Australian Government
Productivity Commission

Potential Benefits of the National Reform Agenda

Productivity Commission Research Paper

Report to the Council of Australian Governments

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From the Chairman's Office

22 December 2006

Dr Peter Shergold AM
Secretary
Department of Prime Minister and Cabinet
3-5 National Circuit
BARTON ACT 2600

Dear Dr Shergold

I have pleasure in submitting to you, as Chair of COAG Senior Officials, the Productivity Commission's report in response to a request by the Secretary of the Treasury for an assessment of the potential economic and fiscal impacts of the National Reform Agenda.

Yours sincerely

Gary Banks

Foreword

In February 2006, COAG agreed to pursue an ambitious new National Reform Agenda (NRA). This embraces not only competition-related and regulatory reform streams, but also a 'human capital' stream covering health, education and training, and work incentives.

This study by the Productivity Commission responds to a request to report to COAG Senior Officials on the potential economic and fiscal impacts of the NRA. It follows previous exercises related to reforms under the National Competition Policy. The information it provides should assist governments to get a better appreciation of the potential scale and distributional consequences in the long term of fully implementing the NRA and meeting its objectives.

Like all model-based exercises, however, the results in this study reflect a range of assumptions and caveats. And they need to be seen as projections of what is potentially achievable, not forecasts of what necessarily will be achieved. Indeed, the results in some areas, particularly for the human capital stream, need even heavier qualification than usual, given the limited information on which they are based. Importantly, for a variety of reasons, the results for the human capital stream are not comparable to those for the other reform streams, and they cannot meaningfully be added together.

In preparing the study, the Commission consulted actively with all nine jurisdictions, including through Heads of Treasuries and the COAG officials working group on competition. In addition, sectoral and modelling experts provided input to or refereed various parts of the work. That said, the nature of the exercise precluded the wider public involvement typical of Commission reports and many aspects of the analysis remain preliminary in nature. As for other Commission studies, however, the findings and analysis in this study are the responsibility of the Productivity Commission itself.

Gary Banks
Chairman

December 2006

Acknowledgments

The Commission gratefully acknowledges the assistance of numerous experts and officials from a range of government agencies from all jurisdictions. In addition, the Commission is grateful for input and feedback from the Bureau of Transport and Regional Economics, the Energy Reform Implementation Group, the National Energy Market Company, and the Australian Energy Users Group. Feedback and advice was also received from Dr John Ainley (Australian Council for Education Research); Dr Stephen Duckett (Queensland Health); Professor Tony Harris (Monash University); Professor Peter McDonald (ANU); and Professor Tony Scott (Melbourne University).

The modelling of potential benefits of the NRA relied on updates to the Australian input–output tables provided by Carl Obst, Ian Bobbin, Doris de Zilva and Kevin Donovan at the Australian Bureau of Statistics and technical development of the MMRF model by Professor Phillip Adams, Dr Mark Horridge and Dr Glyn Wittwer and colleagues at the Centre of Policy Studies (Monash University). Feedback was also gratefully received from the Australian Treasury and State and Territory counterparts on the modelling, including of the revenue implications of NRA reforms.

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Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACCI	Australian Chamber of Commerce and Industry
ACEM	Australasian College for Emergency Medicine
ACPBR	Advisory Committee on Paperwork Burden Reduction
ACT	Australian Capital Territory
ACTAL	Dutch Advisory Board on Administrative Burdens
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
AHMAC	Australian Health Ministers' Advisory Council
AIHW	Australian Institute of Health and Welfare
ANTS	Annual National Transmission Statement
ANZSIC	Australian and New Zealand Standard Industrial Classification
ANU	Australian National University
APERC	Asia Pacific Energy Research Centre
APIA	Australian Pipeline Industry Association
APPEA	Australian Petroleum Production and Exploration Association
AR-DRG	Australian Refined Diagnosis Related Group
ARR	accounting rate of return
ARTC	Australian Rail Track Corporation
ATC	average total cost
BCA	Business Council of Australia
BMI	body mass index

BRTF	Better Regulation Task Force
BTE	Bureau of Transport Economics
BTRE	Bureau of Transport and Regional Economics
CCB	Child Care Benefit
CCTR	Child Care Tax Rebate
CEDA	Committee for Economic Development of Australia
CFIB	Canadian Federation of Independent Business
CGC	Commonwealth Grants Commission
CIA	US Central Intelligence Agency
CIE	Centre for International Economics
CIRA	Competition and Infrastructure Reform Agreement
COAG	Council of Australian Governments
CoPS	Centre of Policy Studies
DALY	Disability Adjusted Life Year
DBCT	Dalrymple Bay Coal Terminal
DEA	data envelopment analysis
DEST	Department of Education, Science and Training
DEWR	Department of Employment and Workplace Relations
DHA	Department of Health and Aging
DHAC	Department of Health and Aged Care
DOTARS	Department of Transport and Regional Services
DSF	Dusseldorp Skills Forum
DSP	Disability Support Pension
DTF	Department of Treasury and Finance, Victoria
DUO	distribution use of system
EBIT	earnings before interest and tax
ECD	early childhood development
EIT	Exports and Infrastructure Taskforce
EMTRs	effective marginal tax rates
ERIG	Energy Reform Implementation Group

ESAA	Energy Supply Association of Australia
ESCOSA	Essential Services Commission of South Australia
ETEF	Electricity Tariff Equalisation Fund
EU	European Union
EUAA	Energy Users Association of Australia
FaCS	Department of Family and Community Services
FaCSIA	Department of Families, Community Services and Indigenous Affairs
FAO	Australian Government Family Assistance Office
FDH	free disposal hull
FIRS	Federal Interstate Registration Scheme
FMG	Fortescue Metals Group
FSR	Financial Service Reform
FTB	Family Tax Benefit
FTE	full-time equivalent employees
GDP	Gross Domestic Product
GFS	Government Finance Statistics
GJ	gigajoule
GMLG	Gas Market Leaders Group
GNE	gross national expenditure
GPs	general practitioners
GSP	Gross State Product
GST	Goods and Services Tax
HILDA	Household, Income and Labour Dynamics in Australia
HRC	Health Reform Committee
HREOC	Human Rights and Equal Opportunity Commission
HRSCEEWR	House or Representatives Standing Committee on Employment, Education and Workplace Relations
IAPs	Intergovernmental Action Plans
IC	Industry Commission
ICT	information and communications technologies

IGT	impaired glucose tolerance
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
IRR	internal rate of return
IRV	Industrial Relations Victoria
L&M	literacy and numeracy
LCV	light commercial vehicles
LNG	liquefied natural gas
LSAC	Longitudinal Survey of Australian Children
LSAY	Longitudinal Survey of Australian Youth
MBS	Medicare Benefits Scheme
MCE	Ministerial Council on Energy
MCE-SCO	Ministerial Council on Energy Standing Committee of Officials
MCEETYA	Ministerial Council of Education, Employment, Training and Youth Affairs
MCMPR	Ministerial Council on Mineral and Petroleum Resources
MES	minimum efficient scale
MFP	multi-factor productivity
MMRF	Monash Multi-Regional Forecasting (model)
MRES	Monash Regional Equation System
mtpa	million tonnes per annum
MW	megawatt
MWh	megawatt hour
NAIRU	non-accelerating inflation rate of unemployment
NAR	National Access Regime
NCC	National Competition Council
NCP	National Competition Policy
NCVER	National Centre for Vocational Education Research
NEM	National Energy Market
NEMMCO	National Energy Market Management Company
NERA	National Economic Research Associates

NHCDC	National Hospital Cost Data Collection
NHPAC	National Health Priority Action Council
NICHD	National Institute of Child Health and Human Development
NPHP	National Public Health Partnership
NRA	National Reform Agenda
NRIWG	National Reform Initiative Working Group
NRTC	National Road Transport Commission
NSW	New South Wales
NT	Northern Territory
OBPR	Office of Best Practice Regulation
OECD	Organisation for Economic Co-operation and Development
OH&S	Occupational Health & Safety
OLS	ordinary least squares
PC	Productivity Commission
PISA	Programme for International Student Assessment
PRRT	Petroleum Resource Rent Tax
PSA	Port Services Act 1995
QCA	Queensland Competition Authority
QLD	Queensland
RIS	Regulation Impact Statement
RRIF	Regulation Reduction Incentive Fund
RTF	Regulation Taskforce
SA	South Australia
SCC	NSW State Chamber of Commerce
SCM	Standard Cost Model
SCMN	Standard Cost Model Network
SCRCSSP	Steering Committee for the Review of Commonwealth/State Service Provision
SFA	Stochastic frontier analysis
SKM	Sinclair, Knight & Merz Pty Ltd

SMEs	small and medium enterprises
SPPs	Specific Purpose Payments
TAS	Tasmania
TEU	twenty-foot-equivalent unit
TFP	total factor productivity
tkms	tonne-kilometres
TPA	Trade Practices Act 1974
TRD	transmission, distribution and retail sectors
TUOS	transmission use of system
UK	United Kingdom
UN	United Nations
US	United States
USCB	US Census Bureau
VCEC	Victorian Competition and Efficiency Commission
VET	Vocational Education and Training
WA	Western Australia
WACC	weighted average cost of capital
WHO	World Health Organisation

OVERVIEW

Key points

- This study assesses the potential maximum (outer-envelope) gains that could be achieved through COAG's National Reform Agenda (NRA) in the long run — assuming *full implementation* of the NRA, and *full adjustment* of the economy to the effects of reform.
- There has been limited information on which to base such estimates and the results should be viewed as exploratory or, at best, broadly indicative.
- Because of inherent differences between the competition and regulatory reform streams and the human capital reform stream, it is not possible to aggregate results into a single measure of the 'impact of the NRA'.
  - That said, the NRA as a whole could be expected to significantly raise activity levels and incomes in all jurisdictions. The benefits would be additional to benefits from 'ongoing' reform programs.
- Improving productivity and efficiency in *energy, transport, infrastructure* and other activities through the competition and regulatory reform streams could provide resource savings of around $10 billion.
  - After a period of adjustment, GDP could be increased by nearly 2 per cent.
  - Governments' combined *net* revenues could rise by up to around $5 billion, with the distribution between governments varying across reform areas.
- Achievement of a 5 per cent improvement in the productivity of *health service delivery* could equate to resource savings (or additional resources to spend on health care) of around $3 billion.
  - After a period of adjustment, this would imply a potential increase of nearly $4 billion in *net* revenues of Australian governments after 10 or more years.
- Enhancement of *workforce participation and productivity* though the NRA stream directed at health promotion and disease prevention, education and work incentives could potentially result in increases in GDP of around 6 and 3 per cent, respectively, after 25 or more years.
  - However, the magnitude of prospective *net* gains in GDP, and in governments' fiscal balances, would depend on the magnitude of costs incurred by governments in implementing specific reform programs.

Overview

Over the last one and a half decades, Australia has experienced continuous economic growth and significant increases in household incomes. This growth has been underpinned by wide-ranging reforms including implementation of the National Competition Policy (NCP). However, many of the reforms initially agreed to by the Council of Australian Governments (COAG) are now in place. An ageing population, global competition and ongoing technological change mean that further reform is needed if Australians are to achieve their potential for even higher living standards in the future.

This imperative has been recognised by COAG, which is embarking on an ambitious new National Reform Agenda (NRA) to address known impediments to further productivity improvement and to achieve higher workforce participation and productivity (box 1).

The Productivity Commission has been requested to evaluate the benefits potentially available from the NRA (box 2). Achieving meaningful estimates of likely outcomes has proved challenging. It has required inferences to be made from limited available information about the sectors affected by reform, and judgements to be made about the scope for improved economic outcomes under the NRA. Consequently, there remains a significant degree of imprecision, arising from:

- lack of specificity about the nature and extent of policy and program, and subsequent economic change that are likely to arise from reform through COAG processes of ministerial councils, NRA individual action plans and legislation;
- lack of detailed evidence on productivity, price and workforce participation changes that could be achieved through NRA and related changes for Australia as a whole and for individual jurisdictions;
- difficulties in separating the potential effects of reforms already in train and ongoing economic change from the effects of reforms to be initiated under the NRA;
- the influences not captured in the analysis of funding decisions of Australian governments; and

- influences that are not captured in the analysis, including the effects of changes in the mix between paid and unpaid employment (such as reductions in unpaid child care, carer activity and volunteerism).

Box 1 **The NRA at a glance**

The National Reform Agenda comprises three streams — competition, regulatory reform and improvements to human capital.

- The *competition* stream involves reforms in the areas of energy, transport, infrastructure and planning, and climate change.
- The *regulatory reform* stream comprises two distinct sets of initiatives. The first is designed to promote best-practice regulation making and review. The second focuses on reducing the regulatory burden in 'hot spots' where overlapping and inconsistent regulatory regimes are impeding economic activity.
- The *human capital* stream covers three areas — health, education and training, and work incentives.
  - The health element comprises two distinct parts. The first seeks to improve the delivery of health services and to modify specific purpose health payments where they cause perverse outcomes. The second is aimed at improving workforce participation and productivity by reducing the incidence of illness, injury and disability and chronic disease in the population.
  - The education and training element seeks to equip more people with the skills needed to increase workforce participation and productivity. Four areas have been targeted: early childhood development; literacy and numeracy; transitions from school to further education or work; and adult learning.
  - The workforce incentives element is designed to increase workforce participation by improving incentives for those groups with the greatest potential to raise their participation rates: people on welfare, the mature aged, and women.

In calculating the potential economic and revenue implications of reform, the Commission has drawn attention to these issues and, to the extent possible, indicated the sensitivity of the results to the assumptions used.

The results in all reform areas — and particularly the 'new' human capital reform stream — are exploratory and should be viewed as only broadly indicative of the benefits potentially available from full implementation of the NRA. The results are intended to help governments better understand the potential scale and distribution of reform's broad economic and fiscal impacts. *The estimates are not forecasts of the impacts of the NRA.*

Box 2 **The Commission's task**

The Commission was asked to investigate, as part of its supporting research program, the potential economic and government revenue impacts of the NRA, as outlined in the 10 February 2006 COAG meeting Communiqué. The main purpose of the investigation is to help governments better understand the scale and distribution (including State and Territory) of the anticipated broad economic and fiscal impacts of reform. (The Commission has not been asked to report on matters relating to climate change technology and adaptation.)

The Commission's task is not to comment or advise on the implementation of the NRA. Decisions on the implementation of reforms and funding are to be made by COAG and relevant governments on a case-by-case basis.

In the time available, the Commission has sought to advance understanding of the possible economic and fiscal outcomes associated with the NRA. The analysis emphasises the likely directions of potential change and broad magnitudes. It does not provide projections of the impacts of the NRA or of individual policy actions, which would be better handled in individual inquiries or studies concerned with implementation options and issues.

The focus of the quantitative modelling in this study is on the longer-run 'outer-envelope' effects of change. That is, it assumes full implementation of the NRA and related changes and complete adjustment of the economy to these effects — typically requiring some 10 years from implementation. Transitional effects are not modelled.

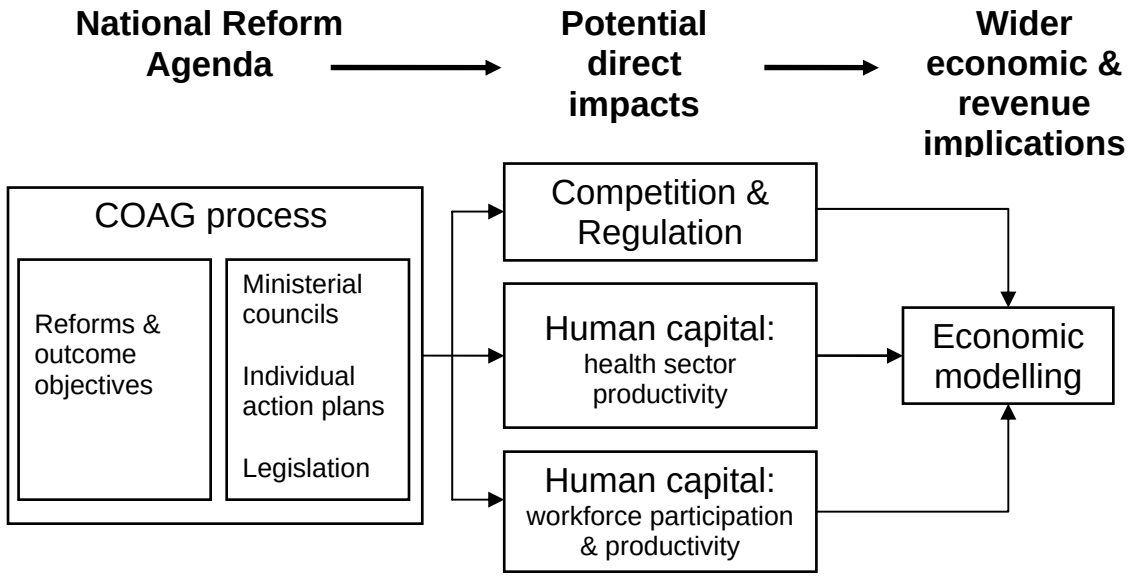
In undertaking the study, the Commission was asked to consult with Heads of Treasuries. It has also consulted widely with sectoral experts and government agencies to test assumptions and receive feedback on analytical and modelling approaches. The consultations generally supported the approach adopted, recognising the ambitious nature of the undertaking and the compressed time scale for its completion.

Notwithstanding these consultations, the analysis has not been subject to the level of public scrutiny typical of Commission public inquiries, and many aspects of the assessment remain preliminary in nature.

The Commission's approach

The NRA and what is known about its implementation plans and detailed reform objectives have guided the quantification of its potential direct impacts — in other words, the policy scenarios (or 'shocks'). These shocks were then used to model the potential maximum — 'outer-envelope' — longer-run effects of the NRA, assuming full implementation of the NRA and complete adjustment to the effects of reform.

Figure 1 **Analytical framework**



It became evident early in the study that the NRA reform streams developed by COAG differ in some important respects.

- The competition and regulatory reform streams can be regarded as falling broadly within the framework established by the previous National Competition Policy, with a focus on productivity and economic efficiency of activities and industries within product markets. Changes in activity levels would characteristically pass the commercial test explicit in the Commission's economic modelling.
- The health service delivery component of the NRA's human capital stream also follows the traditional focus on productivity improvement. However, the health system is complex, with a myriad of market and non-market influences determining outcomes and options for achieving them, in ways distinct from the activities covered in the competition and regulatory reform streams.
- The human capital substreams — health promotion and disease prevention, education and training, and work incentives — all focus on individuals and their potential to contribute to workforce participation and productivity. In contrast, the competition and regulation streams focus on activities or industries.
- The achievement of workforce participation and productivity improvements would require significant additional discretionary outlays by government and households, which could not be included in the Commission's modelling.

- The lead-time between reform and the realisation of benefits from the health promotion and disease prevention and education and training substreams is likely to be protracted relative to other reform streams.

Because of these differences, estimates of the impacts of each reform stream are not comparable. In particular, they cannot be aggregated to provide a single meaningful estimate of the 'impact of the NRA'. For this reason, results for the

- competition and regulatory reform streams,
- health service delivery area of the human capital stream, and
- workforce participation reform area

are presented, and need to be considered, separately.

The economic and fiscal results for each stream have been estimated using an economy-wide general equilibrium model that has been specially updated for this study (box 3).

Box 3 **Modelling framework**

The Commission has used economy wide general equilibrium modelling to quantify the economic and revenue implications of the NRA. Similar frameworks have been used by the Commission on three previous occasions to illustrate the impacts of widely-based national reform — in 1995 for Hilmer and related reforms, in 1999 for a smaller range of NCP reforms of particular relevance to rural and regional Australia, and in 2005 to report on the consequences of NCP reform.

This study uses an updated version of the model adopted in the 2005 exercise. The model — referred to as the Monash Multi-Regional Forecasting – National Reform Agenda (MMRF–NRA) model — treats each State and Territory as a separate economic region with over 50 industry sectors in each jurisdiction.

For this study, the MMRF model was updated to include:

- a more detailed treatment of government finances and the fiscal effects of the introduction of the Goods and Services Tax (GST); and
- a revised treatment of transport services and energy.

The competition and regulatory reform streams

Competition stream

The competition stream of the NRA is intended to:

> …further boost competition, productivity and the efficient functioning of markets. It focuses on further reform and initiatives in the areas of transport, energy, infrastructure regulation and planning and climate change technological innovation and adaptation. (COAG 2006a, pp. 4–5)

The infrastructure activities covered by the competition stream include ports and port authorities, handling and storage facility operations, rail freight infrastructure and electricity transmission grid and gas pipeline operation.

Other nationally significant infrastructure activities, including telecommunications, international liner shipping and postal services, are not within the scope of the NRA. Airports, waterways and shipping channels are not of central focus in the NRA at this stage and are not included in this study.

A common aspect of each of the activities covered by the competition stream is that they are subject to wide-ranging economic regulation, regulatory decision making, competitive tendering of purchasing decisions, and competitive neutrality of government business enterprises.

For energy, transport and other infrastructure covered by the competition stream of the NRA, available information suggests that measures to increase competition, could reduce the impediments to efficient investment and reduce investment risk (table 1). Achievement of the productivity benefits alone would directly benefit users of the goods and services covered by the competition stream by around $2 billion.

While these potential direct benefits to users are substantial, the realised benefits from NRA could be even higher. Areas not canvassed that potentially could yield additional benefits include:

- measures that directly target urban transport congestion, in addition to measures focused on the management of national freight corridors (a separate study is reporting to COAG on congestion issues); and
- more streamlined regulatory procedures affecting bulk commodity port and handling infrastructure.

Policy responses to climate change are likely to have implications for the operation and regulation of energy markets. However, the Commission has not been asked to

examine matters pertaining to climate-change related technological innovation and adaptation.

Table 1 **Maximum potential direct benefits of the competition stream**

NRA sector	*Order of magnitude of 'outer-envelope' effect*	*Nature of potential change*
Energy		
• Electricity	Lower prices of electricity to final users by around 2 per cent, on average	Increased dispatch efficiency in the NEM, more cost-reflective pricing, greater competition between generators, improved regulation of transmission infrastructure and reduced investment risks
	Lower regulatory costs to government	Increased regulatory efficiency from referral of regulation of the NEM to the AER
• Gas	Small decreases in retail gas prices	Increased competition between natural gas suppliers to the Australian market, reduced investment risk and regulatory compliance costs
Road and rail transport	Improved productivity in road and rail freight service provison by around 5 per cent	Improved operational efficiency of the rail network; reduced impediments to innovation in road vehicle configuration and use; reduced compliance costs of regulation; and improved transport infrastructure planning and project appraisal
Ports and associated infrastructure	Improved productivity in major container terminal service provision by around 10 per cent, on average	Increased operational efficiency and reduced impediments to new entrants and efficient investment into port service operations

Regulatory reform

Regulation is pervasive in modern societies and, if well targeted and designed, offers significant benefits. It facilitates many everyday transactions and can help deliver economic, social and environmental outcomes that may not have been possible within the normal workings of markets. At the same time, complying with regulation costs businesses and individuals time and money; and regulation can also have broader economy-wide costs, such as through raising prices or reducing consumer choice, innovation and productivity. Accordingly, to ensure that regulation delivers the greatest *net* benefit to society, it needs to be properly justified and well designed.

The regulatory reform stream of the NRA focuses on:

> …reducing the regulatory burden imposed by the three levels of government. (COAG 2006a, p.8)

COAG also noted that 'the benefits from each regulation must not be offset by unduly high compliance costs'.

Available information suggests that the compliance costs of regulation are significant and could amount to as much as 4 per cent of GDP. While quantifying the proportion of those costs that can be avoided is difficult, domestic and international experience suggests that reductions in the order of 15 to 25 per cent have been committed to, or are likely to be achieved.

If a 20 per cent reduction in Australian compliance costs were to be achieved through full implementation of NRA-consistent reforms, this could result in a direct saving to activities and industries of as much as $8 billion (in 2005-06 dollars).

Achievement of such gains would require that NRA-consistent reforms avoid simply transferring compliance costs between business and government (or households). Instead, genuine NRA-consistent reforms should afford *net* reductions in costs to the community as a whole.

In addition to these potential direct savings, reducing the regulatory burden could produce further efficiency gains. Based on the scope for further reform (indicated by the range of outstanding legislative reviews and the issues confronting the NRA regulatory 'hots spots'), such gains could be potentially significant and even exceed the direct benefits from lower compliance costs.

The potential economy-wide payoffs from the competition and regulatory reform streams could be large

Modelling undertaken for this study indicates that achievement of the productivity and price effects potentially available from the competition and regulatory reform streams of the NRA could add significantly to national output — of up to around 2 per cent of GDP, or around $17 billion (2005-06 dollars) in the longer run. This relates to a period of adjustment, of around ten years, from the implementation of reform. With potentially higher activity levels, household disposable income and household consumption could increase by around one and a half per cent or over $400 per person, supported mainly by higher real after-tax wages and salaries.

Given the pervasive reach of regulation, the estimated outer-envelope benefits of reductions in regulatory compliance costs are substantial and account for around three quarters of the total output gain. Reform in road and rail freight transport accounts for around one fifth of the total.

To the extent that there are additional benefits from the implementation of the legislative review program (particularly when addressing regulatory hot spots), the economic benefits from full implementation of the NRA could be higher than modelled. Moreover, dynamic benefits from more competitive markets, such as the stronger incentives for service providers to continue to improve their productivity and service quality and to innovate in order to achieve a competitive advantage, are also likely to provide further additions to the potential benefits modelled.

Implications of competition and regulatory reforms for States and Territories

To indicate the implications of national reform across Australia, the Commission has estimated the potential economic impacts of NRA at the State and Territory level. These calculations are underpinned by the state-based modelling framework adopted for this study (see box 3). This modelling has been supported by state-specific policy scenarios for the energy and ports sectors, and by the assumption of uniform changes across jurisdictions for road and rail transport and for reduced regulatory compliance costs.

Under these modelling scenarios, all jurisdictions are projected to achieve higher output levels from national reform. After the relocation of labour needed to achieve higher output levels, output (measured by gross state product (GSP)) per person employed is projected to rise in all jurisdictions (table 2). Improved productivity would also raise real wages and household disposable incomes, in turn raising potential consumption levels per person in all jurisdictions.

Table 2 **Indicative output implications of NRA competition and regulatory reforms**

Per cent

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Real GSP/GDP	1.6	1.1	2.0	1.3	3.4	1.4	3.2	0.7	1.7
Employment	-0.1	-0.5	0.2	-0.2	1.4	-0.1	0.5	-0.7	..
Output per person employed	1.7	1.6	1.8	1.5	2.0	1.5	2.6	1.4	1.7

.. Assumed zero.

Behind these consolidated estimates, the impacts of individual reforms are likely to vary between regions. For example, further reform of the National Electricity Market is projected to benefit those participating jurisdictions with the greatest assessed reform opportunities — in particular, New South Wales. Reform in the road and rail transport sectors is projected to benefit Western Australia relative to

other regions, mainly because of the relative importance of distances to the commercial and industrial centres of the eastern coast and the export orientation of the Western Australian economy.

A broadly-based reform program such as the NRA therefore tends to even out the variable regional impacts of individual reforms.

Government revenue implications of competition and regulatory reforms

Government revenue implications of the competition and regulatory reform streams have been assessed on the basis that government spending, in real terms, would be determined by COAG and relevant jurisdictions. Under this assumption, the fiscal benefits of reform are modelled as accruing to government, in the first instance, in the form of a higher 'operating balance' — the model's estimate of government *net* revenue. Changes in this balance would be influenced by growth in income and GST tax receipts and changes in the cost of goods and services purchased by government. However, by assumption, potential changes in *real* government spending on goods and services are not included. Additional real government outlays would be determined by COAG and relevant jurisdictions on a case-by-case basis.

The projected outer envelope increase in Australia's GDP and national income with the implementation of competition policy and regulatory reforms could raise Australian governments' net revenue substantially — by around $5 billion (2005-06 dollars). Of this amount Commonwealth Government net revenue is projected to increase by around $3 billion while the net revenues of State, Territory and local governments collectively are projected to rise by around $2 billion. The main influence on Commonwealth revenue is company and personal income tax collections, while the main influence on State, Territory and local government revenues is property tax and GST receipts. Both Commonwealth and State, and Territory governments benefit from lower priced inputs to government service provision associated with higher productivity.

Human capital stream

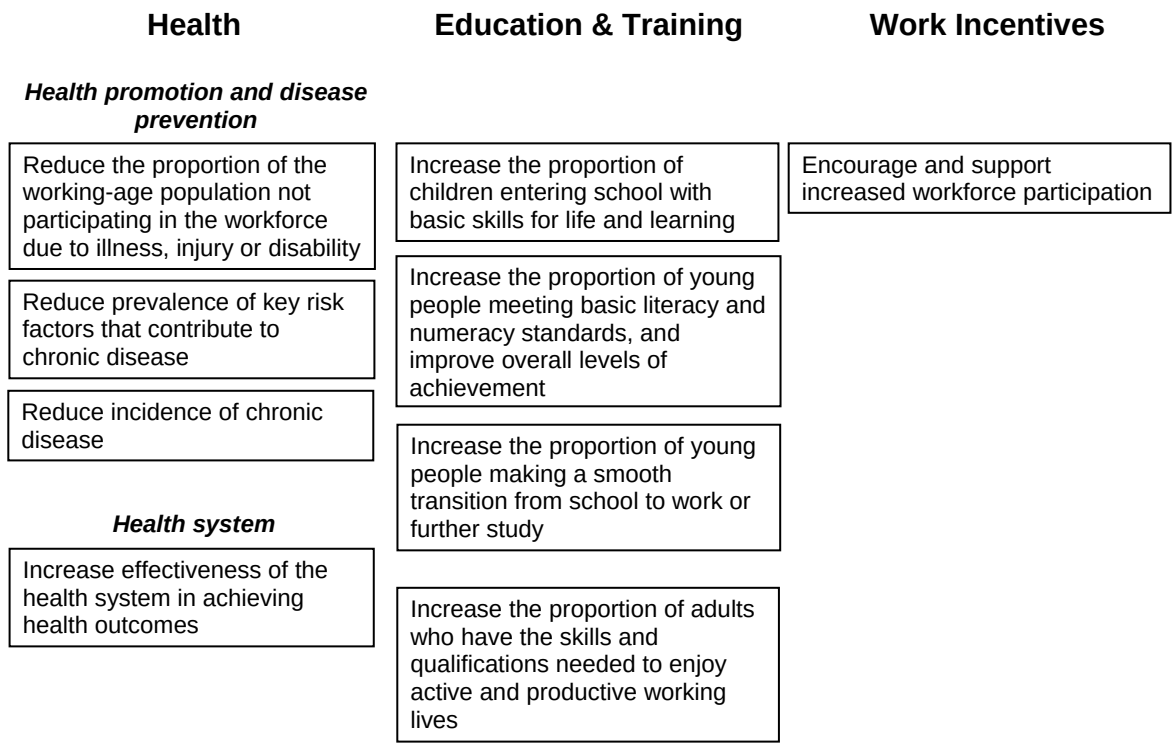
As recognised at the February 2006 meeting of the Council of Australian Governments (COAG), a healthy, skilled and motivated population is critical to workforce participation and productivity, and hence Australia's future living standards. Further, the ageing of the population means that:

> … there will be relatively fewer Australians of working age. To avoid putting too great a burden on those already in work, more Australians need to realise their potential by entering or rejoining the workforce. At the same time, in the face of intense global competition and changes in technology, any reduction in workforce participation needs to be offset by improvements in the ability of the workforce and in productivity. (COAG 2006a, p.1)

By focusing on outcomes directed at enhancing participation and productivity, the human capital stream of the NRA aims to provide Australians with the opportunities and choices they need to lead more active and productive lives.

The human capital stream is made up of three substreams — health, education and training, and work incentives (figure 2). The health substream includes a separate component directed at increasing the effectiveness of the health system.

Figure 2 **Human capital stream and indicative objectives and outcomes**



Source: Adapted from COAG Communiqué, Attachment A, February 2006, p. 1.

As indicated, increasing the effectiveness of the health system focuses on activities or industries, whereas enhancing workforce participation and productivity focuses on individuals and is discussed separately.

Effectiveness of the health system

The NRA seeks to:

> Increase the effectiveness of the health system in achieving health outcomes (COAG 2006d, p. 15).

Reform in the delivery of health services affords the potential to reduce impediments to improved productive efficiency in health service delivery, and to thereby achieve lower costs and/or increased provision, including through higher quality or safety, of health services. It is a matter for COAG to determine how the resources freed by the efficiency improvements might be utilised to advance health or other desired outcomes.

The NRA canvasses a number of reform possibilities, including the review of health system funding arrangements via the Commonwealth-State Specific Purpose Payments (SPPs), the operation of the Medicare Benefits Scheme, utilisation of information and communications technologies and removing impediments to the efficient use of the health workforce. In July 2006, COAG approved several measures aimed at improving the productivity of the health workforce.

Assessing the scope to improve productive efficiency in the delivery of health services is fraught with difficulties. Despite the strategic directions provided by COAG, there is limited information available about likely specific reforms. Nor is there as much evidence-based information about the costs and benefits of reform. What is available suggests that performance gaps for the provision of clinical and other health services, between the least-cost and other service providers can be considerable — estimates of 10 to 20 per cent are common. However, the available indicators have significant limitations. In particular, they are based on (sometimes dated) historical information and do not isolate the effects of policy choices (eg achievement of equity goals in the regional provision of services) from efficiency and other influences. The indicators are also based on an examination of the industry *in situ*, are not 'forward looking', and do not fully take account of the potential for change, as NRA seeks to do. For example, they do not take account of the potential benefits of health workforce reform or of reform of funding arrangements.

Potentially, improved productivity of health service delivery will benefit all jurisdictions. However, there is too little information to make finer judgements about the division of benefits across jurisdictions. Given the potential across jurisdictions for wide-ranging change, simple comparisons of productive efficiency of public hospitals, for example, are not considered to be a sufficiently reliable guide to overall reform opportunities.

Against this background, consultations during the course of the study and earlier qualitative studies by the Commission revealed wide acceptance that significant benefits are potentially available from reform in health service delivery. Consistent with such views, the Commission has applied a 5 per cent improvement in productivity in health service delivery as a broad indication of what could potentially be achieved through full implementation of NRA-consistent reforms. Achievement of this potential could result in resource savings of as much as $3 billion (2005-06 dollars), which could be channelled to provide a higher level of health service as well as meeting other spending priorities.

The achievement of productivity gains of this order from full implementation of the NRA could add up to around 0.4 per cent to GDP, or nearly $4 billion in the longer term after a period of adjustment (more than ten years). Lower health service costs and higher activity levels could raise household disposable income and consumption by as much as 0.2 per cent. With higher incomes, household consumption of health services is projected to increase.

Model estimates suggest an increase in government gross revenue approaching $1 billion (2005-06 dollars). After account is taken of potential impacts of reform on the cost of government service provision and taxation receipts, model estimates suggest State, Territory and local government net revenue could potentially rise by over $2.5 billion and Commonwealth revenue by up to nearly $1.5 billion (2005-06 dollars), including the cost saving from improved health sector productivity.

Workforce participation and productivity

The human capital stream of the NRA comprises three distinct substreams directed at improving workforce participation and productivity — health promotion and disease prevention, education and training, and work incentives. Each substream:

> …aims to provide Australians with the opportunities and choices they need to lead active and productive lives. (COAG 2006a, p. 2)

This reform group focuses on individuals and their potential to contribute to:

- workforce participation — that is, whether a person is in employment or looking for work; and
- productivity — a person's contribution to output while at work.

International comparisons indicate that there is scope to enhance Australia's workforce participation and productivity. This 'first take' is supported by more detailed analyses that suggest the scope for improvement from full implementation of each substreams is substantial. However, the time needed for benefits to

materialise for some human capital reforms (particularly in the health and education areas) could extend over several decades.

With a changing demographic structure due to ageing and other influences, the Commission used the purpose-built demographic model developed for its 2005 study into the 'Economic Implications of an Ageing Australia' to quantify the potential longer-run impacts of the human capital stream on the workforce 25 years out.

The demographic modelling estimated that, with the achievement of NRA human capital indicative objectives and outcomes (figure 2), an increase in workforce participation of up to around 4.9 percentage points could be possible — potentially offsetting the projected impact of ageing on the participation rate over the next 25 years. Factors influencing decisions would include: attitude to paid employment; financial incentives (including interaction between the welfare and tax systems); institutional impediments and workplace flexibility; and the availability of support services.

The potential structural changes associated with higher participation are projected to mainly affect mature-age workers and women, and are within the bounds of workforce changes seen over the last 25 years. However, the additional participants would tend to work fewer hours than 'average' and have lower skill levels, or would need to overcome physical or other impairments to join the workforce.

Most of the (potential) increase in the workforce is likely to result from changes in work incentives. Such programs are mainly a Commonwealth responsibility and include family tax arrangements, disability support pensions and superannuation. These programs have been subject to recent reform. Health, education and training are shared Commonwealth, State and Territory responsibilities.

Full implementation of the health and the education and training substreams of the NRA could also potentially raise the level of workforce productivity by as much as around 1 percentage point, also over the next 25 years. Such an increase would be additional to ongoing labour productivity growth — projected at 1.75 per cent per year (the average for the past few decades) in the Commission's study of Economic Implications of an Ageing Australia, or around 54 per cent over the next quarter of a century.

In addition to affecting workforce participation and productivity, which are the focus of this study, the human capital reforms could also influence the level and age composition of the population. In particular, improved human health achieved through reform could contribute to increased longevity of the Australian population. However, quantifying the economic and fiscal implications of possible changes in

the aggregate size and composition of the population as a result of the NRA, while worthwhile, was not feasible in the time frame of this study.

Potential economic and fiscal effects of human capital reforms

Projected higher workforce participation and productivity could potentially raise effective labour inputs (quality-adjusted hours worked) substantially — by around 8 per cent from levels that would otherwise apply. The achievement of higher labour inputs and the employment of those inputs by industry would potentially raise national output, measured by GDP, above levels that would be otherwise achieved.

Projected higher participation levels are estimated to raise output by up to around 6 per cent, while higher productivity of incumbent workers is estimated to raise output by nearly 3 per cent — after the effect of reforms bite and after a period of adjustment. With higher output, per capita household disposable income and consumption and government revenue could also increase.

Importantly, however, while potentially substantial both in absolute terms and relative to the projected changes for the competition, regulatory reform and health service reform areas, the 'gross' estimates do not take into account program and other implementation costs — which could be sizable — and are not comparable with estimates of the household and fiscal effects of other streams (see box 4).

With this important caveat in mind, model estimates of the impact of human capital stream reforms suggest:

- with higher output and more people in paid employment, household disposable income and household consumption could increase by up to around 7 per cent or around $1 800 (2005-06 dollars) per person, before any additional household financial and other costs;
- achievement of higher workforce participation is estimated to raise State, Territory and local government and Commonwealth net revenue by up to around $9 billion and $14 billion (2005-06 dollars), respectively, before the program costs of achieving NRA workforce participation objectives; and
- achievement of higher workforce productivity is estimated to raise State, Territory and local government and Commonwealth net revenue by up to around $4 billion and $6 billion (2005-06 dollars), though once again, this is before the program costs of achieving NRA workforce productivity objectives.

Other matters

The study guidelines also requested the Commission, to the extent possible, to report on the impact of the NRA on regions and income groups, the separate potential impact of reforms implemented by Australian governments, the expected revenue benefits to *each* State and Territory government and indicative scenarios of the costs of the implementation of the full range of reforms.

Information available to the study did not support meaningful reporting on these matters. Accordingly, while canvassing aspects of the matters in detailed analyses, the Commission has not reported on them in its 'bottom line' results. Additional information needed to complete meaningful estimates would include greater implementation details for the NRA, as well as:

- regional industry incidence of benefits of the competition, regulatory burden and health service delivery streams to provide meaningful measures of the regional implications of those streams;
- likely occupation of potential new workforce participants to achieve meaningful measures of the regional implications of the human capital stream;
- relative importance of and dependencies between the actions of the Commonwealth and State Governments in achieving reform; and
- the regional effects of reform and income sharing arrangements that may be generated to achieve meaningful measures of the impact of the NRA on the revenues of individual jurisdictions.

Box 4 **Limitations of the analysis of the impacts of increased workforce participation and productivity**

The analysis of the potential benefits of the NRA components focused on increasing workforce participation and productivity is novel and exploratory. As indicated, the substreams focus on individuals and their potential to contribute to workforce participation and productivity. By contrast, the competition, regulatory reform and even the health service delivery streams focus on activities or industries and assume no change in household behaviour or choices and no change in workforce characteristics.

The effects of some changes, such as work incentives, could be seen in the near term. However, because of the long lead times associated with reform in areas such as health, education and training, the full impact of the NRA is not likely to be achieved for 25 years or more. Following the achievement of these objectives, there would be a further period of economy-wide adjustment where the benefits would flow through the economy to afford higher levels of output and production income (over around ten years from the impact of reform).

The estimates of the impact of changes in workforce participation focus on potential changes in market activities (ie those arising from participation in paid employment) and do not take account of the impacts of change on:

- non-market activity of households (such as reductions in unpaid childcare, carer activity and volunteerism); and
- the direct household and government costs of achieving higher workforce participation and productivity.

The fiscal estimates do not include initial and ongoing costs of achieving improved health, educational, or training outcomes. Moreover, the fiscal division between the Commonwealth and States and Territories would be sensitive to specific policies. Decisions on actual costs and funding arrangements will be made by COAG on a case-by-case basis.

Finally, while the focus of this study is on the potential impact of the NRA on workforce participation and productivity of the Australian population, this study notes that the reforms could also influence the level and age composition of that population. However, quantifying the economic and fiscal implications of possible changes in the aggregate size and composition of the population as a result of the NRA, while worthwhile, was not possible in the time scale of this study.

Because of the potential importance of these factors, the projected changes in GDP and associated income and government revenue are *not* comparable with the estimates presented for the competition, regulatory reform and even health service delivery streams. It is not possible to aggregate the results into a single measure of the 'impact of the NRA'.

Part A – Framework and Outcomes

1 Introduction

Over the last one and a half decades, Australia has seen continuous economic growth and an associated rise in household incomes. This growth has been underpinned by the benefits of wide-ranging reforms including implementation of the National Competition Policy (NCP). However, most of the NCP reforms initially agreed to by the Council of Australian Governments (COAG) are now in place. An ageing population, global competition and ongoing technological change mean that further reform is needed if Australians are to achieve their potential for even higher living standards in the future.

This imperative has been recognised by COAG which is embarking on the National Reform Agenda (NRA).

This new reform agenda, endorsed by COAG in February 2006, is wide-ranging and ambitious. It comprises three streams — competition, regulatory reform, human capital — which build on, and significantly extend, the successful NCP reform framework (COAG 2006a). The NRA is directed at further improving the performance of the Australian economy and raising the living standards of the community.

1.1 This study

The Commission has been requested to report to COAG Senior Officials on the potential economic and revenue implications of the NRA (appendix A). The Commission was asked to consider all matters covered by the NRA, other than those relating to climate change technology and adaptation. When reporting on the potential effects, the Commission was requested to provide quantitative estimates of the benefits potentially available from the full implementation of NRA reforms and outcome objectives in terms of:

- the impact on GDP and other important economic aggregates;
- the total revenue benefits expected to accrue to the Commonwealth Government and the State and Territory Governments; and
- an indication of the potential economic benefits and government revenues expected to be derived from the major components of the NRA.

The study guidelines are included in appendix A to this report.

The Commission was asked, as far as possible, to provide information on the potential impacts on each State and Territory, region and income group; and to identify separately the potential economic benefits generated by the actions of the Commonwealth and State and Territory governments. In its analysis, the Commission was asked to recognise the different nature of the reform streams and the various time paths over which benefits are likely to accrue, and to provide guidance on the sensitivity of results to the assumptions used.

The assessment focuses on the potential benefits of reform. Also, some broad indicative costs of implementing reforms are provided where feasible. This report does not comment or advise on the implementation of the NRA. Decisions on the implementation of reforms and actual costs and funding will be made by COAG and jurisdictions, on a case-by-case basis.

1.2 What can be delivered

The Commission has sought to assemble information to promote a better understanding of the potential economic and government revenue implications of the competition, regulatory reform and human capital streams of the NRA.

The focus of the study is on the prospective longer-run, maximum ('outer-envelope') effects of reform. The prospective benefits are based on the assumptions that the NRA and related changes are fully implemented and the economy has fully adjusted to the reforms. Dynamic and transitional effects are not modelled. However, an indication of possible adjustment pressures is provided by the estimated impacts of changes to sectoral and regional aggregates.

Achieving meaningful modelling simulations has proved challenging. It has required extensive interpretation of available information about the sectors affected by reform, and judgement about the scope for improvement under the NRA. These assessments have been complicated by a range of factors including:

- lack of specificity about the nature of reforms associated with the NRA;
- lack of evidence linking policy action and resultant sectoral or regional changes;
- lack of evidence on the nature and extent of performance gaps across areas within the scope of the NRA and on the potential for gaps to be closed through NRA and related changes; and
- difficulties in separating the potential effects of reforms to be initiated under the NRA, from those arising from reforms in train and from ongoing social and economic development.

Such unknowns make it difficult to assess how significant the reforms will be and the time scale over which they will be realised. Ideally, case-by-case assessments would be used to gauge the full range of effects of reform and their possible time paths. To achieve such assessments, individual inquiries or micro studies would be required. These are well beyond the scope of the current work. Instead, a '*tops-down*' perspective of the benefits potentially available from reform has been adopted, for the most part.

The tops-down approach uses available information to draw inferences about the potential benefits, at the outer envelope, for a reform stream as a whole. Wherever possible, the scale of benefits is informed by evidence rather than assumption, drawing on existing benchmarking and case studies and on analytical reviews of the literature. It has also been informed by comments provided by Commonwealth, State and Territory COAG officials and sectoral experts consulted during the study.

The results therefore should be viewed as exploratory and conditional upper-limit estimates based on numerous assumptions, *not as forecasts*.

It also became evident early in the study that the NRA reform streams cannot be treated as equivalent nor are the modelled results commensurable.

In broad terms, the competition and regulation streams can be regarded as falling within the framework established by NCP, with its focus on productivity and efficiency. Modelling results presented in this report for these two streams may be considered 'net' in the sense that, in the main, they capture the flow-on effects in terms of the relocation of resources needed to achieve the productivity gains and associated new investment spending by industry.

The health service delivery component of the NRA's human capital stream follows the focus on productivity improvement and so has similarities with traditional reform streams. However, because of the complexity of the health system and myriad of market and government influences on what and how health services are provided, the analysis is more tentative. The modelling in this study, moreover, does not capture all the flow-on effects, particularly in the areas of collective consumption of health services (ie health services provided by the government) and medical benefit and welfare payments.

The human capital substreams of health promotion and disease prevention, education and training, and work incentives, are inherently different from the other streams. In essence, they focus on individuals and the potential to enhance their workforce participation and productivity, whereas the other streams focus on industries. Modelling results presented in this study for these human capital streams should also be considered '*gross*' in the sense that achievement of NRA outcome

objectives via a mix of incentive and program measures would involve unknown up-front and continuing costs not captured in the analysis. The modelled revenue implications of changes in workforce participation and productivity, therefore, do not include important costs and benefits, and the ultimate budgetary outcomes are likely to be sensitive to specific policies. Moreover, the lead time from the introduction of reform to the realisation of direct benefits is likely to be long for some important areas (eg early childhood development and literacy and numeracy) relative to the other NRA reform streams (ie competition and regulatory reform). Consequently, the estimates of the impacts of reform in these areas are much more speculative than those in other reform areas.

