live independently (Robine in Capezuti, Siegler and Mezey 2013, p. 4).The measure draws on data on performance of personal activities of daily living and instrumental activities of daily living.

- *Life expectancy free of a specific disease or disability.* An example of the use of this measure is Nepal, Brown and Ranmuthugala (2008), who derived dementia-free life expectancies for older Australians covering the period 2006 to 2008.

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[121] Indeed, in its European Innovation Partnership on Active and Healthy Ageing, the European Union has committed to an increase in two health life years at birth for the next 10 years (Jagger et al. 2013, p. 1; WHO 2012, p. 1).

## Box B.1 Sullivan's method for calculating health expectancies

Sullivan's original approach — still commonly used in estimating health expectancies — was to combine mortality from a period life table with cross-sectional information on the prevalence of morbidity (Sullivan 1971).

- *The life table*. As a first step, a period life table is constructed using prevailing age and sex specific mortality rates. This indicates the average number of extra years a person of a particular age and sex might expect if current age and sex specific mortality rates were to continue throughout the remainder of their life.

- *Morbidity prevalence*. Age-specific prevalence of morbidity, or disability, in the population is then added to the life table. (Where there are many health states, a severity-weighted prevalence estimate is required. This can be represented using total years with disability for each age-sex category expressed as a rate per 1000 population.)

The table below illustrates Sullivan's method in calculating disability-free life expectancy in a stylised example.

| Age | Survivors | Years lived | Life expectancy (LE) | Disability prevalence | Years with disability | Years without disability | LE with disability | Disability free LE |
|---|---|---|---|---|---|---|---|---|
| 0 | 100 000 | 99 579 | 77.3 | 4.5 | 4 481 | 95 098 | 18 | 59.3 |
| 1 | 99 493 | 397 681 | 76.7 | 4.5 | 17 896 | 379 785 | 18.1 | 58.6 |
| 5 | 99 383 | 496 781 | 72.8 | 9.6 | 47 691 | 449 090 | 17.9 | 54.9 |
| 10 | 99 324 | 496 407 | 67.8 | 8.6 | 42 691 | 453 716 | 17.4 | 50.4 |
| 15 | 99 232 | 495 578 | 62.9 | 5.7 | 28 248 | 467 330 | 17 | 45.9 |
| 20 | 98 898 | 493 158 | 58.1 | 7.6 | 37 480 | 455 678 | 16.8 | 41.3 |
| 25 | 98 350 | 490 068 | 53.4 | 8.5 | 41 656 | 448 413 | 16.5 | 36.9 |
| 30 | 97 705 | 486 886 | 48.7 | 10.6 | 51 610 | 435 276 | 16.2 | 32.5 |
| 35 | 97 031 | 483 217 | 44.1 | 12.2 | 58 953 | 424 265 | 15.8 | 28.3 |
| 40 | 96 256 | 479 167 | 39.4 | 14.3 | 68 521 | 410 646 | 15.3 | 24.1 |
| 45 | 95 352 | 474 122 | 34.7 | 17.9 | 84 868 | 389 254 | 14.7 | 20.0 |
| 50 | 94 195 | 466 899 | 30.1 | 23.5 | 109 721 | 357 178 | 14 | 16.1 |
| 55 | 92 394 | 455 294 | 25.7 | 30.9 | 140 686 | 314 608 | 13.1 | 12.6 |
| 60 | 89 587 | 437 558 | 21.4 | 41.6 | 182 024 | 255 534 | 11.9 | 9.5 |
| 65 | 85 150 | 409 388 | 17.4 | 44.0 | 180 131 | 229 257 | 10.4 | 7.0 |
| 70 | 78 027 | 362 687 | 13.7 | 58.3 | 211 447 | 151 241 | 9.0 | 4.7 |
| 75 | 66 778 | 293 861 | 10.6 | 59.6 | 175 141 | 118 720 | 7.4 | 3.2 |
| 80 | 51 178 | 211 573 | 8.1 | 73.2 | 154 871 | 56 701 | 6.2 | 1.8 |
| 85 | 33 730 | 201 088 | 6.0 | 81.5 | 163 887 | 37 201 | 4.9 | 1.1 |

In the table, disability prevalence refers to disability classified in a dichotomous way, based on the inclusion or exclusion criteria of what constitutes disability and what does not. By substituting severity-weighted disability prevalence for disability prevalence, health life expectancy or HALE, can then be calculated.

*Source*: SA Health (2003).

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| Box B.2 | **The use of health expectancy in Australia** |

Some government agencies in Australia have used health expectancy to monitor population health.

For example, the Australian Institute of Health and Welfare (AIHW) last produced estimates of health adjusted life expectancy (HALE) in its 2007 report *The Burden of Disease and Injury in Australia 2003* (Begg et al. 2007). It is currently undertaking a project to revise and update its previous burden of disease studies and disease monitoring work. The results, expected in late 2015, may include new Australian estimates of HALE (AIHW 2013b).

More recently, the AIHW produced expected years of life without disability covering the period 1998 to 2009 (AIHW 2012b). The estimates drew on data on prevalence of disability and severe or profound core activity limitation from the ABS Survey of Disability, Ageing And Carers.

The South Australia Government sets targets for 'healthy life expectancy' in its Strategic Plan for the State. The current Plan (Government of South Australia 2011) seeks to increase the:

- healthy life expectancy of South Australians to 73.4 years for males and 77.9 years for females by 2020 (target 78)
- 'average' healthy life expectancy of Aboriginal males to 67.5 years and Aboriginal females to 72.3 years by 2020 (target 79).

Progress against the targets is measured against SA Health estimates of HALE based on data in burden of disease studies for South Australia. The latest provisional estimates were issued in 2011 covering the period 2006 to 2008 (SA Health 2012).

In Queensland, HALE estimates were reported by Queensland Health for 2003 and 2006. These were drawn from burden of disease studies for Queensland. However, recent Queensland Chief Health Officer reports, which include information on burden of disease and injury for the Queensland population, do not include health expectancy estimates (Queensland Health 2012).

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Morbidity data for estimating health expectancies can come from burden of disease studies or (self-reported or self-rated) health surveys. For example, the AIHW, SA Health and Institute for Health Metrics and Evaluation (IHME) estimates of HALE draw on morbidity data in burden of disease studies (Begg et al. 2007; IHME 2012b; SA Health 2012). On the other hand, estimates by the AIHW of disability-free life expectancies drew on the ABS Survey of Disability, Ageing and Carers and the General Lifestyle survey (AIHW 2012b, p. 4).

# B.3 Australian health expectancy estimates

The AIHW last published its estimates of HALE for Australia in 2007, drawing on the Australian burden of disease study for 2003 (Begg et al. 2007). The estimates were given by jurisdiction, age, gender, socio-economic quintile and remoteness; and for two years, 1993 and 2003. Some of these estimates are reproduced in table B.1. The AIHW is updating its previous burden of disease studies and disease monitoring work, which may result in new estimates of HALE for Australia in late 2015.

Table B.1 **AIHW: life expectancy and HALE at birth, by location and socio-economic status, 2003**

|  | Life expectancy (LE) | HALE | HALE/LE |
|---|---|---|---|
|  | Years | Years | Per cent |
| **Jurisdiction** |  |  |  |
| NSW | 80.6 | 72.9 | 90.4 |
| Vic | 80.9 | 73.2 | 90.5 |
| Qld | 80.8 | 72.8 | 90.1 |
| WA | 81.3 | 73.5 | 90.4 |
| SA | 80.3 | 71.7 | 89.3 |
| Tas | 79.2 | 71.3 | 90.0 |
| NT | 75.5 | 67.7 | 89.7 |
| ACT | 82.3 | 75.9 | 92.2 |
| **Remoteness** |  |  |  |
| Major cities | 81.2 | 73.5 | 90.5 |
| Regional | 80.0 | 72.0 | 90.0 |
| Remote | 78.1 | 69.5 | 89.0 |
| **Socio-economic quintile** |  |  |  |
| Low | 79.6 | 71.2 | 89.4 |
| Moderately low | 80.0 | 72.0 | 90.0 |
| Average | 80.2 | 72.2 | 90.0 |
| Moderately high | 81.2 | 73.6 | 90.6 |
| High | 82.7 | 75.5 | 91.3 |
| **Australia** | 80.7 | 72.9 | 90.3 |

*Sources*: Begg et al. (2007, pp. 102–103); Commission calculations.

More recent estimates of HALE for Australia as a whole in 1990 and 2010, and by age and gender, were published along with estimates for 186 other countries by the IHME.[122] The estimates drew on data from the Global Burden of Disease Study 2010.[123]

According to the IHME estimates for Australia, a person's life expectancy and HALE at birth in 2010 were 81.5 years and 70.1 years respectively (figure B.1). This means that a person could expect to spend, on average, 11.4 years of their life with disability or disease (which is higher than that given by the AIHW 2003 estimates in table B.1). For those aged 60–64 years, life expectancy and HALE were 24.4 years and 18.7 years, respectively. At ages 80 years and over, life expectancy and HALE were 9.2 years and 6.4 years respectively.

Figure B.1    **Global Burden of Disease 2010: life expectancy and HALE, Australia, 2010, distribution by age, both genders combined**
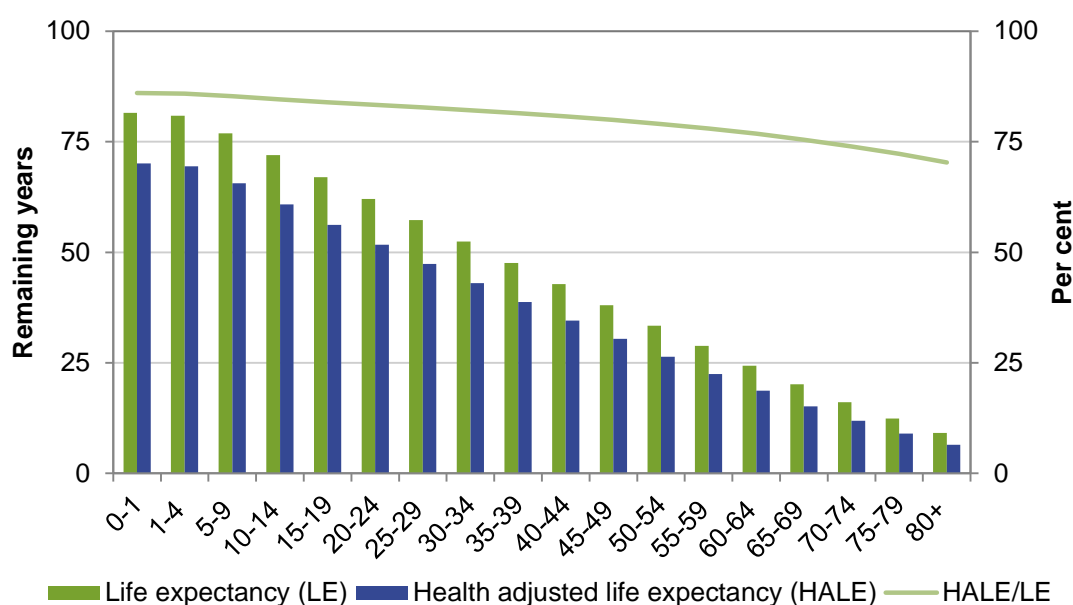


*Data source*: Commission estimates based on IHME (2012b).