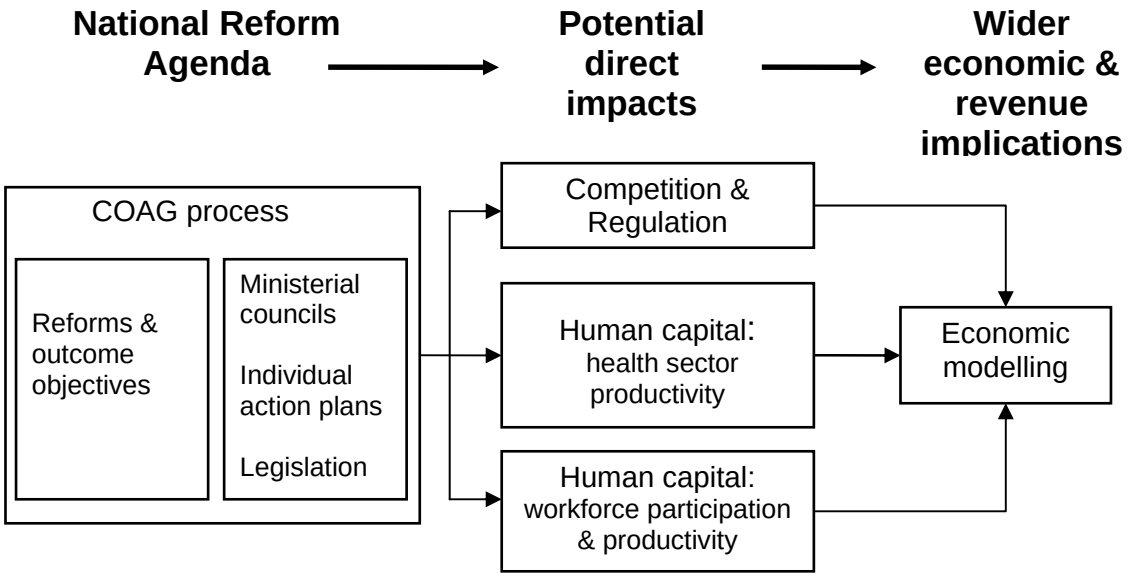
Reflecting these differences between reform streams, the Commission has not aggregated the results into *a single* measure of the 'potential impact of the NRA'. Furthermore, because of uncertainty about the impact of Commonwealth Grants Commission (CGC) and COAG processes on the ultimate distribution of revenues between governments, as well as practical concerns about making fine distinctions between jurisdictions in the modelling, fiscal impacts are reported for the States and Territories in aggregate (rather than for individual jurisdictions) and for the Commonwealth itself.

1.3 The approach

As far as practicable, a common assessment procedure was applied across reform streams. This involved:

- evaluating the scope of potential reform — what reform possibilites are consistent with the NRA;
- assessing the direct impacts of reform streams on sectoral productivity and prices and workforce participation and productivity, and the time scale over which these changes are likely to occur — so as to generate the NRA policy 'shocks' to be applied in modelling of the economic and fiscal effects of the NRA; and
- modelling the flow-on effects of these potential changes — projected broad economic and fiscal outcomes (figure 1.1).

Figure 1.1 **Analytical framework**



Estimating the direct impacts

Drawing on COAG's agenda for national reform, a major part of this report explores the potential direct impacts in terms of productivity, prices and participation arising from individual reform streams, to form the basis for modelling their likely economic and revenue implications.

The direct impacts are measured against the situation of no further reform — a 'business-as-usual' base case. By and large, this base case reflects the economic settings prevailing in the different areas associated with the NRA in the early 2000s.

Consistent with the focus of the study, the direct effects used to inform the modelling are defined as the potential maximum — 'outer envelope' — benefits available from the full implementation of the NRA. These provide the NRA policy 'shocks' to the quantitative model, relative to the business-as-usual base case.

In estimating the outer envelope, this study has included benefits made potentially available by the NRA, broadly construed. Specifically, the concept of the outer envelope is defined to include not only the prospective changes resulting directly from reform *but also changes for which NRA reform is an enabling influence.* An example is where reform helps remove impediments to the implementation of latent technological or organisational change or new investment. The outer envelope could also encompass the influence of other economic changes that are consistent with (or are implied by) the full implementation of the NRA; for example, regulatory or

policy changes, such as to work incentives and labour market regulation, that remove impediments to achieving NRA objectives themselves.

The outer-envelope benchmarks, by definition, do not encompass the impacts of changes that fundamentally alter the 'business as usual' base case and which are clearly unrelated to, or go well beyond, the NRA. For example, they exclude prospective effects of the introduction of any new taxation system.

Sectoral outcomes will be influenced by policy, business and administrative decisions outside of the scope of the NRA, by the pace and intensity of the reform effort and by changes in general economic conditions and ways of working. It is not practicable, nor indeed appropriate, to foreshadow such changes and include them in the current assessment. All factors not captured in the outer envelope, as defined for this study, are implicit in the 'business-as-usual' base case.

The outer envelope therefore should not be construed as 'the most likely outcome' for a sector over the time horizon of reform, but as a likely upper bound.

The achievement of the outer envelope assumes full implementation of NRA reforms, as well as the removal of impediments to the achievement of NRA objectives. It also assumes complete adjustment of the economy to these reforms.

Although international comparisons have been useful in some areas, overseas benchmarks have not generally been used to define the outer envelopes for Australian activities, because of possible social and other differences between countries.

In some instances, available information and analytical frameworks do not support the identification or clear and unambiguous quantification of an outer envelope. In such cases, judgements were made about the broad scale of benefits that could be achieved. The conditionality of such estimates is highlighted throughout this report (eg in the areas of regulatory burden and health service delivery).

The Commission faced a number of challenges, when determining what should and should not be included within the base case. In this context, particular attention was given to what precisely constitutes the 'reform package' for analysis and whether reforms 'in train' are NRA related and within the outer envelope. Where the available estimates of the potential benefits relate specifically to commitments in train, and where these are not modified by the NRA, the Commission has not included these changes in the policy scenario investigated. For example, the Commission has not included estimates of the potential impacts of NCP reform commitments in the Western Australia electricity industry that are not fully realised. Where the available information did not enable a distinction to be drawn between

the impacts of NRA and those of related policies, the Commission subsumed these impacts as part of the outer envelope for the NRA, broadly defined.

The potential direct impacts canvassed for each stream are summarised in table 1.1.

Table 1.1 **Overview of the potential direct impacts of the NRA**

Reform stream and substream	*Description*
Competition	
• Energy Electricity Gas	Increased productivity and more efficient service pricing from the elimination of known impediments to competition and efficient investment.
• Transport and infrastructure Road and rail transport Ports and associated infrastructure	Increased productivity and more efficient service pricing from the elimination of known impediments to competition and efficient investment.
Regulatory reform	Increased productivity from reductions in the compliance costs of regulation faced by business. In addition, significant additional benefits are likely to arise from continuation of the legislative review program and addressing regulatory 'hot spots' (aspects of which would overlap with a reduction in the compliance cost of regulation).
Human capital	
• Effectiveness of health system	Increased productivity from the elimination of funding and institutional impediments to the efficient provision of health services and changes in the mix of services provided.
• Workforce participation and productivity Health promotion and disease prevention Education and training Work incentives	Increased workforce participation arising from removing impediments to participation in paid employment (work incentives) and by improving the health status and education and training achievement of those not in the workforce. Increased workforce productivity from raising the health, education and training levels, particularly of marginal workers.

Modelling frameworks

Economy-wide modelling

The Commission has used general equilibrium modelling on three previous occasions to illustrate the impacts of widely-based national reform. The first exercise modelled many of the Hilmer recommendations and estimated their GDP and government revenue implications (IC 1995). The second exercise was narrower in scope, concentrating on those reforms most relevant to rural and regional Australia (PC 1999a). In that study, a 'tops-down' methodology was used to project national results to each State and Territory according to their industrial base (rather

than to their directly assessed potential for improvement). The third study, involving a review of NCP, took a different approach (PC 2005a). It used a regional modelling framework to estimate the impacts from *observed*, rather than *prospective*, productivity improvements and service price changes over the 1990s when many of the NCP and related reforms were undertaken.

The current study uses an updated version of the regional modelling framework adopted in the 2005 exercise. The model, referred to as the Monash Multi-Regional Forecasting – National Reform Agenda (MMRF–NRA) model treats each State and Territory as a separate economy with 58 industries in each jurisdiction. This version of the MMRF model is especially suited to analysing the effects of change at the State and Territory level.

For this study, MMRF was updated by the model developers at the Centre of Policy Studies at Monash University to include a more detailed treatment of government finances and the fiscal effects of the Goods and Services Tax (GST), and a revised treatment of transport services and energy. The update was facilitated within the time scale of this project by the Australian Bureau of Statistics (ABS) advancing publication of its 2001-02 input-output tables — the first to include the GST — to July 2006, and by its adopting a more appropriate treatment of transport services. The updated model will be made publicly available to enable further examination and validation of data and modelling methods, and applications of the kind undertaken for this study.

The model was applied in a longer run 'comparative-static' framework. The framework is *comparative* in the sense that it compares pre- and post-reform economies and assumes full adjustment. It is *static* in that it does not trace out the adjustment path.

The fiscal analysis differs between studies. In the 1995 exercise, there was an explicit interest in the government revenue implications. The 1999 and 2005 studies focused on total national expenditure rather than revenue implications for governments of reform. In those later studies, budget neutrality was maintained in nominal terms, with any revenue gains being transferred to households. In common with the 1995 exercise, a focus in the current study is on the government revenue implications of reform holding real public spending constant.

This study also reports on the sensitivity of results to selected spending scenarios using alternative model 'closures'.

Details of the MMRF–NRA model and the modelling environment are provided in appendix B.

Demographic modelling

As indicated above, the lead time for some human capital reforms in the areas of health, education and training and work incentives could be considerable — potentially extending over several decades. Over this period, there are expected to be significant changes to the demographic structure of the population due especially to ageing. Thus, it would be inappropriate to assess the implications of reform against current population benchmarks. As MMRF–NRA does not model demographic change, it was necessary to employ a purpose-built demographic modelling framework to take into account the effects of demographic change.

An earlier analysis by the Productivity Commission of the *Economic Implications of an Ageing Australia* (PC 2005f) employed such a framework to examine the changing structure of the Australian population and its implications for workforce participation and productivity. The results of that study have been used to provide a 'business-as-usual' base case for workforce participation and productivity by 2030, assuming no human capital NRA reforms. The demographic modelling was then used to provide an outer-envelope alternative policy scenario that incorporates the potential impacts of reforms in the human capital stream on these labour market outcomes. The difference between the scenarios was used to quantify the potential direct workforce participation and productivity impacts of the NRA by 2030. This has enabled the Commission to identify the extent to which human capital reforms potentially offset the effects of aging, particularly on workforce participation.

The direct workforce participation and productivity impacts were then used to 'shock' the economy-wide MMRF–NRA model to provide a broad indication of the national and distributional effects of the NRA human capital stream. The results from this stream, however, need to be distinguished from modelling of the potential effects of competition, regulation and health service delivery reform streams. For these streams, the time horizons are determined by lags needed to institute reform and the full adjustment of the economy to those reforms. However, for the human capital workforce participation and productivity stream, the time horizon is extended by the time lags underpinning changes in demography and the lead time required for health, education and training and work incentives to bite. For the purpose of this assessment, a time horizon of 25 years has been adopted.

Details of the demographic modelling are provided in appendix C.

1.4 Consultation

The study benefited from feedback received in a series of workshop consultations at which work-in-progress was presented. The workshops were attended by

representatives of State, Territory and Commonwealth government agencies, as well as by researchers with expertise in areas covered by the NRA and representatives of the Energy Reform Implementation Group (ERIG). Workshops were held on the 24-25 May and 10-11 July 2006 to discuss progress in the quantification of the potential outer-envelope direct effects of the NRA. On the 31 May 2006, the Centre of Policy Studies provided a progress report on the MMRF–NRA model update. These workshops were followed by a preliminary results workshop on 18 September 2006 at which draft reports on each NRA stream (except road and rail transport which has been the subject of a separate commissioned inquiry) and preliminary results for sectors were provided. In addition, updates on progress were provided to a Heads-of-Treasuries Subcommittee of Deputies in April, August, October and November 2006.

In addition, consultations with sectoral experts and Australian government agencies were conducted. In particular, officials of the ACCC and Bureau of Transport and Regional Economics were consulted on matters relating to transport and infrastructure; the Energy Reform Implementation Group (ERIG), officials of the Department of Industry, Tourism and Resources (DITR), representatives of the National Energy Market Company (NEMCO) and the Australian Energy Users Group were consulted on matters relating to energy reform; officials from the Department of Health and Ageing, Dr Stephen Duckett (Queensland Health), Professor Tony Scott (Melbourne University) and Professor Tony Harris (Monash University) were consulted on matters relating to health service delivery; officials from the Department of Health and Ageing (DHA), Department of Education, Science and Training (DEST) and the Department of Employment and Workplace Relations (DEWR), the Department of Families, Community Services and Indigenous Affairs (FaCSIA) and Dr John Ainley (Australian Council for Education Research) on matters relating to workforce participation and productivity; and Professor Peter McDonald (ANU) on matters relating to demographic modelling. Feedback was also received from the Commonwealth Treasury and State and Territory counterparts on the modelling of the revenue implications of change.

The consultations broadly supported the modelling approach adopted. Those consulted also appreciated the ambitious nature of the undertaking and the highly compressed time scale for the completion of data base and model updates and supporting sectoral studies. The consultations helped to refine and improve proposed approaches and narrow areas of contention. That said, responsibility for the analysis and judgements made to complete the assessment in the time available rests with the Commission.

1.5 Structure of the report

Chapters 2 and 3 of part A summarise the findings of the sectoral studies and provide the main economic and revenue results of the report for the competition and regulatory reform streams and the human capital stream, respectively.

Chapters 4 to 8 form part B and provide detailed studies of the potential of the productivity and service price impacts of the competition and regulatory reform streams.

Chapters 9 to 14 form part C and pertain to the human capital stream of NRA. Chapter 9 examines the scope for improving health sector productivity, while chapters 10 to 14 cover issues relating to workforce participation and productivity. Chapter 10 provides a framework for the analysis, chapters 11 to 13 analyse the potential impacts of the health promotion and disease prevention, eduction and training and work incentives substreams on workforce participation and productivity. Chapter 14 consolidates the findings of chapters 11 to 13 and uses a demographic model to report the potential benefits of the NRA on workforce participation and participation 25 years out, that is, by 2030.

Appendix A provides the guidelines to the study, appendixes B and C details of the modelling frameworks adopted, appendix D provides additional detail pertaining to the modelling of potential impacts, while appendixes E, F and G provide detailed results for reform areas.

2 Potential economic and revenue implications of NRA competition and regulatory reform

Key points

- NRA competition and regulatory reforms could potentially provide resource savings to industry of around $10 billion.
- With full implementation and full adjustment, these reforms could:
  - increase GDP by nearly 2 per cent;
  - raise household consumption by more than $400 per person; and
  - with real government spending fixed by assumption, raise government net revenues by around $5 billion (2005-06 dollars) — with about 40 per cent accruing to States, Territories and local governments.
- Of the reform areas,
  - a wide-ranging reduction in regulatory compliance costs could offer the largest economic benefits — an estimated increase in GDP of around 1.3 per cent;
  - reform of road and rail freight infrastructure could raise GDP by a further 0.4 per cent; while
  - energy and ports and associated infrastructure reforms are projected to offer smaller, but worthwhile, benefits.
- Full implementation of competition and regulatory reforms could raise output and incomes in each State and Territory.
  - However, the impacts could be expected to differ between reforms areas.
- Sensitivity testing indicates that the estimated impact on GDP of reform does not vary greatly with alternative government spending scenarios.
  - However, the distributional consequences could be significant.

Implementation of the NRA competition and regulatory reform streams offers the potential for significant productivity benefits and efficiency improvements. This chapter reports on:

- the scope of the competition and regulatory reform streams of the NRA (section 2.1);

- the potential direct effects of the NRA on productivity and service prices, as appropriate (section 2.2); and
- modelling of the longer-run economic, government revenue and distributional effects of these reform streams (section 2.3).

The potential changes are regarded as the maximum possible (outer-envelope) benefits potentially available with the full implementation of the NRA and related reforms in the longer run — with no decline in the quality of service provision and complete adjustment to reform-induced changes. That said, an indication of the possible adjustment implications is provided by estimated changes in regional employment. The estimates are intended to provide a broad indication of the potential scale and distribution of the reforms' potential broad economic and fiscal impacts.

A key feature of the projections is the assumption made about the government revenue implications of reform. As noted in chapter 1, the estimates assume actual spending decisions are determined outside of the model. The model's measure of *net* government revenue — the 'net operating balance' — therefore reflects the effects of projected changes in taxation and other receipts, net of changes in the cost of delivering the prevailing level of *real* government services. This assumption does not prejudge the outcome of any revenue distribution which would properly be determined by COAG and the relevant jurisdictions. The impact on fiscal balances is reported for the State, Territory and local governments in total and for the Commonwealth Government.

Because the distributional impacts of change can be influenced by alternative government spending decisions, the sensitivity of results to selected broad government spending scenarios is also examined (section 2.4).

The modelling also emphasises the potential benefits available through a more productive use of the workforce. With aggregate employment assumed to be determined by factors beyond the scope of the competition and regulatory reform streams, achieving higher productivity and national output would involve some relocation of jobs between industries and regions. This chapter reports, in broad terms, on the potential distributional effects of change.

2.1 Scope of the NRA competition and regulatory reform streams

The NRA competition and regulatory streams seek to improve the efficiency with which markets operate and to reduce the regulatory burden that governments place on business. Both streams build on and extend earlier National Competition Policy

reforms (box 2.1). While the two streams are clearly separate, there is nevertheless significant overlap between them. This is especially the case in regulated industries such as electricity, gas and export-orientated infrastructure where regulatory reform is a key mechanism for delivering more competitive outcomes. Given these complementarities, the economic and revenue implications of the competition and regulatory streams are considered together.

Box 2.1 **National Competition Policy**

The NCP provided for:

- an extension of the anti-competitive conduct provisions of the *Trade Practices Act 1974* to unincorporated enterprises and government businesses;
- reforms to public monopolies and other government businesses to enable a more commercial focus and openness to competition, subject to competitive neutrality requirements;
- regulatory arrangements to provide third-party access on reasonable terms and conditions to essential infrastructure services with natural monopoly characteristics; and
- a Legislation Review Program to assess whether regulatory restrictions on competition are in the public interest, and if not, what changes are required.

The NCP Agreement between the Commonwealth and the States and Territories also incorporated previously agreed reform programs for the electricity, gas, water and road transport sectors.

Scope of the NRA competition reforms

The NRA competition stream seeks to boost competition, productivity and the efficient functioning of markets. The reforms agreed to by COAG are varied and wide ranging, covering transport, energy and infrastructure regulation and planning (box 2.2).

The overarching aim of the competition stream is to foster competition in infrastructure industries by:

- removing regulatory impediments to competition and new entrants;
- delivering more effective and efficient regulatory oversight;
- removing unwarranted barriers to investment; and
- improving pricing and investment signals to owners, investors and consumers to promote the more efficient use of resources within the economy.

Box 2.2 **Key NRA competition reforms**

NRA energy reforms seek to:

- improve price signals for energy consumers and investors;
- improve supply efficiency through the roll-out of 'smart' electricity meters and to allow time of day pricing;
- ensure that the electricity transmission system supports a national electricity market, providing energy users with the most efficient, secure and sustainable supply of electricity from all available fuels and generation sources;
- adopt suitable policy settings, governance and institutional arrangements to improve planning and network investment and to streamline regulation; and
- recommit to reforms being progressed by the Ministerial Energy Council.

NRA transport reforms seek to:

- improve the efficiency, adequacy and safety of Australia's transport infrastructure;
- develop proposals for efficient road and rail freight infrastructure through consistent and competitively-neutral pricing regimes;
- harmonise road and rail regulation, including productivity-enhancing reforms; improve road and rail safety regulation and performance-based standards for innovative vehicles that do less road damage;
- strengthen and coordinate transport planning and project appraisal processes to ensure the best use of public investment; and
- reduce current and projected urban transport congestion, focusing on national freight corridors.

NRA infrastructure regulation reforms aim to:

- provide for a simpler and consistent national system of economic regulation for nationally-significant infrastructure, including ports, railways and export-related infrastructure;
- support the efficient use of national infrastructure; and
- reduce regulatory uncertainty and compliance costs for owners, users and investors.

NRA infrastructure planning reforms:

- commit to completing all outstanding corridor strategies under AusLink;
- extend the corridor strategies to include relevant capital city and associated regional ports on the AusLink National Network;
- involve a stocktake of logistics chain coordination arrangements; and
- establish a 'one-stop shop' for significant development projects.

Source: COAG (2006a).

Governments not only regulate these markets, but often participate in them as well through public ownership of facilities. Reforms to ensure that the government business enterprises that compete in these markets receive no competitive advantage or disadvantage by virtue of public ownership can further enhance competition.

This study assesses the effects of competition reform in terms of the key industries affected by NRA reform: electricity (chapter 4), gas (chapter 5), road and rail freight transport (chapter 6) and ports and other significant infrastructure (chapter 7). These chapters detail NRA reform strategies and the scope for improvements in productivity and efficiency at the outer envelope.

After consulting with external stakeholders, significant infrastructure is interpreted in this study as all infrastructure that is, or may potentially be, regulated under Part IIIa of the *Trade Practices Act 1974 (Commonwealth)*, which establishes a legal regime to facilitate access to the services of certain facilities of national significance. It does not cover infrastructure regulated under other sections of the *Trade Practice Act* or under other legislation or non-export-orientated infrastructure. Thus significant infrastructure is interpreted as covering electricity transmission grids; natural gas pipelines; road and rail transport infrastructure; ports, port authorities and handling and storage facilities, but not telecommunications, international liner shipping, postal services, airports, waterways and shipping channels, and water, sewerage and drainage infrastructure.

Scope of the NRA regulatory reforms

The NRA regulatory reform stream focuses on reducing the regulatory burden imposed by the three levels of government. COAG recognises that regulation is essential to ensure markets operate efficiently and fairly, to protect consumers and the environment and to enforce corporate governance standards. It also recognises that the benefits from each regulation should not be offset by unduly high compliance and implementation costs.

To this end, COAG has agreed to:

- establish and maintain effective arrangements to maximise the efficiency of new and amended regulation and avoid unnecessary compliance costs and restrictions on competition;
- undertake targeted public annual reviews of existing regulation to identify priority areas where regulatory reform would provide significant net benefits to business and the community;

- identify further reforms that enhance regulatory consistency across jurisdictions or reduce duplication and overlap in regulation and in the role and operation of regulatory bodies; and
- in-principle, aim to adopt a common framework for benchmarking, measuring and reporting on the regulatory burden.

As a priority, COAG has also agreed to target 10 regulatory 'hot spots' where overlapping and inconsistent regulation is impeding economic activity: rail safety; OH&S; trade measurement; chemicals and plastics; development assistance arrangements; building regulation; business registration; environmental assessment and approvals processes; personal property securities; and product safety.

While the broad strategic commitments under the NRA are clear, the specific proposed reforms are less clear. The use of a multi-faceted public interest test in evaluating new and existing regulation makes it difficult to undertake general assessments without recourse to case-by-case examinations of the relevant issues underlying each regulation, something that is clearly beyond the scope of this study.

Recognising this, the main focus of the regulatory reform component of this study is on reducing the cost of complying with regulation imposed by all three levels of government (chapter 8). In so doing, the policy objectives, and hence the benefits, underlying the regulations are taken as given. Thus, the focus is on reducing unnecessary or excessive compliance costs. Available evidence suggests, nevertheless, that the reforms considered may indeed yield significant benefits. Further benefits may be achievable through policy reviews of reform objectives.[1]

Reducing compliance costs also has implications for governments too. Government departments and agencies comply with government regulation in the same way as private businesses. Lower compliance costs could mean that they would devote less time and resources to compliance. It is for this reason, the focus is on the effect of unnecessary compliance costs on all 'business', spanning government as well as private sector activities.

[1] Chapter 8 also discusses the wide-ranging effects of regulation including on the conditions under which business is conducted and goods and services are provided or traded. It suggests that assessments of the broader implications of regulation and the benefit of reform would appropriately be the subject of case-by-case inquiries or analyses. The competition stream of the NRA covers regulation affecting competition in the energy, transport and infrastructure sectors.

2.2 The potential direct impacts on productivity and prices

Quantifying the potential direct impacts of the full implementation of the NRA competition and regulatory reform streams has proved challenging. The Commission has taken into account the stated reform objectives, reform commitments to date, and available evidence on the impediments to improved productivity and market efficiency.

Nevertheless, there remains a lack of specificity about individual reforms and accordingly the information base on which to develop quantitative estimates is limited. Within the time available, the estimates presented in this study, involve a significant degree of judgement about the breadth of reform opportunities, and the potential productivity and price effects of reform. In making its judgements, the Commission has consulted widely with stakeholders to assess the broad plausibility of the likely magnitudes canvassed.

The outer-envelope productivity and price changes potentially available from the full implementation of the NRA competition and regulatory reform streams are summarised in table 2.1.

The estimated direct impacts draw on available evidence from Australia and, in some cases, overseas. Where national or international benchmarks are used, it is assumed that NRA reduces, but does not necessarily close, the performance gap between Australian activities and benchmark activities. While estimates for each reform area are exploratory, the paucity of detailed information on the potential effects of regulatory reform makes estimates for that area somewhat more exploratory than estimates for the other reform areas.

If the estimated potential direct benefits, though productivity improvements, of competition reform could be achieved, there would be a direct saving to users of the goods and services covered of upwards of $2 billion (2005-06 dollars). If the estimated reduction in regulatory compliance costs were also achieved, the additional benefits could amount to around $8 billion (2005-06 dollars) affording a resource saving of some $10 billion in total.

More detailed information on the methodology and evidential basis of these estimates is outlined for each reform area in chapters 4 to 8. An outline of how these estimates were applied to project the economic and revenue effects of reform using the MMRF–NRA model is provided in Appendix B and D.

Table 2.1 **Direct impacts of NRA competition and regulatory reforms**

Percentage change, outer-envelope estimates

Reform area	*Nature of change*	*Direct impact*	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Electricity generation	Transmission reform increasing dispatch efficiency in the NEM, and further pro-competitive reform	Improved productivity in the use of all inputs in electricity generation	3.7	1.3	1.2	0.6	0.6	0.6	0.6	..
	A more competitive and integrated NEM reducing the need for trade risk management	Improved productivity in the use of labour and financial services by electricity generation	1.5	1.5	1.5	1.5	..	1.5	..	..
	Regulatory governance reform reducing investment risk to participants in the NEM	Lower required risk-adjusted rate of return to capital in electricity generation	-2.4	-1.8	-2.4	-2.0	-2.0	-1.5	-1.9	..
	Increased generator competition, transmission reform and demand-side management reducing electricity prices	Reduction in economic rent through pro-competitive pricing in electricity generation	-2.2	-1.4	-2.2	-1.6	-1.6	-1.2	-1.5	..
Electricity supply	Regulatory governance reform reducing retail compliance costs	Improved productivity in the use of all inputs in electricity retail	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	Regulatory governance reform reducing investment risk in electricity retail	Lower required risk-adjusted rate of return to capital in electricity transmission, distribution and retail	-8.4	-8.0	-7.9	-8.2	-9.7	-5.5	-10.0	-10.3
Electricity sector gov't administration costs	Reducing unnecessary duplication across jurisdictions	Improved productivity in the use of all inputs in government regulation of the electricity sector	25	25	25	25	25	25	25	-3.8[a]
Gas supply	Regulatory governance reform reducing compliance costs	Improved productivity in the use of all inputs in gas supply	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Regulatory governance reform reducing investment risk	Lower required risk-adjusted rate of return to capital in gas supply	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Gas pipeline transport	Regulatory governance reform reducing investment risk	Lower required risk-adjusted rate of return to capital in pipeline transport	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3

(continued next page)

Table 2.1 **(continued)**

Reform area	*Nature of change*	*Direct impact*	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Road and rail freight transport	Reforms increasing the productivity of road freight infrastructure	Improved productivity in the use of all inputs in road freight transport	5	5	5	5	5	5	5	5
	Reforms increasing the productivity of rail freight infrastructure	Improved productivity in the use of all inputs in rail freight transport	5	5	5	5	5	5	5	5
Ports and associated infrastructure	Reforms increasing the productivity of ports and port handling services	Improved productivity in the use of all inputs in container ports and associated infrastructure	10	8	9	3	10	8	..	..
	Increased competition and investment in port services from incumbent port service providers responding to existing capacity constraints or market entrants investing in new infrastructure	Reduction in economic rents through new economically efficient investment in container ports and associated infrastructure	-25	-25	-25	-25	-25	-25	..	..
Regulatory reform	Reduction in regulatory compliance costs from reviewing existing regulations, improved gate-keeping mechanisms for new regulation, greater regulatory consistency across jurisdictions, reduced regulatory overlap and better measurement of regulatory burdens	Improved productivity in the use of business services in all industries[b]	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		Improved productivity in the use of labour in all industries[b]	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		Improved productivity in the use of capital in all industries[b]	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

.. Nil or value less than 0.5. **a** Net of 25 per cent increase for the ACT Government and a 5 per cent decrease for the Commonwealth. **b** Excluding ownership of dwellings.

Source: Productivity Commission estimates.

Although the guidelines to this study request the Commission to report on the actions implemented by the Commonwealth Government and each State and Territory government, the reforms under the competition and regulatory streams are seldom the clear responsibility of one level of government or another. Instead, most of reform areas involve a mix of overlapping responsibilities. This is a point of difference with earlier NCP reforms which could largely be associated with one level of government (IC 1995).

Electricity reform, for example, clearly involves shared and overlapping responsibilities for those jurisdictions participating in the National Electricity Market (NEM): New South Wales, Victoria, Queensland, South Australia, Tasmania, the Australian Capital Territory and the Commonwealth Government. The companies operating the NEM (the National Electricity Market Management Company or NEMMCO) and setting the market rules (the Australian Energy Market Commission or AEMC) are jointly owned by all participating governments. The Commonwealth Government then regulates the market through the Australian Energy Regulator (AER) and the Australian Competition and Consumer Commission (ACCC). The New South Wales, Queensland, Tasmanian and Australian Capital Territory governments are active participants in the NEM through their ownership (or part ownership) of generation, transmission and distribution businesses. State and Territory government regulation also impacts on business participating in the market (eg mandating the use of energy from renewable sources).

In non-NEM states, electricity reform is almost exclusively the responsibility of the Western Australian and Northern Territory governments.

Regulation affecting road and rail transport is wide ranging and includes both Commonwealth, State and Territory and local government regulation. For example, States and Territories regulate roads under the National Road Transport Commission, whilst the Commonwealth *Trade Practices Act* has a significant impact on rail through its access regime under Part IIIA.

The State and Territory governments influence the leasing arrangements for ports, while the Commonwealth Government oversees price regulation. Access regimes come mainly within the purview of the ACCC, although some state-specific access regimes also apply (eg the *Maritime Services (Access) Act 2000* in South Australia, and the *Port Services Act 1995* in Victoria).

Regulatory reform involves a mix of Commonwealth and State and Territory government responsibilities. The available evidence (chapter 8) suggests that there is scope for the Commonwealth Government to reduce its regulatory burden.

Nonetheless, State, Territory and local government regulation is also likely to impose significant compliance costs, as could overlapping and inconsistent regulation.

2.3 Key economic and regional effects

National macroeconomic and sectoral changes

Once the estimated productivity improvements potentially available with the full implementation of the competition and regulatory reform streams work through the economy, the level of economic output as measured by real GDP, could increase by nearly 2 per cent, or $17 billion (2005-06 dollars), compared to the 'no-change' base case (table 2.2).

Table 2.2 **Estimated potential longer-run macroeconomic and sectoral effects of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Variable	*Energy*	*Road & rail transport*	*Ports & associated infrastructure*	*Reduction in regulatory compliance costs*	*Total*
Real GDP	0.05	0.36	0.02	1.31	1.74
Real GNE	0.05	0.28	0.02	0.94	1.28
of which					
Real h'hold consumption	0.06	0.33	0.02	1.12	1.53
Real investment	0.04	0.39	0.01	1.21	1.65
Export volumes	0.08	0.70	0.06	2.85	3.70
Import volumes	0.05	0.31	0.02	1.01	1.40
Terms of trade	0.00	-0.07	0.00	-0.18	-0.26
Real wages	0.12	0.32	0.03	1.19	1.66
Value added (at factor cost)					
Agriculture	-0.04	0.29	0.02	0.38	0.65
Mining	0.13	2.01	0.01	4.10	6.25
Manufacturing	0.09	0.28	0.05	1.54	1.97
Services	0.05	0.29	0.02	1.17	1.53
Employment (persons)					
Agriculture	-0.07	0.35	0.01	-0.46	-0.17
Mining	0.20	2.65	0.00	2.31	5.16
Manufacturing	0.04	0.12	0.02	0.24	0.42
Services	-0.01	-0.09	0.00	-0.06	-0.17

Source: MMRF–NRA estimates.

Reform and the associated higher economic activity could raise household disposable incomes, mainly through higher real wages, potentially increasing real household consumption spending by nearly 2 per cent, or almost $400 annually per person from what it otherwise would be, over the longer term.

The largest contribution to the projected increase in GDP comes from the reduction in regulatory compliance costs. This contribution represent a tops-down estimate of what might be achieved though individual actions to address regulatory hot-spots and to remove excessive compliance costs on business. Potential outer-envelope productivity and efficiency improvements in road and rail freight services are also projected to deliver sizable benefits, highlighting their importance to the traded goods sector of the economy. Reform to further enhance the efficiency of energy service provision, particularly in the NEM, and ports and associated infrastructure services could also provide worthwhile benefits.

Implementation of competition and regulatory reform could lower costs for all sectors. Over the longer run, this could potentially benefit price sensitive export activities in the mining and other sectors, relative to activities selling mainly to the domestic market. In aggregate, with real government spending assumed unchanged, sales of goods and services offshore could increase by around 4 per cent in the longer run. The sensitivity of results to alternative government real spending and fiscal assumptions is discussed below (section 2.4).[2]

State and territory, and regional results

State and territory results

The modelling indicates that the full implementation of the NRA competition and regulatory reform streams is estimated to increase real GSP in all jurisdictions (table 2.3).

[2] In addition, the Commission was requested by the ERIG Secretariat to model the impact of potential productivity improvements in electricity generation in the NEM. The all input productivity improvements specified by the Secretariat were: NSW 3.7 per cent; Victoria 3 per cent; Queensland 1.5 per cent; and South Australia 2.1 per cent. The MMRF-NRA model estimate of the potential increase in GDP from the full achievement of these improvements is 0.02 per cent over the long term. This estimate is lower than canvassed in this study because the ERIG scenario focuses predominantly on NEM generator productivity. This study canvases a wider range of possible reform benefits.

Table 2.3 **Estimated potential longer-run State and Territory effects of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust.*
Real GSP	1.62	1.14	1.97	1.27	3.41	1.40	3.15	0.66	1.74
Employment (persons)	-0.09	-0.47	0.20	-0.25	1.39	-0.13	0.53	-0.69	..
Output per person employed	1.71	1.61	1.76	1.52	2.03	1.52	2.63	1.35	1.74
Real consumption per person	1.59	1.68	1.45	1.55	1.20	1.40	1.34	1.70	1.53
Value added output									
Agriculture	0.59	0.40	0.79	0.57	0.96	1.09	0.85	0.59	0.65
Mining	8.09	4.33	6.92	3.30	6.29	4.68	7.57	1.04	6.25
Manufacturing	1.80	1.27	2.38	1.57	4.10	2.74	2.47	0.94	1.97
Services	1.58	1.06	1.65	1.22	2.80	1.14	1.83	0.66	1.53
Employment (persons)									
Agriculture	-0.29	-0.51	0.03	-0.28	0.30	0.30	0.24	-0.28	-0.17
Mining	6.30	2.58	5.69	2.53	5.23	4.02	5.61	-0.15	5.16
Manufacturing	0.31	-0.19	0.79	0.24	2.26	0.98	1.08	-0.28	0.42
Services	-0.19	-0.55	-0.04	-0.37	0.93	-0.40	0.09	-0.70	-0.17

.. Zero by assumption.

Source: MMRF–NRA estimates.

After the relocation of labour to achieve higher output, value added output per person employed potentially could rise in all jurisdictions. Reflecting differences in the industry structure across jurisdictions and impacts of reform, the more export-orientated jurisdictions of Western Australia and the Northern Territory are projected to expand output and increase employment relative to other jurisdictions.

Assuming changes in real wages by occupational group would equilibrate across regions over the longer run, as would the rates of return to Australian owners of capital, per capita household disposable incomes and household consumption are projected to increase to a similar extent in each jurisdiction.

Nevertheless, for individual reform areas, the regional impacts could vary. For example, further reform of the NEM is projected to benefit activities in New South Wales (appendix E).[3] On the other hand, reform in the road and rail transport sectors is projected to benefit Western Australia relative to other regions — mainly because of the relative importance of distance to the commercial and industrial centres of the eastern coast and the traded-goods sector in the Western Australian economy.

[3] The effects of ongoing NCP reforms in Western Australia are excluded from this analysis (see chapter 4, box 4.1). The impact of these reforms would further raise national output and raise output due to energy reform in Western Australia relative to other jurisdictions.

Projections of potential changes at the industry sector level for each jurisdiction broadly follow national averages. However, reflecting the assumption that any change in real government spending is discretionary and the relative importance of government service provision in the Australian Capital Territory, the service sector in this jurisdiction is not projected to (necessarily) follow national trends. The sensitivity of results to alternative assumptions about government spending are discussed below.

Regional implications

There is also an interest in sub-state or 'regional' implications of competition and regulatory reform. However, information of the potential direct effects of reform that may support such estimates is only available for the energy and ports and related infrastructure reform areas. For these sectors, estimates of the potential direct effect of reform are available at the state-sector level. For the road and rail and the key regulatory reform areas such information is only available at the national level. Any model results for regions based on such broad information therefore can only provide very broad indications of the possible sensitivity of sub-state activity levels to competition and regulatory reform.

Subject to data limitations, it is possible to make some broad observations about the likely impacts of the competition and regulatory reform streams on regions, that is, before the impact of government spending decisions on regional activities. Indicative estimates of regional implications of full implementation of the competition and regulatory reform streams are presented in appendix tables E.9 to E.11.

The modelling results indicate that regional output is likely to increase in all (or nearly all) regions with the full implementation of the NRA competition and regulatory reform streams. Nevertheless, the potential impacts of more narrowly defined reform areas such as energy or ports and related infrastructure are likely to benefit some regions more than others. For example, energy reform focused on the NEM potentially could raise output in all regions in New South Wales but lower output in Western Australia. Similarly reform of ports with emphasis on container port operations could raise output in regions across the eastern States, where container traffic is relatively more important, and potentially contract (expand at a slower rate) in regions in Western Australia, which are more heavily dependent on bulk cargo traffic.

Assuming that the change in national employment is determined primarily by factors beyond the reach of the NRA competition and regulatory reform streams, higher output from higher productivity requires some relocation of labour between

regional activities. Noting the general nature of the policy scenarios assessed, employment in 23 of the 54 regions is expected to be higher than otherwise. Typically, regions estimated to have the largest employment increases are those with the largest output increases. Because land is the constraining factor in agriculture, regions that specialise in agricultural production are projected to have some of the larger overall employment reductions.

Increases in regional output and the relocation of labour away from potentially slower-growing regions could raise labour productivity and regional production income per worker. At the national level, full implementation of the competition and regulatory reform streams could raise real gross product per person employed by around 2 per cent. When the combined effects of projected potential output and employment changes are taken into account, potential output per person employed is projected to increase across regions.

As indicated above, the ultimate regional implications of reform would be influenced by the government spending decisions not anticipated in the modelling. Broad sensitivity analyses of the implications of alternative spending scenarios are outlined below (section 2.4).

Government revenue and expenditure implications

The fiscal modelling of the NRA competition and regulatory reforms captures the key sources of government revenue and expenditure affecting the Commonwealth and State, Territory and local governments. The modelling is nevertheless stylised as it does not anticipate any changes in relativities that may arise out of Commonwealth Grants Commission (CGC) deliberations, other intergovernmental financial arrangements and any changes in Commonwealth, State and Territory financing arising out of the implementation of NRA.

Subject to this broad qualification, full implementation of the NRA competition and regulatory reforms is estimated to increase the net operating balance — the models measure of net government revenue — of Australian governments by around $5 billion. (table 2.4). Around 40 per cent of the additional net revenue is projected to accrue, on average, to State, Territory and local governments with the remainder accruing to the Commonwealth. Most of this projected increase for the Commonwealth Government is associated with higher income and other taxation revenue (appendix E). Most of the additional revenue accruing to State, Territory and local governments is associated with increased property and payroll tax collections and GST-tied grants.

Table 2.4 **Estimated potential longer-run government revenue implications of NRA competition and regulatory reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenues (excluding GST receipts)	1 573	3 415	4 988
GST receipts (net of GST-tied payments)	506	0	506
Total operating revenues	2 079	3 415	5 494
Operating expenses (excluding. GST-tied grant payments)	40	39	79
Operating balance (*net* government revenue)	**2 039**	**3 376**	**5 415**
of which			
Energy	16	115	131
Road and rail transport[a]	221	541	763
Ports and associated infrastructure	16	50	66
Reduction in regulatory compliance costs	1 785	2 670	4 455

[a] Results were obtained using a derivative of the MMRF-NRA model which includes additional intermodal freight transport detail.

Source: MMRF–NRA estimates.

The modelling indicates that some 80 per cent of the additional revenue is likely to be associated with reductions in the compliance cost of regulation through wide ranging regulatory reform. Reform raising the productivity of road and rail transport service provision accounts for about 15 per cent of the overall gain.

While on average, reform is likely to raise net revenues of both the Commonwealth and State, Territory and local government, some variation occurs in the distribution between the two broad levels of government across reform areas.

Available information indicates that, while conclusions may be drawn on the broad implication of reform for government revenues, the net revenue implications of individual reforms and the implications for each jurisdiction need to be determined on a case-by-case basis.

2.4 Sensitivity testing

The analysis in this chapter assumed actual spending decisions are determined outside of the model. Reflecting this assumption, real government spending is held fixed and the model's measure of *net* government revenue — the 'net operating balance' is allowed to vary. The analysis therefore focuses on the question: 'What

are the total revenue benefits expected to accrue to Australian governments from reform?' However, the availability of higher government revenues will affect feasible spending by government.

During the consultation process, information was requested on indicative estimates of the sensitivity of the estimated long-run outer-envelope impacts of reform to alternative assumptions about government expenditure. To assess the sensitivity of projected potential changes in key economic aggregates — real GDP, real household consumption, real government consumption, export volumes and net government revenue — to different assumptions about government spending, two alternative closures involving different assumptions concerning government spending and the fiscal balance are applied.

- Government consumption spending is assumed to move in line with household consumption, with the government surplus (deficit) in each jurisdiction allowed to vary in a similar manner to the reference closure.
- Repeats the first sensitivity test with the additional assumption that personal and company income, product and other tax rates vary uniformly (ie horizontal neutrality) to ensure no change in the net operating balance in each jurisdiction (ie assuming fiscal neutrality) (similar to PC 1999a, 2005a).

The salient features of the reference and alternative fiscal closures are summarised in box 2.3.

The sensitivity tests indicate that the estimated increases in real GDP are similar across all three fiscal policy scenarios (table 2.5). However, the distributional effects of change are somewhat sensitive to alternative assumptions about the disposition of higher government revenues. If higher revenues simply were channelled to a permanent reduction in the budget deficit, domestic absorption would be penalised and available labour and capital resources would tend towards export activities (the reference case, table 2.5).

By contrast, if higher revenues were deployed to raise domestic absorption though additional government spending (the first alternative fiscal assumption) or if fiscal neutrality were maintained (the second alternative fiscal assumption), available labour and capital would tend less towards export activities. Model estimates suggest that simply increasing government spending in proportion to household consumption would not fully absorb the revenue balance that could be generated from reform. With fiscal neutrality (and the assumption of uniform changes in jurisdiction-specific tax rates), both household and government consumption and exports could increase relative to the first alternative fiscal case, as the net revenue balance is driven to zero. These sensitivity tests illustrate that the distributional

effects of change, but not national output as measured by real GDP, are likely to be sensitive to fiscal policy settings.

Box 2.3 **Reference and alternative fiscal policy assumptions**

	Reference case	*Alternative fiscal assumptions*	
Characteristic	*Real government consumption assumed discretionary, budget unbalanced*	*Real government consumption assumed non-discretionary, budget unbalanced*	*Real government consumption assumed non-discretionary, budget balanced*
Real government consumption	Policy determined	Assumed to vary with household consumption	Assumed to vary with household consumption
Personal and company, product and other tax rates	None	None	Jurisdiction-specific tax rates assumed to vary uniformly to achieve fiscal neutrality
Net operating balance	Varies	Varies	Policy determined

Table 2.5 **Sensitivity of national results to alternative fiscal assumptions, NRA competition and regulatory reforms**

Scenario	*Real GDP*	*Real h'hold con-sumption*	*Real govt con-sumption*	*Export volumes*	*Govt operating balance*
	%	%	%	%	$b (2005-06)
Reference case					
Real government consumption assumed discretionary	1.74	1.53	..[a]	3.70	5.4
Alternative fiscal assumptions					
Real government consumption assumed non-discretionary[b]	1.67	1.55	1.56	1.86	0.9
Real government consumption assumed non-discretionary, budget balanced[c]	1.64	1.60	1.58	2.00	..[a]

[a] Fixed by assumption. [b] Government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary. [c] In addition, personal and company, product and other tax rates vary uniformly to achieve fiscal neutrality (ie government operating balance fixed by assumption).

Source: MMRF–NRA estimates.

Changes in the balance between domestic absorption and the trade sector at the macroeconomic level will also have flow on effects at the regional level. For example, use of additional revenue to reduce government deficits would favour the more trade-dependent States and Territories, particularly Western Australia (table 2.6). On the other hand, higher general government expenditure would tend to favour the more government-sector oriented regions, particularly the Australian Capital Territory. However, because government spending spans a wide range of activities including public administration, defence, education, health and community services, the regional impacts of government responses would be sensitive to individual spending decisions and the location of government service providers. The distributional consequences would also depend on the ultimate beneficiaries of government services, including education, health or community services, their income and demographic characteristics.

Overall, the sensitivity tests indicate that the manner in which governments respond to the revenue effects of the competition and regulatory reforms will be crucial in determining the ultimate distributional consequences of reform.

Table 2.6 **Sensitivity of real GSP to alternative fiscal assumptions, NRA competition and regulatory reforms**

Percentage change

Scenario	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Reference case									
Real government consumption assumed discretionary	1.62	1.14	1.97	1.27	3.41	1.40	3.15	0.66	1.74
Alternative fiscal assumptions									
Real government consumption assumed non-discretionary	1.60	0.93	2.02	1.25	3.06	1.45	3.26	1.34	1.67
Real government consumption assumed non-discretionary, budget balanced	2.05	1.38	1.39	0.90	2.34	0.04	-0.15	1.45	1.64

Source: MMRF–NRA estimates.

3 Potential economic and revenue implications of NRA human capital reform

Key points

- NRA human capital stream reforms could enhance the productivity of health service delivery.
  - If total factor productivity could be improved by around 5 per cent through the full implementation of the NRA, potential resource savings of around $3 billion (2005-06 dollars) could be achieved, freeing resources for potential use in health and other services.
  - After a period of adjustment, this could raise GDP and imply a potential increase in household consumption of around $40 per person.
  - With real government spending fixed by assumption, net revenues of governments could rise by around $4 billion (2005-06 dollars).
- NRA human capital reform in the areas of health promotion and disease prevention, education and training and work incentives could enhance workforce participation and productivity and raise potential output and income.
  - If workforce participation could be increased by around 8 per cent (or 4.9 percentage points) by 2030, GDP could increase by around 6 per cent after a period of adjustment.
  - If productive potential of 'baseline' workers could be enhanced by around 2 per cent (or 1 percentage point) over the same period (and employability of workforce participants enhanced), GDP could increase by around 3 per cent, also after adjustment.
  - With higher activity levels, government revenues would rise.
  - However, the above estimates would all need to be reduced to take account of the additional costs of implementing specific reform proposals, which could be substantial.
  - The model analysis also does not take into account non-market productive activity of households (such as reductions in unpaid childcare, carer activity and volunteerism).
- Because of inherent differences between the human capital stream and the competition and regulatory reform streams, results cannot be aggregated to obtain a single measure of the impact of the NRA.

The NRA human capital stream is focused on outcomes needed to enhance workforce participation and productivity, and achieve a more effective delivery of health sector services. This chapter brings together analyses of the individual building blocks of the human capital stream and the Commission's modelling to report on the potential maximum (outer-envelope) longer-run economic, government revenue and distributional implications of reform.

It draws on chapter 9 for indications of the potential to raise the productivity of health service delivery and chapters 10 to 14 for indications of the potential to enhance workforce participation and productivity.

The modelling of the potential outer-envelope longer-run economic and government revenue implications of NRA human capital reforms follows the approach adopted for the competition and regulatory reform stream (chapter 2). Under this approach, real government spending decisions are treated as discretionary and assumed to be determined outside of the model. The fiscal implications of NRA human capital reforms are therefore measured in terms of changes in governments' fiscal balances.

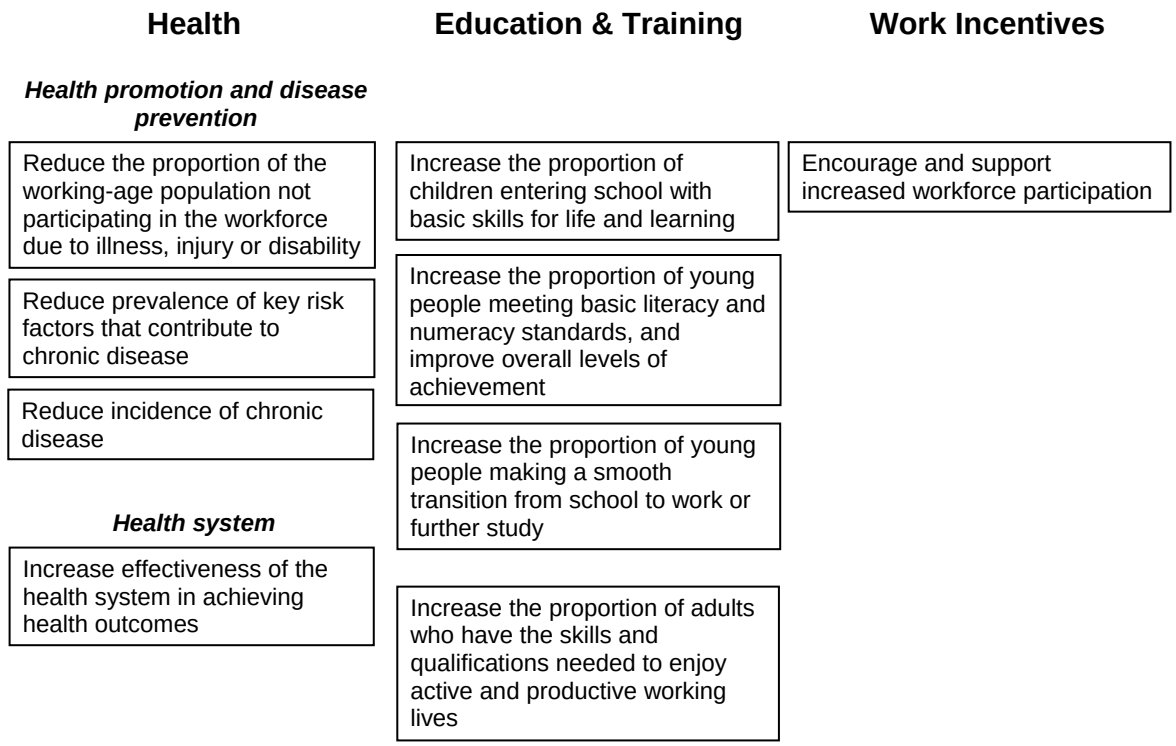
Section 3.1 summarises the scope of the human capital stream of the NRA and outlines important differences between reform streams. Section 3.2 reports estimates of the potential effects of the NRA on the productivity of health services delivery, while section 3.3 reports on the potential effects for workforce participation and productivity. Key sensitivities of the results to alternative government spending scenarios are also reported to aid understanding of the economic and distributional effects of reform.

3.1 Scope of the NRA human capital reform stream

As recognised at the February 2006 meeting of the Council of Australian Governments (COAG), a healthy, skilled and motivated population is critical to workforce participation and productivity, and hence to Australia's future living standards.

By focusing on outcomes directed at enhancing participation and productivity, the human capital stream of the NRA aims to provide Australians with the opportunities and choices they need to lead more active and productive lives. The human capital stream is made up of three substreams — health, education and training, and work incentives. The health substream also includes a separate component directed at increasing the effectiveness of the health system (figure 3.1).

Figure 3.1 **Human capital stream and indicative objectives and outcomes**



Source: Adapted from COAG (2006d, Attachment A, p. 1).

The health service delivery component of the NRA's human capital stream broadly follows the productivity and efficiency improvement focus of the competition and regulatory reform streams. However, the health system is complex with a myriad of market and non-market influences determining outcomes and options for achieving those outcomes in ways not typical of the range of activities covered in the competition and regulatory reform streams.

The human capital health promotion and disease prevention (chapter 11), education and training (chapter 12) and work incentives (chapter 13) substreams focus on individuals and their potential to contribute to workforce participation and productivity. In contrast, the competition and regulatory reform streams (chapters 4 to 8) and the health service delivery substream (chapter 9) focus on activities or industries.

Because of the inherently different nature of the health services delivery and workforce participation and productivity reform components, they are discussed separately.

3.2 Potential impact of reforms to health system effectiveness

The NRA seeks to:

> increase the effectiveness of the health system in achieving health outcomes (COAG 2006d, p. 15)

Reform in the delivery of health services affords the potential to reduce impediments to improved productivity in health service delivery and to achieve increases in the level and/or quality of services. Because it is a matter for COAG to determine how efficiency improvements may be utilised to achieve health or other outcomes, this analysis does not assess the potential to increase the level, quality and/or safety of services.

The NRA canvasses a number of reform possibilities, including the review of health system funding arrangements via the Commonwealth–State Specific Purpose Payment (SPPs), the operation of the Medicare Benefits Scheme (MBS), utilisation of information and communications technologies and removing impediments to the efficient use of the health workforce (chapter 9). In July 2006, COAG approved several measures aimed at improving the productivity of the health workforce (COAG 2006b).

Assessing the potential increase in productivity in the delivery of health services with the full implementation of the NRA is challenging (chapter 9). Despite the strategic directions provided by COAG, there is limited information available about likely specific reforms and evidence-based information about the costs and benefits of reform. Moreover, measuring the productivity performance of the health sector, even within the existing policy framework, is difficult. However, available information and consultations during this study and earlier studies by the Commission do suggest significant benefits would be available from reform in health services delivery.

Available information does not support a division of benefits across jurisdictions. Accordingly, this study assesses the potential economic and revenue effects of improved productivity in health service delivery on the basis of an assumed uniform change in health sector productivity across jurisdictions.

If a 5 per cent improvement in productivity in the national health system were to be achieved through the full implementation of NRA-consistent reforms, this could result in net resource savings of around $3 billion (2005-06 dollars). Lower health service costs could afford a direct benefit to consumers of health services, while freeing resources for potential use in additional service delivery.

Key economic and fiscal results

National and state results

Achievement of a potential 5 per cent improvement in productivity in health service delivery from the full implementation of the NRA could add around $4 billion or 0.4 per cent in terms of GDP, in the longer-run after a period of adjustment (up to ten years or more from the full implementation of reform).

Achievement of lower unit health costs is projected to raise output in each jurisdiction (table 3.1). The largest estimated output increase is projected for Western Australia and Northern Territory reflecting improved competitiveness estimated to arise from reform and relatively high trade exposure of those jurisdictions.

Table 3.1 **Estimated potential longer-run State and Territory effects of NRA health service delivery reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Real GSP/GDP	0.26	0.47	0.46	0.22	0.78	0.23	0.75	0.51	0.42
Employment (persons)[a]	-0.09	0.09	-0.04	-0.19	0.33	-0.22	0.07	0.12	..
Value added per person employed	0.36	0.37	0.50	0.41	0.45	0.45	0.67	0.40	0.42
Real consumption per person	0.17	0.14	0.17	0.20	0.09	0.19	0.12	-0.02	0.15

.. Zero by assumption.

[a] Employment for Australia is assumed unchanged with the implementation of the NRA.

Source: MMRF–NRA estimates.

After the relocation of labour (and other resources), value added per person employed could increase in all jurisdictions in the longer run. After activity and income effects are taken into account, increased health sector productivity could raise real household disposable income (mainly through higher real wages) and real consumption by nearly 0.2 per cent or around $40 per person across jurisdictions. The modelled decline in real consumption per person in the Australian Capital Territory flows from it being (proportionately) the largest employer of professionals, the occupation impacted on most by the productivity improvements in health services delivery. To accommodate this additional labour, real wages fall proportionately more in the Australian Capital Territory and, hence, household consumption.

With higher incomes, average household consumption of health services is projected to increase by around 2 per cent.

Fiscal implications

Achievement of improvements in productivity of health service provision would lower the cost to government of providing at least the same level, quality and safety of service (broadly defined). Governments, as the main purchasers of health services — including though the public provision of hospital and other health services and the operation of the MBS — would gain from improved health sector productivity through lower fiscal costs. After adjustment to lower health costs and consequential economic changes, government operating expenses could decline by around $3 billion (2005-06 dollars) (table 3.2), or around $2 billion for States and Territories and nearly $1 billion for the Commonwealth. With higher activity levels across the economy, government operating revenue is projected to increase, mainly with higher taxation receipts (appendix F, table F.3).

Overall, the net operating balance of governments could rise by around $4 billion (2005-06 dollars) over the longer term; that is, by nearly $3 billion at the State and Territory level and over $1 billion at the Commonwealth level.

Table 3.2 **Estimated potential longer-run government revenue implications of NRA health service delivery reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenues (excluding GST receipts)	267	424	692
GST receipts (net of GST-tied payments)	130	0	130
Total operating revenues	397	424	821
Operating expenses (excluding GST-tied grant payments)	-2 268	-975	-3 243
Operating balance *(net* government revenue)	**2 665**	**1 399**	**4 064**

Source: MMRF–NRA estimates.

In addition to the changes modelled, there could be further changes in the disposition of aggregate fiscal effects between the States and Territories and the Commonwealth arising from cost sharing agreements such as the Australian Health Care Agreements and fiscal equalisation arrangements such as those managed through the Commonwealth Grants Commission process.

Sensitivity testing

For the above analysis, the modelling does not prejudge how the additional fiscal balances would be used, rather it emphasises the additional revenues that would be available to government.

Nevertheless, to provide an indication of the sensitivity of results to alternative fiscal assumptions, the analysis was repeated using two alternative broad assumptions about government spending and the fiscal balance — the first assuming government spending moves in line with household consumption, and the second making the additional assumption that any remaining fiscal balances are distributed to households by uniformly reducing the rate of personal, company, product and other taxes (see box 2.3).

The sensitivity tests indicate that the potential increases in real GDP are similar across all three fiscal closures (table 3.3). However, the distributional effects could differ depending on government spending decisions. For example, if additional purchasing power were channelled to increase domestic demand through higher government spending or higher household spending (line 2 of table 3.3), export potential would be reduced.

Consequently, there would be an associated reallocation of potential activity levels between the more trade exposed regions (such as Western Australia) and other regions (table 3.4).

Table 3.3 **Sensitivity of national results to alternative fiscal assumptions, NRA health service delivery reforms**

	Real GDP	*Real h'hold con-sumption*	*Real govt con-sumption*	*Export volumes*	*Govt operating balance*
	%	%	%	%	$b (2005-06)
Reference case					
Real government consumption assumed discretionary	0.42	0.15	..[a]	1.61	4.1
Alternative fiscal assumptions					
Real government consumption assumed non-discretionary[b]	0.41	0.15	0.16	1.42	3.6
Real government consumption assumed non-discretionary, budget balanced[c]	0.50	0.53	0.55	0.04	..[a]

[a] Fixed by assumption. [b] Government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary. [c] In addition, personal and company, product and other tax rates vary uniformly to achieve fiscal neutrality (ie government operating balance fixed by assumption).

Source: MMRF–NRA estimates.

Table 3.4 **Sensitivity of real GSP to alternative fiscal assumptions, NRA health service delivery reforms**

Percentage change

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Reference case									
Real government consumption assumed discretionary	0.26	0.47	0.46	0.22	0.78	0.23	0.75	0.51	0.42
Alternative fiscal assumptions									
Real government consumption assumed non-discretionary[a]	0.25	0.46	0.46	0.20	0.77	0.20	0.76	0.58	0.41
Real government consumption assumed non-discretionary, budget balanced[b]	0.06	0.51	1.27	0.99	0.11	1.38	1.59	-0.02	0.50

[a] Government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary. [b] In addition, personal and company, product and other tax rates vary uniformly to achieve fiscal neutrality (ie government operating balance fixed by assumption).

Source: MMRF–NRA estimates.

3.3 Potential impact of workforce participation and productivity reforms

The human capital stream of the NRA comprises three distinct substreams directed at improving workforce participation and productivity — health promotion and disease prevention, education and training, and work incentives. Each substream:

> …aims to provide Australians with the opportunities and choices they need to lead active and productive lives. (COAG 2006a, p. 2)

In particular, this overall reform stream primarily focuses on the potential of individuals to:

- participate in the workforce, whether actively employed or actively looking for work; and
- increase their productivity while at work by increasing their effectiveness and reducing absenteeism.

To date, COAG has agreed, in principle, to ten high-level outcomes and associated indicative progress measures (in the area of participation and productivity). COAG has also flagged four priority areas: diabetes; early childhood development; literacy and numeracy; and child care (chapter 10). However, in common with other areas and despite the strategic directions provided by COAG, there is limited information

about: the specific action plans; evidence linking specific actions with workforce participation and productivity outcomes; and the costs and benefits of reform.

Against this backdrop, broad international comparisons have been used to indicate the scope to enhance workforce participation and productivity in Australia (chapter 10). This 'first take' is supported by more detailed assessments of the potential for the health promotion and disease prevention, education and training and workforce incentives substreams to enhance workforce participation and productivity. For health promotion and disease prevention (chapter 11), a case-study approach covering six chronic diseases targeted by the NRA is applied. For education and training (chapter 12), the approach focuses on identifying relevant target groups and appropriate performance benchmarks. Finally, for work incentives (chapter 13), the focus is on identifying opportunities for workplace participation rates of nominated groups to rise, and the implications for workforce productivity.

To arrive at a consolidated effect, it has been necessary to account for interactions within and across substreams and to contend with their diverse maturation periods. For example, improved educational attainment tends to be associated with healthier lifestyles (and vice versa, chapter 14) and higher workforce participation. Moreover, the impact of changing work incentives may be felt relatively quickly, whereas changes to early childhood development might not manifest for more than a generation.

The presence of possible interactions, spillovers and lead times means that the consolidated outcome for workforce participation and productivity may be greater than, equal to, or less than that implied by adding the potential outcomes canvassed for individual substreams at any point in time. Given the inherent problems associated with trying to account for these factors, the simple aggregation of the substream impacts is used to assess the outer-envelope of potential benefits for the human capital stream. Nevertheless, where possible in the consolidation of impacts for individual substreams, an attempt has been made to eliminate overlaps and include spillovers (chapters 11 to 13). The consolidated effects are applied as a *single* policy scenario.

This study also adopts a 25 year time horizon to capture sufficiently the effect of meeting human capital outcome objectives; if anything, reforms impacting on persons aged less than 15 years and chronic disease may require an even longer time frame. To do this, the study applies a demographic model to compare, by 2030, a *baseline* outcome for workforce participation and productivity that assumes no human capital reforms with an outer envelope that incorporates the potential impacts of these reforms.

Full implementation of the health and the education and training substreams of the NRA could also potentially *raise* the level of *workforce productivity* by as much as a further 2 per cent (or around 1 percentage point from projected levels), over the next 25 years (chapter 14). Such an increase would be additional to ongoing labour productivity growth — projected at 1.75 per cent per year (the average over the past few decades) in the Commission's study of the Economic Implications of an Ageing Australia (PC 2005f), or around 54 per cent over the next quarter of a century. The (potential) net increase in workforce productivity above levels that are otherwise projected to be achieved is likely to result from improved health and higher levels of education and training through the achievement of NRA indicative objectives and outcomes.

The potential direct NRA workforce participation and productivity changes by 2030 are summarised in table 3.5. As much uncertainty surrounds the results, estimates should be interpreted as exploratory and only broadly indicative of the potential benefits rather than forecasts (see chapter 11–14). That said, in broad terms, higher participation and productivity is estimated to raise effective labour inputs (quality-adjusted hours worked) by around 8 per cent from levels that could otherwise prevail.

In particular, the estimates canvass a potential 8 per cent increase in workforce participation (after the full achievement of NRA human capital objectives and outcomes) from levels that would otherwise apply. The achievement of such an increase would act to offset the projected effects of ageing over the next 25 years. The projected changes in participation may come from a variety of sources, but are estimated to mainly impact on the mature age, welfare dependant and women (chapter 13), and are not inconsistent with many of the changes observed over the previous 25 years (chapter 10). However, the additional participants would tend to work fewer hours than existing workers and would tend to have lower skill levels, or would need to overcome physical or other impairments to join the workforce.

Most of the (potential) increase in the workforce is likely to result from changes in work incentives. Such programs are mainly a Commonwealth responsibility and include family tax arrangements, disability support pensions and superannuation. These programs have been subject to recent reform. Health and education and training are shared Commonwealth, State and Territory responsibilities (chapter 14).

The potential impacts on workforce participation and productivity are estimated to be largely uniform between States and Territories, but vary slightly with differences in age and other State and Territory demographic characteristics (chapter 14).

Table 3.5 **Potential direct impacts of NRA workforce participation and productivity reforms, by 2030**

Percentage change, outer-envelope estimates

Reform area	*Indicative high-level outcomes*	*Direct impact*	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Health promotion and disease prevention **Education and training** **Work incentives**	▪ Improve the proportion of children born healthy[a] ▪ Improve the proportion of children acquiring the basic skills for life & learning[a] ▪ Reduce the proportion of the working age population not (or under) participating in paid employment due to illness, disability or injury ▪ Reduce the incidence of preventable chronic disease & serious injury among the working age population ▪ Reduce the prevalence of key risk factors that contribute to chronic disease ▪ Increase the proportion of young people meeting basic literacy & numeracy standards ▪ Increase the proportion of young people making a smooth transition from school to work or further study ▪ Increase the proportion of adults with the skills & qualifications needed for active & productive working lives ▪ Improve workforce participation (focussing target groups), in a manner consistent with the long term interests of individuals & the economy, giving due regard to productivity ▪ Increase the provision of flexible working arrangements within the workforce, in a manner consistent with the long term interests of individuals & the economy	**Potential additional workforce participation**								
		Increase in workforce participation rate (binary measure)	8.4	8.4	8.4	8.7	8.4	8.9	7.3	7.8	8.4
		Decrease in average hours worked due to new workforce participants having a greater propensity to work fewer hours	-2.3	-2.3	-2.3	-2.4	-2.3	-2.4	-1.9	-2.1	-2.3
		Decrease in workforce productivity due to a lower than average marginal product of new entrants to the workforce	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.6
		Decrease in disability support pension payments resulting from the shift from welfare to work	-28	-28	-28	-28	-28	-28	-28	-28	-28
		Decrease in age pension payments due to increased longevity	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.7	-0.7
		Enhanced productive potential of workforce									
		Increase in workforce productivity stemming from improved health outcomes and educational attainment	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9
		Increase in the employment rate (lower unemployment)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

[a] Also relates to a subsidiary outcome: closing the gap between indigenous and non-indigenous children.

Source: Chapter 10, box 10.1; adapted from COAG (2006c. p. 6).

While the focus of this study is on the potential impacts of the NRA on workforce participation and productivity of the Australian population, as projected to 2030, reforms could also be influential in determining the level and age composition of that population (box 3.1). However, quantifying the economic and fiscal implications of possible changes in population, while worthwhile, would be complex and extend beyond the scope of the study.

Key economic and fiscal results

National macroeconomic and sectoral results

Projected higher workforce participation and productivity could, over the longer run, potentially raise effective labour inputs (quality-adjusted hours worked) substantially — by around 8 per cent from levels that would otherwise apply. Underpinning this estimate, is a potential 8 per cent increase in workforce participation (contributed by workers with lower productivity, on average, than incumbent workers) and an increase of around 2 per cent in labour productivity of incumbent workers. With a better educated and healthier workforce, the rate of employment of workforce participants is also projected to rise fractionally (ie the rate of unemployment declines) from what it would otherwise be.

The achievement of higher labour inputs and the employment of those inputs by industry would potentially raise national output, measured by GDP, and consumption possibilities per person, above levels that could be otherwise achieved. The estimated effects, however, focus on potential changes in market activities (ie those arising from participation in paid employment) and do not take account of:

- non-market activity of households (such as reductions in unpaid childcare, carer activity and volunteerism); or importantly
- any additional upfront or ongoing direct costs to households or government which could be substantial.

That said, projected higher participation levels are estimated to raise market output by around 6 per cent, while higher productivity of incumbent workers is estimated to raise output by around 3 per cent — after the effect of reforms bite and after a period of adjustment (table 3.6). There would, however, be a substantial lag between implementation of the reform and the achievement of NRA outcomes. The preceding discussion indicated that a time horizon of up to 25 years or more is likely for most reforms from implementation to before the effects of reform bite.

Box 3.1 The potential for NRA to increase Australia's population

It is commonly accepted that life expectancy is increasing over time with advances in medical technology, health awareness and other factors. The demographic modelling assumes that between 2005 and 2030, the average length of life will increase from 78.4 to 82.5 years for males and 83.6 to 86.6 years for females in its 'business-as-usual' base case. Under this assumption, by 2030, the Australian population was projected to be around 2.7 per cent or 568 000 people higher than it would be with no change in life expectancy.

This study focuses on the potential impact of the NRA to enhance workforce participation and productivity of this baseline population, including those that live longer through underlying progressive increases in longevity. In doing this, it focuses on the aims of the NRA in relation to providing '…Australians with opportunities and choices they need to lead active and productive lives' (COAG 2006a, p.2). The analysis therefore asks the question, 'for the expected population in 2030, what are the opportunities to enhance workforce participation and productivity through the NRA?'

However, the influence of the NRA may be more pervasive. For example, actions under the NRA may:

- enable the achievement of further improvements in longevity beyond those anticipated in the baseline population projections;
- be instrumental in avoiding a slippage in longevity arising from the increased incidence of chronic disease linked to lifestyle choices (such as type 2 diabetes); or
- enable an increase in life expectancy above that anticipated in the base line.

Chapters 11 and 14 canvass the potential influences of NRA-linked changes on population size. Preliminary calculations suggest that with improvements, particularly in population health, the population may be upward of 200 000 people larger than it might otherwise have been. However, in the absence of a detailed assessment of *all* of the factors determining the baseline, the analysis does not canvas the extent to which the baseline incorporates the potential effects of the NRA.

While the NRA focuses on enhancing the opportunities and choices for Australians, assessment of the impacts of changes in population *size* bring a different focus. The Commission's recent report on *The Economic Impacts of Migration and Population Growth* (PC 2006g) found that additions to the population though additional migration were unlikely to have a substantial impact on *incomes per person* — even when migrants are relatively highly skilled. Moreover, the Commission's analysis of population growth due to increased longevity suggested such additions would lower incomes per person (PC 2005f).

To know more about the economic impacts of increases in life expectancy — including through actions linked to the NRA — while worthwhile is not the central focus of this study.

The lag for some areas of reforms could well be of a shorter duration (eg in the area of work incentives). However, because of the presence of possible interactions and spillovers between the human capital reform substreams (eg between health, education and work readiness), there are inherent problems in specifying a time path over which the effects of reform could be felt. Once reforms bite, a further period of economic adjustment would be needed as additional or more productive labour are employed and new investment and activity are generated. Overall, the potentially long maturation period also inherently raises the level of uncertainty attached to the estimates.

Table 3.6 **Estimated potential longer-run macroeconomic and sectoral effects of NRA workforce participation and productivity reforms**

Percentage change, real government spending assumed fixed

Variable	*Potential additional participants*	*Enhanced productive potential of baseline workers*
Real GDP	6.07	2.72
Real GNE	4.34	1.97
of which		
Real h'hold consumption	4.79	2.18
Real investment	6.72	3.02
Export volumes	13.86	6.11
Import volumes	5.35	2.40
Terms of trade	-0.90	-0.40
Real wages	-1.53	1.43
Employment (persons)	8.41	0.63
Value added (at factor cost)		
Agriculture	2.73	1.21
Mining	11.52	5.10
Manufacturing	7.40	3.29
Services	5.82	2.62
Employment (persons)		
Agriculture	6.96	-0.03
Mining	14.57	3.34
Manufacturing	10.00	1.32
Services	8.07	0.49

Source: MMRF–NRA estimates.

The economic impacts of increased workforce participation and productivity differ. The potential benefits generated from increased participation would be linked to the addition of new workers which available information suggests would, on average, have lower productivity than incumbent workers.

All other things being equal, absorption of an increased supply of less productive (on average) labour would involve a reduction in real wages (table 3.6). However, the model estimate of real consumption is projected to rise because higher participation and employment in market activities could yield higher measured disposable income than non-participation.

Higher workforce productivity achieved through better health and enhanced education and training would potentially both raise the rate of employment (as a healthier and better educated workforce would tend to have lower rates of structural unemployment) and real wages of employed workers. Higher disposable incomes, mainly through higher real wages could increase consumption opportunities and real consumption.

Overall, enhanced workforce participation and productivity through the full implementation of the NRA and achievement of NRA human capital objectives, could potentially raise household disposable income and household consumption by around 7 per cent or over $1 800 (2005-06 dollars) per person, *before any additional household financial and other costs*.

Consistent with the achievement of higher labour inputs, output and employment could increase in each broad industry sector in the long run (table 3.6). Given the supply of labour, with fixed capital assumed to be readily available at the going rate of return, the more capital intensive, traded sector activities (such as mining) could expand ahead of other activities, in the longer run. With the supply of agricultural land assumed fixed in the longer run, opportunities for expansion in that sector are likely to be less than for other sectors.

State and Territory results

With potentially higher workforce participation in each jurisdiction, output measured as gross state product (GSP) could also increase — from what it otherwise could be and after a period of adjustment (table 3.7). With changes in government spending assumed to be discretionary and determined outside of the model (ie held fixed), the more export oriented jurisdictions of Western Australia and Northern Territory are projected to potentially raise output and increase employment relative to other jurisdictions. Similarly, because of the government service focus of the Australian Capital Territory, output and employment prospects in that jurisdiction would be sensitive to government spending decisions not captured in the modelling.

However, because, on average, additional participants are assessed to work fewer hours and to be less productive than incumbent workers, the potential increase in

real value added output *per person* employed has been projected to decline in each jurisdiction. The model estimates also indicate that the potential change in output per person employed between jurisdictions could vary. For example, the projected potential decline for the Northern Territory is less than half the national average. This reflects, in the main, the high increase in output for the Territory due to its trade exposure, coupled with the lower than average increases in employment arising from the direct effects of NRA reforms.

Table 3.7 **Estimated potential longer-run State and Territory effects of NRA workforce participation and productivity reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Potential additional participants									
GSP/GDP	5.89	6.30	5.40	5.29	8.16	4.71	6.01	3.54	6.07
Employment (persons)	8.33	8.79	7.77	8.00	10.12	7.36	6.79	5.75	8.41
Value added per person employed	-2.44	-2.49	-2.37	-2.71	-1.95	-2.65	-0.77	-2.21	-2.34
Real consumption per person	4.88	4.72	4.84	4.82	4.40	4.74	4.24	5.06	4.79
Enhanced productive potential of baseline workers									
GSP/GDP	2.66	2.83	2.42	2.36	3.61	2.10	2.72	1.61	2.72
Employment (persons)	0.61	0.80	0.35	0.40	1.37	0.11	0.04	-0.48	0.63
Value added per person employed	2.04	2.03	2.07	1.96	2.25	2.00	2.68	2.09	2.09
Real consumption per person	2.23	2.15	2.21	2.15	1.99	2.09	2.06	2.41	2.18

Source: MMRF–NRA estimates.

In line with projected potential changes at the national level (and subject to the same qualifications), potential household disposable income and consumption per person is projected to increase in each jurisdiction with enhanced workforce participation.

With enhancement of the productive potential of the workforce, through the implementation of the NRA (over the next 25 years), GSP could increase in all jurisdictions in the longer run and after a period of adjustment. After some relocation of the existing workforce and potentially some additions to employment (from *lower* structural unemployment, discussed above), value added per person employed could also increase in all jurisdictions.

Higher production incomes per person could raise household net disposable income and consumption opportunities in all jurisdictions.

In principle, results for the States could have been disaggregated to sub-state regions. However, even broadly indicative information that might be used to link workforce participation and productivity changes to regional activities is not available. For example, information is not available on the likely occupation

characteristics of potential or other workers affected, on which to base illustrative estimates of the regional industry — as employers of different occupational groups — implications of the NRA human capital stream.

That said, model simulations of broad economy-wide changes of a kind potentially achievable with the full implication of the human capital stream would typically indicate output could grow in most regions after some relocation of employment.

Fiscal implications

The fiscal modelling of the human capital substreams capture the key sources of potential changes in government revenue from potential workforce participation and productivity changes — mainly income, product and other taxes. The fiscal modelling also specifically takes into account important potential changes in specific government outlays that could be affected by the NRA human capital stream. In particular, the fiscal modelling takes account of potential reductions in:

- DSP that may accompany increased participation as potential NRA induced improvements to health and educational status, and work incentives are assumed to enable more people than otherwise to overcome physical, intellectual or psychiatric impairment and to work at least 15 hours per week;
- aged pension payments as potential NRA induced improvements to health and educational status, and work incentives encourage more people than otherwise to extend their working life; and
- unemployment benefits as potential NRA induced improvements in health and educational status are assumed to improve the employment outcomes of more people balanced against a potential increase in unemployment benefit payments arising from projected increases in workforce participation.

On the other hand, the fiscal effects do not include the initial or ongoing costs of achieving improved health, educational or training outcomes. They also do not include additional financial incentives, support services and other costs to government of enhancing workforce participation.

Against this background, conditional estimates of the potential long-run fiscal impacts of NRA-induced enhancements to the workforce could raise the operating balance of Australian governments by some $24 billion (2005-06 dollars), before the program costs of achieving NRA workforce participation objectives (see table 3.8). Of this ‘gross’ total, based on current fiscal balances, around 40 per cent could accrue to States, Territories and local governments with the remainder accruing to the Commonwealth Government. This division, however, is highly tentative and

only intended to be broadly illustrative. Again, the actual net distribution would depend on the size and distribution of program and implementation costs incurred.

Model estimates suggest that the main influence likely to drive government revenue would be higher individual and company income taxes and product taxes levied mainly by the Commonwealth. Revenue gains estimated to flow to the states largely accrue from property taxes and payroll and GST-tied grant receipts. On the expenditure side, lower input costs to the provision of government services and lower DSP and age pension payments are significant (appendix G). The modelling of these items is outlined in box 3.2.

Table 3.8 **Estimated potential longer-run government revenue implications of NRA workforce participation and productivity reforms**

$ billion (2005-06 dollars), real government spending assumed fixed

	Potential additional participants			*Enhanced productive potential of baseline workers*		
Item	*States, Territories & local gov't*	*Cwlth*	*Total*	*States, Territories & local gov't*	*Cwlth*	*Total*
Operating revenues (excluding GST receipts)	5.1	11.3	16.5	2.3	5.1	7.4
GST receipts (net of GST-tied payments)	1.8	0.0	1.8	0.8	0.0	0.8
Total operating revenues	7.0	11.3	18.3	3.2	5.1	8.2
Operating expenses (excluding GST-tied grant payments)	-2.1	-3.1	-5.3	-0.9	-1.1	-2.0
Operating balance (*net* government revenue)	**9.1**	**14.5**	**23.6**	**4.1**	**6.2**	**10.3**

Source: MMRF–NRA estimates.

Achievement of higher workforce productivity is estimated to raise the net operating balance of Australian governments by around $10 billion (2005-06 dollars), once again before the program costs of achieving NRA health, education and training and work incentive objectives. Of this total, approximately 40 per cent is estimated to accrue to States, Territories and local governments with just over 60 per cent estimated to accrue to the Commonwealth. Again, taxation receipts are likely to be the main factors influencing any increase in government revenues, while on the expenditure side, the cost of providing government services is projected to decline. Also, with the potential NRA-induced improvement in employment outcomes, lower unemployment benefits are estimated.

Box 3.2 **Modelling of the DSP and age pension payments**

Changes in DSP and age pension recipients (those aged 65 and over) from the demographic modelling (appendix C) are applied to DSP and age pension payments, respectively, in MMRF–NRA to assess the implications of additional workforce participation for Commonwealth government expenditure.

NOTE: The MMRF-NRA modelling is undertaken in 2001-02 dollars. The fiscal estimates were updated to 2004-05 dollars using government finance statistics (the latest available) and for summary reporting, projected to 2005-06 dollars on the basis of changes in general price levels.

Disability support pensions

		Australia
Change in DSP payments modelled	%	-28.0
Commonwealth DSP payments	$m (2001-02)	6 404
Implied change in DSP payments	$m (2001-02)	-1 791
Implied change in DSP payments	$m (2005-06)	-2 322

Age pension payments

		Australia
Change in age pension payments modelled	%	-0.7
Commonwealth age pension payments	$m (2001-02)	17 406
Implied change in age pension payments	$m (2001-02)	-127
Implied change in age pension payments	$m (2005-06)	-160

Source: MMRF–NRA model; Productivity Commission estimates.

Sensitivity testing

As indicated in the discussion of the potential implications of competition and regulatory reform and of improved health system productivity, there is interest in the implications of possible alternative broad fiscal scenarios. Results for the reference scenario (in which government discretionary outlays are held fixed) and the two alternative scenarios (box 2.3) are presented for the human capital stream.

In common with other results presented in this study, the estimated increases in real GDP are similar across all three fiscal scenarios (table 3.9). Similarly, the distributional effects of change are sensitive to alternative assumptions about the disposition of higher government revenues. If higher revenues simply were channelled to permanent reductions in budget deficits (or higher surpluses), domestic absorption would be penalised and available labour and capital resources would, again, tend towards export activities (reference case scenario, table 3.9). By

contrast, if higher revenues were deployed to raise domestic absorption through, for example, either demand for government services or household consumption, higher domestic demand would constrain growth opportunities in the traded sector (see the alternative fiscal scenarios).

Table 3.9 **Sensitivity of national results to alternative fiscal assumptions, NRA human capital stream**

Percentage change

	Potential additional participants				Enhanced productive potential of baseline workers			
Scenario	*Real GDP*	*Real h'hold consumpt.*	*Real govt consumpt.*	*Export volume*	*Real GDP*	*Real h'hold consumpt.*	*Real govt consumpt.*	*Export volume*
Reference case								
Real government consumption assumed discretionary	6.07	4.79	..[a]	13.86	2.72	2.18	..[a]	6.11
Alternative fiscal assumptions								
Real government consumption assumed non-discretionary[b]	5.82	4.82	4.81	8.18	2.61	2.19	2.19	3.53
Real government consumption assumed non-discretionary, budget balanced[c]	5.99	5.89	5.78	6.53	2.69	2.64	2.59	2.91

[a] Fixed by assumption. [b] Government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary. [c] In addition, personal and company, product and other tax rates vary uniformly to achieve fiscal neutrality (ie government operating balance fixed by assumption).

Source: MMRF–NRA estimates.

The ultimate distribution effects would be sensitive to government spending decisions, with the effects potentially flowing through to State and Territory activity levels (table 3.10). For example, as indicated in results for other reform streams, projected activity in the Australian Capital Territory increases with estimated changes in real government consumption spending.

Table 3.10 **Sensitivity of real GSP to alternative fiscal assumptions, NRA human capital stream**

Percentage change

Scenario	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Potential additional participants									
Reference case									
Real government consumption assumed discretionary	5.89	6.30	5.40	5.29	8.16	4.71	6.01	3.54	6.07
Alternative fiscal assumptions									
Real government consumption assumed non-discretionary[a]	5.86	5.87	5.43	5.25	6.70	4.75	5.87	5.65	5.82
Real government consumption assumed non-discretionary, budget balanced[b]	7.39	6.66	4.29	4.66	5.63	0.94	-3.76	6.52	5.99
Enhanced productive potential of baseline workers									
Reference case									
Real government consumption assumed discretionary	2.66	2.83	2.42	2.36	3.61	2.10	2.72	1.61	2.72
Alternative fiscal assumptions									
Real government consumption assumed non-discretionary[a]	2.64	2.64	2.44	2.35	2.93	2.14	2.61	2.57	2.61
Real government consumption assumed non-discretionary, budget balanced[b]	3.31	2.98	1.92	1.97	2.57	0.27	-0.85	2.98	2.69

a Government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary. **b** In addition, personal and company, product and other tax rates vary uniformly to achieve fiscal neutrality (ie government operating balance fixed by assumption).

Source: MMRF–NRA estimates.

Part B – Competition and Regulatory Reform Streams

4 Electricity

Key points

- Further competition and regulatory reform could improve the operational efficiency of Australia's electricity supply system and reduce the scope for strategic gaming by generators in the National Electricity Market.
- These outcomes could arise from structural and organisational changes in the generation sector, increased transmission capacity between jurisdictions, enhanced demand-side measures, and improved regulatory governance and risk management.
- NRA electricity reform could potentially lower retail electricity prices by around an average of 2 per cent, from levels that would otherwise apply.
  - If productivity improvements contributing to these changes could be achieved, potential resource savings of up to $270 million (2005-06 dollars) would be available.
- In addition, the NRA would effect the nature of future energy investment and consumption decisions, including through the adoption of new technologies, ways of working *and* measures to address climate change.

The potential direct effects of the NRA and related reforms in the electricity industry are outlined in this chapter. Empirical and other evidence is used to illustrate the potential effects of reforms on productivity, economic rents and electricity prices. However, existing sources of information fall short, often requiring judgments to be made. Specifically, although reforms could provide the opportunity to improve the operational efficiency of the National Electricity Market (NEM) from a system-wide perspective in the eastern States, there is little information on these potential effects, which makes it difficult to identify an outer envelope of benefits potentially available from the NRA.

The guidelines for this study do not require the Commission to examine matters relating to climate change technological innovation and adaptation, which are another part of the NRA. However, it is implied in the NRA reform outcomes that the electricity industry should not be impeded from efficiently adapting to changes in its operating environment, including public policy responses to climate change.

This chapter begins with a discussion on the NRA reform and outcome objectives, in section 4.1. The approach undertaken to estimate the outer-envelope of potential benefits from reform is discussed in section 4.2, while the impediments to further liberalisation of the electricity market are canvassed in section 4.3. The scope for improvement, by removing the impediments to price and efficiency outcomes, is discussed in section 4.4. Quantitative information is presented on the potential effects of reform in the electricity market in section 4.5. A summary is provided in section 4.6.

4.1 NRA reforms and outcome objectives

Reform in the electricity market over the past two decades has played a major role in exposing the market to greater competition and making it more efficient. Since the early 1990s, the Australian electricity industry has undergone significant transformation under the NCP and related reforms. The reforms undertaken to liberalise electricity markets involved:

- structural separation of generation, transmission and distribution activities;
- privatisation or corporatisation of government-owned electricity utilities;
- creation of the NEM, which now covers New South Wales, Victoria, Queensland, South Australia, Tasmania and the Australian Capital Territory;
- creation of a separate wholesale market in Western Australia;
- enhancement of interstate transmission interconnections (or 'interconnectors') and national regulatory arrangements to facilitate open access to network infrastructure;
- removal of regulatory barriers to entry by new market participants in generation and retail, and to inter- and intra-state trade; and
- establishment of contestable retail markets to allow customers to choose their electricity retailer.

In 2001, COAG agreed to examine progress in energy reform, commissioning the COAG Energy Market Review (2002) (the Parer Review). The review identified various deficiencies that were continuing to impede competition and market efficiency in creating a national energy market.

In 2004, COAG endorsed an energy market reform program that was developed by the Ministerial Council on Energy (MCE) in response to the Parer Review (2002). This program is expected to be fully implemented by 2008 (COAG 2006b). COAG reaffirmed its commitment to the MCE reform program by incorporating it into the competition stream of the NRA. The reform agenda builds on and provides

continuity with the NCP, with overarching objectives of strengthening competition, increasing productivity and removing obstacles to the efficient functioning of energy markets.

In February 2006, COAG agreed that further reform of Australia's energy sector would yield significant benefits. In its February 2006 Communiqué, COAG stated that the key target outcomes from electricity reform are:

- improved price signals for end users and investors;
- an integrated transmission system to support the development of a national electricity market; and
- an improved framework for planning and network investment, and streamlined regulation, via suitable policy settings, governance and institutional arrangements and other actions (COAG 2006a).

Establishing a fully functional national transmission grid was considered a priority, along with addressing structural impediments to competition and market efficiency, and developing transparent and effective financial markets to support electricity trade.

To this end, COAG established the Energy Reform Implementation Group (ERIG) to develop a reform strategy and implementation arrangements to deliver prioritised reform outcomes. ERIG released discussion papers in November 2006, and will provide its final assessment to COAG by the end of 2006 (ERIG 2006).

4.2 Approach to estimating outer-envelope reform impacts

The effects of reform were estimated as the outer envelope of possible outcomes from the NRA. These outcomes were identified by examining the potential effects of removing impediments to competition and market efficiency. As such, they do not relate to any specific policy measure that might be implemented to achieve the outcomes.

Some effects of the NCP commitments were included in the outer envelope because they have yet to be fully realised. However, ongoing NCP-style reforms in Western Australia have been excluded, with the exception of residual reforms (box 4.1).

Impediments and the effects of overcoming impediments were assessed by reference to the Commission's review of the NCP (PC 2005a), the COAG Energy Market Review (2002) and other published studies of industry performance and progress in reform. Information available from the ERIG consultation process and

its recent discussion papers was also used. However, although this information represents the best quantitative evidence currently available, it provides only partial evidence on the potential effects of reform. Therefore, it was necessary to use judgment in quantifying the benefits potentially available with the full implementation of the NRA.

Box 4.1 **Exclusion of ongoing electricity reforms in Western Australia**

Core NCP reforms of the Western Australia electricity industry, such as wholesale spot trading and vertical disaggregation, were implemented in 2006. Most of the potential benefits of these reforms have yet to be realised. It will take time for the energy businesses to adjust their production and investment in response to the new market mechanisms. Indeed, experience with the development of the NEM indicates that the economic effects of reform can take many years to emerge fully, particularly those dependent on incentives for efficient investment. Moreover, any future fine-tuning or extension of reform could have a bearing on the extent to which effective outcomes are achieved.

Since these reforms were part of the NCP agreement, they have been excluded from the Commission's outer-envelope analysis. However, further reforms of the style canvassed for the eastern States participating in the NEM are applied to Western Australia.

For the electricity markets in each State and Territory, the direct effects of implementation of NRA reforms were estimated. The reforms include:

- improved price signals;
- integrated transmission systems;
- improved framework for planning and investment; and
- streamlined regulation.

The effects on productivity and prices were considered for each main supply activity — generation, transmission, distribution, and retail. The final estimates of the outer envelope take into account how the effects of achieving the various NRA reform objectives might interact.

A breakdown of the costs of individual supply activities provides a guide to the relative significance of performance improvement in each activity in terms of reducing electricity prices to end users. The cost components of the average retail tariff in each jurisdiction were estimated as shown in table 4.1, using available data on electricity service charges. The estimates indicate that the large majority of costs arise from generation and distribution activities.

In summary, the approach used to estimate the possible directs effects of further electricity reform:

- links effects to the motivating concerns and the ultimate goals of reform;
- attributes the direct effects to the achievement of the objectives of COAG reforms;
- distinguishes between industry-wide and jurisdiction-specific effects of reform by taking into account the nature and extent of impediments, as well as the geographic and other region-specific constraints; and
- takes into account potential overlapping or reinforcing effects of reform objectives.

Table 4.1 **Average electricity tariffs, cost components and shares, 2004-05 and 2005-06**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*[e]
Tariff by component and using region ($ per MWh)[a]									
Total tariff	**86**	**102**	**88**	**138**	**116**	**65**	**147**	**106**	**95**
Generation[b]	44	39	40	49	68	29	96	49	44
Transmission[c]	7	7	9	16	36	8	46	9	44
Distribution[c]	30	45	33	60		22		39	
Retail[d]	5	11	6	13	13	6	6	10	8
Cost shares (%)									
Generation[b]	51	38	45	36	58	45	65	46	46
Transmission[c]	8	7	10	12	31	12	31	8	46
Distribution[c]	35	44	38	43		34		36	
Retail[d]	6	11	7	9	11	9	4	9	8

[a] Based on extrapolation of 2003-04 tariff data from the Electricity Supply Association of Australia (ESAA 2004) to the reference period using ABS electricity consumer and producer price indexes. [b] For New South Wales, Victoria, Queensland and South Australia, based on wholesale electricity price data provided by d-cypha Trade and, in addition, including NEMMCO participant fees and ancillary services charges; for the other jurisdictions, based on electricity cost data published or provided by State and Territory energy market regulators. [c] For New South Wales, Victoria, Queensland and South Australia, based on estimates of transmission and distribution use of system charges (TUOS and DUOS) from ACIL Tasman (2004); for the other jurisdictions, based on electricity cost data published or provided by State and Territory energy market regulators. [d] Based on electricity cost data published or provided by State and Territory energy market regulators. [e] Averages weighted by the quantities of electricity consumption in individual jurisdictions.

Source: Productivity Commission estimates.

4.3 Impediments in liberalised electricity markets

Despite considerable reform over the last decade, it is generally acknowledged that significant impediments to the efficient operation of the NEM remain. Given that considerable new expenditure is likely to be required over the coming decade,

failing to address these issues could impose substantial costs on the community by discouraging efficient and timely investment in the electricity industry.

Prior to the NCP reforms, electricity was supplied by government-owned enterprises operating as vertically-integrated monopolies in separate State and Territory markets. These enterprises were operationally inefficient and sometimes earned 'economic rents', which were dispersed in the form of 'dividends' to their governments and higher wages to their employees. There were also significant cross subsidies between users (IC 1995).

Infrastructure investments by governments was prioritised to maintain very high levels of supply reliability and meeting optimistic forecasts of demand growth. Operational efficiency and recovery of capital costs were of secondary importance. This was associated with significant over-investment in generation capacity, particularly during the 1980s.

The first wave of reform in the early 1990s was directed at reducing operational inefficiencies by commercialising and then corporatising or privatising the government businesses. However, investment disciplines and incentives remained weak and further reforms were deemed necessary.

Electricity markets were liberalised from the mid-1990s under the NCP. The principal aim of this second wave of reform was to improve the efficiency of resource allocation within and between supply-chain activities, through the establishment of the NEM.

The liberalisation of electricity markets can be viewed as a process, not an event (International Energy Agency 2005; ERIG 2006). It required the initial development of effective market mechanisms, which also need to be refined in light of experience. The focus of initial developments concentrated more on short-term issues, such as the creation of the spot market and competitive bidding between generators. The issues today are more focused on impediments to sectoral adjustments to price signals provided by spot and other markets.

In this light, the NRA is intended to strengthen the coordination of decentralised market activities of electricity generators, investors and consumers, by addressing remaining impediments to efficient pricing, investment, risk management and trading. As ERIG suggested, concerning the NEM:

> …. the key policy question to be addressed is how to ensure the economic regulatory regime, incentives, pricing and approvals processes all work together with the overall planning and governance structures to achieve an optimally efficient mix of generation and transmission investment which will provide the lowest delivered cost of energy to consumers, across the whole NEM. (ERIG 2006, p. 12)

The complex nature of the electricity market poses ongoing operational challenges in terms of the generation, transmission and distribution of electricity. For example, new technology and its implementation can affect the efficiency of the system as well as the reliability of the electricity market. This becomes especially important given the inter-connectedness of the electricity market.

In the following sub-sections, the major impediments to liberalised electricity markets are discussed in more detail.

Price signals are weak

Efficient market decisions depend on price signals that reflect the comparative costs and benefits of generating, transmitting and consuming electricity. This is essential if prices are to trigger efficient production and consumption of electricity in different regions, and at different times, within an interconnected market. 'Correct' price signals are also important to efficient investment decisions.