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[122] Also see Salomon et al. (2012), who recently analysed health expectancy for 187 countries, including Australia, drawing on the Global Burden of Disease Study 2010 (IHME 2012b).

[123] The Global Burden of Disease Study is a systematic, scientific effort by a collaborative of researchers worldwide to quantify the comparative magnitude of health loss to diseases, injuries and risk factors by age, sex and geography over time (IHME 2013b). It dates back to the 1990s. The most recent 2010 Study published its first significant findings and an explanation of its methods in *The Lancet* in December 2012. The 2010 Study is broader in scope than previous studies and includes: 291 diseases and injuries, 67 risk factors, 1160 non-fatal health consequences (or 'sequelae'), 20 age groups, and 187 countries (IHME 2013c).

As people age, HALE as a proportion of life expectancy declines — that is, a higher number of the remaining years of life is spent in disability or with disease (figure B.1). At birth, HALE represents around 86 per cent of life expectancy (which is lower than that given by the AIHW 2003 estimates in table B.1). However, at ages 60 to 64 years and 80 years and over, these proportions decline to 76.8 per cent and 70.3 per cent, respectively.[124]

The IHME estimates in table B.2 show that, over time, there has been an expansion of, rather than a compression in, morbidity in Australia. From 1990 to 2010, for both genders combined, life expectancy at birth increased by 4.6 years (from 76.9 years to 81.5 years), whereas HALE at birth increased by 3.7 years (from 66.4 years to 70.1 years).[125] This trend is consistent with estimates for other developed countries such as Canada, New Zealand, Germany, the United Kingdom and the United States. Salomon et al. (2012, p. 2158), who recently analysed health expectancy for 187 countries including Australia, drawing on the Global Burden of Disease Study 2010, also report 'clear evidence of expansion of morbidity'.

These results — namely, the relatively high proportion of an older person's remaining years spent in poor health and the expansion in population morbidity over time — provide evidence of looming pressures on future provision of health and other age-related services in Australia.

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[124] The Global Burden of Disease 2010 Study sheds light on what might be the leading types of disease and disability for older people. For ages 60 to 64 years, these are musculoskeletal disorders (including low back and neck pain) and mental and behavioural disorders. For ages 80+, these are musculoskeletal disorders, neurological disorders and unintentional injuries (IHME 2012a, p. 2 (Country Profile - Australia)).

[125] The AIHW (Begg et al. 2007, p. 115) reported a similar trend from 1993 to 2003. They estimated that life expectancy at birth for both genders increased by 2.7 years from 78 years to 80.7 years, but that HALE increased by less than this — by 2.2 years from 70.7 years to 72.9 years.

**Life expectancy and HALE at birth, both genders combined, Australia and selected developed countries**

Years

| | 1990 | | 2010 | | Change between: 1990 and 2010 | |
|---|---|---|---|---|---|---|
| | *Life expectancy* | *HALE* | *Life expectancy* | *HALE* | *ΔLife expectancy* | *ΔHALE* |
| Australia | 76.9 | 66.4 | 81.5 | 70.1 | 4.6 | 3.7 |
| Austria | 75.7 | 65.8 | 80.6 | 69.1 | 4.9 | 3.3 |
| Belgium | 75.9 | 65.7 | 79.5 | 68.5 | 3.6 | 2.8 |
| Canada | 77.2 | 67.0 | 80.6 | 69.6 | 3.4 | 2.6 |
| Denmark | 75.2 | 65.3 | 78.9 | 67.9 | 3.7 | 2.6 |
| Finland | 75.1 | 63.8 | 80.1 | 67.3 | 5.0 | 3.5 |
| Germany | 75.4 | 65.3 | 80.2 | 69.0 | 4.8 | 3.7 |
| Iceland | 77.6 | 65.5 | 82.2 | 68.4 | 4.6 | 2.9 |
| Ireland | 74.8 | 65.2 | 79.9 | 68.9 | 5.1 | 3.7 |
| Japan | 79.1 | 70.1 | 82.6 | 73.1 | 3.5 | 3.0 |
| Netherlands | 77.0 | 66.5 | 80.6 | 69.1 | 3.6 | 2.6 |
| New Zealand | 75.3 | 64.9 | 80.7 | 69.2 | 5.4 | 4.3 |
| Sweden | 77.6 | 66.8 | 81.4 | 69.6 | 3.8 | 2.8 |
| Switzerland | 77.5 | 67.5 | 82.2 | 70.8 | 4.7 | 3.3 |
| United Kingdom | 75.7 | 65.4 | 79.9 | 68.6 | 4.2 | 3.2 |
| United States | 75.2 | 65.6 | 78.2 | 67.9 | 3.0 | 2.3 |

*Sources*: (IHME 2012a); Commission calculations.

# B.4    Improving and extending the use of health expectancy in Australia

Information about health expectancy in the population has the potential to assist governments in addressing the implications of an ageing population, particularly in the development of more effective policies on health and other services for older people.

Within this context, there is merit in investigating how the current use and reporting of health expectancy in Australia could be improved. Three potential areas appear to warrant further attention.

*Which measure of health expectancy?*

Of the measures of health expectancy, HALE appears to more comprehensively capture alternative health states and, for this reason, may provide a better measure of the quality of life expectancy. Disability-free or disease-free life expectancies

tend to be more partial in their treatment of morbidity. For example, as the AIHW itself noted in relation to disability-free life expectancy, disability does not necessarily equate to poor health or illness.

> For example, in the early stages of disability associated with paraplegia, the affected persons may be considered in poor health, but once their condition is stable they may enjoy good health particularly in the sense that they do not require medical services and may participate in many life areas. Therefore, discussion of 'health expectancy' should not be interpreted as considering years with disability to be of less value than 'health years (without disability) for any policy purposes. (AIHW 2012b, p. 4)

However, the benefit of using HALE needs to be traded off with the significant data requirements needed.

### More timely reporting of health expectancy estimates

The provision of timely information on health expectancy can help governments finesse their age-related polices. The reporting of Australian estimates of HALE has not been timely. AIHW's most recent estimates were reported in 2007 and new estimates may occur in late 2015. In contrast, the SA Health produce estimates of HALE routinely in the form of three-yearly average estimates, with the latest estimates released in 2012. The UK Office for National Statistics report health expectancy estimates on an annual basis, covering the United Kingdom and constituent counties, regions and local authority districts within it (UK Office for National Statistics 2012, p. 1).

Having said that, the production of health expectancy estimates is not costless. Governments would need to commit to using the estimates to ensure that the benefits of having this information are realised.

### Can health expectancy inform the debate surrounding linking health expectancy to the Age Pension eligibility age?

In Australia, health expectancy has generally been estimated by government agencies for the purpose of monitoring population health. Some international commentators, however, have floated the idea of applying health expectancy more broadly than this — such as to setting the age of entitlement for government pensions.

- In their paper on the UK state pension system, Harper, Howse and Baxter (2011) modelled the effects on government spending of linking healthy life expectancy to the state pension age. They suggested that:

… [T]here is substantial merit in using a health adjusted measure of life expectancy as the driver of changes to state pension age. … this measure is intrinsically linked to the ability of an individual to continue to work into later life, and so mitigates the 'substitution problem' [whereby state pensions are substituted with pre-retirement disability welfare payments] . (2011, pp. 42, 40)

- Cutler, Meara and Richards-Shubik (2011) used healthy life expectancy to model the impacts of a hypothetical policy change that increased the ages of eligibility (between 62 and 64 years) for US Social Security and Medicare benefits. They found that until age 70, health appeared to decline slowly and, thus, work capacity is apparently large. They found that rates of new disability were higher at older ages, especially among disadvantaged persons. They concluded that, based upon the health of today's retirees, many more individuals could work than currently do.

- At an Australian seminar on 'Ageing Well: Evidence for a Health Future' in April 2012, Professor Jagger from the University of Newcastle (UK) considered that new data for the EU's Healthy Life Years Indicator — which show that men and women living in the European Union can expect to live disability-free to the age of 62 — have implications for lifting the retirement age (CEPAR 2012).

In considering these options, there would also be value in first exploring the merit of using life expectancy as the basis for guiding any changes to the Age Pension eligibility age. This requires less data than health expectancy estimates, and is already undertaken in some OECD countries (chapter 6).

# C Productivity estimates at the industry level

## C.1 Industry productivity assumptions

Long run productivity trends differ between industries. Should these trends persist, then aggregate productivity will be determined not only by each industry's productivity growth, but also by the degree to which labour shifts between particular industries. This premise underpinned the Commission's 2012 projections of productivity (PC 2012b) which were used to determine the 'reference case' (the 'business as usual' case) against which the impacts of COAG reforms were assessed (PC 2012a). This study uses a similar approach. Over time, and for a range of reasons, industries such as manufacturing and agriculture have declined significantly in relative size, with service industries growing in relative importance and employing a greater share of the economy's labour.

Projecting industry trends is not straightforward. Most industry productivity projections are based on assumptions derived from past trends — an approach that has been adopted for this study. However, past trends may not always provide good insight for making reasonable projections of the future. For example, while an industry may have experienced well above market sector productivity growth over the past 10 or even 20 years, it may be unreasonable to assume the trend will continue over the next 50 years. Such an assumption would mean that an industry would maintain this strong productivity growth for 60 to 70 years — an assumption most would see as unreasonable. The is likely to hold for those industries with poor productivity growth trends. Therefore, in any projection series a significant number of 'judgment calls' must be made which will influence the outcome.

A good starting point for consideration of these issues is the Commission's 2012 analysis of the impacts of COAG's reform agenda (PC 2012b). In that analysis, the Commission developed a reference case using the Monash Multi-Regional Forecasting (MMRF) model (discussed in chapter 1). For details underpinning the 2012 assumptions see PC (2012b, pp. 141–168).

## C.2 The Commission's 2012 MMRF modelling

The MMRF results shown in this section have been extended to 2059-60, so that they can be compared with the results estimated by this report, as shown in section C.3. The modelling suggested that the services sector would continue to grow in relative significance (figure C.1). Even though most industries are projected to return to higher productivity growth rates than those between 2006 and 2011 (table C.1), the compositional shift towards industries with lower productivity depresses aggregate labour productivity growth rates compared with historical benchmarks. On average, over the period examined, the modelling estimated long-run aggregate labour productivity growth rate of 1.3 per cent (figure C.2).

Table C.1    **Labour productivity projections from the Commission 2012 study**

ANZSIC industries

|  | 2006 to 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Post 2016 |
|---|---|---|---|---|---|---|---|---|
| Agriculture, Forestry & Fishing | 1.3 | 1.5 | 1.8 | 2.1 | 2.4 | 2.6 | 2.9 | 3.2 |
| Mining[a] | -4.8 | -3.7 | -2.7 | -1.7 | -0.8 | 0.1 | 1.0 | 1.7 |
| Manufacturing | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 |
| Electricity, Gas, Water & Waste Services | -4.8 | -3.8 | -2.8 | -1.9 | -0.9 | 0.0 | 1.0 | 2.0 |
| Construction | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 |
| Wholesale Trade | 0.6 | 0.8 | 1 | 1.2 | 1.4 | 1.5 | 1.7 | 1.9 |
| Retail Trade | 2.8 | 2.6 | 2.5 | 2.4 | 2.2 | 2.1 | 2 | 1.8 |
| Accommodation & Food Services | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | -0.1 | 0.0 | 0.1 |
| Transport, Postal & Warehousing | 0.8 | 1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.9 | 2.1 |
| Information Media & Telecommunications | 6.0 | 6.0 | 6.0 | 6.1 | 6.1 | 6.1 | 6.2 | 6.2 |
| Financial & Insurance Services | 3.3 | 3.2 | 3.1 | 3 | 2.9 | 2.8 | 2.7 | 2.6 |
| Public Administration & Safety | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Education & Training[b] | -0.9 | -0.7 | -0.6 | -0.5 | -0.4 | -0.3 | -0.2 | 0.0 |
| Health Care & Social Assistance | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.7 |
| Business services[c] | -0.7 | -0.5 | -0.3 | -0.1 | 0.1 | 0.3 | 0.5 | 0.7 |
| Other services[d] | -0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 |
| Ownership of dwellings[e] | 3.0 | 3.0 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.8 |

**a** Productivity projections were made for sub-sectors of the Mining industry which resulted in a long-run average productivity rate between 2017 and 2050 of 1.7 per cent. **b** Productivity in Education and training was assumed to converge to the long-run average of 0 after 2020. **c** Business services includes three industries: Rental, hiring and real estate services; Professional, scientific and technical services; and Administrative and support services. **d** Other services includes two industries: Arts and recreational services and Other services. **e** Productivity in ownership of dwellings relates to the growth rate of Gross Value Added (GVA) and is not labour productivity as the sector is assumed to not use any labour inputs. However, growth in GVA from this sector contributes to total GVA growth and therefore impacts on economy wide labour productivity estimates.
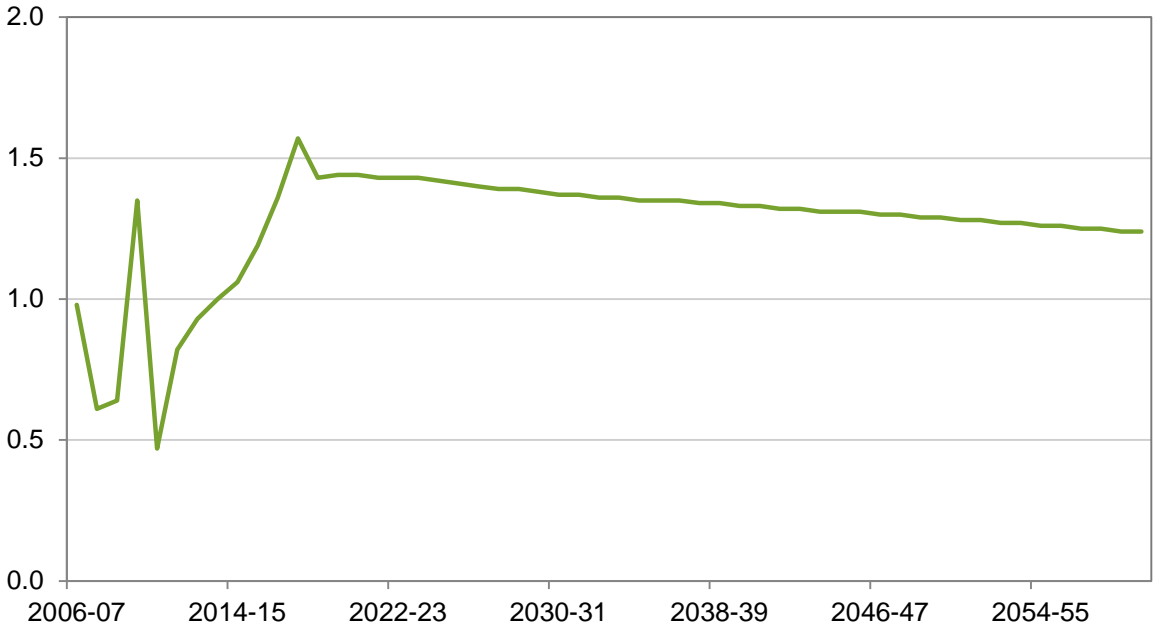
Figure C.1 **Annual hours worked shares by sector, actual 2012-13 and projected 2059-60**

Commission's 2012 study, per cent of total hours worked
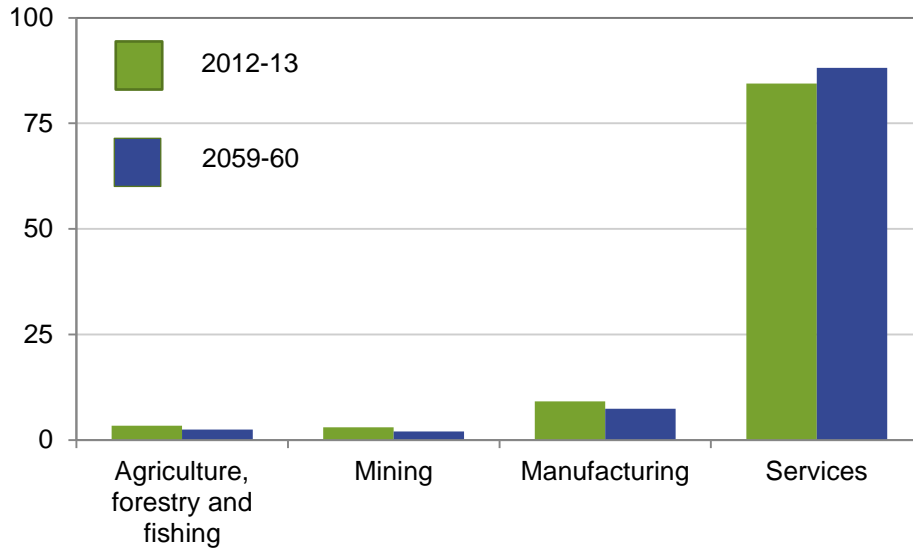
Figure C.2 **Projected economy wide labour productivity growth path**

Commission's 2012 study, Labour productivity growth rate 2006-07 to 2059-60



*Data source*: Based on PC (2012b).

Given these projections, GDP growth rates would be lower than generally experienced in the past. Further, levels of multifactor productivity growth and capital deepening would fall relative to historical norms (figure C.3).

Figure C.3 **Contributions to growth and average productivity estimates with an ageing population from MMRF, historical and projected**

Per cent
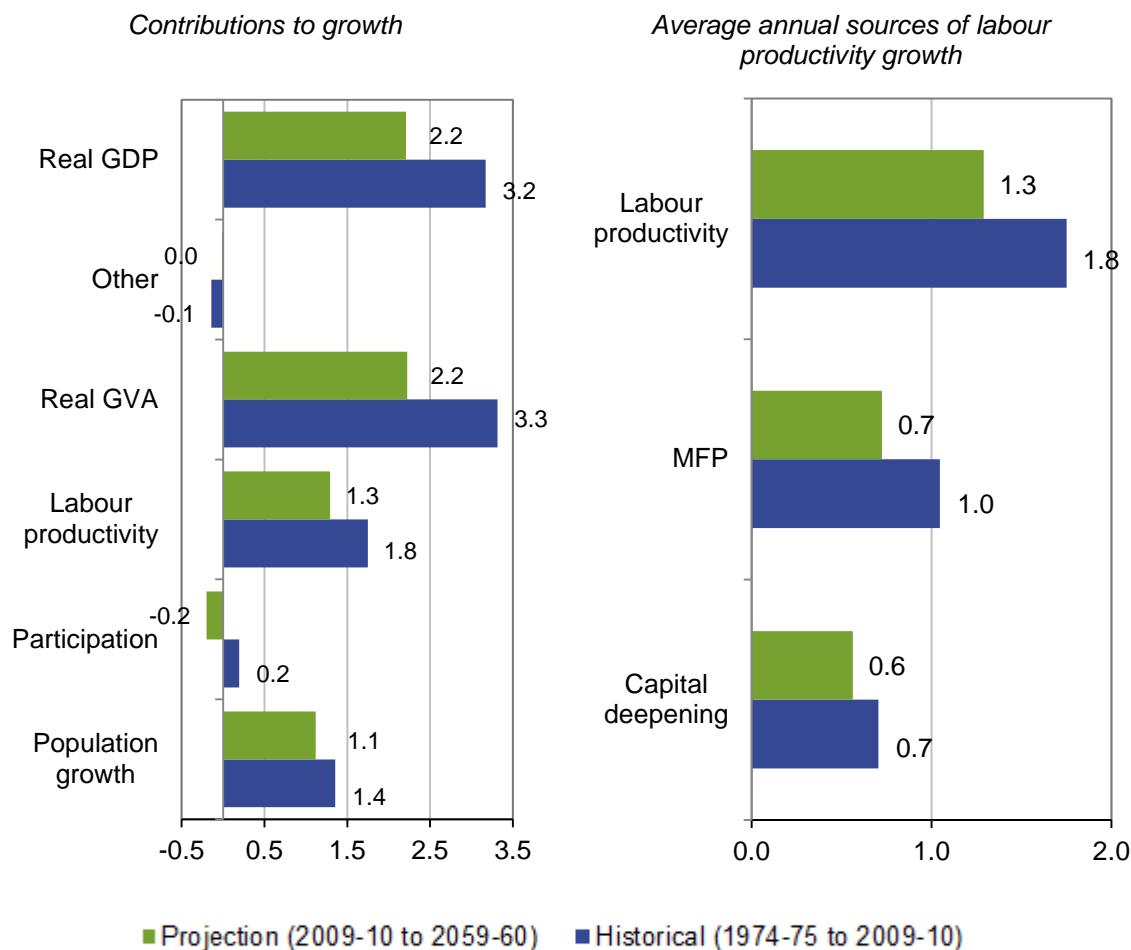


*Data source*: Commission estimates based on PC (2012b).

# C.3 The 'base case' used in this report

This study emulates the disaggregated labour productivity methods adopted in PC (2012b) described above, but uses new industry data and the demographic and labour supply projections from chapters 2 and 3. The detailed methodology is set out in box C.1 and the key industry-specific outcomes in table C.2.