Expected spot prices in a wholesale generation market provide the basis for determining contract prices and investment priorities. However, wholesale prices do not always reflect 'correct' price signals, because of:

- muted feedback from the wholesale to the retail market;
- the imperfect integration of regional markets; and
- strategic behaviour in the wholesale market.

For some large industrial or commercial users, interruptability clauses provide some feedback from the state of system demand. However, under current arrangements, retail consumers are faced with prices that do not reflect short-term market conditions or cost of supply. When demand peaks, the price signals given to households do not change. In contrast, a system that elicits demand responsiveness of users to efficient price signals potentially can test consumer responses to peaks in generation prices, and the need for high-cost, peaking sources of supply, provide information needed to establish in the long run an optimal mix of generation capacity and associated optimal levels of reserve plant margin. Wholesale price volatility also has implications for investment risk, as discussed below.

Transmission is too congested

Access to electricity from the least-cost source depends on the availability of sufficient transmission capacity. The volatility of wholesale prices in the spot market is exacerbated by congestion in the transmission system, both within States

and especially between them. Liberalisation of electricity markets reinforces the role of transmission networks in facilitating trading and enhancing competition opportunities across jurisdictions (via interconnectors). Electricity cannot be supplied from the cheapest source, in the absence of the required transmission capacity. However, it cannot be provided to final users at least cost, unless transmission networks are economically viable as well. That is, gains from trade occur where comparative advantages exist in fuel sources and generation across economically-viable network capacities, which allow demand characteristics in different regions to be satisfied within an interconnected market. Further, this competition lessens generators' ability to use strategic gaming in the wholesale market to raise prices above efficient levels.

Delivering the full potential economic benefits of an integrated transmission network depends on maintaining optimally efficient interconnection capacity. Consequently, what needs to be addressed are impediments to efficient transmission investment that currently exist in the regulatory arrangements governing network operation and investment.

Strategic behaviour occurs

Economies of scale and ownership concentration in the generation sector provide an opportunity for strategic pricing in trading, with periods of high prices driven by the withholding of capacity during periods of peak demand. These price peaks are boosted by the imperfect integration of regional markets and by the sluggish feedback from wholesale prices to retail consumers.

The effects of strategic withholding of capacity are to increase the height of price peaks and to raise profit. However, the extent and duration of such strategic behaviour by an incumbent operator would depend on prevailing market conditions and the threat of entry by new firms, including consideration of their set-up and operational costs. For example, given sunk costs of building a generator, an entrant might not enter unless it could displace the incumbent.

However, as the market grows, the efficiency of generation improves and options for new generation and supply capacity and arrangements expand, new competitors might enter to meet demand and increase competitive pressure on incumbents.

In relation to market power, ERIG noted:

> … there is publicly-available evidence that prices have deviated from the efficient competitive level due to supply withdrawal or re-pricing of capacity by generators (see for example, Bardak 2005, Biggar 2003, Biggar 2005, Short and Swan 2002). (ERIG 2006, p. 47)

Risks need to be managed

Electricity consumption and hence supply are inherently volatile, especially when there are peaks of very high demand, creating risks for market participants. Liberalised electricity markets provide a transparent framework to capture this volatility in cost-reflective pricing. An artificial suppression of price volatility, however, could distort price signals for new investment and thus mute market responses.

A key consequence of liberalising electricity markets is that many market risks are 'internalised' — that is, market participants individually bear and manage risks associated with their production and investment decisions. Consequently, efficient market outcomes require efficient risk management in electricity trade.

Risk management in the restructured electricity industry is partly hampered because of under-developed electricity financial markets. These impede the operational efficiency of the NEM, which might exacerbate price volatility. Generators, retailers and end users contract bilaterally to obtain the desired degree of certainty of prices, loads and other trade terms. But this provides only limited financial liquidity and risk protection to the contracting parties. More sophisticated risk management practices involve the use of electricity derivative products to hedge against price volatility. However, such financial hedges typically cover risk exposure over a short to medium term only.

The paucity of financial instruments to manage long-term risk exposure to price (and hence revenue) uncertainty can raise the required rate of return (accounting for the risk borne by the owners of capital) to productive factors and can impede efficient investment. Consequently, electricity generators have sought opportunities to integrate with retail businesses as a 'physical' hedge for securing a sufficiently large and stable customer base. This strategy can improve the reliability of cash flows as a source of finance for investment in generation capacity.

Liberalisation of electricity markets as initiated under NCP has created a profit-driven investment paradigm. This has heightened the significance of regulatory risk as a potential impediment to efficient investment (PC 2004a, 2005a; ERIG 2006). Regulatory risk arises from the inherent unpredictability of government interventions and decisions. This unpredictability, which can increase market volatility and risk, makes it more costly to raise capital finance and potentially delays investment.

4.4 Scope for improvement

The scope for improvement under the NRA can be thought of as the gap between the price and efficiency outcomes of an optimised system, and the outcomes from current policy settings. This gap could be bridged by removing impediments to efficiency, including: by improving price signals, enhancing the integrated national electricity market, and improving the planning and regulatory framework.

The following interrelated impediments examined are those identified by the COAG Energy Market Review (2002) and others (MCE-SCO 2004; ERIG 2006) as contributing to the current inefficiencies in the electricity industry, namely:

- inadequate competition between electricity generators;
- inadequate transmission links and transmission arrangements that prevent the NEM becoming truly national;
- impediments to the demand side playing a more significant role in the NEM;
- confused governance arrangements and excessive regulation; and
- an illiquid financial contract market.

The combination of reforms addressing the impediments above can be expected to reduce electricity prices through several mechanisms, including:

- net improvements in productivity of capital and other inputs;
- reductions in the cost of capital (accounting for the risk borne by owners of capital) to the electricity industry; and
- reductions in economic rents that accrue to owners of capital.

The following subsections analyse some of the available evidence. As indicated, however, this evidence is partial, largely because no one study analyses the full potential of a broad package of actions, aimed to achieve the reform outcomes proposed under the NRA. Instead, the studies examined tend to consider the effects of achieving one goal, while doing little or nothing toward achieving the others. For example, the effects of optimising the interconnections for the existing set of generators, rather than for the optimal set of actively-competing generators; or, introducing more price flexibility, given the existing interconnectors. The section also discusses:

- the possible effects of further reform of the industry in Western Australia; and
- possible effects in Tasmania and the Northern Territory.

The last subsection presents a summary of the quantitative evidence on the possible effects of the changes under consideration for New South Wales, Victoria, Queensland and South Australia.

Section 4.5 brings the evidence and argument together and provides the outer-envelope estimates of the effects of NRA and related reforms to the NEM.

Competition in electricity generation

The COAG Energy Market Review (2002) raised concerns about structural impediments to competitive bidding and least-cost delivery of electricity within the NEM. It suggested that generators at times exploit capacity constraints, resulting in above-cost bidding and excessive price volatility.

Accordingly, the COAG Energy Market Review (2002) recommended market structure reforms. These included breaking up the government-owned generator portfolios in New South Wales and Queensland, as well as the abolition of the Electricity Tariff Equalisation Fund (ETEF) in New South Wales because of its potential to create barriers to investment and market entry. ERIG (2006, p. 63) also viewed that the disaggregation of generators would lead to more competitive outcomes across the NEM. In addition, the planned phase out of the New South Wales Government's ETEF, which is expected to commence in September 2008 and end in June 2010, was fully supported by ERIG (2006). ERIG also noted that, given the competitive impediments that ETEF creates, 'there may be merit in the New South Wales Government providing certainty regarding its commitment to phase out ETEF' (ERIG 2006, p. 164).

Booth (2003) noted that major generators operating in the NEM were too few to ensure competitive bidding. NEMMCO data showed that there were only 14 substantial independent generators (each owning a combined capacity greater than 1000 MW) as at mid-2005, or just ten if governments are counted as the portfolio owners of all the publicly-owned generators in New South Wales and Queensland. By contrast, there are nearly 40 independent generators competing in the UK wholesale market (before the change to a net pool), and well over 200 generators in the Scandinavian market and the eastern American market, respectively.

Bardak Ventures (2005), after analysing the market structure and performance of the NEM, concluded that it was not fully competitive on the basis of criteria adopted by energy market regulators in the United States. Moreover, it was their view that publicly-owned generators do not have complete managerial independence from their owner governments.

In recent years, there have been mergers and acquisitions among the privately-owned generation plants in Victoria and South Australia, with some involving bringing base-load and peaking plants under common ownership. (Initially, the privately-owned portfolios tended to comprise base-load or peaking, but not both.) Bardak Ventures (2005) believed that this development could increase concentration materially and the scope for market power to be exercised in the NEM. ERIG (2006) suggested that horizontal mergers pose a possible threat to competitive processes.

In estimating the direct impact of structural reform in the NEM, ACIL Tasman (2002) used the PowerMark model to simulate competitive outcomes consistent with bidding by a relatively large number of generators in each NEM jurisdiction.[1] This simulation was based on existing transmission constraints affecting inter-regional trade. However, the relaxation of these constraints would likely increase the impact of structural reform.

The ACIL Tasman (2002) simulations indicated that, even when individual regional markets were perfectly competitive, electricity might still not be despatched at the NEM-wide lowest possible cost because of the transmission constraints. For this reason, the price reductions and improvements in capital productivity, attributable to structural reform of generation alone, are likely to be modest. Price falls in the eastern States range from 1.5 per cent in New South Wales, to 1.8 per cent in Victoria. They reflect reduced returns for generators as a consequence of increased bidding competition (box 4.2). These effects are likely to interact with other competitive and productivity-enhancing reform outcomes (discussed in section 4.5).

Much larger price reductions were estimated by Biggar (2005) — up to 50 per cent in New South Wales, if the withdrawn operating capacity had been made available to the market. However, these price reductions are averaged over the periods for which Biggar concluded that market power had been exercised in 2004, and not over the whole year; and they were estimated using a simplified NEM 'dispatch engine'. Also, Biggar's analysis involved what ERIG (2006, p. 48) called 'a very rigorous benchmark and one which many markets might fail from time to time'.

The available evidence does seem to indicate that strategic gaming by generators is taking place and there is scope for the reform to increase competitive pressures.

[1] ACIL Tasman (2002) assumed that generators bid at their own marginal costs in a competitive market. This assumption is consistent with the theoretical outcome for auctions involving a large number of bidders. The market-clearing price would be equal to the marginal cost of the generator that is the last to be included for despatch, but higher than that of other lower-cost despatching generators. Consequently, most generators could still earn enough revenue to cover variable costs and contribute to, or even cover, capital costs.

Box 4.2 **Electricity despatch auctions**

In the NEM, merit-order despatch can improve efficiency if it results in least-cost sources being used. Generators are scheduled from lowest to highest bid, with the market-clearing price equated to the highest accepted bid.

In order to recover capital costs, generators bid on blocks of supplied power in anticipation of attaining a market-clearing price higher than their operating costs at the margin. If their bids are accepted, they receive a price that equates demand and supply in the market, regardless of their own bids.[a]

There is evidence that under certain circumstances electricity despatch auctions have been subject to 'economic withholding' bidding strategies (Biggar 2005; Booth 2001; Melanie and Brennan 1997; Short and Swan 2002). Generators engaging in this practice add a larger mark-up to marginal cost in their bids than others would do, or even bid part of their capacity into price bands so high to effectively withdraw that capacity from the market. In doing so, they seek to lever up the uniform price received on all their accepted bids.

A strategy of withholding a unit of capacity from the market is profitable when it sufficiently levers up the market-clearing price received by all other despatching capacity unit(s) held by the generator. However, inefficiency can arise as a result of departures of bid-based merit order from cost comparison. A constraint on such a strategy is that it encourages entry, fostering market competition in the long term (Cramton 2004).

A firm exercises market power when it reduces its output or raises the price at which it is willing to sell its output in order to change the market price.

Persistent market power can adversely affect the outcomes of a despatch auction by raising electricity prices above resource costs and creating despatch inefficiencies. As suggested by Fabra, von der Fehr and Harbord (2004), outcomes can be improved by increasing:

- the number of bidders (including through additional interconnectors);
- the elasticity of demand in bidding sessions; and
- the availability of reserve capacity that can be brought into the market through reducing inter-regional transmission congestion.

[a] A shift to the 'pay-as-bid' rule, for example, would eliminate the prospect of winning with a cost mark-up for generators bidding their own marginal costs. Such change in market rules would cause generators to change their bidding practices but not necessarily alter the auction outcomes in a significant way (McAfee 1998).

Coordination and incentives for investment in transmission

Transmission constraints were identified by COAG's Energy Market Review (2002) as the most critical problem facing NEM, and are an NRA priority. Transmission planning and regulation practices were found not to be conducive to the effective development and operation of liberalised electricity markets. The constraints were said to have led to the regionalisation of the NEM, under-development of inter-regional trade and inefficient use of system-wide reserve generation capacity.

In response, the MCE agreed to develop a transmission reform package, of which the establishment of the Australian Energy Regulator (AER) and the Australian Energy Market Commission (AEMC) is a part. Further, in 2004, the first Annual National Transmission Statement (ANTS) was released to mark the new national transmission planning process. The purpose of the ANTS is to provide a nationwide perspective on the potential requirements of transmission flow paths.

The ACCC also initiated a revision of the Regulatory Test with a view to incorporating 'competition benefits' in assessing interconnector investment proposals. This is aimed at removing biases in previous benefit–cost test rules against investment in regulated interconnectors.

The interpretation and execution of the Regulatory Test principles have proved to be difficult and contentious because of the technical complexity in defining network service benefits and evaluating their value to end users (Outhred 2004). A view held by the Energy Users Association of Australia (EUAA 2006) and others is that the existing Regulatory Test has so far failed to facilitate adequate and timely investment in transmission capacity. Benefits — and incentives for investment — may be understated if:

- the test is focused too narrowly on technical efficiency (system reliability and despatch efficiency); or
- alleviating transmission constraints is only interpreted as leading to transfers from generators to end users.

ERIG (2006) considered that the current form of the Regulatory Test is inappropriate and suggested there would be merit in replacing it with a two-step process to guide efficient transmission investment (box 4.3).

Box 4.3 **ERIG views on the Regulatory Test**

ERIG considered the Regulatory Test does not perform its intended role and its links to the regulatory regime are tenuous at best, as outcomes are not directly linked to regulated revenue outcomes.

ERIG concluded that the current form of the Regulatory Test is inappropriate for two reasons. First, a project-by-project assessment cannot be expected to deliver efficient, long-term development of the national network. Second, the current approach attempts to artificially identify and justify an individual project as either improving reliability or providing market benefits when in reality any investment is part of a total network that delivers both reliable and efficient supply.

ERIG considered there would be merit in replacing the Regulatory Test with a two-step process to guide efficient transmission investment.

- Establishing a National Transmission Network Development Plan to deliver integrated, national planning for the longer-term efficient development of the grid.
- This plan would inform the setting of the revenue allowance provided for Transmission Network Service Providers for a regulatory period. Within that period, each project would be subject to a Project Assessment and Consultation process prior to construction.

ERIG also considered there would be efficiency gains from harmonising the differences in reliability and planning criteria and their application across jurisdictions.

Source: ERIG (2006).

Estimates of the annual cost of network congestion attest to the divergence of views on the adequacy or otherwise of current transmission capacity. High-end estimates include $1400 million by Port Jackson Partners (2005), $1200 million by Pareto Associates (Booth 2003), and $900 million by Marsden Jacob Associates (2006). Low-end estimates include $36–45 million by the AER (2006a, 2006b), and $150 million by the NEMMCO (2005). ERIG (2006) considered that the current level of transmission and interconnection is reasonably appropriate for the installed generation capacity and peak demand; but was concerned that future investment may not be sufficient to maximise the system-wide advantages.

There is considerable discord over the usefulness of benefit–cost analysis as a means of executing the Regulatory Test. Some have suggested that it is not practicable for a planning approach to mimic efficient market outcomes, especially the complex incentive effects of network interactions and economies of scale on investment (Hogan 1999; Marsden Jacob Associates 2006). Concern has also been raised about the potential inconsistency between the Regulatory Test and the public-benefit concept underlying benefit–cost analysis, which, it has been claimed, renders such test ‘fundamentally flawed’ (McDonell 2001).

If the above reservation about a planning approach using benefit–cost analysis is justified, even a robust application of the Regulatory Test is unlikely to provide a sufficient basis for guiding investment decisions. Consequently, it would have to be supplemented by other criteria. In this regard, the COAG Energy Market Review (2002) recommended creating an auction market of transmission congestion contracts and using the price of such contracts as a key indicator of the need to increase transmission capacity.

Statistical evidence presented in numerous studies (Bardak Ventures 2005; Port Jackson Partners 2005; Sims 2003) consistently points to excessive price separation and volatility in the NEM compared with some overseas electricity markets known to be more competitive and integrated. Reflecting the significance of transmission congestion, price separation occurs when spot price differences in two regional markets linked by a transmission interconnector cannot be entirely explained by transmission charges and losses.

Arguably, eliminating NEM congestion completely may not be optimal, given that the capital costs of some interconnector augmentations may be higher than the benefits they ultimately generate. As ERIG (2006, p. 12) noted 'at certain times some level of congestion may be efficient and … transmission congestion does not of itself signal market and investment inefficiency'. Nevertheless, improved planning and regulation practices in transmission can bring net benefits by promoting inter-regional generator competition, inter-regional trade and sharing of reserve generation capacity across NEM jurisdictions. Modelling currently underway for ERIG may provide additional information on this issue.

This is illustrated in a study by ACIL Tasman (2002), which uses the PowerMark model to simulate a 20 per cent expansion in interconnector capacity. This was less than the expansion necessary to remove transmission constraints completely. ACIL Tasman (2002) concluded that the assumed expansion of interconnector capacity was likely to yield benefits more than sufficient to recover the cost of interconnector investment. Their estimates of the direct NEM price reductions due to the partial removal of transmission constraints ranged between 5.6 per cent in New South Wales and 1.5 per cent in South Australia.

ACIL Tasman (2002) did not indicate the extent to which these price reductions would be associated with lower generator profit margins or improved despatch efficiency. However, an examination of other empirical evidence relating to despatch efficiency suggested moderate efficiency gains as a consequence of reducing transmission constraints (Douglas 2006).

The outcomes from increasing transmission capacity could overlap with or reinforce the outcomes of pro-competitive reforms as explained in section 4.5.

As transmission capacity increases, transmission capital productivity would be expected to decrease, as the increase in capacity would not be matched by equi-proportional increased interconnector flows (that is, there is lower utilisation of the augmented transmission lines). An estimated increase in total interconnector flows of approximately 4 per cent combined with ACIL Tasman's assumed expansion of 20 per cent in transmission capacity would result in a 13 per cent reduction in transmission capital productivity.

Electricity price signals for end users

The pro-competitive reforms canvassed as part of the NRA provide opportunities for strengthening cost-reflective price signals to end users. An objective of these reforms is to achieve greater demand responsiveness, particularly at times of peak demand. However, facilities supporting such an objective are generally absent in both wholesale and retail electricity markets, with end users typically facing constant prices over any one accounting period (box 4.4).

The COAG Energy Market Review (2002) noted that muted price signals for electricity users could inhibit demand management and full retail contestability.[2] Consequently, it was recommended that demand-side bidding be incorporated into the NEM, 'smart' (or interval) meters be considered for all customers, and regulatory price caps be removed from retail markets.

In its policy statement on user participation, the Ministerial Council on Energy Standing Committee of Officials (MCE-SCO 2004) agreed to investigate the feasibility of using a short-term forward market to facilitate demand-side bidding in the NEM. Further, it endorsed the deployment of advanced metering technology as a long-term goal to promote cost-reflective retail pricing. This persuaded COAG to commit to a progressive roll-out of interval meters for residential customers from 2007 subject to assessment by jurisdictions that interval metering would bring greater benefits than costs.

Industry participants have raised concerns about the implications of interval metering for increased price risk to customers (Pareto Associates 2003; Key Energy and Resources 2003). Also, interval metering could increase average prices of power to some customers. Such equity considerations could offset the benefits from a reduction in peak load.

[2] The weakness of price signals to end users also exacerbates price fluctuations in the NEM.

Box 4.4 **Demand response in an electricity market**

Demand response can be improved by providing better price signals and technology options to market participants so that they can effectively respond to *short-run* market conditions. This could reduce electricity consumption in response to price spikes caused by a transient drop in supply or surge in demand, with consumption being removed in 'merit order', with the lowest-valued uses first. Demand response can also be obtained through providing contracts for demand interruption.

Alternatively, demand response can be obtained by integrating demand bids into the spot trading of electricity — that is, demand-side bidding. With this facility, retailers or bulk users submit bids indicating the quantities of electricity that they would consume at different prices. The market-clearing price can be set by a demand or a supply bid. In either case, accepted demand bids will influence the price by displacing higher supply-side bids by generators. Once the dispatch order is determined, each successful demand bidder is required to limit the use of electricity as bid, and pay for the electricity consumed at the market price.

The demand response obtained from demand-side bidding is not a service in the electricity market because, in principle, a customer cannot sell what it does not own — that is, the forgone consumption of electricity that has not been paid for. Consequently, there is no payment for demand reductions committed through the bidding process.

Source: Ruff (2002).

NEMMCO has demand-side participation arrangements that facilitate demand responses. Wholesale customers are able to reduce their consumption (through 'interruptibility' clauses in their contracts) or supply surplus load from local sources (such as a back-up power generator) into the grid when pool prices are expected to be high. This mechanism has had little impact on market outcomes so far, making available only around 1 per cent of peak summer reserve load in the NEM (Bardak Ventures 2005).

Some market analysts have attributed the low level of demand-side responses to limited demand aggregation activity — combining demand from more than one customer in order to purchase electricity at better prices or terms. Generally, retailers have not been active in accumulating demand responses from their customers as a means to provide ancillary services such as contingency reserves in the NEM. However, aggregation could be arranged through an independent electricity broker (called an aggregator).

ACIL Tasman (2002) used their PowerMark model to estimate the price effects of increasing demand responses in the NEM. A scenario was simulated in which end users taking part in demand-side management would curtail consumption at high prices. Incorporating such demand responses into despatch bidding would

effectively increase the price elasticity of demand facing generators and, hence, reduce their incentive to raise bids above costs at peak periods.

In estimating the price effects of increased user participation, ACIL Tasman assumed demand responding to real-time prices (not just preset tariffs), load reduction at high prices, and broad participation of business customers (accounting for about 70 per cent of electricity consumption). Relatively large price reductions were estimated for Victoria and New South Wales because of the peakiness of electricity demand and the greater scope for real-time load reduction in these markets.

Information sourced from ACIL Tasman's analysis was used in this study to derive indicative estimates of the outer-envelope effects of improving demand management. Projected NEM price decreases by ACIL Tasman (2002) ranged from 5.9 per cent in New South Wales to 2.9 per cent in South Australia. These effects could overlap with the outcomes of other competitive and productivity enhancing reform outcomes (further discussed in section 4.5).

Regulatory governance arrangements

The COAG Energy Market Review (2002) found that there were significant institutional deficiencies in energy market regulation. These deficiencies were attributed to heavy-handed regulatory approaches, to complex code-change processes, to confused roles between government owners, regulators and policy makers, as well as to the large number of regulatory agencies operating at the State and national levels with overlapping responsibilities.

As noted above, in response, the MCE established the AER and the AEMC. These agencies are charged with respective roles and responsibilities to rationalise energy market regulation and rule-making at the national level. They commenced operation in 2005.

Although the establishment of the AER and AEMC was an important step, further reform efforts are necessary to achieve a nationally-coordinated approach to regulating energy markets across Australia. In this regard, Willett (2006) of the ACCC stated that the reform task remains a work-in-progress, particularly given the many legislative and institutional changes needed to transfer roles and functions from jurisdictional agencies to the national counterparts.

Economic gains are expected to accrue from implementing the national approach to energy market regulation. Improved regulatory governance arrangements could help reduce regulatory risk for infrastructure investment, business compliance costs, and regulation administration costs.

The estimated direct effects of these regulatory reforms and governance arrangements are:

- a reduction of 1 per cent in electricity (and gas) retail prices across the States and Territories, reflecting the effect of reduced regulatory uncertainty and hence the risk premium required for energy infrastructure investment (based on ACIL Tasman 2002). This translates into a reduction of 2.3 per cent in the rental price of capital inputs used by each activity in the electricity industry;[3]
- an increase of 2.4 per cent in the efficiency of electricity retail activity, reflecting the effect of reduced regulation compliance costs associated with cross-jurisdictional retail activity;[4] and
- an increase of between 0.01 per cent and 0.04 per cent in the efficiency of government administration in the States and the Northern Territory reflecting reduced regulation administrative costs, combined with a decrease of 0.05 per cent in the efficiency of government administration in the Australian Capital Territory reflecting reduced administration costs for the Territory Government and increased administration costs for the Commonwealth Government.[5]

Development of electricity financial instruments

A well-functioning electricity market depends on liquid trading in financial derivative products. These financial instruments enable energy businesses to share trade risk or to transfer trade risk to a third party. Some of these financial instruments — electricity price-linked derivatives such as swaps, options and futures — can also provide price signals for investment decisions.

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[3] For this present study, the weighted average capital cost (WACC) formula was used to convert the output price reduction into an equivalent reduction in rental capital price — that is, the *price of the capital service flow* in a year. This calculation revealed that the resultant reduction in risk premium for electricity infrastructure investment was modest (less than one percentage point).

[4] This estimate is based on: (i) ACIL Tasman's (2002) assessment that the total compliance cost for each of the 26 electricity retailers that operated in more than one State or Territory was on average about 75 per cent higher than the additional cost incurred for entering a single State or Territory market; (ii) Short's (2003) estimate of the average compliance cost for an electricity retail licensee at $4.6 million; and (iii) the claim by the Business Council of Australia in a submission to Regulation Taskforce (2006) that regulation compliance costs could be reduced by 20 per cent with streamlined business regulation. According to Short (2003), regulation compliance costs in generation, transmission and distribution were relatively small. As such, the potential effects of improving regulatory governance arrangements on the cost efficiency of these activities were not estimated in this study.

[5] Productivity Commission estimates based on reducing the administration costs of relevant State and Territory regulatory agencies by 25 per cent (taking into account most agencies encompass more than just energy regulation), and increasing the administration costs of the relevant Australian Government regulatory agency by 5 per cent.

The establishment of the NEM led to increased use of hedge contracts. However, the contract markets in their present form were considered by the COAG Energy Market Review (2002) to be relatively unsophisticated and illiquid. Around 90 per cent of hedging activity (in megawatt-hour terms) involves bilateral customised contracts with terms limited to between 30 days and three years.

As far as could be ascertained for this study, the volume of financial trading in megawatt-hour terms has barely reached 100 per cent of the physical market. This compares with over five times in England and Wales and over eight times in Scandinavia (Bardak Ventures 2005; Booth 2003). ERIG also noted that the liquidity and depth of trading varies across regions, across time and over products (ERIG 2006, pp. 18–19).

The COAG Energy Market Review (2002) envisioned that diverse and innovative financial products would emerge with a competitive and integrated NEM. Notwithstanding its significant role in facilitating electricity trade, financial hedging is costly and only provides protection against risk exposure over a short to medium term. An alternative way to reduce long-term risk exposure to revenue uncertainty is by ownership of a retail business — known as a 'physical' hedge.

Energy businesses have sought opportunities to integrate generation and retail as a way of capturing economies of scope between these activities and improving trade risk management. Willett (2005a, 2005b) argued that this type of merger activity could be conducive to trade risk management and is not necessarily anticompetitive. Accordingly, the ACCC does not currently object to such vertical integration, in principle. Indeed, in recent years it has approved a number of vertical acquisitions between generators and retailers, particularly between peaking generators and retailers facing relatively high market risks.

Increased competition in the NEM could provide incentives for energy businesses to seek to take further advantage of physical hedging opportunities.

Bardak Ventures (2005) raised concern about the impact of generator–retailer integration on financial hedging liquidity and market competition. This concern is contrary to the empirical evidence presented by Bushnell, Mansur and Saravia (2005) in a study of American electricity markets, which showed that generator–retailer integration and contracting actually play a positive role in increasing market competition (box 4.5).

According to the analysis by the Essential Services Commission of South Australia (ESCOSA 2002), up to 24 per cent of wholesale electricity prices are incurred in the management of trade risk. These costs could be reduced as a consequence of improved risk management. Drawing on this evidence, the potential direct impact of reducing the cost of managing trade risk might be:

- an increase of between 2.6 and 3.0 per cent in productivity of generators operating in the NEM due to lower costs of hedging products available from a fully fledged electricity financial market;[6] and
- an increase of 1.5 per cent in productivity of generators operating in the NEM due to lower costs for managing trade risk as a consequence of increased physical hedging opportunities through generation–retail integration.[7]

On the other hand, more recent information by ERIG indicates limited scope for a decrease in the cost of generation arising from a decrease in the cost of managing trade and hedging risks. One measure of the costs of managing risk is the premium in the contract market relative to the spot market. KPMG advised ERIG that this premium is about $4–5 per MWh (ERIG 2006, p. 42) or about 10–15 per cent of the spot price, only part of which would be saved from potentially lower variation in spot prices and greater liquidity in the hedging market.

Given these different assessments of the scope for productivity improvements in managing trade and hedging costs, the potential direct impacts used in this study are based on information from the ERIG Secretariat. The potential to increase the productivity of generators in NEM states is assumed to be about 1.5 per cent of the cost of hedging, as estimated by KPMG, which would contribute to about a 0.05 per cent reduction in prices at the retail level.

6 This estimate is based on: (i) ACIL Tasman's (2002) assessment that improving financial liquidity in electricity trade could reduce NEM prices by $1 per MWh; (ii) ACIL Tasman's (2002) forecast of average NEM prices between $33–37 per MWh and (iii) information in table 4.1 on the share of generation and transmission costs in retail prices.

7 This estimate is based on: (i) the assessment by National Economic Research Associates (NERA 2004) that the main effect of integrating generation and retail is a reduction in the costs of hedging volume risk and credit risk; (ii) the cost data from ESCOSA (2002) revealing that 5 per cent of wholesale generation costs are incurred in managing volume risk and 4 per cent in managing credit risk, force majeure and other contingencies; and (iii) the assumption that these costs could be reduced by 20 per cent and 10 per cent, respectively, as a consequence of improved risk management.

Box 4.5 **Implications of physical hedging for financial liquidity and competition in electricity markets**

Bardak Ventures (2005) argued that an integrated electricity supplier might not offer financial hedge contracts at reasonable prices to other independent retailers, consequentially raising barriers to market entry by vertically separated generators and retailers.

Generator–retailer integration could reduce hedge contract availability in a concentrated market where dominant integrated suppliers hold sufficient peak and off-peak capacity for most of their own customers' load requirements. However, there is a limit to the profitable use of physical hedging as a substitute for financial hedging.

Physical hedging would be economical only up to a point where synergies (ie, economies of scope) exist between generation and retail operations including trade risk management. National Economic Research Associates (NERA 2004) concluded that integration of generators and retailers is unlikely to be a complete substitute or a hindrance to the development of hedge contract markets.

Regulatory safeguards of the anticompetitive implications of merger and acquisition are provided for in the *Trade Practices Act 1974* and administered by the ACCC. They ensure that generator–retailer integration will not take place if it is deemed to lessen market competition substantially.

By fostering the development of competitive electricity markets, the NRA and related reforms could reduce regulatory hurdles to generator–retailer integration and, hence, lead to greater realisation of economies of scope in electricity production. This outcome could also improve trade risk management.

Structural reform of the electricity industry in Western Australia

Although Western Australia will not be joining the NEM in the foreseeable future, the electricity industry in this jurisdiction has been restructuring to create a more competitive wholesale market for the South West Interconnected System, which supplies around 98 per cent of the State's electricity requirement (Office of Energy 2003).

To this end, Western Power, owned by the Western Australian Government, was restructured in April 2006 into four entities responsible for generation, network services, retail and regional power services. Further, a wholesale electricity spot market commenced operation in September 2006.

The wholesale market has different design features from those of the NEM (Office of Energy 2004). The differences include a bilateral contract market operating in parallel with a spot market in which uncontracted capacity is traded, and trading of reserve capacity. There will also be restrictions on the incumbent generator from

expanding capacity until targets for market entry are achieved. These measures, if effective in promoting competitive trading and efficient investment, could deliver appreciable reform gains in Western Australia.

The West Australian Electricity Reform Task Force commissioned the Allen Consulting Group (2002) to investigate the effect of electricity reform in Western Australia. For the industry as a whole, annual cost savings due to reform were estimated at 4 per cent on average in the next 15 years or so, mainly through capital cost reductions from increased capacity utilisation and deferment of new investment in demand growth cycles. Further, it was estimated that retail electricity prices would fall by 7 per cent on average — exceeding the estimated industry cost savings — as a consequence of increased competition pressure on profit margins.

These effects, while noted, are treated as relating to the implementation of the former NCP program of reforms, and excluded from the economy-wide analysis of the NRA (box 4.1). Instead, the price effects of potential for further reforms (beyond those excluded) for Western Australia have been assumed, after consulting with Western Australian COAG officials, to be the smallest absolute value from New South Wales, Victoria, Queensland and South Australia for a given reform.

Reform benefits in Tasmania and the Northern Territory

Tasmania has the potential to benefit from market efficiency and competitive pricing reform outcomes as examined above in a NEM-wide context. However, estimates of price change in that State were unavailable.

For this study, the direct impact of NRA-consistent competitive reform in Tasmania was assumed to be at the lower end of the estimates for other NEM jurisdictions. This assumption reflects the likelihood of ongoing constraints on transmission flows between Tasmania and Victoria (despite Basslink), which could limit the impact of competitive bidding in the NEM on Tasmanian prices. The estimated price reduction in Tasmania would offset higher base-case prices resulting from transmission charges and other market effects of Basslink.

Electricity restructuring is under way in the Northern Territory, which will see entities operating retail, network and generation services ring-fenced within the government-owned Power and Water Authority. Cavanagh (2006) reported the plan to supply electricity to the Northern Territory via transmission from Queensland, which was claimed capable of reducing electricity costs in the Territory's market by 30 per cent. However, this claim of cost savings has been disputed by some (ABC News Online 2005) and could not be assessed by the Commission in the absence of publicly-available information.

For this study, the direct impact of NRA-consistent competitive reform in the Northern Territory was assumed to be at the lower end of the estimates for New South Wales, Victoria, Queensland and South Australia.

Summary of evidence

The preceding discussion suggests that reform would seek to reduce strategic gaming by generators, reduce transmission constraints, improve demand-side management and end-use price responsiveness, as well as reducing regulatory risk and compliance costs and improving risk management. This could, in turn, lead to the following types of effects:

- efficiency improvements in the use of inputs generally;
- efficiency improvements in the use of capital specifically; and
- reductions in economic rents in generation.

The discussion also canvassed the quantitative information on the possible effects of the changes under consideration for New South Wales, Victoria, Queensland and South Australia. In terms of their effects, the evidence on the consequences of the various reforms is set out in table 4.2. The information was primarily sourced from reported simulations and estimations by ACIL Tasman (2002) as indicated above.

4.5 Possible outer-envelope effects

ERIG in its November discussion papers observed:

> Australia's record of strong energy market reform has led to one of the most competitive and efficient electricity markets in the world. Australia's energy markets rank highly internationally in terms of efficiency and reliability. (ERIG 2006, p. 1)

Nevertheless, ERIG also found:

> …that more can be done to improve the efficiency of Australia's energy sector. Australia can do more to maximize the economic efficiency with which energy is extracted, transformed, distributed and used, without compromising the reliability of Australia's energy system. (ERIG 2006, p. 2)

The ERIG Secretariat provided the Commission (on 14 December 2006) with preliminary model estimates suggesting an average increase of 2.5 per cent in total factor productivity in electricity generation across major NEM jurisdictions would be possible with further electricity market reform. If achieved, this improvement would permit a potential 1 per cent reduction, on average, in retail prices.

Table 4.2 **Background evidence of the potential direct effects of NRA and related reforms from early 2000s**

Per cent change

Reform		*NSW*	*Vic*	*Qld*	*SA*
Competition in electricity generation					
Reduced strategic gaming by generators	Effect on NEM prices	-1.5	-1.8	-1.6	-1.6
Investment in transmission					
Reduced transmission constraints	Effect on NEM prices	-5.6	-1.7	-2.5	-1.5
Increased interconnector capacity	Effect on capital productivity	-13.3	-13.3	-13.3	-13.3
Electricity price signals for end users					
Improved demand-side management and end-user price signals	Effect on NEM prices	-5.9	-5.2	-3.2	-2.9
Regulatory governance arrangements					
Reduced regulatory risk	Effect on retail prices	-1.0	-1.0	-1.0	-1.0
Reduced compliance costs in retail	Effect on retail productivity	2.4	2.4	2.4	2.4
Reduced government administration costs[a]	Effect on govt activity	-0.03	-0.04	-0.02	-0.04
Development of financial instruments					
Improved risk management	Effect on NEM prices	-0.15	-0.15	-0.15	-0.15

[a] Estimates for other States and Territories are Western Australia -0.03, Tasmania -0.03, Northern Territory -0.01, Australian Capital Territory 0.05, the latter reflecting an increase in Commonwealth Government costs.

Sources: ACIL Tasman (2002); Productivity Commission estimates.

ERIG's recent discussion paper findings and model estimates provide revised qualitative and quantitative information that the Commission has used to make judgments about the possible outer-envelope benefits of energy reform. In addition, to these recent ERIG assessments, this study has drawn on other available evidence prepared by ACIL Tasman from the early 2000s which provided an input to an earlier COAG Energy Market Review (table 4.2).

In view of ERIG's broad assessment, the ERIG Secretariat's more up-to-date modelling results, the qualification of the earlier data, other consultations during this study and energy reforms progressed since the early 2000s, the Commission has reservations about taking the full effects canvassed by the measures in table 4.2 as indicators of reform potential. In the absence of more comprehensive and up-to-date

information, this study assumes that only a portion of the gains canvassed could be achievable in practice. Where the gains from reform appear to be overlapping, the assessment is based on the judgment that the combined effects of these reforms is less than the sum the components. Details of the Commission's analysis of the earlier information is provided in box 4.6.

Overall, the Commission considers that, at the outer envelope, full implementation of NRA electricity reform could reduce end-user electricity prices by around an average of 2 per cent, from levels that would otherwise apply (table 4.3).

The Commission emphasises, however, that these are estimated *static* gains achievable with the full implementation of the NRA. An improved regulatory and administrative environment could deliver potentially greater *dynamic* gains — through enhanced efficiency of new investment and the uptake of new technologies and ways of working. The Commission also notes that measures adopted for the abatement of greenhouse gases may also significantly affect the conditions under which electricity is supplied and used in Australia.

In its recent review of NCP, the Commission found that:

> …there is a need to enhance the operation of the National Electricity Market. Addressing regulatory fragmentation and policy uncertainty in relation to greenhouse gas abatement is also critical to the [energy] sector's future performance…(PC 2005a, p. 177)

ERIG also noted in its discussion papers:

> …Australia's electricity demand is forecast to increase sharply over the next 10 years and beyond and will require significant investment in generation and transmission. The key challenge for policy makers is to ensure that measures are in place to support efficient investment in each sector and deliver the lowest overall cost of energy to consumers. (ERIG 2006, p. 13)

Box 4.6 Analysis of background evidence of the potential direct effects of NRA and related reforms

Increase in total factor productivity of generation

Productivity improvements could result from reduced transmission constraints and improved price signals (from demand-side management and end-use prices signals). Given the overlap between the benefits of these reforms and reduced strategic gaming by generators, the Commission assessed that there was scope to improve total factor productivity in the electricity generation sector from these factors combined.

Decrease in the economic rent of generation

This reflects information on NEM prices reported and provided by ACIL Tasman (2002) (table 4.2), which the Commission adjusted to a contribution to changes in retail prices, based on the cost shares reported in table 4.1.

Increased interconnector capacity

The background analysis canvassed the effects of potential increases in interconnector capacity. ACIL Tasman's (2002) benefits of reduced transmission constraints were based on a 20 per cent increase in the capacity of all interconnectors (and a 4 per cent increase in interconnector flows), suggesting a decrease in transmission capital productivity of 13 per cent (table 4.2). However, as acknowledged by ACIL Tasman, the 20 per cent increase in capacity of all interconnectors:

> … is not intended to provide an optimal position but to provide an indication of the market benefits in terms of lower pool prices and electricity costs [that] would ensue from a larger, less constrained transmission system. (ACIL Tasman, p. 52)

In the absence of other information, the Commission made the judgment that transmission service levels and capacity would increase to accommodate the requirements of generation and electricity users. As a result, the scenario does not include an explicit reduction in the productivity of capital of transmission.

Improved risk management

Improved risk management could arise from lower costs of hedging products available from a fully fledged electricity financial market and lower costs of managing trade risk from increased physical hedging opportunities through generation-retail integration.

Reduced regulatory risk

Achievement of reduced regulatory risk is assumed to reduce end-user prices.

4.6 Summary of direct impacts

NRA and related reforms could increase competition between generators, reduce transmission constraints, improve demand-side management and end-use price responsiveness, reduce regulatory risk and compliance costs and improve risk management. The potential effects of reforms could include efficiency improvements in the use of inputs and reducing economic rents in generation.

Overall, the Commission considers that, at the outer envelope, NRA reform could reduce retail electricity prices by around an average of 2 per cent, from levels that would otherwise apply. Reform could also reduce government administration costs.

The direct effects adopted in the electricity reform policy scenario are presented in table 4.4. These values are calibrated to the Commission's general equilibrium modelling framework. If the productivity improvements contributing to these changes could be achieved, a resource saving of as much as $270 million (2005-06 dollars) would be available.

Table 4.3 **Estimated contributions to potential average final-user prices of electricity with full implementation of the NRA[a]**

Per cent contributions

Reform	*Contributing variable*[b]	*NSW*	*Vic*	*Qld*	*SA*	*Tas*	*ACT*	*WA*	*NT*
Reduced strategic gaming by generators, reduced transmission constraints and improved demand-side management and end-use price signals	Increase in TFP of generation	-1.9	-0.5	-0.5	-0.2	-0.3	na	-0.3	-0.4
	Decrease in economic rent of generation	-0.5	-0.3	-0.4	-0.3	-0.4	na	-0.5	-0.5
Improved risk management	Increase in productivity of labour and financial services used in generation	-0.1	-0.1	-0.1	-0.1	-0.1	na	na	na
Reduced regulatory risk	Decrease in post-tax rate of return on assets in generation	-0.5	-0.4	-0.4	-0.4	-0.4	0.0	-0.6	-0.6
	Decrease in post-tax rate of return on assets in transmission, distribution and retail	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.4	-0.3
Reduced compliance costs in retail	Increase in TFP of retail	-0.01	-0.03	-0.01	-0.02	-0.01	-0.01	-0.01	0.00
Sum of all effects on retail prices		**-3.4**	**-1.9**	**-2.0**	**-1.6**	**-1.7**	**-0.5**	**-1.8**	**-1.9**
Reduced government administration costs[c]	Increase in productivity of government expenditure	-0.03	-0.04	-0.02	-0.04	-0.03	0.05	-0.03	-0.01

a For Tasmania, the Australian Capital Territory, Western Australia and the Northern Territory, price effects were assumed to be the smallest absolute value for New South Wales, Victoria, Queensland and South Australia for a given reform. For the Australian Capital Territory, the price effect of generation-related reform is zero as no generation is recorded. **b** The variable is affected by the NRA reform. **c** Effect on government administration costs, not contribution to retail price changes. Data for the Australian Capital Territory includes reduced administration costs for the Territory Government and increased administration costs for the Commonwealth Government.

Source: Productivity Commission estimates; tables 4.1 and 4.2.

Table 4.4 **Estimated potential direct effects of full implementation of NRA electricity reforms[a]**

Reform	*Contributing variable*[b]	*Unit*	*NSW*	*Vic*	*Qld*	*SA*	*Tas*	*ACT*	*WA*	*NT*
Reduced strategic gaming by generators, reduced transmission constraints and improved demand-side management and end-use price signals	Increase in TFP of generation	%	3.7	1.3	1.2	0.6	0.6	na	0.6	0.6
	Decrease in economic rent of generation	%	2.2	1.4	2.2	1.6	1.2	na	1.6	1.5
Improved risk management	Increase in productivity of labour and financial services used in generation	%	1.5	1.5	1.5	1.5	1.5	na	na	na
Reduced regulatory risk	Decrease in post-tax rate of return on assets in generation	%	-2.4	-1.8	-2.4	-2.0	-1.5	na	-2.0	-1.9
	Decrease in post-tax rate of return on assets in transmission, distribution and retail	%	-8.4	-8.0	-7.9	-8.2	-5.5	-10.3	-9.7	-10.0
Reduced compliance costs in retail	Increase in TFP of retail	%	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1
Reduced government administration costs[c]	Increase in productivity of government expenditure	%	0.03	0.04	0.02	0.04	0.03	-0.05	0.03	0.01

a For Tasmania, the Australian Capital Territory, Western Australia and the Northern Territory, direct effects were assumed to be the smallest absolute value for New South Wales, Victoria, Queensland and South Australia for a given reform. For the Australian Capital Territory, the price effect of generation-elated reform is zero as no generation is recorded. **b** The variable is affected by the NRA reform. **c** Effect on government administration costs, not contribution to retail price changes. Data for the Australian Capital Territory includes reduced administration costs for the Territory Government and increased administration costs for the Commonwealth Government.

Source: Productivity Commission estimates based on the MMRF-NRA database and table 4.3.

5 Gas

Key points

- Sources of potential benefit from further reform in the gas industry include:
  - reduced regulation compliance costs and investment risk from improvement to the regulatory governance arrangements; and
  - establishment of a spot market for gas.
- The estimated potential benefits are:
  - an increase of 0.4 per cent in the cost efficiency of gas supply. If this reduction could be achieved a resource saving of some $11 million (2005-06 dollars) would be available; and
  - a reduction of 2.3 per cent in the required post-tax rate of return on assets to pipeline transport (transmission) and gas supply (distribution and retail).
- Overall, this suggests that retail gas prices might be 0.2–0.5 per cent lower than they would otherwise be under future market conditions.

The potential direct economic effects of NRA-consistent and related reforms in the gas industry are outlined in this chapter. These effects are assessed in relation to the benefits potentially available from eliminating impediments to efficiency and competition in gas markets.

Major impediments to efficiency and competition in gas markets are identified by reference to the COAG Energy Market Review (2002), the Productivity Commission's reviews of the Gas Access Regime and National Competition Policy (NCP) (PC 2004a, 2005a), the Gas Market Leaders Group (GMLG) National Gas Market Development Plan (GMLG 2006), and the Ministerial Council on Energy (MCE) deliberations, analyses and decisions in response to these and other reports. Draft findings of the Energy Reform Implementation Group (ERIG) have also been taken into consideration.

The direct effects are evaluated in terms of efficiency improvement. All of the gains from reform are assumed to be passed on in the form of lower gas prices to end users in Australia. The direct effects of reform on gas markets were estimated for the activities of gas pipeline transport (transmission) and gas supply (distribution and retail).

5.1 NRA reforms and outcome objectives

Since the early 1990s, market reforms in the gas industry have centred on promoting competition in gas markets. Reforms implemented by governments under the NCP included:

- removal of all legislative and regulatory barriers to interstate trade in gas;
- corporatisation and privatisation of government-owned gas utilities;
- structural separation or ring-fencing of transmission and distribution activities in each State and Territory;
- introduction of the National Gas Access Code for third-party access to gas transmission and distribution pipelines; and
- introduction of full retail contestability for customers.

Notwithstanding the progress made under the NCP, the COAG Energy Market Review (2002) (the Parer Review) reported that there remained scope to further improve the efficiency and competitiveness of gas markets.

In 2004, the MCE developed a reform program with specific initiatives to strengthen the governance arrangements for the economic regulation of gas (and electricity) markets. One key objective of this program was to reduce regulatory compliance costs and regulatory risks.

At the same time, the MCE developed a set of principles aimed at encouraging transparency, investment and entry in gas markets, which could strengthen competition and enhance reliability and security of gas supply to Australian industrial, commercial and household users.

In December 2005, the MCE established the industry-led GMLG to prepare a gas market development plan that explored options for delivering on the reform principles set out in the MCE gas reform program. In June 2006, the GMLG reported to the MCE on a National Gas Market Development Plan, recommending establishment of a bulletin board and development of a short-term trading market for gas that would provide for a mandatory price-based balancing mechanism for wholesale gas trading.