> **Box C.1** **Approach to projecting labour productivity rates**
>
> Aggregate labour productivity (LP) can be estimated as a weighted average of the labour productivity rates of industries: $LP_t = \sum_{i=1}^{N} w_{it} \frac{Y_{it}}{L_{it}}$ $where$ $w_{it} = \frac{L_{it}}{L_t}$ .
>
> $L_t$ is the economywide hours worked, $L_{it}$ are estimates of the hours worked for the ith industry at time t, and $Y_{it}$ is the gross value added of the ith industry at time t (ANZSIC 2006 industry classification). Projected industry labour shares ($w_{it}$) were primarily based on projecting forward linear trends observed between 1985-86 and 2012-13 in National Accounts data (ABS Cat. no. 5204.0). However, for some industries, this approach yielded unreasonable long-run estimates of shares. For Agriculture, forestry and fisheries; Manufacturing; and Wholesale trade, the projected long-run shares using this method were either negative or close to zero. For these industries, a minimum labour share was assumed. Conversely, for Mining and Construction, the historical trends suggested high long-run labour shares, reflecting the heavy influence of the recent mining boom. For these industries, maximum shares were assumed. So shares added to 100, any residual was evenly deducted (or added) to each industry.
>
> For industry specific labour productivity rates, historical trends were also used to inform future projections. Trends were taken from National Accounts data (ABS Cat. no. 5204.0, table 15) for the aggregate productivity cycle between 1998-99 and 2011-12. However, as for industry labour shares, some trends were constrained to ensure reasonable long run productivity rates. For Mining; Electricity, gas, water and waste services, Rental, hiring and real estate services; Public administration and safety; and Education and training, the estimated productivity trends were negative. With the exception of Mining and Electricity, gas, water and waste services, the long-run labour productivity of these industries were assumed to be equal to the average productivity growth seen of the entire period (1995-96 to 2012-13) for which data is available (noting the issues surrounding its measurement discussed in chapter 4). Longer run averages, as used in PC (2012b), were adopted for Mining and Electricity, gas, water and waste services, as the recent circumstances that lowered productivity in these industries are unlikely to persist. Similarly, the significant fall in labour shares apparent for Agriculture, forestry and fisheries is unlikely to continue indefinitely, and so the longer-run labour productivity estimate used in PC (2012b) was applied. For Construction; Professional, scientific and technical services and Administrative support services long run rates were based on industry-specific peak to peak estimates.
>
> As it is unlikely that industries would return to long-run productivity trends immediately, this study considered the typical adjustment period following a productivity shock (see below). Following that analysis, it was assumed that productivity rates in each industry would return to their long-run rates by 2014-15.
>
> Apart from industry specific labour usage and productivity rates, growth in the value of output in the ownership of dwellings sector must also be projected. While this sector does not use labour (as per National Accounts definitions), it does add to output and so also influences measured aggregate labour productivity. Growth in the value of output from dwellings was assumed to follow the growth in ownership transfer costs, which grew on average around 2 per cent per year in real terms between 1960 and 2012.

The base case outcome is a projected aggregate labour productivity growth rate of an average 1.5 per cent over the period from 2011-12 to 2059-60. The most significant driver of differences in average productivity levels between the Commission's 2012 analysis and that used in this study is the differences in industry composition.

Table C.2    **Labour shares and long-run productivity growth rates**
            Per cent

| | 2012-13 | | Base case 2059-60 | |
| --- | --- | --- | --- | --- |
| *Industry* | *Labour shares* | *Productivity* | *Labour shares* | *Long-run productivity* |
| Agriculture, Forestry & Fishing | 3.4 | -1.3 | 2.3 | 3.2 |
| Mining | 3.0 | 3.2 | 2.5 | 1.7 |
| Manufacturing | 9.1 | -0.1 | 6.6 | 1.72 |
| Electricity, Gas, Water & Waste Services | 1.4 | 6.5 | 1.2 | 2.0 |
| Construction | 9.9 | 0.8 | 9.9 | 1.7 |
| Wholesale Trade | 4.2 | -0.5 | 3.3 | 2.7 |
| Retail Trade | 9.0 | 2.2 | 7.4 | 2.5 |
| Accommodation & Food Services | 5.6 | -2.2 | 5.5 | 1.0 |
| Transport, Postal & Warehousing | 5.6 | 1.2 | 5.5 | 2.2 |
| Information Media & Telecommunications | 2.0 | -4.4 | 1.3 | 2.3 |
| Financial & Insurance Services | 3.8 | 7.6 | 2.6 | 2.5 |
| Public Administration & Safety | 6.2 | 4.2 | 5.6 | 0.3 |
| Education & Training | 7.3 | -0.9 | 8.3 | 0.1 |
| Health Care & Social Assistance | 10.4 | 5.2 | 13.3 | 0.8 |
| Business services[a] | 13.5 | 2.4 | 19.9 | 1.2 |
| Other services[b] | 5.5 | -2.4 | 4.8 | 1.2 |
| Dwellings (GVA growth)[c] | 0.0 | 2.4 | 0.0 | 2.0 |
| Period average productivity (2011-12 to 2059-60) | na | na | na | 1.5 |

[a] Business services includes three industries: Rental, hiring and real estate services; Professional, scientific and technical services; and Administrative and support services. [b] Other services includes two industries: Arts and recreational services and Other services. [c] Productivity in ownership of dwellings relates to the growth rate of GVA and is not labour productivity as the sector is assumed to not use any labour inputs. However, growth in GVA from this sector contributes to total GVA growth and therefore impacts on economy wide labour productivity estimates.

*Source*: Commission estimates.

The growth rates are not constant throughout the period, reflecting that it takes time for individual industries to return to their long-run average productivity growth rates and because the labour shares of industries are trending over the projection period (section C.4).

## C.4    Linking short-run and long-run productivity trends

As noted in box C.1, the speed with which an industry's productivity growth rate (labour or multifactor productivity) returns to a long run steady state has important ramifications for short-run estimates of aggregate productivity. This study uses shorter adjustment periods than the 2012 report, reflecting that some of the transitions forecast by that report have now already occurred, and based on further investigation of the empirical evidence for transitions to long-run productivity rates.

Even in the relatively stable period of economic growth between 1989-90 and 2011-12, productivity has been volatile (figure C.4). For almost all industries, the labour productivity series shows that productivity rates vary significantly on a year-on-year basis. However, recent data reveals growth rates generally well below the historical averages of industries, raising the question of the period taken to return towards average historical levels (or even whether such adjustment will occur or a new long run level emerge).

While the reasons for low and negative productivity in some industries vary, for most, past periods of negative productivity growth do not appear to be persistent. Across all industries (bar Electricity, Gas, Water and Waste Services discussed below), periods of negative productivity have lasted four years at the longest (figure C.5). And evidence suggests that for industries such as Mining (B), which has recently experienced negative productivity growth, current poor productivity levels would not be expected to persist. For mining, around one-third of the fall in multifactor productivity between 2000-01 and 2006-07 was due to increased investment prompted by higher commodity prices and was unrelated to the underlying efficiency of the industry (Topp et al. 2008).

The exception to the relatively short periods of negative productivity growth is the Electricity, Gas, Water and Waste Services industry (D). This industry has experienced negative labour productivity growth for almost all of the past 12 years. The poor performance has been driven by outcomes in the two largest sub-sectors — Electricity supply and Water supply, sewerage and drainage services — due to a mix of issues in output measurement and regulatory influences.

- For electricity, the combination of rising peak demand, retail price regulation, high and somewhat arbitrarily set reliability standards, along with a poorly functioning incentive based regulatory regime has encouraged significant capital investments, some of which were inefficient and others taking place earlier than what should have otherwise efficiently occurred (PC 2013b). These have lowered capital utilisation and labour productivity. However, falling demand and recent reforms have addressed many of the flaws in the incentive regulatory regime. There are likely to be significant reductions in the future growth of

investment in this industry. On top of these factors, measured productivity has also been affected by other regulatory interventions that have altered the cost of supplying electricity through inducing shifts away from coal-fired power to higher-cost, but less polluting, generation.
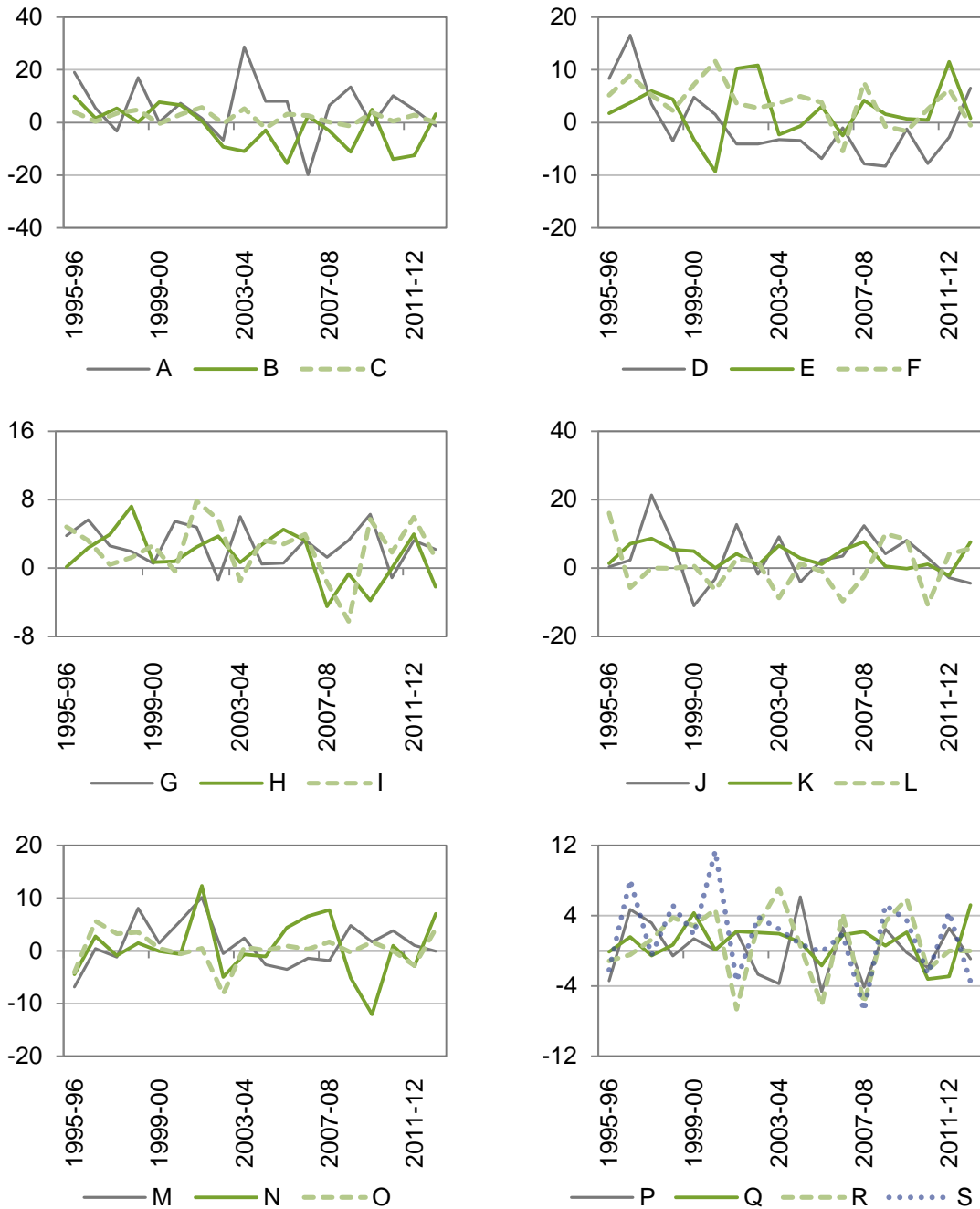
- For water supply, sewerage and drainage services, water restrictions in response to widespread drought (accompanied by lasting changes to water usage patterns), along with investments to improve water security (such as desalination plants) have been key determinants in explaining the industry's poor productivity performance (Topp and Kulys 2012). As with electricity, however, it is unlikely that the effects of the increased capital investments on productivity will persist.