COAG has incorporated the MCE reform program into the competition stream of the NRA. Although COAG's 10 February 2006 Communiqué made no mention of specific initiatives for gas reform, the further development of domestic gas markets is implicit in NRA objectives, which included:

- yielding significant efficiency and energy security benefits, including gas prices that are lower than they would otherwise be under future market conditions;

- facilitating the most efficient, secure and sustainable supply of electricity from all available fuel sources including gas; and
- streamlining energy market regulation and improving the framework for energy infrastructure planning and network investment.

In November 2006, the MCE Standing Committee of Officials released various documents related to the MCE's proposed legislative changes to the gas and electricity access regimes, including an explanation of the gas legislative framework and exposure drafts of the National Gas Law and National Gas Rules (MCE-SCO 2006).

Policy responses to climate change in general would impact on gas markets. However, the terms of reference for this study exclude the examination of matters relating to climate change technological innovation and adaptation, which are another part of the NRA.

5.2 Australian gas industry

The natural gas industry comprises distinct sectors within the supply chain, which take natural gas from the point of extraction to the point of use. The key sectors are: exploration and production, transmission, distribution, retailing, and end-users.

Much of Australia's major gas reserves are offshore and some distance from major markets. The gas basins with the largest recoverable reserves are the Carnarvon and Browse basins (in Western Australia), the Bonaparte Basin (in the Northern Territory), the Gippsland Basin (in Victoria) and the Cooper–Eromanga Basin (on the border of South Australia and Queensland). Although the Bonaparte and Browse basins have significant reserves, they are yet to be developed (PC 2004a). Coal seam methane has emerged as an important source of gas production in the Bowen and Surat Basins in Queensland and in a number of areas in New South Wales (APPEA 2004).

Natural gas is extracted from underground wells and then processed into pipeline quality gas for domestic markets or liquefied natural gas (LNG) for export. The total production of natural gas in Australia in 2004-05 was 1634 petajoules, an increase of 9.5 per cent from 2003-04 levels. Exports represented around 35 per cent of total production (576 petajoules) (ABARE 2006).

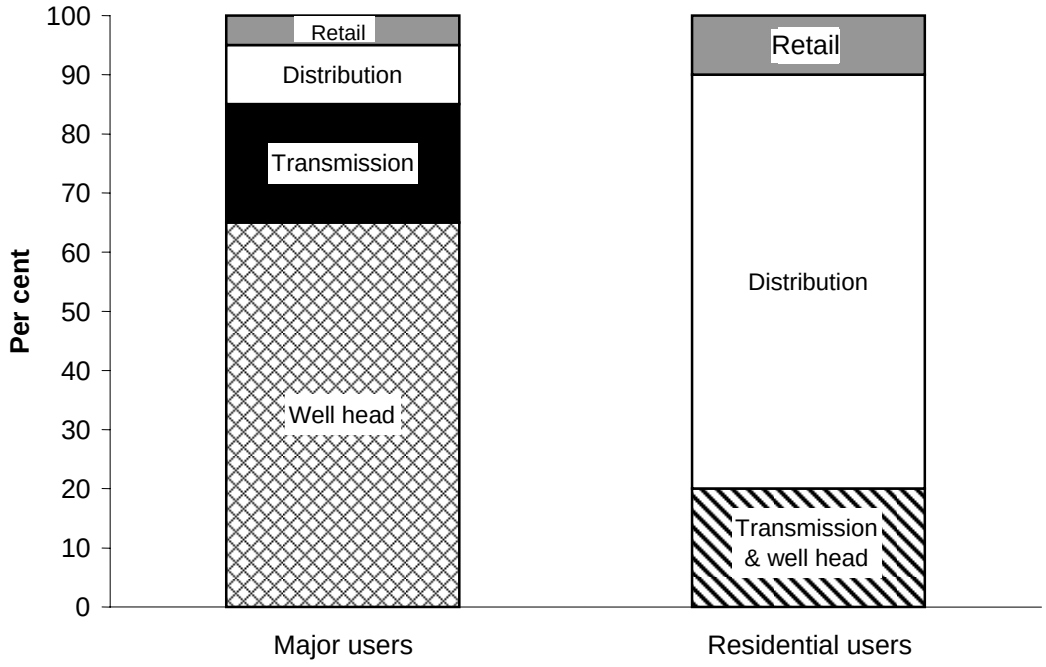
Natural gas consumption in Australia in 2004-05 was around 1058 petajoules (or about 19 per cent of total primary energy consumption). Demand for natural gas differs across sectors. About 87 per cent of natural gas is consumed in the industrial and commercial sectors. Key sectors include manufacturing, mining, metal and

electricity generation. The residential sector consumes about 13 per cent of natural gas.

Transmission pipelines generally transport large volumes of natural gas under high pressure from production fields to the city gate, or to large customers along the pipeline. It is estimated that there are currently more than of 21 000 kilometres of pipeline in Australia that are used to transmit natural gas (APIA 2006). This is an increase of about 50 per cent since figures reported in 1997 (PC 2004a). Distribution networks transport natural gas from gate stations and reticulate it into residential houses, offices, hospitals, factories and other businesses. Retailers sell natural gas to end user consumers, including residential households, hospitals and factories.

The composition of natural gas cost of supply varies by type of user (figure 5.1). For major gas users, the well head cost is the most significant cost, accounting for about 65 per cent of the cost of delivered natural gas. For residential users and 'retail users', distribution and retail account for a greater share, about 80 per cent of the final gas price.

Figure 5.1 **Composition of natural gas costs**



Source: PC (2004a).

5.3 Scope for improvement

The main effects of gas reform are likely to arise from two sources:

- efficiency improvement from streamlined regulatory governance arrangements; and
- establishment of a spot market for gas.

Efficiency improvement from streamlined regulatory arrangements

In its 2004 Review of the Gas Access Regime, the Commission concluded that wide discretionary powers entrusted to regulators in approving gas access arrangements for gas transmission and distribution pipelines could create scope for regulatory uncertainty, inconsistency and error (PC 2004a). The Commission also noted that the existing access regime could distort investment in favour of less risky projects, potentially raising costs to consumers.

The effects of overcoming the above and other problems by streamlining regulatory governance arrangements for gas markets were estimated in the broader context of energy (electricity and gas) market regulation as discussed in chapter 4 — regulators being typically responsible for both electricity and gas markets. In particular, in chapter 4 the Commission considered the estimated direct effects of improvements in regulatory governance in the electricity industry are:

- a reduction of 1 per cent in electricity (and gas) retail prices across the States and Territories, reflecting the effect of reduced regulatory uncertainty and hence the risk premium required for energy infrastructure investment (based on ACIL Tasman 2002). This translates into a reduction of 2.3 per cent in the rental price of capital inputs used by each activity in the electricity industry;
- an increase of 2.4 per cent in the efficiency of electricity retail activity, reflecting the effect of reduced regulation compliance costs associated with cross-jurisdictional retail activity;[1] and

[1] This estimate is based on: (i) ACIL Tasman's (2002) assessment that the total compliance cost for each of the 26 electricity retailers that operated in more than one State or Territory was on average about 75 per cent higher than the additional cost incurred for entering a single State or Territory market; (ii) Short's (2003) estimate of the average compliance cost for an electricity retail licensee at $4.6 million; and (iii) the claim by the Business Council of Australia in a submission to Regulation Taskforce (2006) that regulation compliance costs could be reduced by 20 per cent with streamlined business regulation. According to Short (2003), regulation compliance costs in generation, transmission and distribution were relatively small. As such, the potential effects of improving regulatory governance arrangements on the cost efficiency of these activities were not estimated in this study.

- an increase of between 0.01 per cent and 0.04 per cent in the efficiency of government administration in the States and the Northern Territory reflecting reduced regulation administrative costs, combined with a decrease of 0.05 per cent in the efficiency of government administration in the Australian Capital Territory reflecting reduced administration costs for the Territory Government and increased administration costs for the Australian Government.[2]

In the gas industry, improved regulatory governance arrangements would help reduce costs by easing the compliance costs for gas pipeline operators, distributors and retailers, and by lowering the regulatory risk for investors in gas infrastructure (transmission and distribution pipelines). No estimates of cost savings from this reform that are specific to the gas industry could be found in published sources. To illustrate the nature of the potential benefits it was assumed for this study that improved regulatory outcomes reduce the production costs in the gas transmission and distribution industry by the same extent as they would in the electricity industry. Accordingly, the estimated cost-saving effects of this reform are:

- a reduction of 2.3 per cent in the rental price of capital inputs to pipeline transport (transmission) and gas supply (distribution and retail), reflecting reduced risk premiums for investment in gas infrastructure such as pipelines; and
- an increase of 0.4 per cent in cost efficiency of gas supply, reflecting reduced regulation compliance costs.[3]

Gas market

Increase pipeline investment and new sources of gas supply in the Australian gas market have been underpinned by bilateral contracts between major gas pipeline operators, distributors, gas field operators and major end-users. There is some short-term contractual trading around the longer-term contracts, but there is no transparent national market for short-term trading in gas (GMLG 2006).

In December 2005, the MCE established the GMLG to prepare a Gas Market Development Plan. In particular, the group was asked to further develop options for a bulletin board and city gate spot market or an alternative market development plan

[2] Productivity Commission estimates based on reducing the administration costs of relevant State and Territory regulatory agencies by 25 per cent (taking into account most agencies encompass more than just energy regulation), and increasing the administration costs of the relevant Australian Government regulatory agency by 5 per cent.

[3] This estimate is based on the estimated effect of reduced regulation compliance costs associated with cross-jurisdiction retail activity for electricity (2.4 per cent), and adjusted for the extended industry classification of gas supply that includes both retail and distribution.

that provides equivalent benefits in terms of transparency and lowering barriers to market entry.

The GMLG commissioned McLennan Magasanik Associates to conduct a cost–benefit analysis of two options: a bulletin board and a short-term trading market over the first ten years of operation. It estimated the overall net benefits of a bulletin board to be $0.7 million. For the short-term trading market, it estimated an overall net benefit of $31 million over the ten-year period — costs of $17 million and benefits of $48 million. The benefits were estimated to accrue primarily to producers and retailers ($22 million and $17 million, respectively), with pipeline owners and end-users receiving more modest benefits (both $5 million) (McLennan Magasanik Associates 2006, pp. x–xvii). In the long run, some of the benefits initially allocated to producers, pipeline owners and retailer might be competed away eventually accrue to end-users.

In October 2006, the MCE agreed with the GMLG recommendations to establish a bulletin board and develop the design of a short-term trading market (MCE 2006).

In its discussion paper on energy financial markets in November 2006, ERIG (established by COAG in February 2006) considered that the GMLG recommendations were worthwhile and should be encouraged. Nonetheless, it concluded that the effects of the bulletin board and a short-term trading market on financial market liquidity and the efficiency of the gas market are expected to be modest (ERIG 2006). The GMLG is currently developing the information bulletin board.

Given that the estimated benefits from a bulletin board and a short-term trading market are small (representing less than 0.06 per cent of the industry's domestic sales value per year), it has been assumed for this study that these benefits are encompassed in the estimated cost-saving effects of streamlined regulatory arrangements (discussed above).

Upstream issues

The COAG Energy Market Review (2002) expressed concerns about upstream supply concentration for efficiency and competition in gas markets. The scope for competition in the east coast gas market was claimed to be compromised by high concentration in gas field ownership and joint marketing arrangements. The key recommendations on upstream issues were to:

- preclude States from exempting the future arrangements for joint marketing of natural gas application from the competition rules of the *Trade Practices Act 1974*;

- undertake a review of the appropriate treatment of unproduced areas in existing production licences due for renewal; and
- undertake a review of the gas industry's principles for third-party access to upstream facilities (COAG Energy Market Review 2002).

The COAG Energy Market Review (2002) also noted that significant producer provisions in the Victorian *Gas Industry Act 2001* may have the effect of restricting significant producers' ability to market separately. As such, it concluded that if Esso and BHP Billiton are to be required to separately market in the future, these provisions should be repealed. The Essential Services Commission reviewed these provisions in 2003 and recommended they be repealed, which the Victorian Government did in 2004 (NCC 2004, p. 7.16).

The MCE referred the recommendations of the COAG Energy Market Review to the Ministerial Council on Mineral and Petroleum Resources (MCMPR), which has policy responsibility for upstream gas issues. The MCMPR did not support precluding States from future exemptions, and was cognisant of advice from the Australian Treasury that the Commonwealth already has provision to override any State/Territory exemptions from the application of section 45 to joint marketing arrangements. The MCMPR also concluded that there is no systematic problem concerning exploration production effort in production licence areas. Nonetheless, the MCMPR noted that Victoria was preparing a separate report looking at issues associated with certain production licences in the Gippsland Basin and strategies to deal with these issues.

The MCMPR agreed to undertake a review of the industry's third-party access principles (MCE 2004). The MCE endorsed the decisions of the MCMPR (MCE 2004). The MCMPR review of the industry's upstream third-party access principles was completed in July 2005. It found no substantive evidence of abuse of market power or a deterioration of the ability to negotiate access. The review concluded there was support for continuing the arrangements and no compelling case to amend the industry's third-party access principles. It recommended that the principles be reassessed at an appropriate interval (five years). The next review is scheduled for 2010.

Nonetheless, in its discussion paper on energy financial markets in November 2006, the Energy Reform Implementation Group considered that further work is required to assess the upstream areas of acreage management and joint marketing (ERIG 2006).

It is now generally recognised that a south eastern Australian market for gas exists (ACCC 2006a; GMLG 2006). There is emerging competition between basins —

Bass Strait, Gippsland, Otway, Moomba and coal seam methane (in New South Wales and Queensland) — and potential competition from Papua New Guinea and the Timor Sea.

The Expert Panel On Energy Access Pricing noted:

> For gas, as the demand for the supply of natural gas has grown in Australia, gas pipeline transportation has become more contestable and competing pipelines have emerged which supply gas to large demand centres from competing gas basins. This inter-basin and pipeline-to-pipeline competition has increased the contestability of the market and in a number of cases has moderated the market power of pipeline owners. (Expert Panel On Energy Access Pricing 2006, p. 50)

Competition in gas markets is likely to be assisted further by the inclusion of information on all major gas fields on the Bulletin Board being developed by the industry Gas Market Leaders Group.

International trade in gas has also developed rapidly, driven by demand growth for gas as both as a primary commodity and as a processed product in Asia, Europe and the United States (APPEA 2004). Australia's exports of liquefied natural gas are forecast to increase significantly in the next few years, as new projects come on line and overseas markets look to increase the use of cleaner fuel. ABARE forecast that the value of liquefied natural gas exports will increase by 30 per cent in 2006-07 to around $5.7 billion (15 million tonnes) (Penm 2006).

The issues raised about upstream acreage management and joint marketing arrangements relate to policies about the broader management of Australia's natural resources rather than ensuing competition and efficiency in the provision of gas infrastructure services. Moreover, no NRA-consistent program for reform in the upstream production of gas has been identified in this study.

5.4 Summary of direct impacts

The estimates of reform-induced efficiency gains in the gas industry are presented in table 5.1. In the absence of detailed information and given the modest scope of the assessment, a uniform scenario of change is assumed to apply across jurisdictions. Overall, the potential direct economic effects, while worthwhile, have been assessed to be modest.

- A 2.3 per cent reduction in the required post-tax rate of return on assets for transmission pipelines attributable to lower regulatory risk. For example, if investors in a transmission pipeline were prepared to accept a rate of return of 8.20 per cent prior to reform, then after reform they would be accept 8.01 per cent because of the reduction in regulatory risk.

- A 2.3 per cent reduction in the required post-tax rate of return on assets for distribution pipelines attributable to lower regulatory risk.
- A 0.4 per cent increase in cost efficiency of gas supply attributable to lower regulation compliance costs.

These three effects combined suggest a decrease in retail gas prices of between 0.2 and 0.5 per cent might be possible.

Table 5.1 **Estimated potential direct effects of full implementation of NRA**

Industry / variable	*Unit*	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Gas pipeline transport									
Rate of return on assets[a]	%	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Gas supply									
Rate of return on assets[a]	%	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Total factor productivity[b]	%	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Implied aggregate direct impact									
Retail gas price[c]	%	-0.3	-0.3	-0.5	-0.2	-0.2	-0.4	-0.4	-0.4

a Effects of reduced investment risk attributable to regulatory governance reform. **b** Effects of reduced regulation compliance costs attributable to regulatory governance reform. **c** Combined direct effects of efficiency improvement and economic rent reduction on retail gas prices.

Source: Productivity Commission estimates.

6 Road and rail transport

Key points

- Further reform of the regulatory and administrative frameworks affecting road and rail freight transport could improve productive efficiency of the industry and lower impediments to timely and efficient investment.
- In its public inquiry into road and rail freight infrastructure pricing (conducted in parallel with this study), the Commission found potential efficiency improvements are likely to be available from:
  - more efficient investment spending on road and rail infrastructure;
  - greater harmonisation of regulatory processes and flexibility in pricing options; and
  - the introduction of performance-based standards.
- Numerous studies provide evidence that public infrastructure investment increases an economy's productive capacity.
  - However, there is a paucity of information on the potential for productivity gains stemming from reforms in road and rail infrastructure.
- Based on the limited empirical information available and qualitative information received in its public inquiry, the Commission has applied a 5 per cent improvement in productivity of road and rail freight transport to provide a broad indication of potential benefits available from reform.
  - If this were achieved, a potential cost saving of about $2 billion (2005-06 dollars) would be available.
- These estimates do not take into account for the effects of measures to address urban transport congestion and, closely linked, reform of road and rail passenger transport.

The potential direct effects of the NRA and related reforms that may affect road and rail transport service provision are discussed in this chapter. The chapter distinguishes between road and rail freight transport and urban and intercity passenger transport. It also distinguishes between the freight and passenger transport service task and the provision of infrastructure supporting freight and passenger transport services.

This chapter is informed by the findings of the Productivity Commission inquiry into road and rail freight infrastructure pricing (PC 2006a, 2006b). This inquiry, undertaken in parallel with this study, has taken a broad approach to assessing the

benefits potentially available from reform in the road and rail freight transport sector. In its report, the inquiry has taken account of potential NRA reforms and objectives. The chapter also notes that many of the reforms pertinent to road and rail freight transport would also affect hire and reward passenger transport. Further there are particular reform objectives that could have an indirect bearing on passenger transport — in particular, urban congestion. The chapter notes that there is a separate COAG review of urban congestion (COAG 2006a).

Sections 6.1 outlines NRA reforms and outcome objectives relating to road and rail transport and the main activities covered by the NRA. Section 6.2 provides background to current NRA reforms. An outline of the potential effects of reform is provided in section 6.3 while section 6.4 reports on the scope for productivity improvement by reference to the findings of the Commission road and rail inquiry. Section 6.5 summarises the freight policy scenario pertinent to quantifying the economic and government revenue benefits of reform.

6.1 NRA reforms and outcome objectives

As part of the NRA, COAG endorsed a new NCP aimed at:

> …providing a supportive market and regulatory framework for productive investment in, [amongst other things], transport infrastructure, and its efficient use, by improving pricing and investment signals and establishing competitive markets. (COAG 2006a, p.5)

This framework affects road and rail transport directly through the competition policy *transport* substream. Noting that transport activity contributes about 5 per cent of GDP and Australia's freight task is expected to almost double in the next 20 years:

> COAG has agreed to improve efficiency, adequacy and safety of Australia's transport infrastructure by committing to high priority national transport market reforms …(COAG 2006a, p.6)

Reform commitments to date under the transport substream to this end include:

- a Productivity Commission inquiry into efficient road and rail freight infrastructure pricing;
- harmonisation and reform of rail and road regulation including road and rail safety regulation, and performance-based standards to lessen road damage;
- adoption of Australian Transport Council–endorsed national guidelines for evaluating new public road and rail infrastructure projects to ensure the best use of public investment; and

- reduction of current and projected urban transport congestion, within current jurisdictional responsibilities, to be informed by a review of the main causes, trends and impacts in Australia's major cities and options for managing congestion focusing on national freight corridors and local networks where they interact with national corridors.[1]

The NRA also affects road and rail transport through the *infrastructure regulation* substream which, by means of the Competition and Infrastructure Reform Agreement (CIRA), aims to:

> …reduce regulatory uncertainty and compliance costs for owners, users and investors in significant infrastructure and to support efficient use of national infrastructure. (COAG 2006a, p.6)

CIRA, in conjunction with the Competition Principles Agreement 1995, seeks to provide for a simpler and consistent national system of economic regulation for nationally significant infrastructure, including road and rail infrastructure, so that third party access to significant infrastructure can be provided on commercial terms and conditions. Such provisions apply to road and rail infrastructure with natural monopoly characteristics such as railway lines.

Finally, road and rail transport service provision will be affected by the *infrastructure planing* substream, which focuses on strategic assessments of future infrastructure needs. Implementation strategies covered in this substream include:

- a commitment to complete all 24 corridor strategies under AusLink …;
- extending the corridor strategies to include relevant capital city and associated regional ports on the AusLink National Network;
- … a stocktake of logistics chain coordination arrangements; and
- establishing a 'one-stop shop' in each jurisdiction … for significant development projects. (COAG 2006a, p.7)

Of importance to these is the AusLink National Network, which covers road, rail and intermodal transport facilities such as terminal operations.

[1] The review is being oversighted by a joint Commonwealth, State and local government steering committee.

The NRA and related reforms are wide-ranging and potentially cover all aspects of the road and rail task including both passenger and freight transport (box 6.1). In line with the scope of the Commission's road and rail freight infrastructure pricing inquiry, this study focuses on the potential for productivity improvements in road and rail freight services (ANZSIC 611 and the freight related aspects of ANZSIC 620).

Box 6.1 **Road and rail transport and related transport services in terms of the ANZSIC**

ANZSIC		*Units mainly engaged in*	*Primary activities*
611	Road freight transport	Transportation of freight by road	Delivery services Furniture removal Long haul services Taxi truck service Truck hire
612	Road passenger transport	Bus transport Taxi and other road passenger transport	Charter passenger and tourist long and short distance bus operators Taxi and hire car service with driver and taxi base operations
620	Rail transport	Operating railways (except tramways) and associated infrastructure and services	**Freight related** Railway container terminal operation Freight transport service **Passenger related** Passenger transport service Railway station operation Suburban railway transport Terminal operation
661	Services to road transport	Operating parking services and other service to road transport	**Freight related** Container terminal or park provision Weighbridge operation **Other** Toll bridge and road operation Inland vehicular ferry operation Car park and parking station operation

Sources: ABS (*Australian and New Zealand Standard Industrial Classification, 1993*, Cat. no. 1292.0.15.001); and ABS (*Input-Output Product Details, 1998-99*, Cat. no. 5215.0).

Because interactions and spillovers exist, individual NRA and related reforms directly affecting freight transport cannot be considered in isolation. For example, reforms such as those relating to national corridor strategies could interact with strategies to improve safety. Consequently, the potential impacts of the NRA on road and rail freight transport are assessed using a 'tops down' approach in which a

single estimate of the benefits of reform are canvassed. Although there could be interactions and spillovers between reforms directly affecting freight transport and reforms to reduce urban road congestion with regard to national freight corridors and passenger transport, assessment of these was not within the scope of the Commission's inquiry and would only be covered incidentally in the Commission's estimate.

6.2 Australian road and rail freight transport

Australia's road network is far more extensive than its rail network, with more than 800 000 kms of roads compared to around 44 000 kms of rail track. Road and rail transport services contribute about 2 per cent of GDP (ABS 2005a and BTRE 2003). Road freight transport alone contributes around 1.1 percentage points of this figure, while rail freight transport contributes around 0.3 percentage points. The remainder relates to and passenger services.

The *road network* consists of: the AusLink National Network; State highways; main roads; privately operated toll roads; local roads; and unsealed rural roads and tracks. Most of the road network has a bitumised, concrete sealed or other type of improved surface (for example, gravel or crushed stone) (Austroads 2005).

The *rail network* consists of: the national interstate corridors on the AusLink National Network, intra-state networks connecting the hinterland to capital cities or ports; private lines owned by mining companies particularly in Western Australia, Queensland and South Australia, and sugar companies in Queensland; and urban passenger networks that are also used by freight trains in Melbourne, Sydney and Brisbane. Different sections of the rail network support varying combinations of axle mass, train speed, train car width (broad, standard or narrow) and train length.

The ownership and management of road and rail infrastructure and transport services are typically divided into below and above operations. Above–road and rail operators run vehicles that haul freight (locomotives or trucks). Below–road and rail operators fund and/or manage the road and rail infrastructure on which these operators run their vehicles. These functions are performed by a mix of government and private sector operators. That said, specialist railway rolling stock and railway lines servicing mines are notable exceptions.

The NRA follows a gradual move towards a more coordinated national system for the regulation and funding of the road system. In the late 1800s and early 1900s, road provision was largely the responsibility of State Governments and local governments. The Commonwealth Government began funding road infrastructure projects in the 1920s and, by the mid-1970s, had assumed full responsibility for

funding the construction and maintenance of 'National Roads' (the major links between the State and Territory capital cities).

In the early 1990s, road funding responsibilities across jurisdictions were formalised. The Commonwealth Government continued funding National Roads, but increased the coverage of the network and began funding urban links. State and Territory governments were responsible for providing arterial roads and local governments, within each State jurisdiction, for providing local roads. The national land transport plan, AusLink, was introduced in 2004-05 to integrate planning of and investment in the National Network and achieve more consistency in funding road and rail networks.

The State and Territory-specific road transport regulation that evolved resulted in considerable regulatory variation across jurisdictions. In 1991, the National Road Transport Commission (NRTC) was established to develop uniform national approaches to operational and regulatory reform. This was intended to improve road efficiency, for example, by encouraging the use of larger, more efficient freight transport vehicles. Since the NRTC's inception, regulatory reforms have covered:

- uniform heavy vehicle charges;
- uniform arrangements for transporting dangerous goods;
- vehicle operation reforms (encompassing uniform or more consistent national vehicles standards; road worthiness, mass and loading rules, oversize and over mass vehicles, driving hours, route restrictions, and other road rules);
- a national heavy vehicle registration scheme;
- a national driver license scheme; and
- a consistent and equitable approach to compliance and enforcement of road transport rules. (PC 2005a, p. 419)

As part of the NCP reforms introduced from the mid-1990s, a number of sector–specific reforms were introduced in the road transport industry. The main reforms included implementation of heavy vehicle charges and a uniform approach to regulating heavy vehicles in order to improve the efficiency of the road freight sector, enhance road safety and reduce the transaction costs of regulation (PC 2005a).

Also, through coordinated planning under AusLink, Commonwealth, State and Territory governments have been systematically reviewing road networks and developing coordinated plans to ensure that critical components of the national road system are capable of accommodating heavier vehicles.

Rail funding and regulation

Rail freight transport also has been gradually evolving from non-integrated State and Territory based systems into a more integrated, nationally focused system. Before the round of NCP reforms commenced in the 1990s, the rail industry was dominated by government business enterprises that were monopoly providers of rail services in a particular State or Territory. Instigated by NCP reforms, significant changes to the rail industry's governance arrangements, infrastructure access arrangements and structure were introduced through:

- a program of vertical separation, commercialisation and privatisation (including the application of competitive neutrality arrangements);
- the establishment of a national access regime under Part IIIA of the Trade Practices Act; and
- the National Rail Reform Agreement to reduce the costs of transporting interstate freight by increasing train speeds and tonnages, and standardising practices, technologies and access conditions.

As a result of the commercialisation of rail, there is a more direct link between rail infrastructure pricing, maintenance and investment decisions, when compared with road infrastructure investment and pricing. Under third party access regime arrangements, revenues that infrastructure managers earn from rail freight operators' use of the network are generally directly negotiated with rail infrastructure users.

Rail infrastructure managers also receive funds from governments for investment projects. For example, rail managers on the AusLink National Network have access to AusLink funds on a similar basis to roads, as do managers of regional rail infrastructure under AusLink's Strategic Regional Program.

Despite these developments reform of the rail industry over the last decade has largely occurred jurisdiction by jurisdiction, resulting in the development of multiple access regimes and overlapping regulatory bodies (PC 2005a, p. 217). In addition 'rail safety' has been listed by COAG as a regulatory 'hot spot' in the regulatory reform stream of the NRA (COAG 2006a, p. 9).

6.3 Potential effects of NRA reforms

The implementation of NRA and related reforms could achieve higher productivity in the provision of road and rail services and lower service prices. These effects could occur through further reform-induced improvements in the operational efficiency of road and rail service provision, in the decision-making process for

road and rail infrastructure management, including investment decisions, in the pricing of road and rail infrastructure to users, and in reductions in the compliance costs of regulation.

Enhancements in transport infrastructure may include construction of new or improved roads or railway lines, expansion of the capacity of existing transport networks or operational improvements leading to reduced travel distances or reduced freight delay from traffic congestion.

Measurable improvements in freight transportation services can include lower service costs per tonne kilometre, more accessible networks, reduced transit times and down time, and greater reliability of pick-up and delivery. Such improvements, as well as improving productivity within the freight sector, could flow on to provide additional opportunities to increase productivity in activities dependent on freight transport (Lakshmanan and Anderson 2002). For example, improved productivity in freight service provision can allow firms to adopt just-in-time delivery systems and maintain lower levels of inventories. Reduced costs in transport inputs also provide flow-on incentives for firms to receive and distribute larger and less frequent shipments of inventory, thus reducing inventory carrying costs per unit of output.

Cognisant of these potential freight transport and wider community benefits, the Commission has identified a number of NRA-consistent measures to promote road and rail efficiency (box 6.2).

In addition, the Commission has canvassed more fundamental road reforms that would potentially involve commercialisation of road infrastructure provision, including for example, use of mass–distance location–based charges for national highways. Such a framework is likely to be more efficient, innovative and responsive to user demands than could be achieved under the current system, and thus, could be expected to stimulate higher productivity than otherwise available with NRA reforms. However, such reforms would require further detailed assessment and trials. Moreover, there was no basis for the quantification of specific potential future productivity gains for the purpose of this study.

More efficient road and/or rail infrastructure spending outcomes are likely to have wider benefits including for passenger transport service providers and households.

Box 6.2 **Possible NRA-consistent measures to raise productivity in road and rail freight service provision**

Road

- Where possible, replacement of prescriptive regulations that restrict particular types or configurations of heavy vehicles from using all or some roads with performance-based regulations to promote flexibility and innovation, potentially allowing higher mass limits for trucks.
- Rigorous application of regulatory impact criteria to all road transport regulation. Systematic reviews of the appropriateness and cost–effectiveness of existing regulations, consistent with COAG's commitment for governments to undertake targeted annual public reviews of existing regulations.
- Improved road investment decision-making frameworks for infrastructure funding by inclusion of a clear project selection process, greater stakeholder involvement and public transparency, with formal procedures for public consultation. These principles have been broadly adopted as part of the AusLink framework and should be applied across all jurisdictions.

Rail

- Nationally consistent and coordinated rail regulatory frameworks (safety, operational and technical standards) — including the *possibility* of moving to a single national regulatory regime and regulator.
- Stricter application of the corporatisation model to government–owned railways, including greater clarity of corporate objectives, improved transparency and a general strengthening of accountability.
- Greater transparency of funding of Community Service Obligations — including enunciation of objectives and demonstration of how contributions will achieve stated objectives at least cost.
- Incorporation of an objects clause and pricing principles similar to those recently included in Part IIIA of the Trade Practices Act in all rail access regimes — including allowing multi-part pricing and price discrimination, when they aid efficiency.

Source: PC (2006b).

Urban congestion

As part of the NRA, COAG made a commitment to:

> '…reduce current and projected urban transport congestion within current jurisdictional responsibilities, informed by a review into the main causes, trends, impacts and options for managing congestion focusing on national freight corridors.' (COAG, 2006a, p.6).

Broadly, congestion occurs because transport infrastructure has limited capacity and is an open access service not generally subject to *ex ante* rationing. As traffic increases beyond a certain level, both passenger and freight transport users experience additional costs associated with congestion, such as additional travel time and operating costs. Congestion also can have negative spill-over effects such as through air and noise pollution.

In order to avoid congested areas, transport users will take alternative routes, often of longer duration, or defer taking trips. For example, many freight-transport operators tend to travel outside of peak periods and avoid congested areas of road networks. Nonetheless, sometimes bottlenecks cannot be avoided and congestion can impose significant costs on freight operators. Since the freight task is expected to grow substantially in the future, urban congestion poses a substantial risk to productivity in the freight sector.

In this context, reforms to lower urban congestion could reduce transport business operating costs and the time-related cost of congestion delays for passenger motor vehicle users as well as freight operators. For example, lower congestion levels could reduce labour costs of truck drivers, the number of trucks required to deliver a given freight task as well as fuel and maintenance costs of operating commercial vehicles in stop-start conditions.

The Commission in its road and rail inquiry examined some of the costs of congestion (PC 2006a, 2006b). It found, amongst other things, that the costs imposed on road users by congestion in Australia are:

- in general, a significant problem only in large urban centres at particular times and locations; and
- generated by both passenger and freight traffic, with passenger vehicles being the main cause. (PC 2006b, p. 6.21)

The review of urban congestion trends, impacts and solutions, agreed by COAG, is being undertaken separately to this study. The review will examine:

> …the major causes of Australia's urban congestion, including traffic growth and management, to develop a coherent and cooperative framework for governments to address this problem for COAG's consideration. (COAGb, p. 56)

This review will inform measures by States and Territories, as the principal level of government with primary responsibility for planning, developing and managing urban transport systems. It also would inform measures to address infrastructure bottlenecks on urban sections of the AusLink national network (COAG 2006b, p. 56).

6.4 Scope for improvement

Despite recent reforms, there is still considerable scope to improve the efficiency and sustainability of transport services in Australia. The scope for productivity improvement in road and rail service delivery was examined by the Commission in its inquiry into road and freight pricing in order to provide broad indications of the potential benefits of reform. The Commission found that while there are a number of studies examining the effect of potential productivity gains for the economy resulting from reforms in the transport sector, few involve actual empirical estimation of these productivity impacts. Most studies considered rely on past experience or judgement to postulate the values of potential productivity improvements.

Given the paucity of information, the approach adopted by the Commission in its inquiry involved reviews of:

- recent productivity trends;
- qualitative assessments of the potential for reform-related increases in productivity; and
- quantitative assessments of the potential impacts of more efficient or enhanced infrastructure spending.

The broad findings of the study are summarised in box 6.3.

The studies considered generally assumed productivity increases of between 2 and 16 per cent. In its discussion draft, the Commission canvassed the possibility that the full implementation of NRA and related reform could raise the productivity on all inputs to the freight task by 5 per cent (PC 2006a). Subsequently, the Commission reassessed its review of other studies, conducted public hearings and held consultations with inquiry participants and industry experts. On the basis of this review process and further investigations, the Commission found that a 5 per cent long run improvement in the productivity of all inputs to road and rail freight services provided a meaningful indicative estimate of potential benefits available with the full implementation of the NRA (PC 2006b). For the purpose of this study, this estimate has been adopted as the indicative estimate of what may be potentially available with the full implementation of the NRA.

Box 6.3 **Productivity Commission findings on analyses relating to past productivity trends and productivity potential in road and rail freight transport**

Recent developments

Recent productivity growth in the road transport sector has been linked to rapid technological and organisational change, including the use of information and communications technologies, the employment of vehicles designed to haul greater volumes, with associated lower costs per tonne kilometre, which have almost halved non-bulk interstate road freight rates. For rail, longer trains and higher axle mass limits have reduced the cost per tonne kilometre travelled. Productivity has also increased as a result of greater utilisation of the rail network following major investments (such as longer passing loops and terminal siding track lengths) in addition to structural and regulatory reforms, particularly over the 1990s.

Previous Productivity Commission and other modelling

The Commission previously examined the issue of road and rail reform, suggesting that reforms in road maintenance and construction could lead to a productivity increase of 10 per cent (IAC 1989). In the Hilmer study (IC 1995), the Commission estimated that moving to a uniform regulation system under the then-newly formed NRTC would increase labour and capital productivity in road by 5 per cent. The Commission further examined the potential impact of NCP reforms on major infrastructure industries (PC 1999a). It found that potential improved productivity in road transport from reforms, such as the adoption of NRTC proposals dealing with heavy vehicle charges, transportation of dangerous goods by road and mass limits, could be around 3 per cent. For rail, it was found that corporatisation and movement to 'best practice' service provision could lead to productivity improvements of just over 8 per cent.

The Commission has also examined actual changes experienced during the 1990s in the key infrastructure activities encompassed by the NCP reforms (PC 2005a). It found increases in total factor productivity of rail freight and passenger services, on average, of 8 per cent per year between 1989-90 to 1997-98.

Other studies have examined the socio-economic impacts of increases in the freight task and reforms consistent with NRA, more efficient road pricing and the impact of microeconomic reforms generally on the transport sector. These studies have canvassed productivity gains in the transport sector ranging from 2 to 16 per cent.

Overseas studies

The Commission also examined overseas reviews of the relationship between public infrastructure spending and output. From these, it calculated that a 1 per cent increase in infrastructure spending could lower service prices by 4.5 per cent. Assuming some 'under investment' in road and rail infrastructure, this implies that additional public spending could raise the productivity of road and rail service provision.

Sources: PC (2006a, 2006b).

The Commission also canvassed more fundamental reform involving commercialisation (eg involving mass-distance location-based charges for national highways). If this were achieved even higher productivity benefits for the road sector may be possible.

At this stage, the focus of the Commission's investigations has been on the potential for the NRA to improve productivity in road and rail freight services. In addition, the reach of reforms under the NRA transport, infrastructure regulation and infrastructure substreams could extend to intercity and urban road and rail passenger transport. Such reforms would include the NRA commitment to reduce current and projected urban transport congestion, within the transport substream. At this stage, the Commission has not investigated the myriad of influences that the NRA may have on urban passenger transport, including though government responses to reduce urban congestion. The Commission notes, in this regard, that the COAG Review of Urban Congestion is due to report to COAG in December 2006.

6.5 Summary of direct impacts

Efficient provision of road and rail freight infrastructure and services is of great importance given Australia's dispersed population and production centres. Efficiency in each mode will be promoted by regulatory reforms to reduce costs and improve infrastructure investment decision-making processes. The size of these efficiency gains is difficult to determine. Comparison of reforms or productivity gains with overseas experiences has limited relevance, given the distinctive nature of the Australian freight task.

Informed by the Commission's inquiry into road and rail infrastructure pricing, this study applies a 5 per cent productivity increase on *all* inputs to the production of road and rail freight services. If this were achieved a cost saving of about $2 billion (2005-06 dollars) would be available, in addition to what might be achieved by ongoing growth within the current regulatory framework.[2]

The Commission notes that further gains could arise from reductions in urban congestion, which is subject to a separate COAG review and the impact of reforms more generally on the provision of road and rail passenger services.

[2] Estimated on the basis of ABS input-output data for 2001-02 projected forward to 2005-06 on the basis of GDP.

7 Ports and associated infrastructure

Key points

- Further reform of the regulatory and administrative frameworks affecting ports and associated infrastructure could improve operational efficiency of the industry and lower impediments to timely and efficient investment.
  - These benefits would accrue through measures including the facilitation of access for new entrants to port infrastructure and reducing the regulatory and administrative impediments to investment.
- The productive efficiency of ports can be influenced by many factors, both within ports and at the port-landside interface.
- For *container ports*, this study compares processing rates at major Australian ports with those of a roughly comparable offshore port noted for its relatively high processing rates. Based on those comparisons:
  - Productivity improvements of nearly 10 per cent, on average, could be possible.
  - If this were achieved, a resource cost saving of up to about $160 million (2005-06 dollars) would be available.
  - The study also canvasses the impact of improved investment incentives flowing from regulatory reform.
- For *bulk port* operations, addressing regulatory barriers to timely and efficient investment in export infrastructure could generate additional gains.

The potential direct effects of the NRA and related reforms that may affect ports and associated infrastructure are discussed in this chapter. The chapter distinguishes between container and bulk ports. In quantifying the effects of reform, the focus is on container port operations. Although full implementation of the NRA is likely to also benefit bulk ports, quantifying the potential effects nationally is problematic because of the specialised nature of individual ports and the lack of comprehensive or sector wide information.

In quantifying the potential direct benefits available from reform of Australia's container ports, the chapter adopts a tops down approach. It uses selected benchmark information to draw broad inferences about possible efficiency gaps pertaining to these ports. It also uses available information on returns to capital to draw inferences about the potential for new investment in ports. The estimates are

intended to provide a broad indication of the character and magnitude of the potential effects of reform.

The chapter focuses on the economic benefits potentially available from reform. It does not canvass issues relating to the appropriateness of planning or environmental regulation that may be pertinent to the location and operation of port facilities.

Section 7.1 outlines NRA reform streams impacting on ports and associated infrastructure. Section 7.2 identifies significant ports that are likely to be the focus of reform while section 7.3 canvases the potential effects of port reform. Section 7.4 then assesses the scope for improvement in terms of improved productive efficiency and incentives to invest. Section 7.6 summarises the direct effects potentially available from the full implementation of NRA reforms to ports and associated infrastructure.

7.1 NRA reforms and outcome objectives

In part, COAG's new NRA agenda seeks to extend and refine some elements of the generic reform framework applying to government business enterprises, including port authorities, under NCP, but with a focus on significant ports. The agenda is aimed at:

> …providing a supportive market and regulatory framework for productive investment in, [among other things], transport and other export–oriented infrastructure, and its efficient use, by improving pricing and investment signals and establishing competitive markets. (COAG 2006a, p. 5)

This framework affects ports and associated infrastructure directly through the competition policy *infrastructure regulation* substream which seeks to establish a simpler and nationally consistent approach to regulating and approving significant infrastructure projects. Significant infrastructure includes ports and export related infrastructure, as well as other nationally significant infrastructure including road and rail infrastructure (see chapter 6). To support this objective, COAG signed a Competition and Infrastructure Reform Agreement (CIRA) which aims to:

> …reduce regulatory uncertainty and compliance costs for owners, users and investors in significant infrastructure and to support efficient use of national infrastructure. (COAG 2006a, p. 6)

To achieve these objectives COAG agreed, amongst other things, that:

- ports should only be subject to economic regulation where a clear need for it exists to promote competition in upstream or downstream markets or prevent the misuse of market power; and

- where ... economic regulation of significant ports is warranted, it should conform to a consistent national approach based on the following principles:
    - wherever possible, third party access to ports and related infrastructure facilities should be on the basis of terms and conditions agreed between the operator of the facility and the person seeking access;
    - wherever possible, commercial outcomes should be promoted by establishing competitive market frameworks that allow competition in and entry to port and related infrastructure services, including stevedoring, in preference to economic regulation;
    - where regulatory oversight of prices is warranted …, this should be undertaken by an independent body which publishes relevant information; and
    - where access regimes are required, and to maximise consistency, those regimes should be certified in accordance with the Trade Practices Act 1974 and the Competition Principles Agreement. (COAG 2006b, pp. 32 & 33)

To facilitate the desired competition objectives, a number of specific approaches have been agreed, including:

- port planning should facilitate the entry of new suppliers of port and related infrastructure services;
- third party access to port facilities should be provided on a competitively neutral basis;
- charters for port authorities should include guidance re commercial returns and avoiding exploitation of monopoly powers; and
- any conflicts of interest between port owners, operators or service providers as a result of vertically integrated structures should be addressed on a case by case basis with a view to facilitating competition. (COAG 2006b, p. 33)

COAG has indicated that significant ports include major capital city ports and facilities at these ports, major bulk commodity export ports and facilities — except those considered part of integrated production processes — and major regional ports catering for agricultural and other exports (COAG 2006a, p. 62).

In addition to these specific approaches, COAG agreed to review the regulations covering ports, port authorities and storage and handling operations at all significant ports.

Beyond the port specific elements of NRA, the efficiency of ports and associated infrastructure may also be influenced by reforms to nationally significant infrastructure generally and related reforms to road and rail transport in particular. In this context, COAG has agreed to a number of reforms designed to improve the efficiency of road and rail use and infrastructure. These initiatives may improve the efficiency of ports by improving the land side freight linkages from ports (see chapter 6). The proposal to reduce the projected impact of urban congestion could

also have substantial impacts on the efficiency of ports and related infrastructure in major capital cities. In this context, the Commission notes that a separate COAG review will report on these issues.

For the purposes of this study, a 'ring fence' approach has been adopted to define what broad activities may be affected by the NRA. Under this approach, all facilities at the interface between sea and land based transport and logistics operation are considered part of 'ports and related infrastructure'. In terms of the industries of the Australian and New Zealand Standard Industrial Classification (ANZSIC), ports and related infrastructure include: stevedoring, water transport terminal operation, port operators and other services to water (box 7.1).

In 2001-02, the latest year for which comprehensive data are available on these activities, gross output was estimated at $3.1 billion or around $4.1 in 2005-06 dollars.1 Of this total, about 46 per cent is contributed by container ports and associated infrastructure and 54 per cent by bulk ports.

Box 7.1 Ports and related infrastructure in terms of the ANZSIC

ANZSIC		*Units mainly engaged in*	*Primary activities*
6621	Stevedoring	The provision of labour for the loading and unloading of vessels	Ship loading or unloading service (provision of labour only); Stevedoring
6622	Water transport terminals	The operation of ship mooring facilities or of passenger or freight sea transport terminals (including sea cargo container terminals and coal or grain loaders) used for the loading or unloading of vessels	Coal loader operation (sea transport); Container terminal operation (marine cargo); Freight terminal operation (sea transport); Grain loader operation (sea transport); Passenger terminal operation (sea transport); Ship mooring service; Terminal operation (sea transport)
6623	Port operators	The maintenance and leasing of port facilities to facilitate the land-sea transition of goods and passengers	Port operation; Wharf facility leasing; Wharf provision

Sources: ABS (*Australian and New Zealand Standard Industrial Classification, 1993*, Cat. no. 1292.0.15.001); and ABS (*Input-Output Product Details, 2001-02*, Cat. no. 5215.0).

1 ABS, Canberra, pers. comm., 30 November 2006, assumes a similar contribution of ports to GDP between years.

7.2 Significant ports in Australia

As indicated above, COAG specified that the NRA will focus on 'significant' ports. For the purpose of this study, the Commission selected for analysis the top 10 ports in Australia in terms of the value of goods handled. The largest *container terminals* in this group are located in the major capital cities and handle approximately 80 per cent of Australia's international cargo (imports plus exports) by value, while bulk ports typically handle larger trade volumes (table 7.1).

Table 7.1 **Weight and value of international cargo handled at selected major Australian ports, 2003-04**

Port	*Cargo type*[a]	*Value*	*Weight*
		$ billion	million tonnes
Melbourne	Container	49.0	18.6
Sydney	Container	41.2	18.0
Brisbane	Container	20.3	18.5
Freemantle	Bulk/container	15.6	19.4
Dampier	Bulk	8.6	100.6
Adelaide	Container	7.1	5.7
Newcastle	Bulk	4.8	80.3
Hay Point	Bulk	4.5	78.0
Gladstone	Bulk/container	3.7	45.7
Townsville	Bulk	3.1	8.5

[a] The predominant cargo type handled.

Source: BTRE (2006a).

The *bulk ports*, not all of which may ultimately be deemed significant ports for the purposes of implementing the NRA, handle a wide range of commodities such as minerals, grains and bulk liquids.

Most of Australia's coal exports are handled through supply chains on the east coast leading to, in Queensland, Abbot Point, Gladstone, Brisbane, Dalrymple Bay and Hay Point; and in New South Wales, Newcastle and Port Kembla. Australia's iron ore exports are shipped from a number of ports in Western Australia, including Port Hedland, Dampier and Port Walcott.

Institutional and structural arrangements

Australian ports operate under a diverse range of ownership and management arrangements with increased private sector involvement since 1990. Most ports are operated by public statutory authorities with many of these adopting the 'landlord model' in which they provide only core services such as channel maintenance, navigation, port promotion and strategic planning, while leasing land to private

operators for cargo-handling activities. A notable exception is South Australia where the private sector operates the commercialised ports.

At all major *container terminal ports*, stevedoring services are supplied by only two providers — Patrick and P&O Ports (except for Adelaide and Burnie where there is currently only one service provider). Under the current industry structure, Patrick and P&O Ports have a major role in managing the landside interface with container-terminal ports, including downstream road and rail transport services, container storage and vehicle booking systems. The nature of long-term leases at ports and access to suitable land for further port development have been identified as factors that may hinder new entry and the scope for increased competition (ACCC 2005 p. 29). However, the ACCC (2006b) has observed that a number of port managers have expansion plans that could provide an opportunity for new entrants to become established and that this could result in greater scope for shipping lines to exercise countervailing power and more effective price competition within the industry.

Bulk ports are operated under a number of institutional models. At Gladstone, Brisbane and Abbot Point, the terminals are publicly owned and operated. Some other ports are privately-owned facilities that are part of vertically-integrated supply chains, such as those handling coal and iron ore at Hay Point and Port Hedland. Other bulk ports, including those at Newcastle and Port Kembla, are controlled by members of export industries and operate under common-access arrangements through state-based regulatory regimes.

Regulatory framework

The ACCC monitors the prices, costs and profits of container terminal operators in Adelaide, Brisbane, Burnie, Melbourne, Perth and Sydney under Part VIIA of the *Trade Practices Act 1974* (TPA). The monitoring program was introduced as part of the Australian Government's waterfront reforms to provide information on the progress of reforms in container terminal activities and to ensure that the cost of the stevedoring levy was absorbed by the stevedores.[2] While ACCC monitoring does not restrict the prices that stevedores can charge, it can temper incentives to exercise market power through public disclosure.

The National Access Regime (NAR), set out under Part IIIA of the TPA, establishes a legal right for third parties to share the use of certain infrastructure services on

[2] The stevedoring levy, which came into effect in February 1999, was introduced to recover the cost of entitlements for stevedoring employees made redundant as a result of waterfront reform. The levy ceased at the end of May 2006.

reasonable terms and conditions.[3] Currently, no access regimes for port infrastructure are been certified as effective or declared under the NAR. State-based access regimes apply at Dalrymple Bay and prescribed ports in South Australia and Victoria. The Ports Access Regime under the *Maritime Services (Access) Act 2000* provides for access to facilities at seven commercial ports in South Australia. In Victoria, the *Port Services Act 1995* (PSA) defines the economic regulatory framework that applies to the commercial seaports of Melbourne, Geelong, Portland and Hastings. Under the PSA, specific port services are 'prescribed services' which may be subject to price regulation (ESC 2003).

The construction of export infrastructure, including port infrastructure, is subject to complex planning approval processes. Generally, planning approvals are the responsibility of state and territory governments, and cover matters such as the environment, occupational health and safety, local planning and zoning and industrial relations. Some states are trying to facilitate infrastructure investment by providing a 'one-stop shop' to expedite the planning and approval process.

It has been argued that the regulatory framework contributes to delays in capacity expansion of infrastructure. The Exports and Infrastructure Taskforce (EIT 2005, p. 6) raised concerns that efficient commercial investment can be delayed or even deterred by inappropriate policy settings. In particular, they note that approval processes for infrastructure projects are unnecessarily long (EIT 2005, p. 3) However, it should be noted that planning delays are not the only reason for infrastructure bottlenecks which impede the seamless flow of goods through the supply chain.

7.3 Scope for improvement

Container terminal ports

Estimates of the productivity improvements that potentially could be achieved at Australian container port facilities with the full implementation of the NRA, are based on a comparison of the current performance of Australian ports with that of an international benchmark port.

[3] The NAR applies only to services of major infrastructure facilities where it would be uneconomic to develop another facility and where access would promote competition in another market. Services can be 'declared' for access by third parties under Part IIIA, or where all statutory criteria under section 44 of the TPA are met. Alternatively, an existing access regime can be certified as effective under the NAR, thus precluding any potential application for declaration of services covered under the regime.

There are, however, many factors that can influence the productivity of ports of which the regulatory environment is just one. For example, observed productivity differences can occur because of location, technology adopted and access to key road and rail infrastructure as well as differences in the frequency and size of ships visiting the ports and type of freight that is being moved (PC 2003a, Hamilton 1999). Differences can also occur because of cyclical factors, including variations in capacity utilisation associated with economic cycles and a different stages of the infrastructure investment cycle. In addition, the overall efficiency of a port is likely to be based on the current most limiting factor.

Given the relatively small scale of container trade between Australia and the rest of the world and the shallow draft at some Australian ports (particularly the Port Melbourne channel – the busiest container port in Australia), a comparable port would need to have a relatively low rate of container movements, by world standards, and be visited by small ships. Given the geographic location of New Zealand and the relatively small size of it's economy, container ports there are more likely than many to have a similar composition of ships. Further, the scale of New Zealand port operations is not large relative to Australian operations, so that any economies of scale are unlikely to distort productivity comparisons with Australian container terminals.

Of New Zealand container ports, the Port of Tauranga was adopted in this study as a relevant international benchmark. The Port of Tauranga provides an example of productivity improvements that were achieved when regulatory reform similar to the NRA was implemented. For this port, control was moved from a statutory authority to a corporate entity in 1988 (Port of Tauranga, 2006). Subsequent to that change, investment in transport linkages, a new container terminal and the adoption of a modern port management system were undertaken. In the decade following corporatisation, there was a doubling of throughput and the number of containers moved. Subsequently, productivity as measured by these indicators has continued to improve. The port has also achieved high levels of productivity through the use of leading technology and efficient intermodal connections.

Productivity improvement

This study uses net crane rates as an indicator of the overall productivity of container ports and associated activities. This is a widely benchmark of productivity performance of ports (see box 7.2).

Box 7.2 **Measuring relative performance between ports**

Crane rates are a partial measure of technical efficiency, reflecting the application of both labour and capital resources. Crane rates are a useful means of comparing ports and related efficiency because they are:

- influenced by the efficiency of the port as a whole;
- calculated based on a published methodology;
- regularly reported by the Bureau of Transport and Regional Economics (BTRE); and
- widely accepted and used by industry participants as a performance indicator.

Changes in the rate of crane moves can reflect the influence of many factors including the layout of the terminal, access to storage and the composition of freight. Moreover, land-side infrastructure can also influence the productivity of ports as measured by the rate of crane moves.

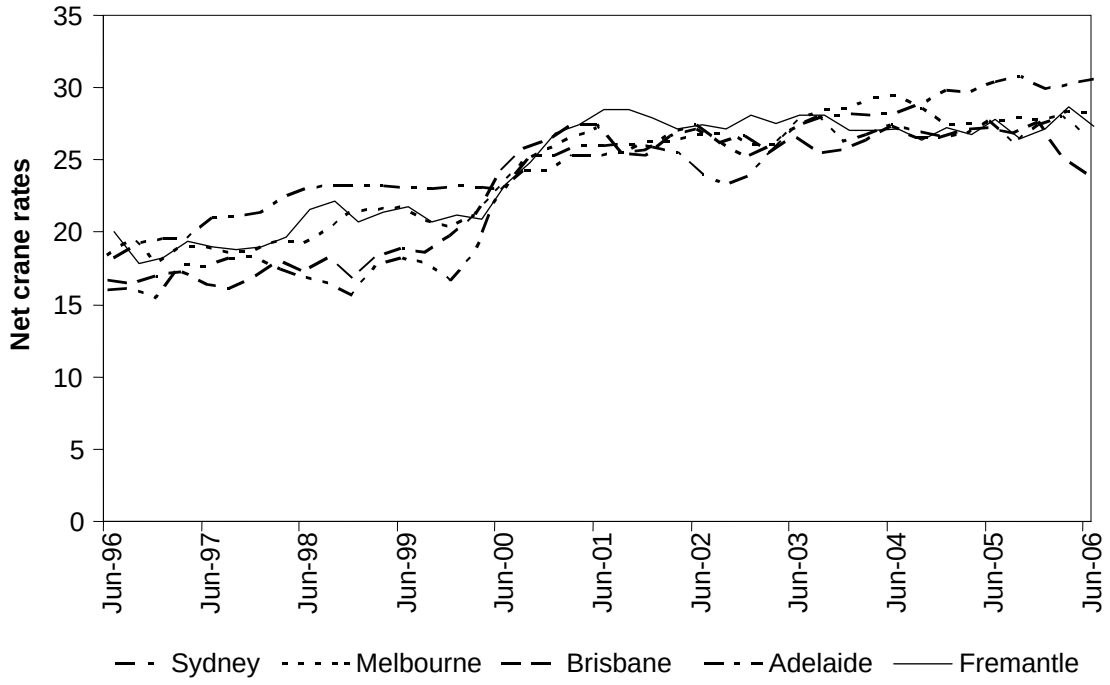
The Port of Tauranga has attempted to calculate net container moves on a consistent basis with the statistics published in the BTRE journal *Waterline* which are the statistics used to indicate port efficiency in Australia for this study.

Sources: BTRE (2002), PC (2003b), Hamilton (1999).

Crane rate data indicate that Australian ports have achieved significant productivity improvements, particularly in the late 1990s (figure 7.1). However, available information suggests little further productivity improvement over the last 5 years.

The data suggest that productivity at the Port of Tauranga remains above that of all Australian ports (table 7.2). The Port of Adelaide, which is managed by a private sector operator (see above), had the highest estimated net crane rates of Australian ports in 2005-06. Based on inter-port comparisons, it would appear that further productivity improvements may be achievable.

Figure 7.1 **Trends in average net crane rates for selected Australian container terminals, 1996 to 2006[a]**



a Net crane rates are containers moved divided by the elapsed crane time (total allocated crane hours or gross hours less operational and non-operational delays).

Source: BTRE (2006d).

Table 7.2 **Average net crane rates for container terminals, 2005-06**[a]
Containers moved per hour[b]

Sydney	*Melbourne*	*Brisbane*	*Adelaide*	*Fremantle*	*Port of Tauranga*
27.0	28.1	26.0	30.4	27.4	32.2

a No estimate is provided for Darwin because of its relatively small scale. **b** Net crane rates are containers moved divided by the Elapsed Crane time (total allocated crane hours or gross hours less operational and non-operational delays).

Sources: BTRE (2006d), Port of Tauranga, pers. comm., (2006).

Full implementation of the NRA is likely to lower impediments to productivity improvement and enable the productivity of Australian ports to be raised absolutely and in relation to other ports. The infrastructure reform substream is likely to directly facilitate productivity improvements through reducing regulatory uncertainty and compliance costs and supporting the efficient use of infrastructure (see above). The transport and infrastructure planning substreams of the NRA are likely to support productivity gains by improving the interface between ports and landside transport and the flow of goods to and from ports in a timely and efficient

manner. The regulatory reform substream could also yield productivity gains by facilitating investment – thereby also increasing competition – and addressing priority hot spot areas influencing the movement and handling of transportable goods (eg rail safety regulation and chemicals and plastics regulation).

However, as noted above, it is possible that because of influences such as location, and access to infrastructure, it may not be practicable to fully bridge the productivity gap through the NRA and related reform. For the purposes of providing a broad indication of the potential benefits of the NRA, it is assumed that full implementation of the agenda would enable at least half the productivity gap between Australian container ports and the current performance levels of the Port of Tauranga to be bridged, over the next 5-10 years. This would imply an increase in the productivity of container ports of between 3 per cent for South Australia and 10 per cent for New South Wales and Western Australia (table 7.3). It is also assumed that the potential productivity improvement would relate to all inputs, including labour, capital and goods and services used in providing container port services.

Table 7.3 **Estimated potential productivity improvements in container ports with full implementation of the NRA[a]**

State	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*
	%	*%*	*%*	*%*	*%*	*%*
Unit cost reduction (All input productivity improvement)	10	8	9	3	10	8

[a]Based on net crane rates contained in table 7.2. Estimated as a 50 per cent reduction in the difference in container moves per hour relative to the Port of Tauranga. The productivity improvement for Tasmania is assumed to be equal to the lowest of the non-corporatised ports (ie all ports except South Australia).

Source: Productivity Commission estimates.

Incentives to invest

At present, there are a number of potential impediments to new investment in port and related infrastructure in Australia. These impediments include uncertainty over access to port infrastructure, the added costs associated with extensive planning approval processes for the development of new facilities and uncertainty surrounding access to and pricing of road and rail transport infrastructure. In addition, investors face the risk of regulators implementing price and access arrangements that differ from those expected. As a result of these uncertainties and risks, commercial operators are likely to seek a higher rate of return than would otherwise be required to invest. This difference is termed a risk premium and will typically result in higher prices being charged to users of port services and lower levels of investment than might otherwise occur. It also may result in sub-optimal outcomes.

The performance of the interface between ports and road and rail infrastructure can also impose costs on port related activities and add to risk at to port and related activities. In addition to the expected operational delays caused by traffic congestion, regulation of road and rail infrastructure can also impose risks and uncertainties for port operators. These risks and uncertainties include the basis for accessing the rail network, restrictions on the weight and configuration of trucks and trains accessing the ports and uncertainty concerning the timing and nature of road improvements, alterations and pricing.

The reforms included in the NRA competition stream have the potential to reduce regulatory uncertainty and thereby the risk premium associated with existing as well as potential providers of port infrastructure and related services. Reductions in regulatory uncertainty are likely to encourage productivity enhancing investment by incumbent operators and new entrants. Such investment is likely to raise productivity and to increase competition. This is of particular importance in the longer run in view of the expected growth in the international freight task.

There can also be more direct impediments to new investment in ports. For example, constraints on the availability of suitable land for extending existing container ports or building new facilities. Also, long-term infrastructure leasing arrangements favouring incumbent operators can raise barriers to new entrants (ACCC 2006b, p 51). Reforms included in the infrastructure regulation and infrastructure planning stream have the potential to address these kinds of impediments.

In broad terms, the full implementation of the NRA competition and regulatory reform stream is likely to encourage more efficient and timely investment in container ports and associated infrastructure and increased competition in container port services.

One means of assessing potential improvements from reducing the regulatory risk-related premium and regulatory barriers to potential new investment is to compare the rates of return achieved by Australian container port operators and overseas operators over time. Such comparisons are fraught with difficulty because rates of return across units and over time can vary for many reasons including:

- the regulatory and administrative environment — and any attendant regulatory risks and barriers to efficient competition;
- the inherent risk of operating in a particular market; and
- cyclical and other factors.

Subject to this significant qualification, comparative information is available from data provided by the ACCC monitory reports.[4] The information shows (table 7.4) that average returns to Australian stevedoring operations (stevedoring, port side storage and payments for port based vehicle booking systems — ACCC 2006, personal communication, December 20) have risen:

- significantly since 1998-99; and
- relative to average rates at New Zealand ports.

Table 7.4 **Average rates of return of operators at Australian and New Zealand container ports — earnings before interest and tax/average assets, 1998-99 to 2005-06**

	1998-99	*1999-2000*	*2000-01*	*2001-02*	*2002-03*	*2003-04*	*2004-05*	*2005-06*
	%	*%*	*%*	*%*	*%*	*%*	*%*	*%*
Australian stevedores	11	13	15	19	26	28	23	22
Selected New Zealand operators	18	19	19	17	15	14	10	9
Difference[a]	71	43	24	-12	-43	-50	-55	-57

a Calculated as the New Zealand rate *less* the Australian rate, *divided* by the Australian rate. New Zealand data is for firms undertaking stevedoring activities.

Source: ACCC (2006b).

The Commission has not received information in the course of this study that would enable the difference to be meaningfully decomposed to determine the relative importance of factors contributing to changes in the returns:

- to Australian operators over time; and
- differences between Australian and New Zealand operators.

That said, the comparison does provide a plausible basis for canvassing the implications of lower regulatory risk and reductions in regulatory and administrative impediments to new investment in Australian container ports — and associated increases in competition arising from new or potential investment. Assuming current returns are above the 'normal rate of expected, risk adjusted return' (ie the risk adjusted rate of return that would apply in a competitive market), higher investment would be accompanied over time (say over a period of 5-10 years) by the progressive adjustment of unit returns to container ports towards

4 Data on unit revenues, costs and margins were sourced from the ACCC Container Stevedoring Monitoring Report 2004-05. ACCC (2006b) aggregates individual company data to obtain national average revenue, cost and margins, expressed on a per unit basis.

'normal' levels. Some of that adjustment would be due to the lowering of regulatory risk; and some due to an increase in competition.

For the purposes of providing a broad indication of the benefits from reduced regulatory risk and regulatory related impediments to investment, it is assumed that full implementation of the NRA would enable the average gap in unit returns, with benchmark New Zealand ports, over the period 2003-04 to 2005-06 to be reduced by half. This would amount to a 25 per cent reduction in the rate of return to Australian container port operators.

Bulk ports

Of particular concern in recent years has been the capacity of Australian bulk handling ports and export supply chains to meet demand — particularly for commodities such as coal and iron ore. For example, in its submission to the Export and Infrastructure Taskforce (EIT), Xstrata Coal estimated that forgone coal tonnage from capacity restrictions at Dalrymple Bay and Port Waratah (Newcastle) was about 6.5 million tonnes.5 (Xstrata 2005, p5) The surge in demand combined with constraints in the export supply chain resulted, in some instances, in significant queues. Such delays can raise operating costs and reduce the international competitiveness of the coal industry from levels that might otherwise be achieved. However, the case of the Dalrymple Bay coal loader illustrates that a variety of factors, including regulation, can contribute to capacity constraints (box 7.3).

If the need for increased capacity in bulk handling facilities has not been fully anticipated and new investment is required, given the nature of these facilities, there will always be a lag — potentially substantial — before new capacity can be brought on line. In the interim, there are a number of strategies port operators and export industries can use to help manage supply constraints, including queue management systems and improvements in supply chain logistics.

There is a concern that regulation may considerably lengthen the time it takes to bring new capacity on line. While the EIT acknowledged that the unanticipated nature of the surge in coal demand contributed to the widely publicised queuing of ships at the Dalrymple Bay Coal loader, it also indicated that current regulatory requirements can add up to two years to the time required to bring new facilities on line (EIT 2005, pp. 28-30).

5 Xstrata noted the amount of forgone revenue from capacity restrictions was small when compared with the increase in total export revenue as a result of higher commodity prices.

Box 7.3 **Capacity constraints and regulation at Dalrymple Bay**

The Dalrymple Bay Coal Terminal (DBCT) was established in 1983 by the Queensland Government as a common-user coal export facility. The infrastructure at Dalrymple Bay is publicly-owned and leased to DBCT Management. DBCT Pty Ltd, which is wholly owned by the terminal's users, is sub-contracted to operate the terminal on behalf of DBCT Management.

The DBCT has considerable market power as an export coal terminal for the Bowen Basin coal mining industry and its coal handling services have been declared for third-party access under Part V of the *Queensland Competition Authority Act 1997* (QCA Act). Under this access regime, the access provider, DBCT Management, negotiates access with users. In the event that an access agreement cannot be concluded, either party can lodge a dispute with the Queensland Competition Authority (QCA) for mediation or arbitration.

In June 2003, DBCT Management submitted a draft access undertaking relating to the terms and conditions of access for the coal handling services at DBCT to the QCA. As a part of the QCA's investigation into the undertaking, it addressed a range of issues including pricing, the provision of capacity, the scope of the undertaking and operational arrangements.

The QCA made its final determination not to approve the draft access undertaking in April 2005. Commentators expressed the view that the delay in the decision had held up capacity expansion plans at DBCT at a time when excessive ship queuing and large demurrage costs were being experienced at the port. The QCA rejected assertions that its investigation either delayed the expansion of the terminal or caused the queue of ships off the Hay Point coastline. The QCA maintained that the boom in demand in early 2004 had not been foreseen by either the users of DBCT or DBCT Management.

They identified a number of factors that contributed to the infrastructure bottleneck that occurred at Dalrymple Bay, including: limitations of the coal chain delivery system at the time meant that the terminal was not operating at its full potential capacity; the collapse of a terminal coal reclaimer reduced terminal capacity; high ship arrival rates, in addition to a decline in ship sizes, increased the number of ships to be handled; and the absence of a capacity management system exacerbated congestion problems.

In June 2006, the QCA published its decision to approve the revised access undertaking submitted by DBCT Management in January 2006. The most recent terminal expansion from 55 to 59 million tonnes per annum (mtpa) was commissioned in August 2006 — with future expansions to 68 mtpa due to be commissioned in September 2007 and 85 mtpa in October 2008.

Source: QCA (2006).

The costs associated with excessive components of approval processes include the delay or deferring of investment decisions and the loss of production. However, if those delays can be overcome, increased investment may also increase competition and reduce costs. This potential is especially pronounced in relation to port and related services in Australia.

This underscores the importance of having efficient regulatory frameworks in place, which strike an appropriate balance between the costs and benefits of government intervention and regulation.

Full implementation of the infrastructure regulation and infrastructure planning substreams of the NRA could potentially reduce regulatory risk and impediments to efficient and timely investment. In addition, implementation of the regulatory reform stream could lower compliance costs to industry and increase competition.

The longer-run direct benefits could include higher productivity of service provision and lower required risk premiums. The completion of new infrastructure projects may also occur in a shorter time-span, helping to avoid short-run capacity constraints, improve the responsiveness of industry to changes in demand and increase competition in port services.

At this stage, however, the Commission does not have estimates of the potential direct impacts of the NRA in terms of productivity or the reduction in risk at bulk ports. Because of the diversity of these ports in terms of their size, scale and composition of commodity trade, establishing such estimates at the industry level, although worthwhile, would be problematic.

Given these considerations, the potential effects of the NRA reforms on bulk ports have not been quantified for this study.

7.4 Summary of direct impacts

Available qualitative and quantitative information suggests that potentially significant benefits could be achieved at Australian container ports through NRA reforms. For these ports, potential productivity improvements were estimated on the basis of a relevant international benchmark.

Assuming that each jurisdiction could reduce the gap between current productivity levels and the benchmark performance level by at least one half, productivity at Australian container ports could be improved by 3 to 10 per cent from current levels (table 7.5). If this were achieved a cost saving of about $160 million (2005-06 dollars) would be available.

It is contended that achieving efficient regulation and addressing impediments to new investment could yield new efficient investment, including new entrants to the sector, and bid down unit returns. If the Australian container port industry could reduce the average gap with reference level by one half, the unit cost of capital potentially could be reduced by 25 per cent.

New economically efficient investment would in turn be an enabling influence on the progressive adoption of cutting-edge technologies and ways of working, and thus the achievement of productivity potential.

Table 7.5 **Consolidated estimates of NRA reform-induced effects on container ports and related infrastructure**

State	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*
	%	*%*	*%*	*%*	*%*	*%*
Improvement in the productivity of all inputs	10	8	9	3	10	8
Reduction in unit returns to investment	25	25	25	25	25	25
Implied direct price effects (price reduction)	13	12	13	9	13	12

Source: Productivity Commission estimates.

Further benefits may also be available to bulk ports through the reduction of regulatory uncertainty and other impediments to timely and economically efficient investment. However, available information does not support the quantification of the sector-wide benefits of reform.

8 Regulatory burden

Key points

- Unnecessary or poorly designed and implemented regulation can impose excessive compliance costs on business, restrict competition and distort the allocation of resources in the economy.
- Significant gains have been made over the past 20 years from regulatory reforms directed at removing long-standing impediments to competition.
- However, sufficient attention has not been paid to the growth of new regulation and the associated compliance costs. Available information suggests that the compliance costs of regulation are significant and could be as high as 4 per cent of GDP per annum.
- Based on domestic and international evidence, it is considered that NRA-consistent reforms have the potential to reduce compliance costs by up to 20 per cent.
  - If this reduction could be achieved, a resource saving of as much as $8 billion (2005-06 dollars) would potentially be available.

Regulation is pervasive in modern societies, and well targeted and designed regulation offers significant benefits. It facilitates many everyday transactions and can help deliver economic, social and environmental outcomes that may not have been achieved with the normal workings of markets. At the same time, complying with regulation costs businesses and individuals time and money, and can also have broader economy-wide impacts, such as through raising prices or reducing consumer choice, innovation and productivity. Accordingly, to ensure that regulation delivers the greatest net benefit to society, it needs to be properly justified, well designed and avoid imposing unwarranted compliance costs.

This chapter outlines the NRA regulatory reforms and objectives. It explores the ability of these reforms, given the nature of Australia's regulatory system, to reduce compliance costs. To do this, domestic and international evidence of compliance costs is examined and the possibility for reductions assessed. In examining the potential effects of NRA-consistent reforms, this chapter focuses on regulatory reform not covered in other chapters.

8.1 NRA reforms and outcome objectives

There are approximately 60 Commonwealth Government regulators and national standard-setting bodies involved in developing and/or administering regulations. A further 40 Ministerial Councils are involved in making regulations. Allowing for various organisations in the States and Terrorities, there could be up to 1300 regulators (including some 700 local governments) across the three levels of government (PC 2005c, RTF 2006).

In this context, the regulatory reform stream of the NRA focuses on reducing the regulatory burden of all three levels of government (COAG 2006a). To this end, COAG has outlined a range of reforms.

All governments have agreed to seek best practice regulation through enhanced regulatory impact analysis to limit unnecessary compliance costs, reduce restrictions on competition and provide greater consultation and transparency. This analysis includes recognising the cumulative burden of regulation and improved measurement of the compliance costs of regulation (box 8.1).

Box 8.1 **Best practice regulation reforms**

COAG has agreed that governments will aim to maximise the efficiency of new and amended regulation and to avoid unnecessary compliance costs and restrictions on competition by:

- establishing and maintaining 'gate keeping mechanisms' to ensure that the impact of proposed regulatory instruments are made fully transparent to decision makers in advance and to the public as soon as possible;
- improving the quality of regulatory impact analysis through the use of cost–benefit analysis (where appropriate);
- improving the measurement of compliance costs, such as through the use of the Business Cost Calculator; and
- broadening the scope of regulatory impact analysis to recognise the effect on individuals and the cumulative burden on business (where appropriate) and considering alternatives to new regulation, including the existing options used in other jurisdictions.

Source: COAG (2006a).

All governments have also agreed in-principle to adopt a common benchmarking framework for measuring and reporting the regulatory burden in each jurisdiction. The Commission's 'Performance Benchmarking of Australian Business Regulation' study aims to develop a range of feasible quantitative and qualitative performance

indicators and reporting frameworks, for use across all levels of government. This study will assist COAG to implement its in-principle decision to adopt a common benchmarking framework (PC 2006d).

Further, all governments have committed to completing outstanding 'priority' legislative reviews arising from the NCP Legislative Review Program. This public review process has also been recommitted to under the NRA, with governments agreeing to:

> … undertake targeted public annual reviews of existing regulation to identify priority areas where regulatory reform would provide significant net benefits to business and the community (COAG 2006a, p. 5).

All governments have also agreed to take action to address 10 cross-jurisdictional 'hot-spot' areas where overlapping and inconsistent regulatory regimes are impeding economic activity.[1] Box 8.2 lists the 10 regulatory areas and provides selected examples of the nature of overlap and inconsistency.

Box 8.2 **Regulatory reform of the cross-jurisdictional 'hot spots'**

All jurisdictions have committed to identifying and addressing as a priority those areas where overlapping and inconsistent regulatory regimes are impeding economic activity. COAG agreed to take immediate action by addressing 10 areas: rail safety; OH&S; trade measurement; chemicals and plastics; development assessment arrangements; building regulation; business registration; environmental assessment and approvals processes; personal property securities; and product safety.

Overlap and inconsistency problems can arise in a number of ways:

- *Domestic inter-jurisdictional overlaps and inconsistencies*: between the Commonwealth and States and Territories but also between States and Territories themselves. For example, despite having a national building code, State and Territory governments retain the ability to make regulations, leading to inconsistencies in a number of areas.
- *International inconsistencies:* between domestic and international standards can mean that some products (including inputs) that are well recognised in overseas markets are not permitted in Australia and export businesses may have to comply with both domestic and international standards. This is sometimes the case for businesses dealing with chemical and plastics regulation.

(continued next page)

[1] The first six hot spots were agreed to at the February 2006 meeting of COAG and the remaining four at the July 2006 meeting.

Box 8.2 **(continued)**

- *Variation in definitions and operational reporting:* for example, OH&S provisions vary according to the State or Territory, raising compliance costs for employers operating in more than one jurisdiction.
- *Repetitive information provision:* businesses often have to provide the same or similar information to different levels of government. For example, to register a business there are two processes: applying for an Australian Business Number (Commonwealth Government) and registering a business name (State government). Businesses need to provide the same or similar details to comply with both requirements.

These concerns are not new, with a considerable number of reviews and reform initiatives having been developed to address them. The Commission has undertaken public inquiries covering a number of these areas including building regulation, product safety, OH&S, environmental bilateral agreements and rail safety. In addition, several Ministerial Councils have been requested to develop action plans on ways to harmonise State government regulations.

While there has been some success in implementing reforms, progress has been slow. Existing regulatory inconsistencies ideally should be addressed through systematic reviews and implementation of the recommendations. However, experience shows that a reform agenda is often not enough, with genuine reform also requiring strong political leadership and follow-through in all jurisdictions.

Source: RTF (2006).

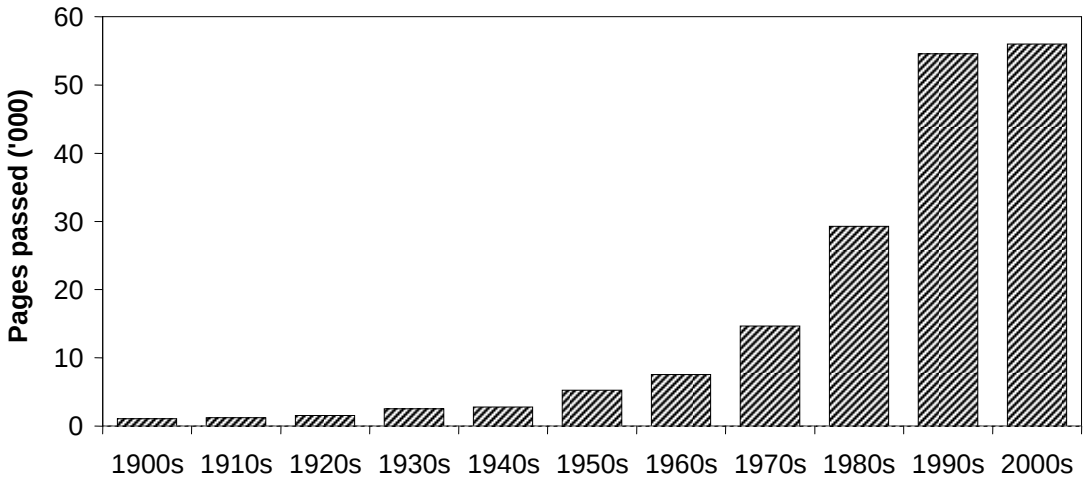
8.2 Regulatory developments in Australia

Regulation is broader than the 'black-letter law' of legislation, statutory instruments and by-laws — it also includes 'quasi-regulation' and government instruments such as industry codes of conduct and mandatory rules. While not all regulation is enshrined in legislation, it still imposes obligations and costs on business.

The recent increase in the burden of regulation impacting on business is well documented (for example, BCA 2005 and RTF 2006). One crude measure of this increase is the growth in the volume of regulation. For example, between 2000 and 2004, as many pages of Commonwealth Government legislation were passed as during the period 1901 to 1969 (figure 8.1). This growth has added to the already 'large' stock of existing regulation. The Regulation Taskforce noted that there are more than 1500 Commonwealth Acts of Parliament and around 1000 statutory rules in force, as well as an unknown quantity of Commonwealth 'subordinate'

legislation (RTF 2006).[2] This is in addition to State and local government regulation.

Figure 8.1 **Estimated growth in Commonwealth Government primary legislation, 1901 to 2004**



a Data for 2000s are based on actual pages of legislation passed in 2000 to 2004.

Source: BCA (2005).

There may be legitimate reasons for some growth in regulation. For example, as incomes have increased, demand for regulations that protect the natural environment or improve safety regimes have also risen. Another reason paradoxically relates to Australia's regulatory reform agenda aimed at removing many of the impediments to competition and efficiency. Much of this regulatory reform agenda has involved 're-regulation' — replacing one set of regulation with another. While reforms have generated net benefits to the community (see section 8.5), the resulting regulation has sometimes been complex to administer and comply with (Banks 2005).

An increase in the risk aversion in many spheres of life has also increased pressure on governments to regulate to provide a 'solution' to everyday problems, and there is always political pressure on governments from interest groups to enact regulations that provide benefits to particular sections of society.

The cumulative impact of the growth in regulation is that businesses are subject to a vast and complex assortment of regulation, with a potentially considerable regulatory burden. This burden tends to fall more heavily on Australia's many small

[2] Subordinate legislation is a collective term for statutory rules, regulations, ordinances, by–laws and rules. It is made by persons or bodies that Parliament has delegated some of its law–making powers (often a government department).

businesses which have less capacity to deal with it. Regulatory burden also imposes broader costs on the government and the economy as a whole (box 8.3).

Box 8.3 **Potential costs of regulation**

As a form of government intervention in markets, regulation generally has fewer fiscal costs to government than other forms of intervention. However, regulation still imposes a number of costs on society. For this study, these costs are broadly classified as:

- *governments administration costs* — costs incurred by the government in 'regulating';
- *compliance costs* — the costs incurred in fulfilling and proving compliance with specific regulations; and
- *efficiency costs* — the costs imposed on the economy when regulation distorts the use of resources.

Governments incur costs in designing, implementing, enforcing, reviewing and updating regulation. Generally, it is difficult to precisely estimate government regulatory administrative expenses as they tend to be spread across many government organisations, across different levels of government, and are often combined with other operating costs. However, the administrative expenses of a sample of 15 dedicated Commonwealth Government regulatory agencies approached $2 billion in 2003-04 (PC 2005a) — providing some evidence that government administration costs alone are not trivial.

Reducing government administration costs — although generally welcomed by tax payers — is not the primary focus of NRA regulation reforms. Even so, there may be potential cost savings to government which result from better and more effective regulatory systems such as by eliminating duplication and inconsistencies between jurisdictions. Of course, implementing the NRA regulatory reforms will entail its own government administration costs. A discussion of these costs is outlined in section 8.6.

Compliance and efficiency costs of regulation are discussed in sections 8.3 and 8.5, respectively.

Government actions to reduce burdens

Governments have periodically sought to limit or reduce business compliance costs, and to counter pressures leading to over-regulation generally. For example:

- there have been a number of ad hoc reviews addressing business compliance costs, including the 1996 Small Business Deregulation Taskforce, the Commonwealth Treasury's Financial Services Reforms Refinement project and reviews undertaken by the Board of Taxation; and
- reforms to regulation-making processes have also been introduced, such as the Regulation Impact Statement process (adopted by the Commonwealth and most

State and Territory governments), which seeks to ensure that regulations are properly assessed before being implemented.

In response to more recent concerns from business about the growth of regulation and its cumulative burden, in October 2005 the Commonwealth Government appointed a Taskforce on Reducing Regulatory Burdens on Business ('Regulation Taskforce') to examine and report on areas of Commonwealth Government regulation that imposed undue costs on business. The Commonwealth Government has agreed (in full or in part) to almost 90 per cent of the Taskforce's recommendations (box 8.4).

Box 8.4 Commonwealth Government response to the Regulation Taskforce

The Commonwealth Government released its final response to *Rethinking Regulation: Report of the Taskforce on Reducing Regulatory Burdens on Business* on 15 August 2006. The Government agreed (in full or in part) with 158 of the Taskforce's 178 recommendations.

In doing so, the Government committed to address the regulatory burden across a wide range of areas including labour market, consumer protection, building, environmental, financial, superannuation and trade-related regulations.

To address the underlying causes of over regulation and excessive compliance costs, the Commonwealth Government agreed to:

- improve the Regulation Impact Statement (RIS) process, including requiring a higher level of impact analysis;
- mandate the use of cost–benefit analysis, particularly for significant regulatory proposals;
- mandate the use of the Business Cost Calculator for all regulatory proposals (see below);
- ensure that Cabinet considers only regulatory proposals for which an adequate RIS has been prepared, unless there are exceptional circumstances (and, if so, requiring a review within one to two years); and
- undertake reviews of all regulation every five years.

The Commonwealth Government's Office of Best Practice Regulation (formerly Office of Regulation Review) will be responsible for assisting with the implementation of the Government's reform program, including training government departments in RIS and cost–benefit analysis, and reporting on compliance with these principles of regulatory best practice.

Sources: Australian Government (2006).

State and Territory governments have also been undertaking regulatory reform. A number of jurisdictions have conducted reviews similar to the Regulation Taskforce. Some State governments have also set targets to reduce regulatory compliance costs (see below). Selected examples of State and Territory regulatory reform initiatives are provided in box 8.5. The Commission's annual publication, 'Regulation and its Review 2005-06', provides a more comprehensive description of reforms undertaken by the States and Territories in 2005-06 (PC 2006c).

Box 8.5 **A 'sample' of State regulatory reform initiatives**

Consistent with the principles and objectives agreed to in the NRA, the States and Territories initiated a wide range of regulatory reforms in 2005-06:

- **New South Wales** is undertaking or has recently completed regulatory reviews such as: the NSW Government Red Tape Review — an internal review of unnecessary administrative burdens imposed on NSW government agencies; IPART's review of the burden of existing regulation in NSW on business and the community; and a series of rolling reviews of specific industries examining the regulatory burden facing small business.
- **Victoria** undertook a review into streamlining the planning permit process and transport congestion; merged several regulators; and introduced a number of new Acts to simplify and consolidate the legislative framework.
- **Queensland** completed the 2004-05 Red Tape Reduction Stocktake, assessing that regulatory reform had reduced compliance costs in Queensland by $14 million; and undertook a number of public reviews including a review of regulatory 'hot spots' as well as industry specific reviews (manufacturing, retail and tourism).
- **Western Australia** established a number of forums and roundtables to provide small business with an opportunity to raise concerns, and is currently undertaking a review of State taxes.
- **South Australia** created a Competitiveness Council which will provide progress reports on the implementation of government initiatives to reduce compliance costs; requires compliance costs to be quantified in regulatory proposals using the Business Cost Calculator; and undertook a survey of small business to identify and reduce 'red tape' hot spots.

Source: PC (2006c).

8.3 Regulatory compliance costs

It is well recognised that regulation imposes compliance costs on businesses, by requiring them to undertake activities and provide information to governments and third parties.

The Business Cost Calculator is a measurement tool that aims to capture the vast range of compliance costs on business.[3] It does this through the eight compliance cost categories: notification, education, permission, purchase costs, record keeping, enforcement, publication and documentation, and procedural changes. It also includes an additional 'other cost' category to capture costs not readily classifiable to one of the above eight groups (DITR 2006). Examples of compliance costs, consistent with the scope of the Business Cost Calculator, relate to the costs associated with:

- providing staff time to fill in and lodge forms, and undertaking inspections and audits of premises or processes;
- recruiting and training staff in new processes or the use of new equipment;
- purchasing materials and equipment to comply with a regulation such as a fire extinguisher;
- staff time used in undertaking fire safety drills several times a year;
- paying administrative fees associated with lodging applications;
- supplying customers with information regarding products or displaying signs around dangerous equipment;
- establishing and maintaining reporting systems (including information technology systems), such as the details of accidents in the workplace or training provided to employees on hazardous substances; and
- obtaining advice from specialists, such as accountants and lawyers, to assist with compliance.

As some level of regulation is necessary to meet desired policy objectives that benefit the community, some level of compliance costs will be *unavoidable* — that is, the optimal level of compliance costs is *not* zero. The aim of governments should be to establish regulatory requirements in a way that *minimises* the costs, including compliance costs, necessary to achieve the given policy goals.

In practice, compliance costs incurred by business often exceed the level necessary to achieve the policy objectives. The Regulation Taskforce identified a number of ways that excessive compliance costs can arise, including:

- an unnecessarily high frequency of reporting or the supply of similar/same information to a number of government organisations or levels of government;

[3] The Business Costs Calculator was developed by the Office of Small Business in the Department of Industry, Tourism and Resources.

- a greater coverage of regulation than originally intended because of poor design/implementation, or because the real value of thresholds has been eroded by inflation (for example, the superannuation guarantee exemption);
- overlaps and inconsistency between jurisdictions;
- inconsistencies in definitions and criteria; and
- regulation that is redundant or not justified by policy intent.

In examining the impact of NRA-consistent regulatory reform, a broad 'tops-down' approach has been taken in this study. Evidence of the size of compliance costs and the extent to which these measured costs are excessive have been reviewed and broad conclusions about what is potentially avoidable have been made. This approach does not try to assess the impacts of removing excessive compliance costs in specific areas (such as the identified 'hot spots') or aggregate those impacts across the economy (a 'bottoms-up' approach).

In addition, this analysis assumes that the NRA-consistent reforms are fully implemented. The potential effects are, therefore, the 'most likely upper bound', not necessarily the 'most likely outcome'.

Regulatory reform initiatives that result in a direct transfer of compliance costs from the business sector to the government sector (or individuals) are not considered as potential benefits of reform. In this context, initiatives to reduce taxation compliance burden on business, for example, will only be considered a benefit of reform if there is *no* offsetting increase in government administration costs to help business comply with existing taxation policy objectives.

Issues in measuring compliance cost

The starting point in estimating the scope to reduce unnecessary compliance costs is to first assess the evidence of the size of overall compliance costs. However, there are a number of measurement issues that need to be considered.

First, the NRA regulatory reforms aim to reduce the regulatory burden of the compliance costs to the entire community (business, government, individuals). Ideally, it would be desirable to understand the magnitude of overall community compliance costs. However, most studies have a principal focus of measuring regulatory compliance costs of 'business' — that is, privately owned businesses operating for a profit. Nonetheless some studies do have a slightly broader scope.

Second, it is often difficult to disentangle regulatory compliance activities from normal business activities. For example, some compliance activities (such as basic

record keeping) would have been undertaken by business regardless of the regulatory requirement, making it difficult to estimate the incremental cost to business for activities that are directly caused by regulation.

Third, it is important to have a clear understanding of the costs covered by each study. For the purposes of this chapter, compliance costs (as defined above) include a broad range of costs generally consistent with those covered by the Business Cost Calculator. Nevertheless, some studies focus on more limited definitions generally because this information is readily available. For example, most overseas studies focus on measuring a subset of business compliance costs — referred to as 'administrative burdens' using the so called Standard Cost Model (SCM) methodology (box 8.6). The focus of the NRA reform objectives, however, is not just on 'administrative burdens' but on the overall regulatory burden imposed by compliance costs. Even so, these SCM studies still provide some insight into a portion of the compliance costs imposed by regulation.

Box 8.6 **The Standard Cost Model methodology**

The Dutch government developed the SCM to measure the 'administrative burden' that regulation places on business. Administrative burdens are defined as:

> '…the costs of complying with government imposed 'information obligations'… where information obligations are the requirement to obtain or prepare information and subsequently make it available to either a public authority or a third party. (OECD 2005a, p. 4)

As measured by this framework, the administrative burdens are associated only with activities related to businesses *providing information*. This includes the costs of filling in and lodging forms, updating manuals, or preparing safety plans and submitting these to government or having these available for audit or inspection.

Based on this definition, administrative burdens are a subset of the costs normally considered to be regulatory compliance costs. This definition does not take into account the costs associated with collecting and processing information, other than when they are associated directly to compliance with a specific obligation to produce information (OECD 2005a). It does not include permit fees, one-off costs associated with the introduction of new legislation such as education and training or the purchase of necessary equipment such as a first aid kit.

As the SCM is a framework designed for European countries, it explicitly takes into account administrative burdens stemming from the European Union as well as national government regulations. Those from other levels of government, however, are not considered in the overall attempt to calculate compliance costs.

Based on the narrow definition and the exclusion of lower levels of government, measured estimates of costs using the SCM can be interpreted as a 'lower bound'.

Sources: OECD (2005a), SCMN (2005).

Empirical evidence of regulatory compliance costs on business

International estimates of administrative burdens

Using the SCM, the governments of the Netherlands and Denmark found that regulatory administrative burdens of business in these countries were 3.6 per cent (€16.4 billion) and 2.4 per cent (€4.5 billion) of GDP, respectively (SCMN 2005). In attempting to measure these costs on business, the Netherlands include 'public owned businesses which cover their own costs' as well as privately owned businesses. In contrast, Denmark has focused strictly on the privately owned businesses.

In December 2006, the United Kingdom Government released a government-wide action plan identifying methods to reduce red tape in the UK economy. This action plan reported that annual administrative burdens in the UK was £13.7 billion in May 2005, using the SCM approach (UK Cabinet Office 2006). The Financial Services Authority and Revenue and Customs agency carried out separate measurement exercises, also using the SCM methodology, with a combined administrated burden estimated to be around £6 billion (Real Assurance Risk Management 2006a, 2006b). Aggregate UK administrative burdens are, therefore, considered to be around £20 billion (or 1.6 per cent of GDP). Nevertheless, the reports associated with these administrative burden estimates have stressed that the estimates are not necessary statistically robust but rather are an indication of the overall burden.

The Czech Republic, Norway, Germany, Poland, Italy and Sweden have also announced that they are attempting to estimate the cost of administrative burdens on 'business' using the SCM (OECD 2006a).

A survey by the Belgian Federal Planning Bureau suggests that the administrative burden on business in Belgium was around 1.7 per cent of GDP in 2004, following a number of years of administrative reform (Janssen, Kegels and Verschueren 2006).[4]

In summary, international estimates of administrative burdens on business generally are generally around 2 per cent of GDP, with the exception of the Netherlands (table 8.1). Obviously, if a broader range of compliance costs were to be included, the measured cost should be higher. However, empirical information is not available to judge how much higher they would be. Nevertheless, the Dutch Government believes that these other costs (not included in the measurement of administrative

[4] Only limited information regarding this survey is available in English.

burden) could be 'much more than the administrative burdens' (Ministry of Finance (Netherlands) 2006).

Table 8.1 **Administrative burden cost estimates**

Country	*Reference year*	*% GDP per year*
Netherlands	2002	3.6
Belgium	2004	1.7
Denmark	2004 to 2006	2.4
United Kingdom	2005	1.6

a Includes a broader range of compliance cost than just administrative burdens.

Sources: Janssen, Kegels and Verschueren (2006), SCMN (2005).

Compliance costs in Canada

Based on a 2005 survey of around 7000 'businesses', the Canadian Federation of Independent Business (CFIB) claims that the cost to Canadian businesses of complying with regulation is likely to be around $33 billion annually (2.6 per cent of GDP).[5] This result is based on assessments by businesses of the amount of time spent doing paperwork related to regulation and other related activities such as education and training, professional fees and costs associated with special equipment and renovations solely to comply with regulations. The suggested estimate provided by the CFIB also includes an estimate for the cost of lost sales as a result of regulatory delays (CFIB 2005). While the methodology used to calculate this latter component is questionable, the cost of lost sales is generally not included in estimates of 'compliance cost', including those derived using the Business Cost Calculator.

Evidence of compliance costs in Australia

The Lattimore study

Lattimore et al. (1998) estimated 'paperwork' compliance costs for Australian businesses to be approximately $11 billion in 1994-95 (2.3 per cent of GDP) drawing on the results from a 1996 Small Business Deregulation Taskforce survey and Evans et al. (1997). Compliance costs were defined to include the costs of managers and staff time, costs of external advisers and incidental costs such as specific travel, stationery, postage and computer use. Aggregate tax compliance

5 The 2005 CFIB report does not provide a definition of the scope of businesses covered in the survey. As it is a survey undertaken by a business association, it would presumably cover a strict definition of businesses in the private sector.

costs for Australian business tax payers were suggested to be around 80 per cent of the estimated compliance costs.[6]

The Lattimore study provides one of the few attempts to measure overall compliance costs of regulation for Australian business. However, the estimate produced predates the impact of changes in regulation since 1994-95, including the introduction of *A New Tax System* in 2000 and the *Financial Service Reform (FSR) Act 2001*. Accordingly, in this respect, the results are likely to be an underestimate of the compliance costs of regulation in 2006.

OECD estimates of the costs of business 'red tape' in Australia

As part of an international study, the OECD (2001) estimated Australian compliance costs for small and medium enterprises (SMEs) — covering tax, employment and environmental regulation — to be approximately $17 billion (2.9 per cent of GDP) in 1998. Compliance costs were defined in this OECD study to include the time and resources spent by owners, managers, staff or hired experts to understand regulations, collect, plan, process, report, retain data, and fill in forms required by government. They included administrative fees but not taxes. Compliance costs also included information technology expenditure but not expenditure on machinery or equipment (box 8.7 provides an overview of the methodology).