- While for the Electricity, Gas, Water and Waste Services industry, the effects of the surge in capital investments are likely to dissipate, some of the other factors are structural and will permanently raise the input requirement of the industry. And given the current measurement of outputs, while it is likely that these changes have improved the quality of outputs, this will not be reflected in measured productivity.

Analysis of the effects of other shocks to the economy on labour productivity can also provide evidence to inform judgments about the duration of adjustment periods. Researchers at the Bank of England have found that for developed countries, even major economic crises (the Global Financial Crisis excepted) did not have persistent labour productivity impacts (Oulton and Sebastia-Barriel 2013). Labour productivity was found to rebound quickly.

the base series, productivity growth rates fall initially from current levels (2.2 per cent in 2012-13) as they adjust towards long-run assumed levels (figure C.6). Further, in both, the shift towards a more service based economy results in a gradual deterioration in labour productivity — a result more pronounced in the Commission's 2012 study into the impacts of COAG reforms (PC 2012b).

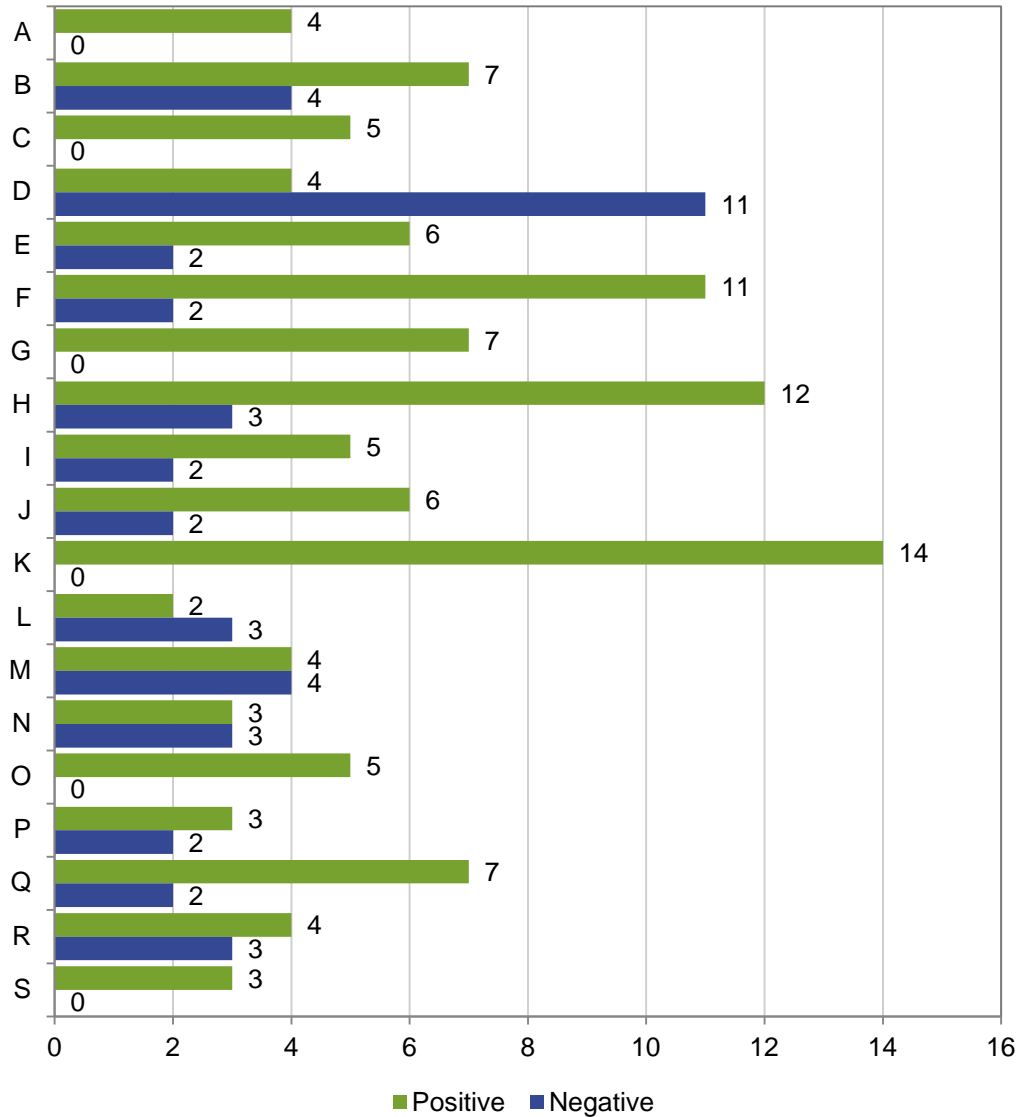## Figure C.4    **Industry labour productivity growth rates, 1995-96 to 2012-13**

Per cent



A Agriculture, Forestry and Fishing
B Mining
C Manufacturing
D Electricity, Gas, Water and Waste Services
E Construction
F Wholesale Trade
G Retail Trade
H Accommodation and Food Services
I Transport, Postal and Warehousing
J Information, Media & Telecommunications

K Financial and Insurance Services
L Rental, Hiring and Real Estate Services
M Professional, Scientific & Tech. Services
N Administrative and Support Services
O Public Administration & Safety
P Education & Training
Q Health care & Social Assistance
R Arts and Recreation Services
S Other Services

*Data source*: ABS (Australian System of National Accounts, cat. no. 5204.0, table 15).

Figure C.5    **Maximum consecutive years of positive and negative labour productivity growth, 1995-96 to 2012-13**



A Agriculture, Forestry and Fishing
B Mining
C Manufacturing
D Electricity, Gas, Water and Waste Services
E Construction
F Wholesale Trade
G Retail Trade
H Accommodation and Food Services
I Transport, Postal and Warehousing
J Information, Media & Telecommunications

K Financial and Insurance Services
L Rental, Hiring and Real Estate Services
M Professional, Scientific & Tech. Services
N Administrative and Support Services
O Public Administration & Safety
P Education & Training
Q Health care & Social Assistance
R Arts and Recreation Services
S Other Services

*Data source*: ABS (Australian System of National Accounts, cat. no. 5204.0, table 15).

Figure C.6    **Economy wide labour productivity growth rate assumptions, 2011-12 to 2059-60**

Per cent
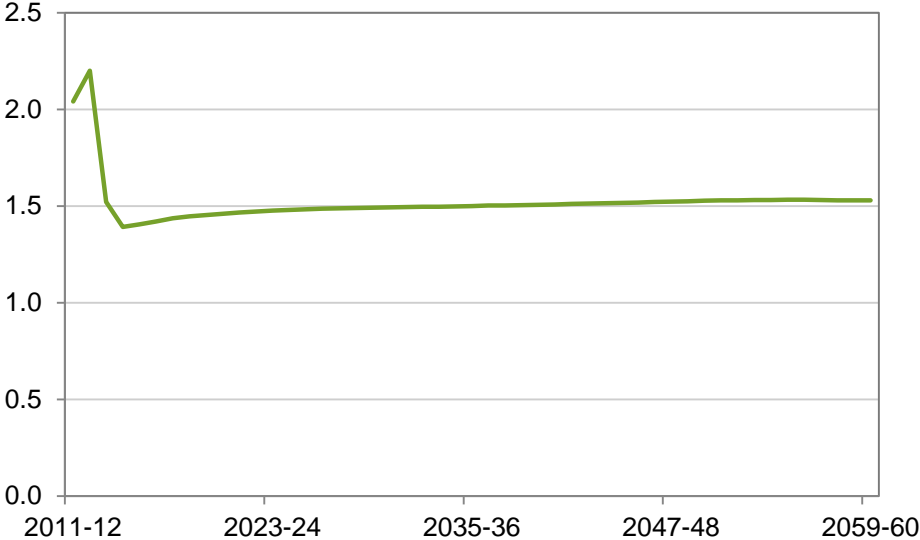


*Data source*: Commission estimates.

# D    Comparing projections

This appendix contains charts that compare the economic projections made in the following reports:

- the Australian Government's Intergenerational Report of 2002-03 (hereafter IGR 2002);

- the Productivity Commission's report of 2005 on the economic implications of an ageing Australia (denoted by PC 2005);

- the Australian Government's Intergenerational Report of 2010 (hereafter IGR 2010), which also revises the projections in the intergenerational report of 2007 (denoted by IGR 2007r).

There have been some challenges in making the comparisons, including that:

- the projections of several indicators in the reports are presented in charts, and not as raw data

- where projections of reports are set out in data tables, they are often for specific years which are not able to be compared with the projections of other reports.

The main technique for enabling comparison of projections is to extract raw data from the reports (and in the case of the PC's report, from the website) and, where there are missing data, supplement that with data extracted from charts using a software application.[126]

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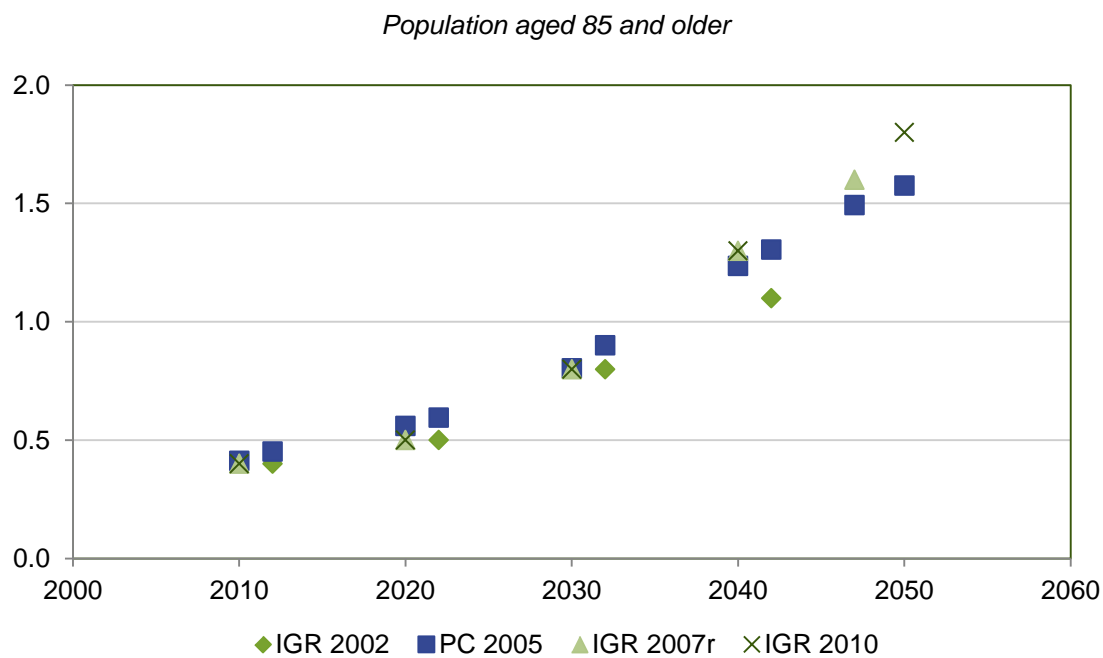[126] Data were extracted from charts using Webplot Digitizer, (http://arohatgi.info/WebPlotDigitizer/).

# Demographic projections

### Figure D.1 **Population projections**
Millions of people

*Total population*



◆ IGR 2002  ■ PC 2005  ▲ IGR 2007r  ✕ IGR 2010

*Population aged 65 to 84*



◆ IGR 2002  ■ PC 2005  ▲ IGR 2007r  ✕ IGR 2010
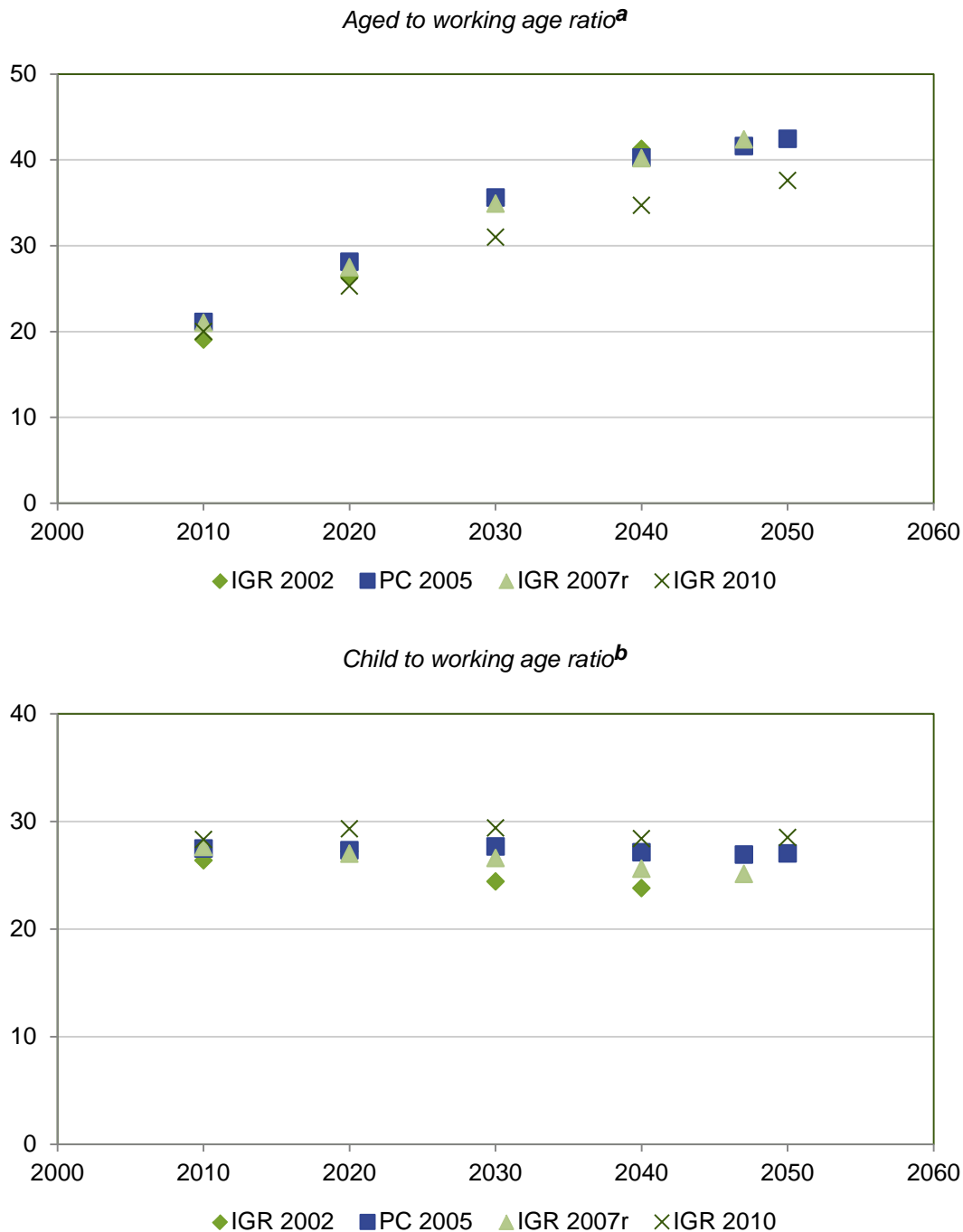
Figure D.1    **(continued)**

*Population aged 85 and older*



Data source: Australian Government (2002, p. 22 table 3); Australian Government (2010 Appendices A and D), PC (2005d).

## Figure D.2    **Projections of dependency ratios**
### Per cent

*Aged to working age ratio[a]*



IGR 2002    ■ PC 2005    ▲ IGR 2007r    ✕ IGR 2010

*Child to working age ratio[b]*



◆ IGR 2002    ■ PC 2005    ▲ IGR 2007r    ✕ IGR 2010

**a** The proportion of people aged 65 and older to people of traditional labour force age, 15 to 64. **b** The proportion of children aged under 15 to people of traditional labour force age, 15 to 64.

*Data source*: Australian Government (2002, p. 22); Australian Government (2010 Appendices A and D); PC (2005d).

# Fiscal and economic projections

**Figure D.3** **Fiscal gap projections**[a]
Per cent of GDP
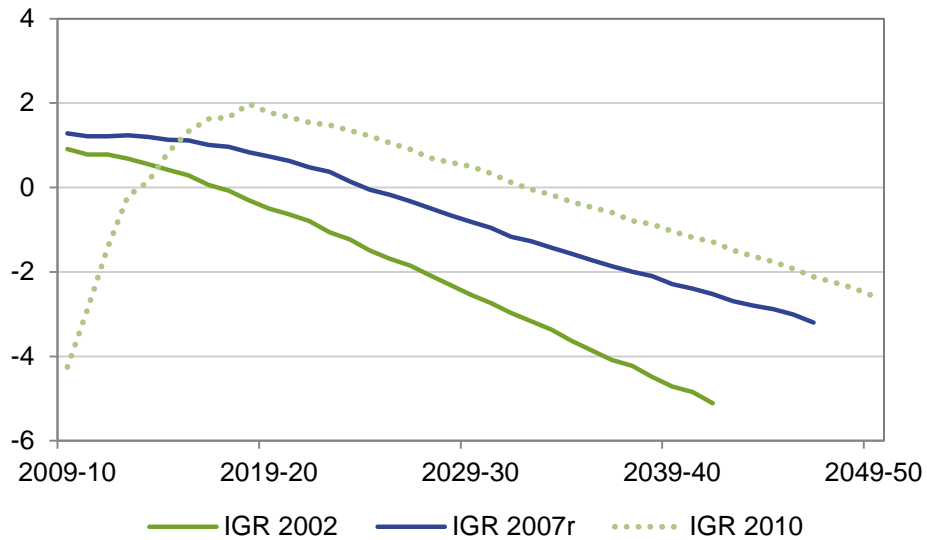


**a** Fiscal gap is the gap between government receipts and payments and is equivalent to the primary balance.
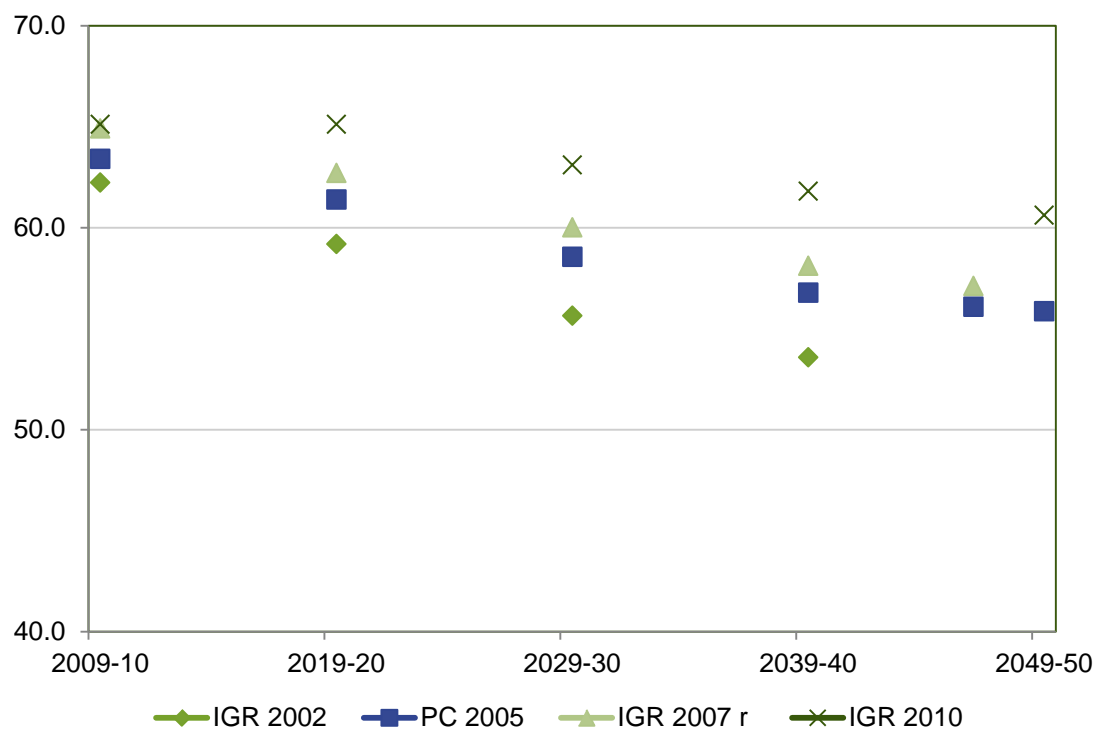
*Data source*: Digitised data from charts in Australian Government (2002, p. 7 chart 4); Australian Government (2010, p. 40 chart 3.2).