Using these OECD survey results and the Lattimore et al. (1998) estimate that SME compliance costs account for 85 per cent of compliance costs incurred by all businesses (large and small), compliance costs, across all size businesses, are likely to be around 3.5 per cent of GDP for the three areas of regulation covered by the OECD study. Nevertheless, in certain respects, this 'all business' estimate is still likely to be an underestimate of the overall compliance burden as it does not cover all areas of regulation and is based on dated information.[7]

6 Business taxpayers include sole traders, partnerships, companies, trusts and superannuation funds. The non–profit organisations are excluded from the research.

7 The OECD's estimate of compliance costs in Australia does not include the additional compliance costs associated with regulation introduced since 1998, including *A New Tax System* in 2000 and the *Financial Service Reform (FSR) Act 2001*.

Box 8.7 **OECD 'Business Views' survey methodology and scope**

In 1998-99, the OECD surveyed the regulatory environments of 11 member countries, assessing business views on the burden of taxation, employment and environmental regulations from local, State and Commonwealth regulations. The farming and mining sectors were *not* included in the study.

In designing the survey, the OECD focused on three areas of regulation and SMEs in order to increase the likelihood that one 'knowledgeable person' could answer the questions. SMEs were divided into three size categories: 1 to 19 employees, 20 to 49 employees and 50 to 499 employees. (This definition is broader than the SME definition used by the ABS which only includes firms employing less than 200 people.) Firms surveyed were asked to estimate: the number of hours they spent per month complying with the regulations; the cost of hiring external assistance; and information technology infrastructure expenditure required to comply with the regulations. Average hourly labour costs in the business service sector were used to produce an estimate of the internal compliance cost per year. Survey responses were extrapolated to estimate a compliance burden for SMEs in each country surveyed.

The Australian Chamber of Commerce and Industry (ACCI) was responsible for distribution and collection of the surveys in Australia. It collected data from SMEs and had a survey response rate of 78 per cent — the highest a the countries surveyed.

Source: OECD (2001).

Compliance cost of taxation

In examining the complexity and compliance costs of the tax system, Oliver and Bartley (2005) made the judgement, based on their own literature review, that tax compliance costs would be around 2 per cent of GDP. In a recent study of international taxes commissioned by the Commonwealth Government, Warburton and Hendy (2006), drawing on the literature review by Evans (2003), stated that compliance costs for personal income tax, corporate income tax and value added taxes (GST) are up to 2.5 per cent of GDP. Both of these studies base their judgement on information which predates the introduction of the GST, indicating that taxation compliance costs could be higher in 2006.

1996 Small Business Taskforce survey

The Small Business Taskforce, based on a commissioned survey, reported that the compliance costs for the average small business in 1996 were measured to be approximately $7000 per year (covering local, State and Commonwealth

Government regulations).[8] The survey results suggested that approximately $3000 per year was spent on external consultants (Small Business Deregulation Taskforce 1996). This phone-based survey covered around 1200 small businesses selected from all States, from metropolitan and non-metropolitan areas and from all industries except agriculture (Yellow Pages 1996).

Extrapolating this suggested compliance cost across all businesses provides a rough estimate of around $8.5 billion in 1996 (or 1.6 per cent of GDP). This estimate is considerably lower than other estimates for Australia, partly as the survey did not include capital costs associated with regulation (Banks 2003).

Submissions to the 2006 Regulation Taskforce

Submissions to the 2006 Taskforce on Reducing Regulatory Burdens on Business provided a range of data estimates on the cost of compliance to business. In the submissions, individual businesses provided estimates of how much it cost them to comply with regulations, including:

- suggested transition costs for initial licensee education and training requirements of the FSR Act (2001) of about $200 million with ongoing costs were claimed to be around $100 million per annum across the industry (BCA 2005);
- compliance costs associated with accreditation from National Industrial Chemicals Notification and Assessment Scheme were claimed to be somewhere between $15–$25 000 per substance (not including direct fees) (Remove Obstacles to Australian Manufacturers 2005);
- the ongoing compliance cost of giving privacy notices over telephone sales were claimed to cost the industry between $1–2 million per annum (Insurance Council Australia 2005); and
- the GST compliance of the average restaurateur or caterer was suggested to be nearing $7 000 per annum (Restaurant and Catering Australia 2005).

In its submission to the taskforce, the NSW State Chamber of Commerce cited its 2003 survey of 'business red tape' claiming that the average business in NSW spent up to 400 hours a year (or almost $10 000) complying with regulations or meeting its legal obligations (SCC 2005). Based on this survey result, a rough estimate of compliance costs, in time alone, would be in the order of $12 billion economy-wide in 2003 (or 1.4 per cent of GDP).

[8] In all industries (including manufacturing), small businesses were defined to be businesses that employ less than 20 people.

The Australian Chamber of Commerce and Industry (ACCI) claimed, in its submission, that the total cost of regulation (that is, overall compliance cost in addition to efficiency costs) in Australia could be as high as $86 billion (10.2 per cent of GDP) (ACCI 2005). However, the Regulation Taskforce raised concerns about the methodology used in the study (RTF 2006). Moreover, no separate estimate of compliance costs was provided in the ACCI submission.

Victorian Government estimate of compliance costs

Reducing the Regulatory Burden is the Victorian Government's commitment to reducing compliance costs on business (see below). Preliminary modelling by the Victorian Department of Treasury and Finance suggests that business compliance cost of regulation in Australia is likely to be around $33 billion (Brumby 2006).

In summary, estimates of likely compliance costs incurred by Australian business vary considerably (table 8.2). These results are derived from business surveys which ask respondents to estimate resources used in complying with regulations.

Based on the 2001 OECD study — the most recent (although still dated) and comprehensive study — business compliance costs in Australia would likely to be somewhat greater than 3 per cent of GDP, especially if a wide-ranging definition of compliance cost, such as that used for the Business Cost Calculator, is applied. If the compliance costs incurred by other sectors of the community (such as government compliance costs) were to be included, the overall compliance costs of regulation to the Australia economy is expected to be higher.

Table 8.2 **Survey-based indicators of the level of business compliance costs for Australia**

Study	*Reference year*	*Regulation covered*	*% GDP per year*
Small Business Deregulation Taskforce (1996)[a,b]	1996	All regulation	1.6
SCC (2005)[a]	2003	All regulation	1.4
Lattimore et al. (1998)	1994-95	All regulation	2.3
OECD (2001)[a,b]	1998	Taxation, employment & environment	3.4
Oliver and Bartley (2005)	1990s	Taxation	2.0
Victorian Government (Brumby 2006)[a]	2006	All regulation	3.6
Warburton and Hendy (2006)	Not stated	Taxation	up to 2.5

[a] Productivity Commission estimate based on the study results. [b] Survey excluded the agricultural and mining sectors.

Efforts to reduce excessive compliance costs

International experience

In 2004, based on the SCM estimate of administrative burdens, the Dutch Government agreed to a range of measures intended to reduce these burdens on business by 25 per cent. If achieved, this suggests savings to business of some €4 billion.

In a 2006 progress report, the Dutch Government claimed that administrative burdens had been reduced by around €2 billion or 12–13 per cent by the end of the first quarter of 2006 (Ministry of Finance (Netherlands) 2006). By the end of 2006, the Dutch Government expects approximately 16 per cent of administrative costs will have been reduced, with the remaining 9 per cent achieved by the end of 2007. Owing to the detailed methodology used by the SCM to measure overall administrative burdens, the Dutch Government is able to specify the alleged cost savings associated with each particular initiative. A description of all measures, date of implementation and the expected saving were published in the progress report. In addition, this reform program is overseen by the independent Advisory Board on Administrative Burdens (ACTAL), which comprises individuals and members of the business community (ACTAL 2006).

In 2005, the Belgian Government claimed, based on the three surveys of administrative burdens undertaken by the Federal Planning Bureau, to have reduced administrative burdens on businesses by 25 per cent in only two years. If it has been achieved, this reduction would represents a saving of €1.7 billion (Kafke 2006).[9]

Denmark, Austria, and the Czech Republic have committed to targets in the order of 20 to 25 per cent for a reduction their overall 'business' compliance cost burdens over the next two to four years (table 8.3). Sweden has committed to reducing the regulatory burden imposed by its taxation regime and business annual reporting by 20 and 15 per cent respectively. At this stage, there is no information to assess whether these targets are likely to be achieved by these countries. Nevertheless, as these countries are members of the SCM Network — an international group concerned with measuring and reducing administrative burdens — there may be some international pressure to make progress towards achieving these targets.

[9] Only limited information regarding this survey is available in English.

Table 8.3 **Targets to reduce the administrative burden**

Country	*Reduction target*	*To be achieved by*
	%	Year
Netherlands	25	2008
Denmark	25	2010
Austria	25	2010
Sweden	15 to 20	Mid 2010
United Kingdom	25	2010
Czech Republic	20	2010
Canada[a]	20	–

[a] Recommendation only.

Sources: OECD (2006a), ACPBR (2006), UK Cabinet Office (2006).

In March 2006, the Canadian Advisory Committee on Paperwork Burden Reduction recommended that the Canadian Government set an aggregate target to reduce administrative burdens by 20 per cent (ACPBR 2006). As yet, this recommendation has not been endorsed by the Canadian Government.

Commonwealth Government Regulation Reduction Incentive Fund

In 2005, the Commonwealth Government established the Regulation Reduction Incentive Fund (RRIF) to provide local government authorities with incentives to introduce regulatory compliance reforms with the intended aim of reducing costs to small business. The RRIF aims to achieve this objective through the streamlining of many council processes such as the establishment of online facilities for the lodgement and tracking of planning applications and building permits; booking building and health inspections; and applying for approval for home-based businesses. The individual savings to small business were projected by local councils using the Business Cost Calculator. In aggregate, the cost savings are expected to represent around $450 million by 2007 (Bailey 2005).

State government targets to reduce compliance costs

Both Victoria and South Australia have announced state regulatory reform programs that aim to reduce the compliance costs of regulation by 25 per cent.

South Australia has established a Competitiveness Council that will make recommendations to the government on regulatory reforms specifically aimed at reducing compliance costs on business (based on the Business Cost Calculator approach) (Maywald 2006). In addition, South Australia Government departments

will submit 'action plans' to the Competitiveness Council that outline their contribution to the government's overall 25 per cent reduction target.

'Reducing the Regulatory Burden' is the Victorian government's commitment to reducing compliance costs on business by 25 per cent over the next five years (with 15 per cent over the next three years) using the SCM methodology (Victorian Government 2006).

1996 Small Business Taskforce survey

The survey commissioned by the Small Business Taskforce (referred to above) found that the average costs of *excess* compliance time identified by small business owners was around $2500 per business per year (in 1996 dollars) — representing approximately 35 per cent of compliance costs (Yellow Pages 1996). However, the authors of the survey noted that some businesses (classified as 'strong doctrinal objectors') believed that any time spent complying with specific regulations (taxation, superannuation guarantee levy and worker compensation) was 'excessive'.

2006 Regulation Taskforce

The Regulation Taskforce indicated that it was not in a position to estimate the excessive element of compliance costs in the time available. However, it did canvass the possibility that excessive compliance costs represented around 20 per cent of total compliance costs. In this context, it made the judgement that the unnecessary costs 'may well total billions of dollars' based on the empirical evidence it reviewed together with the evidence in submissions of significant unnecessary compliance costs at the individual enterprise level (RTF 2006).

8.4 Scope for reducing compliance costs

In assessing the scope to reduce compliance costs, it would be desirable to understand the magnitude of overall community compliance costs as the NRA regulatory reforms aim to reduce the regulatory burden of the compliance costs to the entire community (business, government, charities, non-governments organisations and individuals).

The studies examined in this chapter suggest regulatory compliance costs on *business* tends to be around 2 to 3 per cent of GDP with some studies suggesting business compliance costs could be approaching 4 per cent of GDP. The particular results, however, depend on methodology used and coverage of the studies. As

these studies are generally dated, it is considered that they do not capture the additional and cumulative costs to business of the recent growth in regulation.

Government organisations also incur compliance costs associated with meeting regulations — either government specific regulations such as *Public Service Act 1999* or general regulations such as building codes or OH&S regulation. However, little empirical information is available about the general size of these costs incurred by government. Nevertheless, it is considered that strategies to reduce excessive compliance costs to business would tend to have benefits to the government sector as well.

With this in mind, it is judged that compliance costs could be at least as high as 4 per cent of GDP per year — up to $35 billion in 2005-06. In making this judgement, a broad definition of regulatory compliance costs has been used that is largely consistent with the scope of the Business Cost Calculator.

Even with a likely estimate of the overall compliance cost, what is not known is the extent to which these costs can be avoided (that is, the excessive compliance costs component). The only direct guide of the likely magnitude of excessive compliance costs for Australia relates to small businesses (around 35 per cent) and is known to have an upward bias resulting from a proportion of businesses sending a protest message (Yellow Pages 1996).

From the evidence presented on domestic and international initiatives to reduce the regulatory burden, most jurisdictions and countries have committed to, or are likely to achieve, reductions in the order of 15–25 per cent.

If a 20 per cent reduction in Australian compliance costs were to be achieved through full implementation of NRA-consistent reforms, this would result in a saving of as much as $8 billion in 2005-06 (0.8 per cent of GDP per annum).

Consistent with the broad definition of compliance costs adopted for this study, the NRA regulatory reforms are expected to reduce labour hours spent complying with regulations as well as leading to a more efficient use of other inputs such as capital and business services (such as accountants and lawyers). Importantly, NRA-consistent reforms that result in a transfer of compliance costs from business to the government sector (or individuals) would not be considered as a part of the potential benefits of reform.

8.5 Efficiency costs of regulation

Efficiency costs are generally the lesser-known costs of regulation. They derive from the generation of a less efficient allocation of resources than would otherwise have been used. Unjustified, poorly designed and/or implemented regulation can unnecessarily increase prices and reduce consumer choice, innovation and productivity. While these costs are not explicit — they are not 'paid for' *directly* by business or consumers — they nevertheless indirectly affect producers and/or consumers and are a cost to the economy.

Full-implementation of NRA-consistent regulatory reforms should reduce these efficiency costs by minimising, if not removing, unjustified restrictions on business and consumer decision making. In doing so, the merits of the policy objectives of regulation may, however, have to be reconsidered — that is, an assessment of whether or not the policy objective itself is reasonable may be needed in some cases.

Scope for reducing efficiency costs of regulation

In the time available for this study, it has not been feasible to estimate the likely effects of specific actions that may be implemented as part of the NRA to reduce efficiency costs. The area is too wide ranging: each area would require a separate inquiry or study to assess the costs, benefits and outcomes involved.

Past analysis suggests that the efficiency gains from regulatory reform are potentially large (box 8.8); indeed, many times greater than the benefits from reduced compliance costs. While Australia has already undergone considerable regulatory reform, removing many long-standing impediments to competition and structural efficiency over the past couple of decades, there are likely to be significant improvements in efficiency to be gained from further regulatory reform. In this context, the Commission has highlighted a number of examples where specific reviews would offer the prospect of substantial future benefits, such as anti-dumping, pharmacies, and single desk marketing authorities (PC 2005a). COAG has also acknowledged scope for more reform with the commitment to completing outstanding 'priority' legislation reviews arising from the NCP and the agreement to progress reform in regulatory hot spots (such as OH&S).

Box 8.8 **Some indications of the efficiency benefits from Australia's regulatory reforms**

Australia has undergone considerable regulatory reform over the past couple of decades, removing long-standing impediments to competition and structural efficiency. Throughout this period, studies that have investigated the potential benefit of efficiency improvements have been wide ranging in subject matter with the potential benefits generally significant. While the estimated impacts of potential policy changes are influenced by the analytical framework and the assumptions made, the empirical estimates provide a useful indication of the magnitude of benefits, for example:

- Analysis of the impacts of NCP reforms suggested that they were likely to raise Australia's real GDP by around 5.5 per cent (IC 1995). Subsequent analysis in 1999 suggested that NCP reforms most relevant to rural and regional Australia would increase GDP by around 2.5 per cent (PC 1999b).
- One study of the 2000 tax reforms, including the introduction of a goods and services tax, suggested that they would be likely to increase GDP by around 2.5 per cent (Access Economics 2005a).
- In a 2005 Business Council Australia report, Access Economics suggested that the past workplace reforms are likely to have added at least 1.7 per cent to GDP by reducing average rates of unemployment.
- Modelling of the recent reductions of tariffs on textiles, clothing and footwear, passenger motor vehicles and the removal of general tariffs suggests that they are likely to increase GDP by around 0.2 per cent (Econtech 2003, PC 2000, PC 2002).
- Dee and Hanslow (2000) examined the gains potentially available from eliminating barriers to trade in services, allowing for the comprehensive removal of restrictions on all modes of service delivery. They found Australia's projected gain from global liberalisation of services trade is likely to increase GDP by around 0.4 per cent of GDP a year.

Regulatory and structural reform over the past 20 years has contributed to the productivity surge that has underpinned an extended period of sustained economic growth and rising household incomes (PC 2005a).

8.6 Implementation costs to reduce excessive regulatory burden

In general, costs associated with the implementation of the reform principles outlined by COAG include:

- greater resources devoted to the implementation of an enhanced regulatory impact analysis, such as the increased responsibilities and transformation of the Office of Regulation Review into the Office of Best Practice Regulation (OBPR);

- the costs associated with undertaking reviews of regulation to encourage competition and efficiency;
- the costs associated with the implementation of the recommendations from these reviews; and
- the costs associated with developing a common benchmarking framework and with data collection and reporting.

More specifically, international experience suggests that implementing compliance cost reduction initiatives generally requires additional government spending including:

- expenditure associated with measuring the cost of existing regulations; and
- funding for a central organisation to steer the reforms, monitor and report on progress, in addition to some additional resources for line departments with significant regulatory functions.

While the Commission has not attempted to estimate the likely implementation costs to reduce excessive compliance costs from NRA-consistent reforms, international evidence of the government fiscal expenditure required to achieve these reductions are small relative to the benefits. In the Netherlands, for example, the implementation costs associated with initiatives have been estimated to be less than 1 per cent of the expected decrease in administrative burdens (BRTF 2005).

8.7 Summary of direct impacts

Based on domestic and international evidence, Australian compliance costs could be as high as 4 per cent of GDP per annum. It is considered that NRA-consistent reforms have the potential to reduce these costs by up to 20 per cent (0.8 per cent of GDP per annum or as much as $8 billion in 2005-06 values).

For the purpose of this assessment, the Commission has assumed that the associated compliance costs savings are concentrated in the value adding input of labour and fixed capital inputs and business professional services.

These potential savings do not include any efficiency gains from an improved resource allocation that might result from further regulatory reform (such as anti-dumping or statutory marketing authorities, OH&S). Based on the magnitude of past gains and the fact that there is likely to still be further scope for structural reforms (as indicated by the range of outstanding legislative regulatory reviews), these additional gains may potentially be greater than those achieved through reduced compliance costs.

Part C – Human Capital Stream

9 Productivity of health services delivery

Key points

- The NRA health services component of the NRA focuses on the efficient and effective use of health resources — the productivity of the health system.
- Assessing the potential outer-envelope effects of reform of health services has been a challenging task.
  - Limited detail is available about specific reforms under the NRA.
  - Limited evidence exists about the potential effects that might arise from reforms.
  - Even measuring productivity performance in the health sector is difficult.
- Studies suggest that performance gaps between health service providers in the current health system can be considerable — estimates of 10 to 20 per cent are common. However, the indicators have significant limitations.
  - They are based on (sometimes dated) historical information and do not isolate the effects of policy choices from efficiency and other influences.
  - They are also based on an examination of the industry in its present state, and are not 'forward looking'. They do not fully take account of the potential for change as the NRA seeks to do.
- Against this, from consultations during the course of the study and earlier studies by the Commission, it is widely accepted that significant benefits would be available from reform in health services delivery.
- If improvement in total factor productivity of about 5 per cent, as many accept, were achieved, a cost saving of about $3 billion (2005-06) would be available.
- Changes within the health system to achieve such reform benefits would be progressively realised over the long term (up to 10 years or more).

Improving the productivity of the delivery of health services was nominated as an objective of the NRA at the February 2006 meeting of COAG. In this chapter, the potential for productivity improvement is assessed. In so doing, the Commission is cognisant of the myriad of market and government influences on what and how health services are provided, and the changing composition of services that are delivered.

The Commission has been asked to assess the economywide effects of improving productivity in the delivery of health services. Key challenges in this task are the

absence of detailed reform proposals, a lack of detailed evidence-based information about the costs and benefits of such specific reforms, as well as the incomplete and varying quality of productivity studies in the health sector.

9.1 Tops-down approach used

The development of wide-ranging and precise policy proposals for reforming the delivery of health services will need to be based on comprehensive assessments of the costs and benefits of specific initiatives. Given that COAG is not yet in a position to decide on particular reforms, it has not been possible to use an evidence-based (bottoms-up) approach to assess the possible gains that would arise. Accordingly, the tentative estimates presented in this chapter are largely judgments, drawing in part on studies in Australia and overseas.

A limitation of the 'tops-down' approach used here is that it does not shed light on the total potential benefits that might be possible, as well as some of the potential costs and social trade-offs (equity, access and income distribution effects) that might occur. Further, the estimates do not provide sufficient information for governments to make decisions about which specific reforms to implement. Rather, the analysis can provide governments with an indication of the broad effects on the economy from improving productivity in the delivery of health services.

COAG would then need to develop specific policy options for health sector reform, drawing on assessments of the benefits and costs of these options.

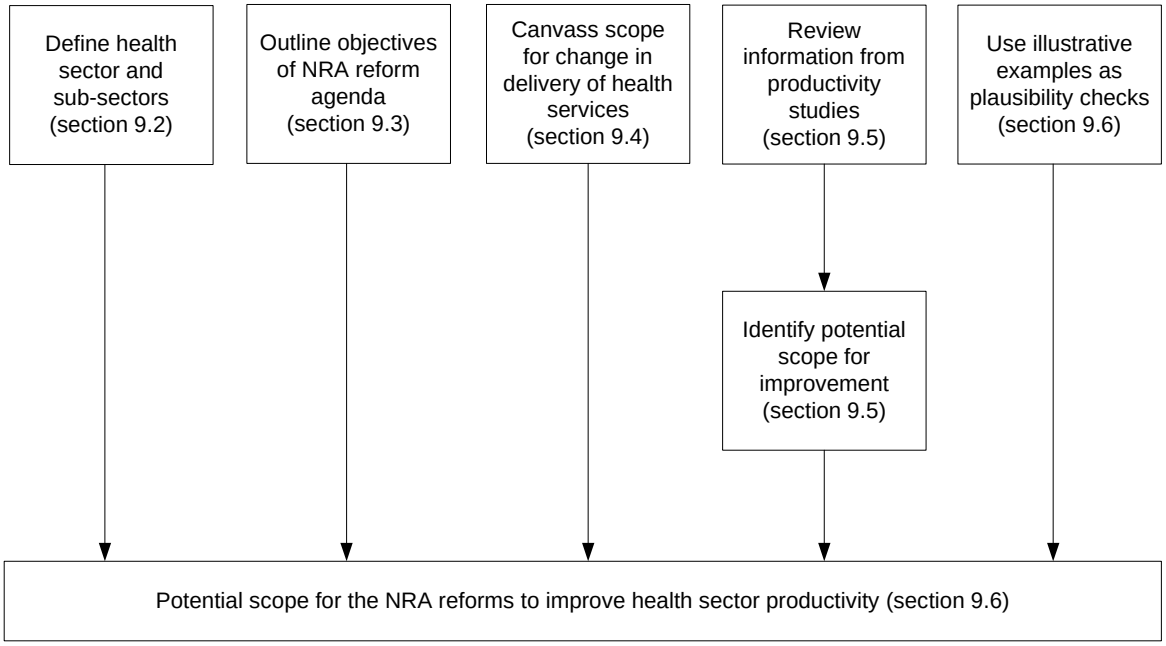
In essence, the scope to improve productivity presented in this chapter represents an upper bound ('outer-envelope') of what might be expected from the NRA reform agenda, while preserving the overarching government policy environment for Australia's health system.

Study framework

Given that the implementation detail of the NRA is to be decided in the future, and there is a lack of reliable empirical evidence about how much productivity improvement in the health system could be achieved, a 'tops-down' approach has been adopted for assessing potential productivity gains (figure 9.1).

Under this approach, the dimensions of the health sector and the individual subsectors (for example, hospitals) are first canvassed, in order to provide a context for the extent of improvement achievable in those subsectors (section 9.2).

Figure 9.1 **Framework for assessing NRA-consistent health productivity gains**



A study framework of the health system is then developed. It was formulated by initially analysing the broad objectives of the NRA reform as well as recent suggestions for reform (as discussed in section 9.3). This was an important step to understanding the issues and the complex arrangements in the delivery of health services.

Section 9.4 discusses health sector productivity and the scope for changes in the delivery of health services. A brief review of Australian and international research provides information on which a judgment has been made about the extent to which there might be an apparent productivity gap (measured inefficiency) in the health sector as a whole and to what extent productivity might vary within each subsector (section 9.5). The measures of productivity (inefficiency) reported here, in general, compare the performance of entities within a subsector to that of a notional benchmark entity. As such, they should not be interpreted as measures of relative productivity across subsectors.

The next step in the study framework was to consider what studies suggest about the performance gaps between health service providers in the current health system (section 9.6). As many factors contribute to the variation in the relative performance of entities within a subsector, allowance was made for those that might be wholly or partially outside the influence of those government policies that are within the scope and context of the NRA. In addition, allowance was made for any biases, or unknown factors, implicit in the empirical studies which have been reviewed.

Finally, illustrative examples were considered as a check on the plausibility of the potential for the NRA to improve productivity.

9.2 The dimensions of the health sector

In this section, an economic profile of the health sector is provided. The composition of the health sector is explored by analysing the cost shares attributable to subsectors. Information is also provided on the size of the national health sector workforce.

Health services are provided to promote, restore and maintain a healthy population. Services include health promotion, disease prevention, the detection and treatment of illness and injury, and the rehabilitation and palliative care of individuals who experience injury or poor health.

There are complex arrangements between governments, and between government and non-government organisations, for planning, funding, delivering and regulating the delivery of health services. The Commonwealth Government has significant financial and policy responsibility for health services, including primary care, aged care and health insurance. State and Territory governments are largely responsible for the direct operation of services such as public acute care and public health (including health promotion and disease prevention). Local governments, non-government organisations and the private sector are also involved in the direct provision of health services. Private practitioners provide most medical, dental and allied health care.

Scope and size of the health sector

A 'Health and Community Services' industry is included in the Australian and New Zealand Standard Industrial Classification (ANZSIC) system. This sector contains a range of activities such as:

- public and private acute care hospitals, psychiatric hospitals and nursing homes;
- general practice and specialist medical services;
- pathology and diagnostic imaging services;
- allied health services, including dental services, optometry and optical dispensing, physiotherapy, and chiropractic and osteopathic services;
- other health care services, including ambulance services;
- veterinary services; and
- community care services.

Based on the national accounts, the health and community services sector accounted for about 5.7 per cent of Gross Domestic Product (GDP) in 2002-03 (table 9.1). Veterinary services and community care services are not part of the health sector for the purposes of this study. Excluding the value added of these subsectors, it has been estimated that the health sector value added accounted for 4.8 per cent ($37.5 billion) of GDP in 2002-03.

Table 9.1 **Health sector expenditure and gross value added, 2002-03**

	Estimate	*Ratio to GDP*
	$m	%
Industry gross value added		
Health and community services – ABS National Accounts[a]	44 881	5.7
Health services – Productivity Commission[b]	37 511	4.8
Expenditure		
Health expenditure – Australian Institute of Health and Welfare[c]	72 452	9.6
Health services – Productivity Commission[b]	46 310	5.9

[a] ABS National Accounts, Health and Community Services gross value added (ABS *Australian System of National Accounts, 2005-06,* Cat. no. 5204). [b] The Commission's estimates were derived from recurrent expenditure data on public hospitals (AIHW 2004a) and published experimental ABS data on costs for the private sector on health and community services (ABS *Australian Industry, 2002-03*, Cat. no. 8155.0). The ABS national accounts health and community services value added figure of $44 881 million in 2002-03 was about $2 400 million greater than the Commission's estimate of the valued added in the health and community services sector. In the absence of information regarding the discrepancy in value added, the Commission scaled up equi-proportionally industry gross value added (labour and capital) in all of the subsectors (except for hospitals) to remove the discrepancy, on the assumption that the discrepancies were due to missing information of government activity in these subsectors. Value added is assumed be 81% of total costs. [c] As reported in table 2 of Australian Institute of Health and Welfare (AIHW), Health Expenditure Australia, 2003-04.

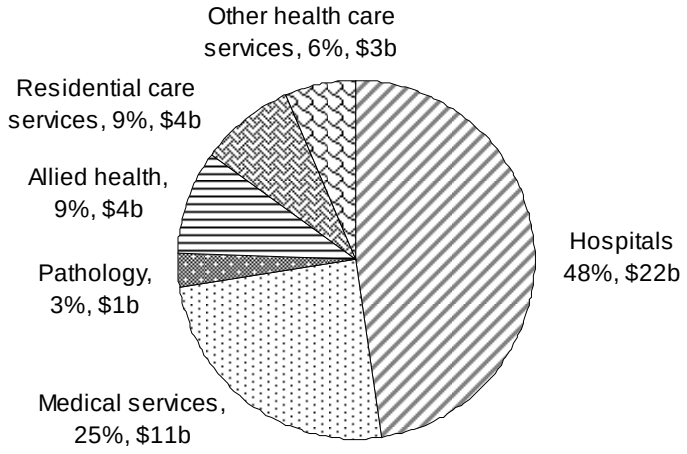
Sources: AIHW (2004a); ABS (*Australian Industry, 2002-03*, Cat. no. 8155.0, Canberra; *Australian System of National Accounts, 2005-06*, Cat no. 5204, Canberra); Productivity Commission estimates.

According to the Australian Institute of Health and Welfare (AIHW) health expenditure series (AIHW 2004a), spending on health services[1] accounted for about $72.5 billion in 2002-03, representing a ratio to GDP of about 9.6 per cent. The AIHW health expenditure series includes spending on health goods and services, health-related services and health-related investment (AIHW 2005a). For example, the AIHW series includes expenditure on pharmaceuticals. In the national accounts (ANZSIC framework), production of pharmaceuticals are classified to sectors other than the 'health and community services' sector (for example, in manufacturing).

[1] Expenditure for the sector is much larger than value added because it includes the cost of intermediate inputs.

After excluding veterinary services and community care services, the Commission has estimated total costs in the health sector to be about $46.3 billion in 2002-03. Estimates of the health subsector costs and shares are shown in figure 9.2.

Figure 9.2 **Australia's health services sector, 2002-03**
Estimates of subsector costs and shares, current prices



Sources: Productivity Commission estimates based on AIHW (2004a); ABS (*Australian Industry, 2002-03*, Cat. no. 8155.0, Canberra).

Health sector labour force

As labour accounts for a large share of health sector costs, reforms that affect the use of labour are likely to have significant implications for productivity within the health sector. Various reforms in this area have been proposed (COAG 2006a; PC 2005e).

In 2002-03, about 695 200 people (or about 7.4 per cent of the Australian workforce) were employed in the health sector (table 9.2). The largest groups were intermediate clerical, sales and service workers (188 400), registered nurses (152 900), generalist medical practitioners (35 800) and enrolled nurses (21 000).

Table 9.2 **Employment in the health sector, 2002-03[a]**

Occupation	*Total employed (persons)*
	'000
Managers and administrators	**13.1**
Health services managers	5.3
Other managers and administrators	7.8
Professionals	**324.2**
Registered nurses	152.9
Generalist medical practitioners	35.8
Specialist medical practitioners	18.9
Physiotherapists	9.4
Medical imaging professionals	9.9
Registered midwives	8.6
Other professionals	88.7
Associate professionals	**82.7**
Medical technical officers	13.4
Enrolled nurses	21.0
Ambulance officers and paramedics	8.9
Other health and welfare associate professionals	11.7
Other associate professionals	27.6
Intermediate clerical, sales and service workers	**188.4**
Other	**86.8**
Total employed in health sector	**695.2**

a Annual average of data for August 2002, November 2002, February 2003 and May 2003.

Source: ABS (*Labour Force Survey* 2006, unpublished).

9.3 NRA reform and outcome objectives

A reform agenda developed within the NRA offers the potential to improve the efficiency and effectiveness of the health sector. The sector's contribution to the economy is significant and growing. As noted by COAG:

> … improving the effectiveness of the health sector is necessary to enhance significantly overall productivity. (COAG 2006d, p. 20)

Given that COAG has not yet identified specific details of reform in the delivery of health services, the Commission considered reform proposals which have been previously canvassed by other stakeholders, and which might form part of a future reform agenda.

Recent suggestions for reform

A number of potential areas for reform have been canvassed. One area commonly cited is the split in responsibilities for the funding and provision of health care between the Australian and State and Territory governments, and the resultant cost-shifting and fragmentation of service delivery (FitzGerald 2006). For example, elderly people are often retained in state-run acute care when alternatives, such as Commonwealth-funded residential care, could be more appropriate and cost-effective. Another example raised is that some of the patient load in state-funded public hospital emergency departments could be more efficiently provided through Commonwealth Government funded primary care services.

An important decision of COAG is that Commonwealth–State Specific Purpose Payments that significantly affect the health system should be reviewed prior to their renegotiation (COAG 2006a). In this light, governments might consider reviewing the Australian Health Care Agreements to the extent that they prevent or impede worthwhile measures to improve the productivity of the health sector.

Better utilisation of e-health information and communications technologies (ICTs) could improve efficiency, including through more streamlined and accurate patient health records (PC 2005d). Podger (2006) expressed similar views and also raised the need for more patient-oriented health care and greater competition in the acute care sector.

System-wide productivity gains could come from addressing impediments to more effective and efficient scopes of work, appropriate mixes of competencies, and job redesign (PC 2005e).

Some of these prospective areas for reform have been nominated to be part of the health stream of the NRA. The report of the COAG National Reform Initiative Working Group cited greater flexibility in the scope of practice of health professionals and the sharing of patient health information across providers. The July 2006 COAG meeting (COAG 2006c) listed several measures to improve the productivity of the health workforce, following the 2005 Productivity Commission health workforce report (PC 2005e).

The scope to improve the efficient operation of the Medicare Benefits Scheme (MBS) was also canvassed in the Commission's health workforce report. It was noted in the report that there needs to be careful analysis of the costs and benefits of broadening the range of MBS items and eligible service providers. It was also noted that there is a bias in rebates in favour of procedural over consultative services. Such distortions could result in incentives that lead to the adoption of less cost-effective medical procedures. In its response to the Commission's

recommendations, the Commonwealth Government stated that it would continue to improve the efficiency and transparency of existing mechanisms and undertake reviews of the payment methodologies used under the MBS (attachment A in COAG 2006c).

The NRA reform initiatives will take place in an environment of increasing health expenditures and ongoing pressures to contain costs and improve efficiency. The scope to improve productivity might be modest compared with those achieved from reform in the utilities sector during the 1990s. Whereas in the utilities sector, productivity was achieved mostly through a substantial shedding of labour, it is widely recognised that there is a 'shortage' of health professionals. However, as the health sector accounts for a large share of the economy, any productivity gains are also significant.

It is possible that governments might also consider a wider range of reforms to the health sector and policy settings that could deliver substantial reductions in the cost of providing health services, but also involve trade-offs regarding quality and safety of outcomes. Any such changes are outside the scope of this study — it only addresses productivity improvements which would be attained without reducing the quality and safety of outcomes.

9.4 NRA and the productivity of health service delivery

Productivity is a measure of the rate at which outputs of goods and services are produced per unit of inputs. In the context of health, with increasing levels of output and their changing nature (due to technological advances), an increase in productivity arises where:

- the cost is lower than would otherwise have occurred; or
- output, including quality, is higher for a given level of expenditure.

The inputs are the resources used to deliver health services — such as labour, capital and intermediate goods and services. Health outputs include the occasions of service or number of patient separations. Health outputs are, in turn, viewed as the means to achieve health outcomes (for example, increased life expectancy or an improved quality of life).[2]

[2] For further discussion, refer to appendix C in PC (2005d).

In the context of this study, efficiency can be considered as the product of two components — allocative and technical efficiency.[3] Improvements in technical efficiency are derived when less inputs are used to provide the existing level of services and health outputs. Allocative efficiency is observed when a given or higher quality of health services is provided using a lower cost mix, or composition, of inputs or even services.

Efficiency improvements could occur within health subsectors and between subsectors. Within a subsector, for example medical services, lower costs might be achieved by using less of a given input (for example, labour) provided that the level of health services, or output, is unchanged. Better utilisation of the mix of inputs (for example, substituting capital for labour) could result in efficiency gains as well.

Compositional changes across subsectors also have the potential to improve productivity. For example, improved 'case management' of patients by doctors across the health system or the use of pharmaceuticals as substitutes for hospital services could lead to cost saving in the health sector (assuming prescriptions of drugs are cost effective vis-à-vis hospital treatments and health outcomes are not diminished).

It is widely accepted that measuring productivity in the health sector is a '… complex undertaking, especially when there exist conceptual challenges, multiple objectives and great scope for measurement error' (Jacobs, Smith and Street 2006, p. 1). In reference to measuring productivity in hospitals, Mortimer et al. (2006, p. 1) noted that the 'quality of both inputs and outputs is frequently poorly measured or unobservable' and that in such circumstances 'there is the very strong possibility that measurement error and omitted variables mask or inflate between-hospital differences in performance'.

There is also likely to be a number of factors explaining the observed variations in performance, in addition to the impediments to be addressed by the NRA policy environment. Such influences can be beyond the control of health service providers or governments and reflect the external environment within which they operate. For example, population mortality rates are heavily dependant on the demographic structure of the population; surgical outcomes are dependent on the severity of disease of patients, general health of patients and recovery management; the performance of emergency ambulance services might be influenced by local geography and density of the population; and cultural and economic conditions can

[3] The change in efficiency from the adoption of new technology over time is assumed to continue independently of the NRA reform agenda. Nevertheless, the NRA could influence the mix and rate of adoption of new technologies.

influence the efficient cost of delivering health services (Jacobs, Smith and Street 2006).

Furthermore, comparisons of productivity performance are likely to be confounded by differences in choices made by governments in the level of services delivered, such as pursuing social and equity objectives. These choices can involve additional expense (that is, they involve a deliberate trade-off between cost and outcomes). For example, some health inputs would be difficult to reduce without affecting on the level, quality and access to health services. As such, health costs per patient in rural and remote areas would be expected to be higher in order to maintain levels and quality of health services that accord with the collective preference of the community.

The exogenous, or uncontrollable, environment makes it difficult to identify 'best practice'. As such, identifying the potential productivity gains from implementation of the NRA based on measured inefficiencies needs to be undertaken with caution. The results should be considered tentative and as broadly indicative of the potential for improvement.

9.5 Exploring the potential for improvement

Although there is limited information on which to base estimates of the potential for productivity improvement in the health sector, information that links possible policy changes to changes in the sector is virtually non-existent. In addition, the measures of inefficiency cited in the studies do not capture shifts in the level of performance over time and policy makers need to take this into account when considering the overall scope for improvement.

This section draws on various studies to assist in forming tentative judgments about the possible level of inefficiency which might exist in the Australian health sector and, by implication, the potential for improvement. Where possible, the information is provided at the subsector level.

In general, the studies cited in this section assess the productivity performance of providers within a subsector relative to a notional benchmark entity within that subsector. As noted earlier, the measures of efficiency cannot be compared across subsectors to make inferences about the relative productivity of subsectors, such as comparing the efficiency between public and private hospitals or between GP services and nursing homes.

There is a number of reasons why caution is required in interpreting the following efficiency studies for the purposes of identifying how reform might improve health sector productivity in Australia. These include:

- differences across the studies that fundamentally affect the variation in the measures of productivity, such as:
  - differences in health care policies and arrangements across the countries in the studies that were undertaken;
  - variations in the services provided by the entities in each study;
  - variations in the definition and measurement of outputs and inputs;
  - variations in the techniques used to estimate productivity;[4]
- generic problems associated with defining and measuring outputs in the health sector, which could lead to specification and measurement error, possibly biasing upwards the productivity gain;
- none of the studies were undertaken for the purposes of identifying how specific health reforms might affect productivity; and
- many of the studies are dated.

Importantly, because these studies identify the scope for improvement by benchmarking entities in the context of snapshots — typically, in the mid-1990s — they reflect the policy boundaries prevailing at that time. Therefore, the studies do not take into account the potential for NRA to significantly alter the institutional environment through, for instance: revising the division of responsibilities across jurisdictions, re-negotiation of Australian Health Care Agreements and measures to target workforce and scope of practice issues.

These studies therefore do not provide a particularly robust foundation on which to deduce the inefficiency in Australia's health sector or the contribution that reform contemplated under the NRA might deliver. To undertake such a task would require more research work and time than available for this study.

The results of the studies therefore are drawn together to help make a tentative judgment about the extent to which a productivity gap might exist in Australia and the level of productivity gain that might be achievable in the context of the proposed NRA policy environment.

[4] Some techniques cannot distinguish between random fluctuations or statistical noise in the data and might attribute these to differences in productivity.

Studies on health sector productivity

Australian studies

Table 9.3 summarises the relevant Australian literature on productivity gaps in hospitals. A productivity gap measures the performance of entities relative to that of observed best practice in the sample.

There is a large variation in the estimates, ranging from 3 to 47 per cent for public hospitals. There is very limited, and rather dated, information for measured inefficiency in private hospitals. Notwithstanding the various estimation techniques used in the studies to derive the measures of inefficiency, the productivity gap in the hospitals subsector might be in the order of 20–25 per cent under current policy settings.[5]

A study in 2003 of Australian aged care services found that average cost savings of 17 per cent might be achieved if all aged care establishments operated efficiently (Rao, Coelli and O'Donnell 2003).

Finally, a study of school dental health services in Queensland found that most of the oral health care units sampled might be able to reduce their inputs by up to 20 per cent, while maintaining the same number of completed treatments (SCRCSSP 1997).

International studies

The empirical studies on the efficiency of overseas health subsectors largely focus on the United States, the United Kingdom and selected European Union countries. Over 20 studies were considered in the international context, with a large proportion being in the public hospitals subsector. Results from studies on inefficiency in public hospitals are presented in table 9.4. The results indicate variability in the estimates of inefficiency and the many caveats discussed earlier need to be kept well in mind. That said, the productivity gap, on average, might be in the order of 15–20 per cent.

[5] The broad estimates for the productivity gaps in this section are based on a simple average of the results of relevant models in the studies cited.

Table 9.3 **Estimates of inefficiency in Australian studies of public and private hospitals**

Study	*Sample*	*Factor inputs*[a]	*Estimation technique*[bc]		*Inferred inefficiency*
Public hospitals					
SCRCSSP (1997)	109 public hospitals (Victoria) (1994-95)	MFP (labour, other)	DEA	Model 1	19%
		MFP (labour, other)	DEA	Model 2	11%
		MFP (labour, other)	DEA	Model 3	33%
		MFP (labour, other)	DEA	Model 4	10%
		MFP (labour, other)	DEA	Model 5	47%
Yong and Harris (1999)	35 public hospitals (Victoria) (1994-95)	Labour	SFA	Model 1	3%
		Labour	SFA	Model 2	5%
Wang and Mahmood (2000a)	112 public hospitals (NSW) (1997-98)	TFP	DEA	Model 1	20%
		TFP	DEA	Model 2	27%
Wang and Mahmood (2000b)	114 public hospitals (NSW) (1997-98)	MFP (labour, capital)	SFA	Model 1	9%
		MFP (labour, capital)	SFA	Model 2	11%
Mortimer (2002)	38 public hospitals (Victoria) (1993)	MFP (labour, capital)	DEA	Model 1	16%
		MFP (labour, capital)	SFA	Model 2	17%
Paul (2002)	223 public hospitals (NSW) (1995-96)	TFP	SFA	Model 1	26%
Mangano (2003)	116 public hospitals (Victoria) (1992-93 to 1995-96)	TFP	SFA	Model 1	25%
Queensland Department of Health (2004)	74 public hospitals (Qld) (2000-01 to 2002-03)	TFP	DEA	Model 1	8%
Private hospitals					
Webster, Kennedy and Johnson (1998)	301 private hospitals (Australia) (1991-92 to 1994-95)	TFP	DEA	Model 1	27%
		TFP	SFA	Model 2	26%
		TFP	SFA	Model 3	18%

[a] Measurements for total factor productivity (TFP) include all inputs (labour, capital and other inputs); multi-factor productivity (MFP) generally refers to labour and capital. However, the term MFP is used here to also describe the studies which include labour and other non-capital inputs as the factors of production. [b] The estimation techniques referred to in this table are data envelopment analysis (DEA) and stochastic frontier analysis (SFA).[c] Some of the empirical studies use various estimation methods and sensitivity analysis by changing model specifications such as inputs/outputs and analysis of the size and location of hospitals. For simplicity, various modelling results have been represented as model 1, 2 etc.

Sources: Mangano (2003); Mortimer (2002); Paul (2002); Queensland Department of Health (2004); SCRCSSP (1997); Wang and Mahmood (2000a, 2000b); Webster, Kennedy and Johnson (1998); Yong and Harris (1999).

Table 9.4 Estimates of inefficiency in public hospitals from selected international studies

Study	*Sample*	*Factor inputs* [a]	*Estimation technique*[bc]		*Inferred inefficiency*
Gerdtham et al. (1999)	Swedish hospitals in 26 Counties, 1989–1995	TFP	SFA	Model 1	0%
		TFP	SFA	Model 2	9%
Linna and Hakkinen (1999)	48 acute care Finnish hospitals, 1994	TFP	SFA	Model 1	14%
		TFP	DEA	Model 2	15%
		TFP	DEA	Model 2	10%
		TFP	DEA	Model 4	13%
		TFP	DEA	Model 5	8%
Jacobs (2001)	232 UK NHS hospitals, 1995-96	TFP	OLS	Model 1	46%
		TFP	OLS	Model 2	39%
		TFP	OLS	Model 3	41%
		TFP	DEA	Model 4	6%
		TFP	DEA	Model 5	36%
		TFP	DEA	Model 6	25%
		TFP	DEA	Model 7	13%
		TFP	DEA	Model 8	20%
		TFP	SFA	Model 9	14%
		TFP	SFA	Model 10	17%
		TFP	SFA	Model 11	16%
		TFP	SFA	Model 12	12%
		TFP	SFA	Model 13	13%
Biorn et al. (2002)	48 Norwegian hospitals, 1992-2000	MFP (labour, other)	DEA	Model 1	22%
Street (2003)	226 UK acute care hospitals, 1999	TFP	OLS	Model 1	31%
		TFP	SFA	Model 2	13%
		TFP	SFA	Model 3	10%
Harrison, Coppola and Wakefield (2004)	US Federal hospitals, 1998 and 2001	TFP	DEA	Model 1	32%
		TFP	DEA	Model 2	21%
Yaisawarng and Burgess (2006)	131 US Department of Veterans Affairs hospitals, 2000	MFP (labour, capital)	SFA	Model 1	6%

a Measurements for total factor productivity (TFP) include all inputs (labour, capital and other inputs); multi-factor productivity (MFP) generally refers to labour and capital. However, the term MFP is used here to also describe the studies which include labour and other non-capital inputs as the factors of production. **b** The estimation techniques referred to in this table are data envelopment analysis (DEA), stochastic frontier analysis (SFA) and ordinary least squares (OLS).**c** Some of the empirical studies use various estimation methods and sensitivity analysis by changing model specifications such as inputs/outputs and analysis of the size and location of hospitals. For simplicity, various modelling results have been represented as model 1, 2 etc.

Sources: Biorn et al. (2002); Gerdtham et al. (1999); Harrison, Coppola and Wakefield (2004); Jacobs (2001); Linna and Hakkinen (1999); Street (2003); Yaisawarng and Burgess (2006).

In addition to the above information, Hollingsworth (2003) provided a detailed review of published applications of efficiency measurement in the health sector in overseas jurisdictions. His literature review included 188 journal and book publications on various hospitals and health services up to 2002, with about half of the cited studies relating to the hospital subsector. The measured inefficiency in health subsectors as identified in Hollingsworth (2003) included:

- between 5 per cent and 29 per cent for hospitals (average inefficiency scores were grouped by type of hospitals);
- between 18 per cent and 35 per cent in primary care (average inefficiency scores of primary care providers in the European Union and United States); and
- about 25 per cent for nursing homes (average inefficiency scores for nursing homes in the European Union and United States).Studies of national health systems.