## Figure D.4  Real GDP and real GDP per person annual growth projections

*Real GDP annual growth*



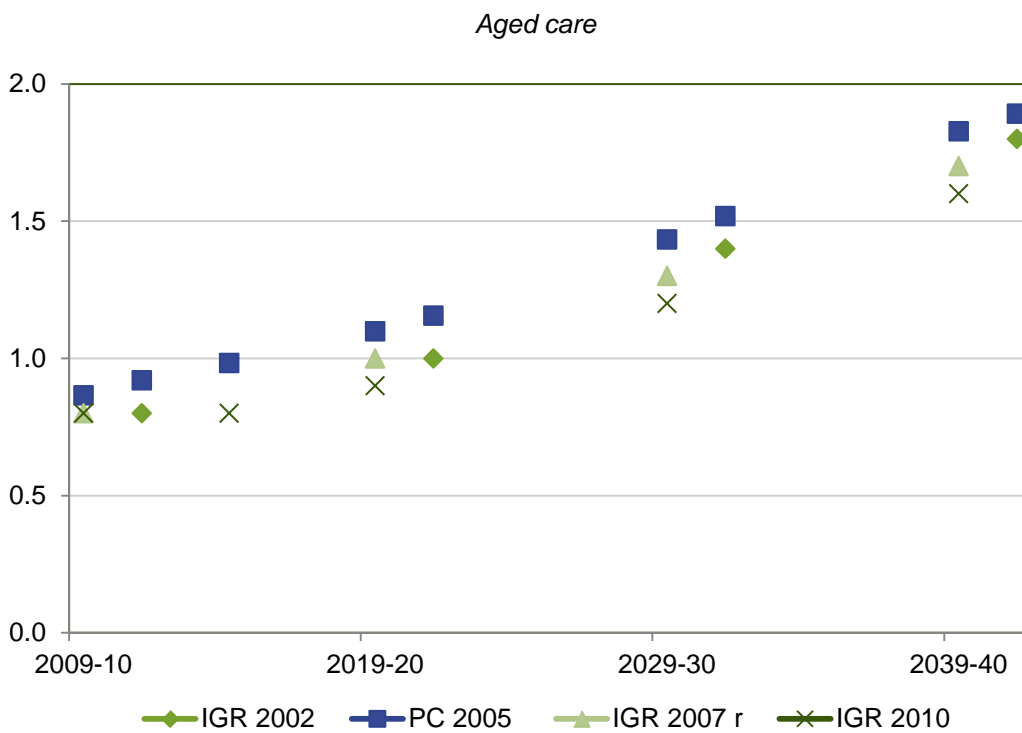*Real GDP per person annual growth*
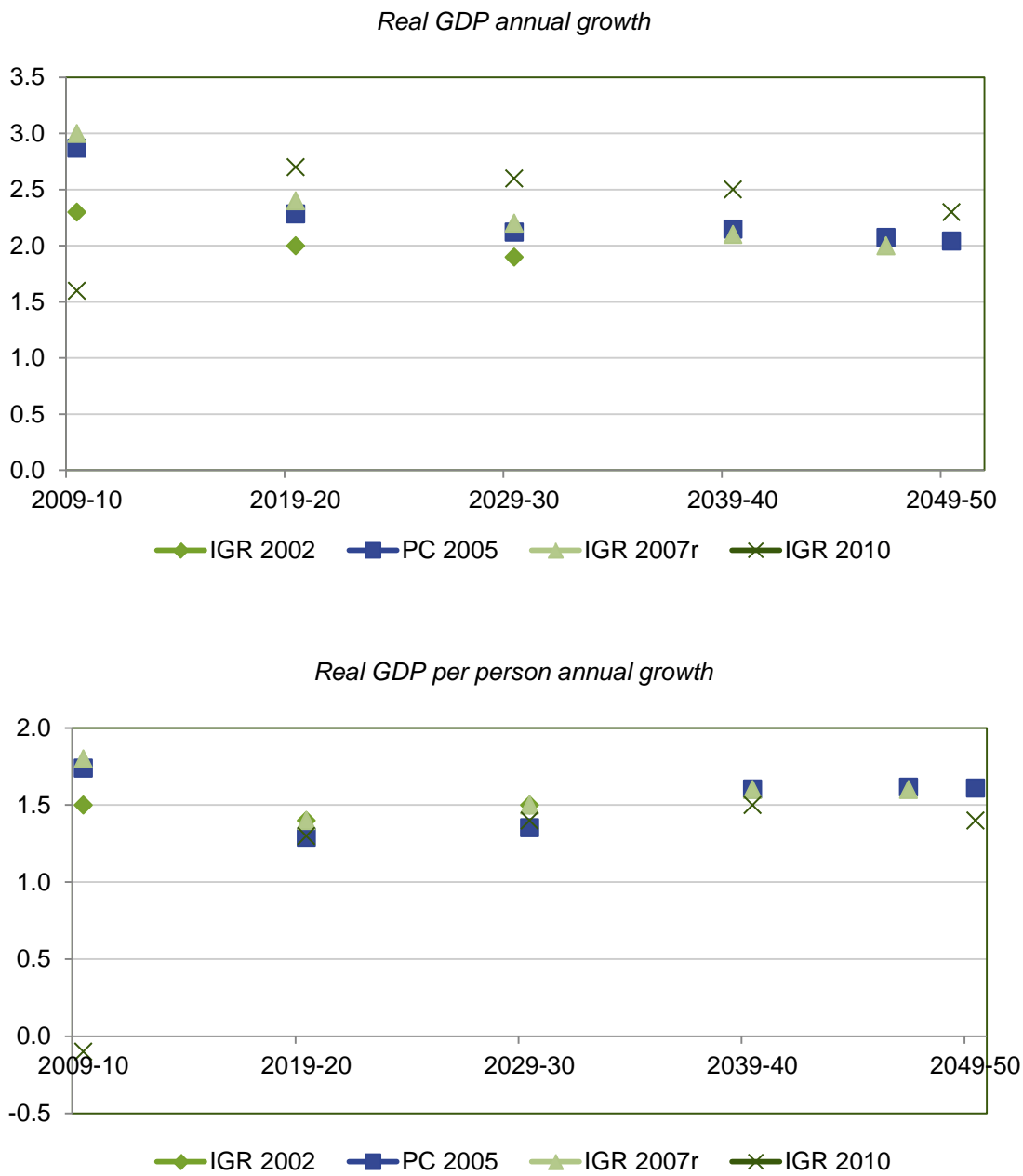


*Data sources*: Australian Government (2002, p. 6 chart 3); Australian Government (2010 Appendices A and D); PC (2005d).

Figure D.5    **Projections of participation rates of people aged 15 years and older**

Per cent



*Data sources*: Digitised data from Australian Government (2002, p. 6 chart 16); Australian Government (2010 Appendices A and D); PC (2005d).

**Projections of selected Australian Government expenditure**
Per cent of GDP

*Health*



*Aged care*



(continued next page)

## Figure D.6   (continued)

*Age and Services Pension*



IGR 2002 ◆   PC 2005 ■   IGR 2007 r ▲   IGR 2010 ✕
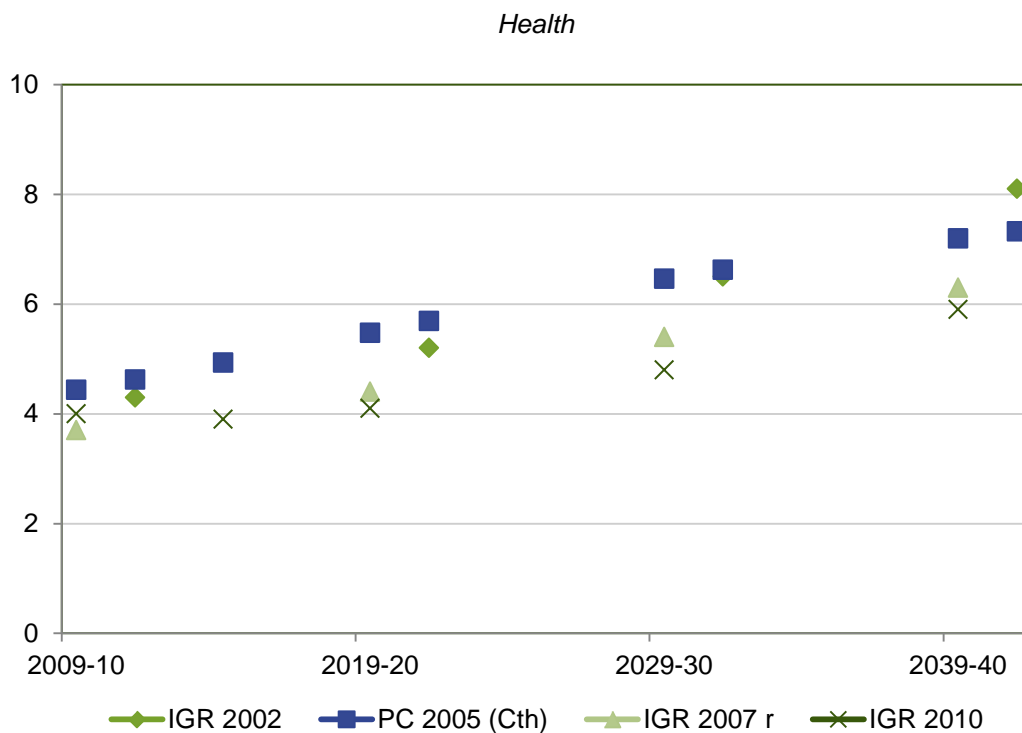
*Disability Support Pension*



IGR 2002 ◆   PC 2005 ■   IGR 2007 r ▲   IGR 2010 ✕
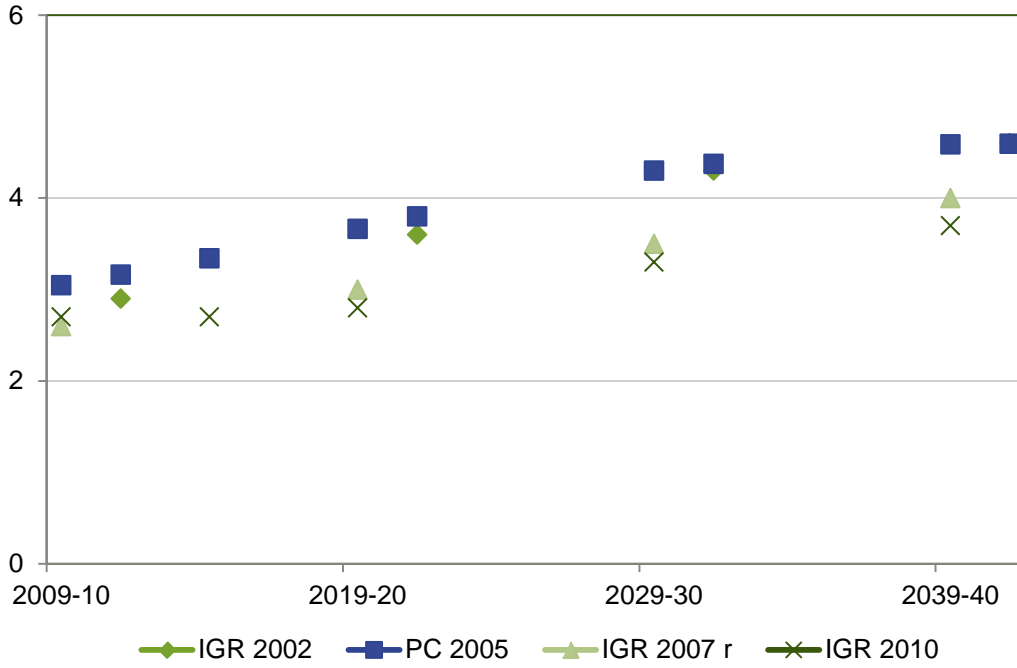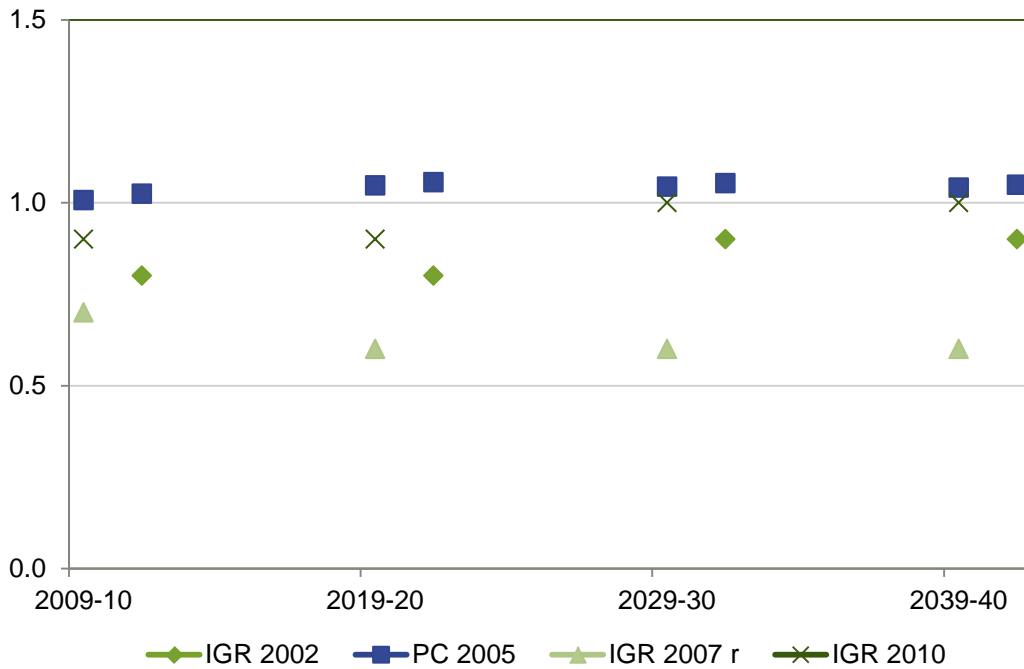
*Data sources*: Australian Government (2002, p. 69); Australian Government (2010 Appendices A and D); PC (2005d).

# E The 3Ps

This appendix provides a brief technical description of the supply-side identity used as the framework for estimating GDP per capita. The framework is commonly referred to as the 3Ps approach, as developed in the first Australian Government Intergenerational Report (Australian Government 2002).

It is based on breaking GDP into its multiplicative components:

- the population
- hours worked per capita (broadly speaking, 'participation')
- the amount produced per hour (productivity).

In fact, the 3Ps is more a convenient label than a literal description of the supply side of the economy that it models, since 'participation' as described above depends on labour force participation rates, employment rates and average hours worked (as described in section E.1).

Each component of the supply side identity must be estimated. In principle, it would be desirable to identify and model the links between the various components to improve the consistency and reliability of the results, and for policy analysis.

In some instances, relationships between variables have been exploited. For example, male and female participation rates are clearly related, and this relationship has been used in some modelling. Similarly, male and female mortality rates underpinning population projections are also related and cannot diverge over the long run. They have been modelled accordingly.

However, many other relationships have not been modelled. For example, long-run changes in hours worked might be a function of the participation rates, since marginal workers may find it hard to secure full-time jobs or may wish to work in part-time jobs. Similarly, productivity rates might be linked to:

- the age structure of the population given the inverse u-shaped profile of wage rates and age
- employment rates, given marginal workers might be expected to have lower productivity rates than clear 'insiders'.

Generally, these effects are not likely to be large, as suggested by the scenarios explored in the PC's 2005 ageing report (PC 2005d). Some possible effects, such as the potential linkage between productivity rates for specific age groups and age are generally inconclusive for the age groups relevant to output in the economy.

# E.1 The building blocks of the supply-side of the economy

The 'three' Ps amounts to the calculation of GDP as the multiple of 6 factors:

$$GDP_t = POP_t \frac{LF_t}{CPOP_t} \times \frac{EMP_t}{LF_t} \times \frac{HOURS_t}{EMP_t} \times \frac{CPOP_t}{POP_t} \times \frac{GDP_t}{HOURS_t}$$

= population × participation rate × employment rate × average hours

× civilian population rate × productivity

where:

- POP is the resident population (averaged over the fiscal year)
- GDP is gross domestic product
- LF is the labour force (those who are employed or unemployed and looking for work)
- EMP is employment
- HOURS are hours worked
- CPOP is the civilian population aged 15 years and over (the denominator in the ABS's measure of labour force participation rates). Recent trends in CPOP and the population aged 15 or more years have been very similar given that there has not been a marked shift in permanent defence force numbers (in comparison to other periods, such as the Second World War).

Since modelling the effects of ageing is a major concern of the framework, projections are built up from data that reflect the age structure of the population:

- $CPOP_{a,s,t} = CPOPRATE_{a,s,t} \times POP_{a,s,t}$ where CPOPRATE is the forecast civilian to total population ratio by age (a), sex (s) and time (t) for working age people
- $LF_{a,s,t} = PR_{a,s,t} \times CPOP_{a,s,t}$ ,where PR is the forecast participation rate
- $EMP_{a,s,t} = EMPRATE_{a,s,t} \times LF_{a,s,t}$ where EMPRATE is the forecast employment rate (or one minus the unemployment rate)

- $PTEMP_{a,s,t} = PTSH_{a,s,t} \times EMP_{a,s,t}$ where PTSH is the share of total employment in part-time work and PTEMP is part time employment

- $FTEMP_{a,s,t} = EMP_{a,s,t} - PTEMP_{a,s,t}$ where FTEMP is full time employment

- $HOURS_{a,s,t} = AVHRSPT_{a,s,t} \times PTEMP_{a,s,t} + AVHRSFT_{a,s,t} \times FTEMP_{a,s,t}$. where AVHRSPT and AVHRSFT are average part-time and full-time hours worked per year for part-time and full-time workers. The sum of $HOURS_{a,s}$ for any given t is the measure of labour supply.

It should be noted that the actual ratios of CPOPRATE of a given age to the corresponding population age group are sometimes greater than one, which appears untenable since the resident population includes permanent defence force personnel. However, in the context of the 3Ps calculations, this divergence can occur due to timing issues.

First, the ABS benchmarks the civilian population series against corresponding estimates of the civilian resident population, but this involves some forecasting:

> The Labour Force Survey estimates are calculated in such a way as to add to independent estimates of the civilian population aged 15 years and over (population benchmarks). These population benchmarks are based on the most recently released estimates of Final and Preliminary quarterly Estimated Resident Population (ERP) … Since the most recently released ERP estimates lag the current time period for Labour Force estimates by nine months, the Labour Force population benchmarks are created by projecting forward three quarters past the most recently released quarterly ERP estimates. The projection is based on the historical pattern of each population component - births, deaths, interstate migration and net overseas migration (NOM). Projected estimates of NOM are supplemented with other data sources to better forecast population changes in the short-term. (ABS 2013, *Explanatory Notes to Labour Force, Australia, August 2013*, Cat. No. 6202.0, released 12 September 2013.).

Second, the annual estimated resident population by single year of age relate to the stock at the end of June each year,[127] whereas the labour force data used in this report relate to the average of 12 months of data over each fiscal year on participation and employment outcomes. To put population numbers on an equivalent basis, a two year moving average of the corresponding population numbers is used, as this centres the population estimates on December. A centred estimate of this kind will not correspond to the average population over the year. More complex methods are possible, but this approach at least ensures that the GDP per capita value incorporates an easily understood (and calculated) value of the

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[127] The ABS only publishes data by single year of age on an end June basis (ABS, 2013, *Australian Demographic Statistics*, Table 59, Estimated Resident Population by Single Year of Age, Australia, Cat. No. 3101.0).

population. In trend terms, any errors associated with this approach will be negligible, especially compared with other uncertainties in long-run projections.

This study estimated the values of CPOPRATE, PR, EMPRATE, PTSH, AVHRSPT, AVHRSFT for each age and sex over the period 2011-12 to 2059-60. Overall productivity levels can then be characterised as:

$$\frac{GDP_t}{HOURS_t} = \frac{GDP_0}{HOURS_0} \times (1 + \gamma)^t$$

where $\frac{GDP_0}{HOURS_0}$ is the base year productivity level and $\gamma$ is the estimated productivity growth rate discussed in chapter 4 and appendix C.

# F    The MMRF model

The Monash Multi-Regional Forecasting (MMRF) model is a recursive-dynamic, multi-regional general equilibrium model developed by the Centre of Policy Studies (CoPS) at Monash University. It models the states and territories as separate regions, recognising:

- domestic producers classified by industry and domestic region

- eight region-specific household sectors

- an aggregate foreign purchaser of Australia's exports

- Australian Government, state and territory governments.

The model explicitly represents intra-regional, inter-regional and international trade flows based on regional input-output data derived by CoPS from national input-output tables. It includes detailed data on state and Commonwealth government budgets. Second round effects are determined by input-output linkages, assumptions about the economic behaviour of firms and households, and resource constraints.

MMRF has recursive-dynamic capabilities that trace out relationships, such as demographic change, physical capital accumulation and the accumulation of greenhouse gas emissions. Important elements of the theoretical structure of the version of MMRF used by the Commission include:

- the capacity to estimate state populations, taking account of varying age-specific fertility and mortality rates; international migration; and interstate migration (the latter driven by the relative competitiveness of industries)

- health costs that vary with the ageing of individual state's populations

- age and gender specific participation rates

- labour movements between occupations based on relative returns

- industry investment based on the expected rate of return on capital relative to the industry's long-run average rate of return

- demand for Australian exports driven by the export price of Australian products, with supplies responding to changes in the export price relative to the domestic price

- the use of labour, produced capital and agricultural land that varies in response to changes in the relative cost of these factors

- household consumption of commodities that varies in response to changes in household income and the relative prices of goods consumed

- productivity improvements that reduce resource costs.

The current reference year for the MMRF model is 2005-06.

Key outputs from the MMRF model include projected changes in:

- national and state outputs, as measured by gross domestic and state products

- revenues and expenditures for states, territories and Australia as a whole.

The basic model is described in CoPS (2008) and PC (2012b).

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