Although studies on the efficiency of the health subsectors are important in gauging the efficiency of a health service, system-wide studies may provide insights into the overall efficiency of the health sector.

It should be noted that each country's unique set of economic and social attributes, as well as health financing and organisational structures, make it difficult to compare the efficiency of national health systems. This difficulty is further compounded by the lack of appropriate comparative data and the competing methodologies which have been applied.

With these caveats in mind, information on the inefficiency of the Australian health system from a number of international studies is presented in table 9.5.

Table 9.5 **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).

Sources: Productivity Commission estimates based on Afonso and Aubyn (2005); Evans et al. (2001); Gravelle et al. (2003); Greene (2003); Kumbhakar (2004); Vasanthakumar (2005); WHO (2000).

The above empirical studies on national health systems suggest that, on average, the productivity gap for Australia might be in the order of 10–20 per cent.

Assumption about the productivity gap

As noted earlier, a key step in the approach used in this chapter is making judgments about the extent of the potential inefficiency in Australia's health sector. Studies on health sector productivity were largely considered in terms of hospitals in Australia and overseas as well as national health systems in general. Despite the prevailing large variation in the estimates of measured inefficiency reported in the studies, the productivity gap for the health services sector in Australia might be in the order of 20–25 per cent. Based on the studies on international jurisdictions, while noting the even broader range of caveats, the productivity gap might be in the order of 15–20 per cent for the health system as a whole. On the other hand, studies on the relative performance of national health systems suggest that the productivity gap for Australia's health system might be in the order of 10–20 per cent.

Drawing on the information in the Australian, overseas and system-wide studies on health sector productivity, a *plausible gap at the outer envelope* could be up to around 20 per cent, on average, across the health sector. This conclusion is a matter of broad judgment having regard to the complexities and lack of detailed information about the scope for productivity improvement in the health sector. It should be noted that this is an *assumed total factor productivity gap*, that is, a productivity gain from a reduction in the use of all inputs.

9.6 Potential scope for NRA to improve health services productivity

The scope of NRA-consistent reforms is expected to be wide-ranging and across the health sector. However, in the absence of detailed policy proposals and detailed cost–benefit analyses about the proposals, it is difficult to infer the effect of the NRA on productivity in the health sector with any precision. Some degree of judgment is needed in estimating what NRA-consistent policies could achieve.

Estimated differences in relative performance between entities exist for many reasons. These include data quality; the choice of inputs and outputs and their measurement; and socio-economic and demographic characteristics of the relevant population. Service objectives may differ, for example, equity issues and access to services in rural and remote areas.

There are also complexities in the regulatory and other operating environments. For example, it might be possible that the payment structure of the MBS results in choice of procedures for patients with no significant differences in costs but with some variation in the quality of the service provided. In this instance, eliminating such price distortions would lead to a productivity improvement. On the other hand, some procedures might deliver similar outcomes, have different costs per procedure as well as disparities in the co-contributions made by patients. In such instances, patients are likely to choose the least expensive co-contribution option for the medical procedure, even though that might not be the least expensive for the taxpayer.

The above discussion would suggest that measuring efficiency and identifying the causal factors responsible for differences in performance are complex tasks. Indeed, in light of the estimation problems, the complexities associated with regulatory environments and the absence of any detail about policy proposals, it would be prudent to err on the side of caution.

The further complication, alluded to above, is that the studies do not explicitly take into account the potential for NRA to alter the institutional environment against which the productivity gap was identified in the studies.

Given these constraints, the feasible approach adopted in this chapter was to gauge the potential gains from NRA by mechanistically assessing what might be available from bridging the plausible productivity gap. Moreover, the approach is tempered by an assumption that governments are unlikely to completely bridge that gap through NRA.

To this end, it is assumed that NRA-consistent reforms could bridge one-fifth of the assumed productivity gap in the hospitals subsector (that is, a 4 per cent gain) and one-tenth of the assumed productivity gap in the other subsectors (a 2 per cent gain). The context here is that these gains can be achieved while maintaining or improving the quality and level of outcomes. Further, these gains are in addition to any efficiency gains that might occur in the absence of any NRA-consistent reforms, from sources such as the adoption of new technology.

It has been also assumed that government reforms have greater scope to improve productivity in the hospital subsector (both public and private) than in the non-hospital subsector. One reason is the greater complexity in the hospitals subsector and the intricate funding arrangements, including the MBS and its payment system. Also, there is likely to be greater variability in performance in the hospitals subsector arising from different operating and service characteristics of hospitals, including their size, structure and location. Scope to improve efficiency by

removing impediments to job design are also likely to be higher in the hospitals subsector.

Combining the assumptions about the scope to bridge the productivity gaps and the size of the productivity gap (as discussed in section 9.5), the scope for the total productivity gain in the health sector could be of the orders shown in table 9.6.

Given the relative shares of the subsectors to the total sector, a 4 per cent gain in the hospital subsector would contribute 1.9 percentage points, while 1 percentage point would be contributed by the other subsectors, including medical services. The total subsectoral productivity could therefore increase by about 2.9 per cent.

Table 9.6 **Assumed potential health sector productivity gains under NRA-consistent reforms**

	Subsector productivity	*Subsector shares*[a]	*Contribution to productivity gain of sector*[b]	*Implied expenditure savings*[bc]
	%	%	%	$m (2005-06)
Subsectoral productivity				
All hospitals (public and private)	4	48	1.9	1 170
Other, including medical services	2	52	1.0	634
Change in composition of services across sector			1.7	1 036
Total sector		**100**	**4.6**	**2 840**

[a] All hospitals and other subsectors shares are derived from figure 9.2. [b] Totals may not equal due to rounding. [c] The implied expenditure saving of $2.8 billion is based on estimated 2005-06 total health sector costs, which exclude veterinary services and community care services. These costs were estimated at around $46 billion in 2002-03 (section 9.2). A 2005-06 reference estimate for total health sector costs (excluding veterinary services and community care services) of around $60 billion was obtained using national accounts health and community services sector trends (ABS 2006a).

Source: Productivity Commission estimates.

Improving allocative efficiency through changes to the composition of services across the health sector is also expected to improve overall productivity in the sector. Examples include:

- where residential care is more appropriate and cost-effective than hospital acute care for elderly people;
- where primary care services (such as GPs) are more appropriate and cost-effective than hospital emergency departments; and
- where preventative care and early intervention is more appropriate and cost-effective than hospitalisation. Based on a recent study by the Victorian Government Department of Human Services (2006), about 16 per cent of all hospital bed days in Victoria in 2004-05 were considered avoidable if preventative care and early disease management were applied.

In all cases, the reforms need to be assessed and approved according to appropriate cost–benefit analyses (for example, to assess whether the benefits of preventative care are greater than the avoided hospital costs).

Changing the composition of health services, while maintaining the overall health outcomes of the population, is assumed to increase sectoral efficiency by a further 1.7 per cent. This allocative efficiency improvement is in addition to that achieved in each subsector. Examples below on aged care and emergency departments indicate that savings of this order might be achievable from compositional changes in the health sector.

In aggregate, the productivity gain as a result of NRA-consistent reform could be in the order of 4.6 per cent. This would represent a cost saving of around $2.8 billion of the estimated 2005-06 total health sector costs.

Most of the productivity gain under NRA-consistent reform might be achievable within ten years. To the extent that some NRA reforms could depend on the entry of newly qualified health professionals, for example, some of the effects may take longer than ten years to be fully realised.

Are the assumptions plausible?

A number of exercises were undertaken to reflect on the plausibility of these 'tops-down' estimates. The examples provided below suggest that the assumptions made about the scope for productivity improvement under the NRA appear plausible. However, the illustrative examples need to be considered with caution. There is the potential of indirect spillovers of health expenditures into other health areas, including the wider economy, as a result of cost savings identified in a particular health sector.

Simulation of a reduction in public hospital costs

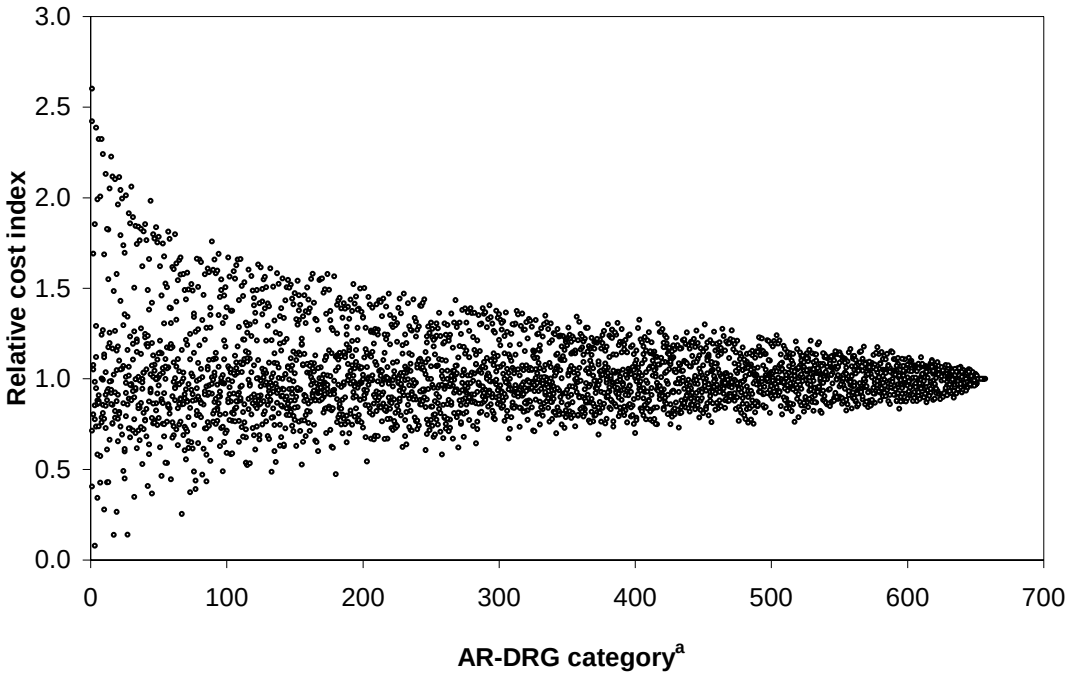
A simulation analysis of public hospital costs is used to illustrate the extent to which productivity improvements (average cost reductions) by medical treatment category (Australian Refined Diagnosis Related Group — AR–DRG) would affect total expenditure. Simulations are of a narrowing of the gap between the cost per AR–DRG in each state and the lowest cost observed for each AR–DRG across states. The method is outlined in box 9.1

Box 9.1 **Simulation analysis methodology**

A simulation analysis was conducted to ascertain the effect on expenditures as costs per procedure are moved towards the lowest observed cost for such procedures across States. Average total cost (ATC) data for mainland States for Australian Refined Diagnosis Related Group (AR DRG) medical treatment category was obtained from the Australian Department of Health and Ageing National Hospital Cost Data Collection (NHCDC). The data were for 2003-04 for New South Wales, Victoria, Queensland, South Australia and Western Australia. (Costs data for categories with less than two jurisdictions were excluded — eliminating 10 AR–DRGs from a possible 661).

A 'relative cost index' was constructed for each AR–DRG in each State by dividing the ATC in each State for each AR–DRG by the national ATC for each AR–DRG. A state AR-DRG would assume an index value of 1 if its ATC equalled the national average. The distribution of the relative cost indexes for each AR–DRG, ranked by variation in the relative cost index, in 2003-04 is shown in the figure below. The distribution shows significant variation in average costs within and between AR DRGs.

To calculate the impact on expenditure, the ATC for each AR–DRG is multiplied by the number of services performed in each State and summed. To simulate the potential impact of productivity improvements on public hospital expenditure, the total expenditure (ATC multiplied by separations) for each State is adjusted by modifying the ATC for each AR–DRG category in each State (except the benchmark State for each AR-DRG category), and then multiplying and summing.

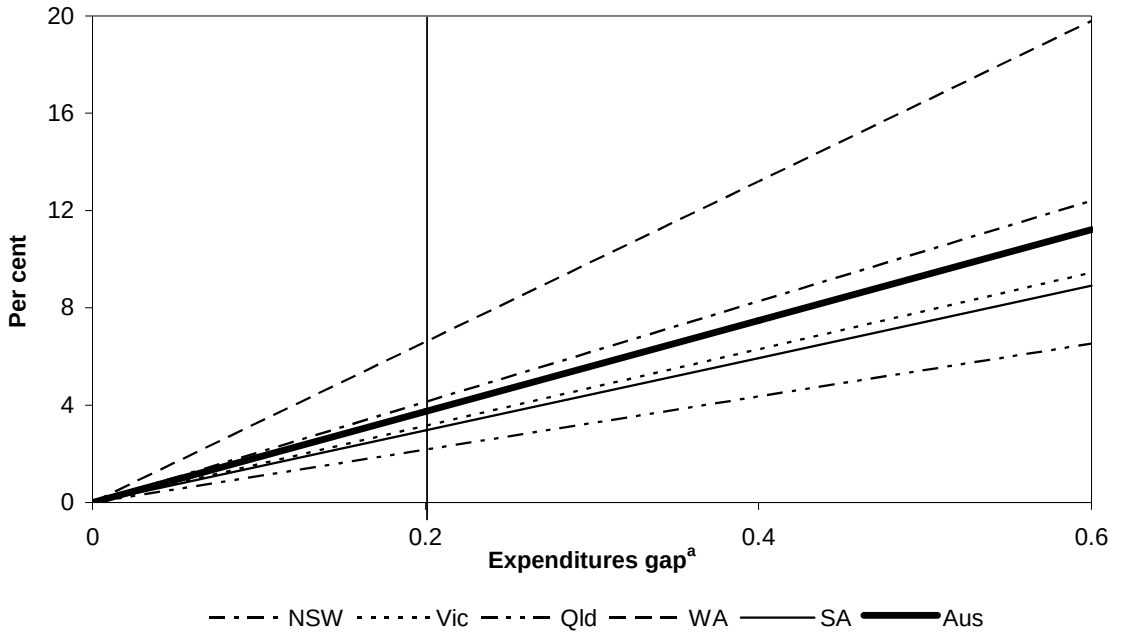


a Medical treatment categories are sorted in descending order of the total variation in the relative cost index of each AR–DRG.

Source: Productivity Commission estimates.

If total public hospital expenditure in Australia were to be reduced in the order of 4 to 5 per cent, then an improvement in productivity (or narrowing of the gap for each AR–DRG in each State, except for the benchmark State for each AR–DRG) in the order of 20–25 per cent would be required (figure 9.3).

Figure 9.3 **Decline in total expenditure associated with narrowing the gap in medical treatment costs**

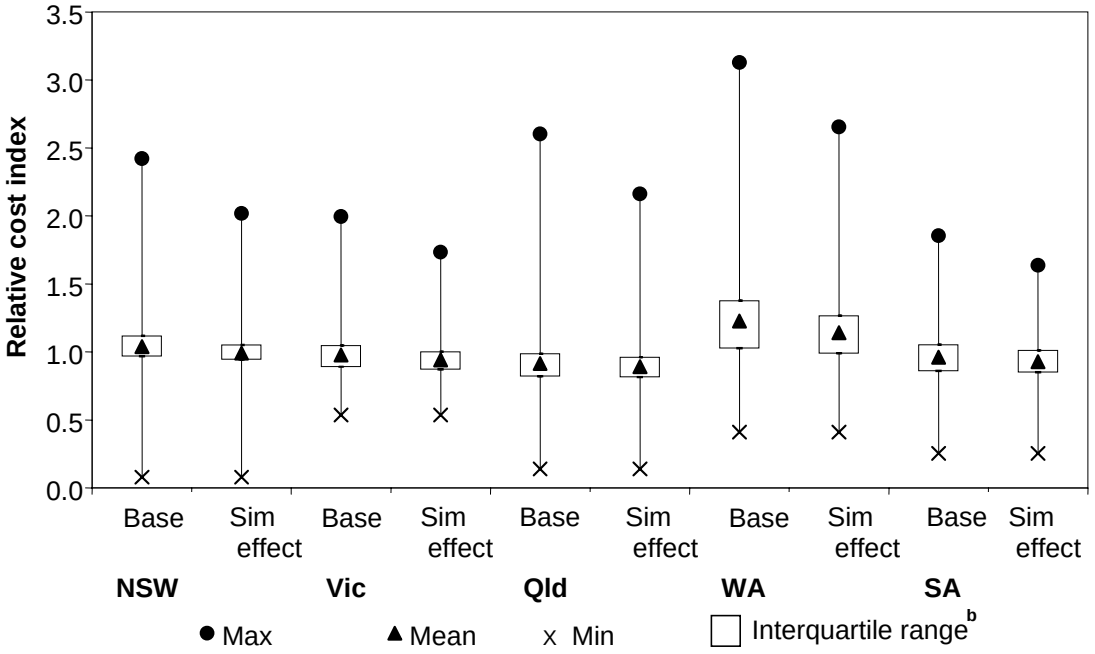


a A proportional narrowing of the gap in expenditure between each State and the lowest cost observed for each AR–DRG category across States. For example, public hospital costs for Australia, on average, that are 20 per cent closer to the best practice costs in Australia in each AR–DRG treatment category are associated with a reduction in total public hospital expenditure in Australia of 3.7 per cent.

Source: Productivity Commission estimates.

The effect on the distribution of the relative cost across AR–DRG categories of a 20 per cent narrowing of the gap in cost for each AR–DRG is illustrated in figure 9.4. The first column for each state illustrates their current distribution of the relative cost index and the second column shows the distribution once the gap with observed best practice has been reduced by 20 per cent for each AR–DRG. The results indicate the extent to which the distribution of the relative cost index decreased across AR–DRGs in each state (signified by the compression and, in some cases, reduction of the interquartile ranges). Significant differences in the cost of AR–DRGs across states would remain.

Figure 9.4 **Simulated effect of a 20 per cent reduction in the cost of medical treatment relative to the national average[a]**



a 'Base' case is the cost of medical treatment in 2003-04 relative to the national average. 'Sim effect' is the outcome of a simulated reduction by 20 per cent in the cost of medical treatment in each AR-DRG category. A relative cost index of 1.0 indicates the national average cost for each AR–DRG treatment category. A relative cost index greater than 1.0 indicates that the cost of the AR–DRGs for that state is above the national average and vice versa. **b** The interquartile range is the range within which the middle 50 per cent of the ranked data for 651 AR–DRGs are found.

Source: Productivity Commission estimates based on Department of Health and Ageing (2006).

Proposed reform of health services in Western Australia

In 2004, the Health Reform Committee (HRC) recommended to the Western Australian Government a number of changes that would reduce the cost to the government of delivering health services (HRC 2004). The reform strategy, which has been endorsed by the Western Australian Government, related to three key areas:

- better management of demand for health services;
- achievement of cost efficiencies; and
- optimisation of the revenue base of the Department of Health.

After combining the expenditure and revenue reform strategies, the HRC estimated that the implementation of the reform package could reduce the growth in health expenditure by 10 per cent over five years. By 2008–09, about 93 per cent (or $290 million) of the savings would arise from the demand management strategy. The other 7 per cent (or $22 million) would come from cost efficiencies achieved in

the provision of pathology, pharmacy and catering (HRC 2004, p. 115). The savings from the demand management strategy would result from:

- reducing unnecessary hospital admissions by providing better integrated primary care services (GPs), and community and home-based care;
- providing health care in the most appropriate setting, including building the capacity of Perth's general hospitals, and providing dedicated subacute facilities to redirect non-tertiary work away from the tertiary hospitals; and
- reducing the average length of stay in hospitals and increasing day surgeries where it is clinically appropriate.

The savings are estimated to be equivalent to about $250 million of the Western Australian Government's health expenditure of $2.5 billion in 2002-03. The savings represent about 4.4 per cent of total estimated health sector expenditure in Western Australia. The savings of 4.4 per cent are an overestimate of the overall improvement in cost efficiency because other costs would be incurred, such as:

- increased health expenditure by individuals, non-profit health providers and the Commonwealth Government — associated with, for example, the joint Commonwealth–State Government proposal to construct health care facilities; and
- substitution for hospital services by GPs, involving payment by individuals and the Commonwealth Government.

The overall improvement in the cost efficiency (or productivity) would need to take into account the costs of providing these other services.

Reducing compliance costs for GPs

A study by the Commission (PC 2003b) identified that GPs' administrative and compliance costs resulting from Commonwealth Government policies and programs amounted to about $228 million in 2001-02 (about 5 per cent of total revenue collected by GPs). If government reform could reduce these compliance costs by, say, 20 per cent, this would result in a cost saving of about $44 million (or 1 percentage point reduction as a share of total revenue).

Improving interface between hospital emergency departments and GP services

One of the problems identified in the current health system is the extent to which patients attending public hospital emergency department wards have relatively minor conditions which could be treated by GPs. There is considerable debate regarding the proportion of primary care patient presentations to hospital emergency

departments. The Victorian Government Department of Human Services (2003) estimated that 37 per cent of Victorian metropolitan hospital emergency department presentations could have been treated by GPs. On the other hand, the Australasian College for Emergency Medicine (ACEM) (2004) stated that general practice-type patients (usually considered to be category 4 and 5 under the Australasian Triage Scale) represented 10–14 per cent of emergency department presentations. The ACEM (2004) also noted that given that general practice-type patients attending emergency departments are at the low end of complexity and costs, such patients accounted for only 6 per cent of the total cost of emergency department presentations.

According to the Independent Pricing and Regulatory Tribunal of New South Wales (IPART 2003), the use of emergency departments to provide GP type services in New South Wales was estimated to cost an additional $110 million per annum, compared with $30 million for the provision of these services under the Medicare Benefits Schedule. The net cost to the community ($80 million) from providing the services in emergency departments rather than in a general practice setting represented 1.5 per cent of New South Wales public hospital costs in 2002-03. This could represent an overestimate to the extent that patient co-payments are not considered.

Improving appropriateness of care for older Australians

Another problem identified is a shortage of aged care beds. According to Podger (2006) and the AHMAC Care for Older Australians Working Group (COAWG 2004), at any point of time, about 2000 older people nationally are in hospital beds (or about 2.4 per cent of total hospital beds) and waiting for residential aged care to become available.

Reform in this area could improve outcomes for older patients and also reduce costs, to the extent that hospital beds cost more than aged care beds. The cost savings from improving the appropriateness of care for these people would depend on the costs of a hospital bed for such a person (which is likely to be lower than the cost of an average hospital bed) and the costs of providing residential aged care services. According to IPART (2003), the use of public hospitals in lieu of nursing home care in New South Wales is estimated to cost an additional $87 million per annum, while providing equivalent services in residential aged care facilities would cost $15–20 million per annum. The net cost to the public hospital and aged care subsectors represented about 0.8 per cent of public hospital and aged care costs in New South Wales in 2002-03. This could be an overestimate to the extent that private contributions from residents towards residents' aged care place costs are not considered.

The anecdotal examples presented in this section are broadly consistent with the assumptions that the compositional effect of reform to the health sector might provide productivity improvements in the order of 1.7 per cent.

9.7 Summary of direct impacts

In this chapter, tentative estimates are presented of the potential productivity improvements in the delivery of health services that might arise in the long term as a result of reforms under the NRA.

Key challenges in assessing the economy-wide effects of improving productivity in the delivery of health services are the absence of detailed reform proposals, a lack of detailed evidence-based information about the costs and benefits of such specific reforms, as well as the incomplete and varying quality of productivity studies in the health sector.

The tentative estimates of productivity improvement and the economy-wide effects presented in this study do not provide sufficient information for governments to make decisions about which specific reforms should be implemented. The development of wide-ranging and precise policy proposals for reforming the delivery of health services will need to be based on comprehensive assessments of the costs and benefits of specific initiatives.

In the long term (more than ten years), a total factor productivity improvement in the order of 4–5 per cent, with an upper bound of 5 per cent, might be possible. This would represent a cost saving of about $3 billion of the estimated total health sector costs in 2005-06.

10 Framework for assessing the potential impacts on workforce participation and productivity

Key points

- The human capital stream of the NRA is directed at improving workforce participation and productivity. It comprises three substreams: health promotion and disease prevention; education and training; and work incentives.
- The analytical framework provides a means for assessing the outer-envelope potential for changes in human capital to influence workforce participation and productivity. It consists of three elements:
  - international comparisons with what has been achieved in other countries;
  - supporting analysis to identify the scope for change, including the workforce participation and productivity possibilities associated with each substream; and
  - demographic modelling to isolate the potential impacts of policy-induced changes in human capital, compared with projected baseline participation and productivity outcomes for Australia by 2030.
- The analytical framework is exploratory, reflecting:
  - limited guidance concerning specific action plans for the human capital stream of the NRA;
  - diverging views about the scope for improving human capital outcomes, and about the role that policy might play in the process; and
  - the varying and often uncertain duration of the maturation periods associated with the changes.

As recognised at the February 2006 meeting of COAG, a healthy, skilled and motivated population is critical to workforce participation and productivity, and hence Australia's future living standards. At the broadest level, the ageing of the population means that:

> … there will be relatively fewer Australians of working age. To avoid putting too great a burden on those already in work, more Australians need to realise their potential by entering or rejoining the workforce. At the same time, in the face of intense global competition and changes in technology, any reduction in workforce participation needs

> to be offset by improvements in the ability of the workforce and in productivity. (COAG 2006a, p. 1)

By focusing on reform initiatives directed at enhancing participation and productivity, the human capital stream of the NRA aims to provide Australians with the opportunities and choices they need to lead more active and productive lives. The human capital stream is made up of three substreams — health, education and training, and work incentives.

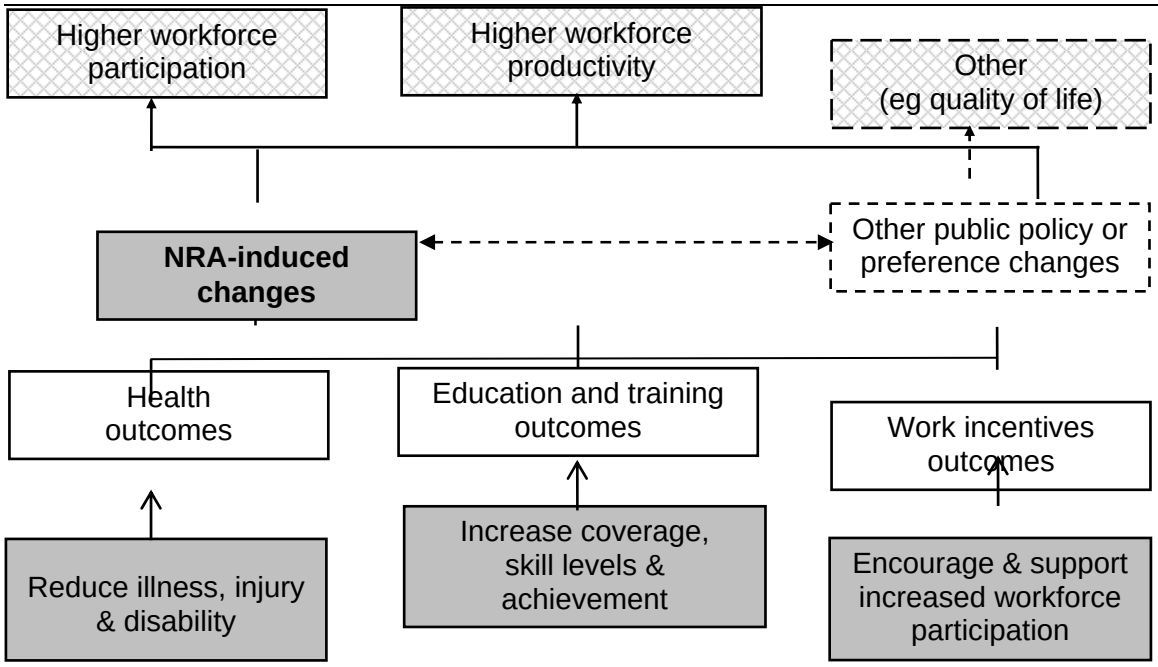
Potentially, achievement of the objectives of each substream could raise workforce participation. On the other hand, the impact on productivity is likely to vary across the human capital substreams. In particular, the initiatives envisaged as part of the health and education and training substreams are likely to improve labour productivity, compared with what it would have otherwise been. In contrast, policy initiatives for the work incentives substream are likely to have a negative influence on Australia's overall labour productivity level as some marginal workers enter the workforce.

This chapter provides a brief overview of the key elements and links associated with the human capital stream of the NRA. It then outlines the main elements of the analytical framework used as a reference point for assessing the potential economic impacts, specifically for workforce participation and productivity, of the three human capital substreams in subsequent chapters. Following this, international comparisons of workforce participation and productivity are made as a basis for considering the international context in which reform is taking place. Finally, some broad historical and projected baseline trends in Australia's workforce participation rates and labour productivity growth are presented as a basis for assessing the potential consolidated effects of human capital reform relative to the projected baseline 25 years hence, that is in 2030.

10.1 An overview of the key elements and links associated with the human capital stream

The key elements and links associated with the three human capital substreams of the NRA are summarised in figure 10.1.

Figure 10.1 **Human capital stream — key elements and links**



The health outcomes substream involves additional and/or more effective health promotion and disease prevention measures to reduce the incidence of illness, injury and disability and the prevalence of key risk factors that contribute to chronic disease. This will assist people to participate in the workforce and improve their productivity. Opportunities for improvements are assessed in chapter 11.

The education and training substream involves initiatives in the areas of: early childhood development; literacy and numeracy; transitions from school to work or further study; and adult learning with a view to increasing the coverage, skill levels and achievement of the education and training system. A detailed consideration of opportunities for improvements in this area is presented in chapter 12.

The work incentives substream involves initiatives to encourage and support increased workforce participation, with a particular focus on people on welfare, the mature aged and women, in a manner consistent with the long-term interests of individuals and the economy. Opportunities for improvements in this area are considered in chapter 13.

To date, little has been settled by the participating governments in relation to specific human capital reform proposals in an NRA context. However, at the July 2006 meeting of COAG, leaders agreed on eleven high-level outcomes within a lifespan or life-cycle framework to guide the subsequent development of the human capital reform agenda (box 10.1).

Box 10.1 **Indicative high-level outcomes for the human capital stream**

Eleven indicative high-level outcomes have been agreed to as a framework for the human capital stream. They include:

- significantly improve the proportion of children that are born healthy (*subsidiary outcome: the gap between indigenous and non-indigenous children is closed)*;
- significantly improve the proportion of children acquiring the basic skills for life and learning (*subsidiary outcome: the gap between indigenous and non-indigenous children is closed)*;
- reduce the proportion of the working age population not participating and/or under-participating in paid employment due to illness, injury or disability;
- reduce the incidence of preventable chronic disease and serious injury among the working age population;
- reduce the prevalence of key risk factors that contribute to chronic disease;
- increase the effectiveness of the health system in achieving health outcomes;
- increase the proportion of young people meeting basic literacy and numeracy standards, and improve overall levels of achievement;
- increase the proportion of young people making a smooth transition from school to work or further study;
- increase the proportion of adults who have the skills and qualifications needed to enjoy active and productive working lives;
- improve overall workforce participation, with a particular focus on target groups, in a manner consistent with the long-term interests of the individual and the economy, giving due regard to productivity; and
- increase the provision of flexible working arrangements within the workforce, in a manner consistent with the long-term interests of the individual and the economy.

Source: COAG (2006c, p. 6).

COAG is committed to assessing the progress of the human capital stream over time. To facilitate this, COAG has agreed to a series of indicative progress measures for each high-level indicative outcome (COAG 2006c, Attachment D). These measures are taken into account in the following chapters.

The July meeting of COAG asked senior officials to prepare specific reform proposals for consideration at its next meeting, which is scheduled for the first half of 2007 — beyond the reporting date for this study. According to the COAG Communiqué, it is necessary and appropriate for these specific reform proposals to include agreed policy directions, outcomes and commitments, multilateral and jurisdictional specific actions, progress measures and milestones. It is envisaged

that each proposal will specify those specific actions to be undertaken jointly and those to be handled by individual jurisdictions. As an initial tranche of human capital reforms, COAG agreed that work will be undertaken on specific reform proposals in four priority areas. The priority areas cover each human capital substream and include:

- *diabetes* — with the aim of improving health outcomes and building on the National Chronic Disease Strategy and the Australian Better Health Initiative;
- *early childhood* — with the aim of supporting families in improving childhood development outcomes in the first five years of a child's life, up to and including school entry;
- *literacy and numeracy* — with the aim of improving student outcomes in these areas; and
- *child care* — with the aim of encouraging and supporting workforce participation of parents with dependent children (COAG 2006c).

The points of focus in terms of the changes induced by initiatives in each substream are the associated impacts on workforce participation and/or productivity (figure 10.1). Clearly, participation and labour productivity outcomes are affected by other areas of public policy as well as non-policy influences such as work, family and leisure preferences. However, the focus of this study is on the potential for improving workforce participation and productivity through potential reform initiatives within the human capital substreams of the NRA alone.

As reflected in figure 10.1, there is also scope for overlaps and spillovers within and between the human capital substreams to shape the potential NRA-induced changes in workforce participation and productivity. For example, improvements in the educational attainments of the population are likely to have positive effects on health status and workforce participation rates. The presence of overlaps and spillovers means that the consolidated outcomes for workforce participation and productivity might be greater, equal to, or less, than that implied by adding the projected substream outcomes. Of course, adding these outcomes may involve double counting (overestimation), in which case failure to quantify the presence of positive spillovers (underestimation) would be a countervailing influence. Further, there may be a trade-off between participation and labour productivity for the human capital stream. This will occur if potential additions to the workforce have lower labour productivity than the existing workforce as a whole. These issues are taken up in chapter 14.

Finally, it is also important to recognise that a complete assessment of the policy initiatives within the human capital stream would consider impacts beyond those on workforce participation and productivity — for example, their impact on quality of

life. Also relevant to any complete assessment is whether the benefits, broadly conceived, of the proposed policy initiatives or reforms exceed their costs. However, the scope of this assessment is narrower than that usually applied to assessments of proposed reform initiatives. Consistent with guidance for the study, it considers, in broad terms, information on indicative costs of providing additional services towards achieving the human capital objectives. However, it does not provide a cost–benefit analysis of new proposals.

10.2 The analytical framework

Some preliminary observations

In the absence of detailed published implementation action plans for each of the human capital substreams, information on the scale and nature of the specific reform proposals likely to be associated with this aspect of the NRA is sketchy.

Consequently, the analytical framework developed for this study aims to reflect the broad or outer-envelope potential for improvement in this area, having regard to the high-level indicative outcomes and associated progress measures agreed for each substream by COAG at its July 2006 meeting (COAG 2006c). Effectively, the framework reflects the broad aims outlined by COAG for the human capital stream and the assessment of the potential effects on workforce participation and productivity. In forming a view about the potential effects, the analysis has been guided by feedback from relevant government departments and agencies at workshops held in May, July and September 2006.

This approach is consistent with the guidance provided for the study (see appendix A) which observed:

> It is noted that modelling the economic impact of the broadly defined Human Capital reform outcomes would only produce very general estimates of economic benefit and outer-envelope estimates of what could potentially be achieved, and that the benefits may only accrue over a long period of time.

The analytical framework is necessarily *exploratory* in nature. It has required a review of published information to identify the scope for raising workforce participation and productivity through changes to the areas of human capital targeted by the NRA, taking into account the likely impact on workforce productivity of employing marginal workers. It has also involved the development of demographic and general equilibrium models to inform assessments of the implications for the economy at large.

The exploratory nature of the framework reflects considerable uncertainty associated with the human capital stream, including the inevitable evolutionary nature of the process for identifying and implementing specific reform proposals. Indeed, as noted in the Communiqué to the February 2006 meeting of COAG:

> In some cases there is agreement on what should be done in general terms; in other cases, a number of diverse and innovative approaches need to be tried.
>
> The different circumstances in a country as large and varied as Australia require diverse kinds of actions rather than a 'one size fits all' approach (COAG 2006a, p. 2).

Beyond this, important differences between the human capital stream and the competition and regulatory reform streams of the NRA impact on the nature of the analysis of potential benefits. For the latter reform streams of the NRA, there are often firmer conceptual frameworks and information bases to guide policy development, and a broad agreement on the specific reform proposals required to secure desired outcomes. In sharp contrast, there is a greater diversity of views about the scope for improving human capital outcomes and the role that policy can play in this process. In part, this reflects a greater level of complexity, the existence of important information gaps about the relative merits of different initiatives, and the difficulty of isolating the additionality (or specific contribution) that NRA-induced policy changes can make to workforce participation and/or productivity outcomes.

The main elements of the analytical framework

The analytical framework developed to aid the assessment of the potential outer-envelope economic impacts of changes in human capital for each of the substreams was refined in response to feedback provided by Commonwealth and State and Territory government officials at the three workshops. The framework comprises three distinct elements:

- international comparisons to identify what has been achieved in other countries;
- a variety of different forms of supporting analysis to identify the scope for change, including the workforce participation and productivity possibilities associated with each substream; and
- demographic modelling to isolate the potential impacts of policy-induced changes in human capital on projected participation and/or productivity outcomes for Australia by 2030.

International comparisons

The first element — *international comparisons* — provided a 'first take' on the outer envelope that could be potentially achieved for each of the substreams. These comparisons fall into two distinct groups. First, comparisons of Australia's workforce participation and labour productivity rates with those of other OECD countries. Second, comparisons involving other aspects of performance of direct relevance to each substream including, for example:

- mortality rates associated with different chronic diseases;
- levels of achievement for the different segments of the education and training system — early childhood development, literacy and numeracy, transitions from school to work or further study, and adult learning;
- workforce participation rates for key sub-groups of the workforce including people aged 55 to 64, women aged 25 to 44 and people on the disability support pension; and
- successful programs or policy initiatives in areas of relevance to each substream.

Supporting analysis

The second element — *various forms of supporting analysis* — was undertaken primarily to review Australia's existing performance in some detail for the activities and/or groups targeted by the reform process. An important part of this analysis involved an examination of Australian and international studies that have explored the relationship between past changes in health status, education and training outcomes and work incentives, and the resulting workforce participation and productivity outcomes. This literature review augmented the contribution of international comparisons in informing assessments of the outer envelope of potential achievements.

For the health promotion and disease prevention substream the supporting analysis focused on effects for workforce participation and labour productivity for those aged 15 and over as any effects on those aged less than 15 years will be small over the projection period. Reflecting the sub-groups of the population targeted by the education and training substream, the key workforce effects were analysed for a wider age range that includes those aged less than 15 years. For the work incentives substream, the focus was on those aged 15 to 64 as the short to medium workforce related effects for the remainder of the workforce/population are likely to be small.

The results of the supporting analysis were used to determine to what extent the 'first take' on the outer envelope (provided by the international comparisons)

needed to be refined. In effect, it involved 'digging deeper' to identify the real scope for lifting Australia's workforce participation and productivity performance through reforms for each human capital substream.

A distinctive feature of the human capital stream is the variation in time frames associated with the potential impacts of reform initiatives. In some cases, the impacts could be realised relatively quickly with policy change, while the impacts of some other initiatives are likely to have much longer maturation periods. For example, many of the possible changes to policy settings that affect work incentives (such as varying the age threshold for accessing the age pension) could change the financial incentives of households and impact on participation decisions relatively quickly — perhaps within one or two years of any change. In contrast, impacts in the health promotion and disease prevention and education and training areas on rates of workforce participation and productivity may take a generation or more to materialise.

The supporting analysis also outlined the key assumptions associated with the estimates of the participation and productivity possibilities. Where appropriate, the sensitivity of the results to the underlying assumptions has been indicated.

Finally, where feasible, indicative estimates of the costs associated with realising the potential gains related to each substream have been developed. However, in view of the absence of detail on specific reform possibilities, as well as the wide range of feasible possibilities and the limited nature of existing data in this area, the analysis is confined to a broad qualitative commentary. Appropriate cost–benefit analysis should be undertaken before embarking on any specific policy reform.

Demographic modelling

The remaining element of the analytical framework — demographic modelling — enabled the identification of the significance of the outer-envelope changes in human capital for workforce participation and labour productivity in the context of the challenges posed for Australia by population ageing. An earlier analysis by the Productivity Commission of the *Economic Implications of an Ageing Australia* concluded, other things being equal, that Australia faces a pronounced ageing of its population over the next forty years (PC 2005f). This ageing process was projected to slow the growth of the workforce, lead to a decline in workforce participation and lessen Australia's potential growth rate. The Commission also noted that policy measures which raise workforce participation and productivity would enhance income growth and Australia's capacity to 'pay' for the costs of ageing. In this context, it is noteworthy that a key motivation underlying the human capital stream

of the NRA is to ameliorate at least some of the adverse impacts of population ageing on the community (COAG 2006a).

Chapter 14 draws on the workforce participation and productivity possibilities identified for the health, education and training and work incentives substreams reported in chapters 11, 12 and 13 respectively. It applies a demographic model to compare a 'business-as-usual' baseline outcome for workforce participation and productivity by 2030 (assuming no human capital NRA reforms) with an outer-envelope scenario that incorporates the potential impacts of the human capital stream on these labour market outcomes.

The demographic model developed for the *Economic Implications of an Ageing Australia* report (PC 2005f) projects future population size and structure. Since the labour market is not directly modelled, the model used assumptions about labour supply and productivity to guide the projections. The assumptions about key parameter values can be interpreted as providing plausible, but nonetheless conditional, outcomes that might arise from a full modelling of economic behaviour in the labour market.

The current implementation of the model used a standard set of assumptions drawn from PC (2005f) for the baseline:

- 'medium' life expectancy;
- fertility is stable at current levels; and
- net overseas migration is fixed at 115 000 people per year with an unchanging age–sex structure (see appendix C).

The values for the labour market parameters are based on recent trends.

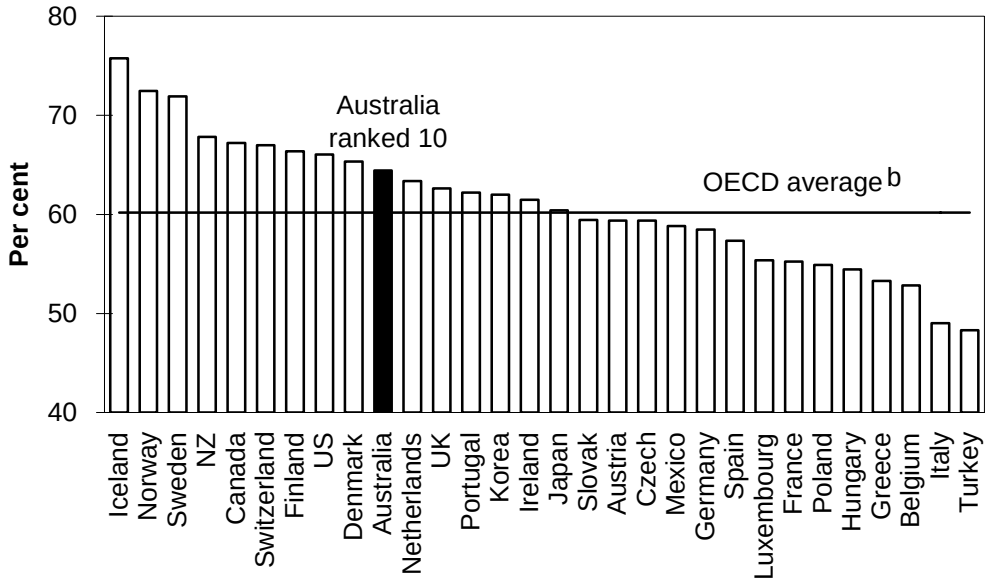
A 'first take' on the outer envelope for workforce participation and labour productivity

As noted previously, most of the human capital stream of the NRA is directed at improving Australia's workforce participation and productivity performance. But, what scope is there to improve these labour market outcomes? In seeking to answer this question, it is useful to consider how Australia compares internationally and how helpful these comparisons are likely to be in identifying broad possibilities for improvement.

Workforce participation rates — how does Australia compare?

In 2005, Australia's workforce participation rate (based on raw data compiled by the OECD) was somewhat above the OECD average — 64.4 per cent compared with an OECD average (unweighted basis) of 60.2 per cent. However, Australia's participation rate was below that of nine other OECD countries including Iceland (75.7 per cent), New Zealand (67.8 per cent), Canada (67.2 per cent) and the United States (66.0 per cent) (figure 10.2).

Figure 10.2 **OECD total workforce participation rates, 2005[a]**



a The workforce participation rate is defined as the workforce (employed and unemployed persons) expressed as a percentage of the working age population, taken to cover those aged 15 years and over. **b** OECD unweighted average.

Source: OECD (2006e).

In the same year, Australia's participation rate for persons aged 55 to 64 was 55.5 per cent, close to the OECD average (unweighted basis) of 54.5 per cent. However, Australia's participation rate for this age group was below that of 12 other OECD counties including Iceland (86.1 per cent), New Zealand (71.0 per cent), the United States (62.9 per cent) and Canada (57.9 per cent).

To take another example, for women aged 25 to 54, Australia's participation rate was 73.8 per cent. This is above the OECD average (unweighted) of 69.3 per cent in 2005. Even so, Australia's participation rate for this group gave it a ranking of 20 in the OECD, well behind Sweden (86.5 per cent), Iceland (85.1 per cent), and Canada (81.1 per cent), and to a lesser extent, New Zealand (76.4 per cent) and the United States (75.3 per cent).

Comparisons for men and women in aggregate and for other age groups in 2005 also reveal relatively large participation rate gaps between Australia and 'high workforce participation rate' OECD countries. Comparisons over the past ten years yielded similar outcomes.

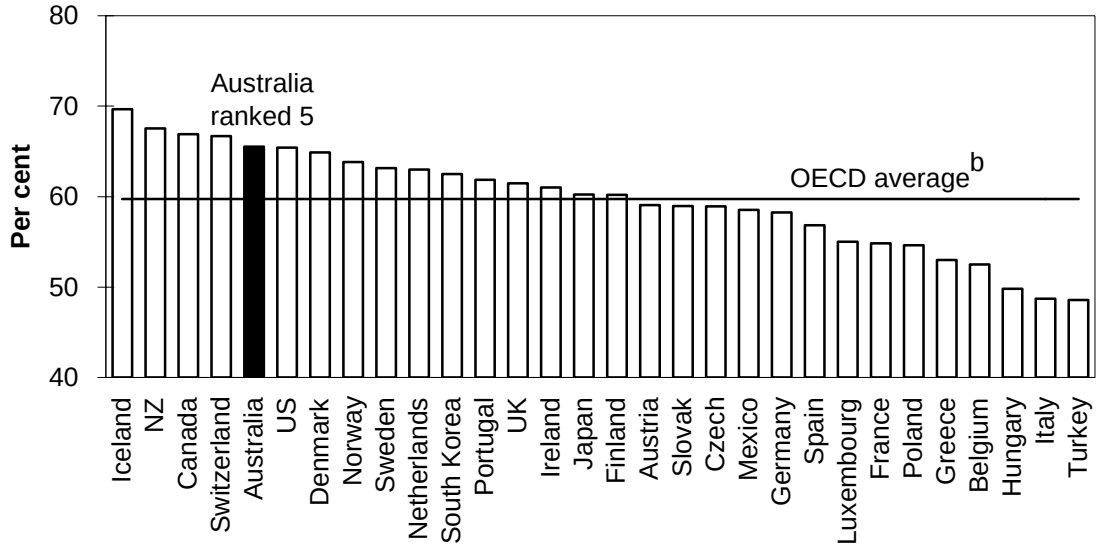
Closer analysis of the raw data used in these comparisons indicates that some of the observed differences in published participation rates arise from differences in statistical practices across countries. These differences arise for several reasons including variations in the treatment of: defence personnel; institutionalised populations; the coverage of some age brackets; paid maternity leave; definitions of unemployment; and temporary residents.

Adjustments to the raw data to standardise for these differences in statistical practices enhance the comparability of the data. This, in turn, improves our understanding of the magnitude of the gap between Australia's workforce participation rates relative to those of other countries and the potential for improvement.

Adjustments to the raw data for some of the more important differences in statistical practice, lift Australia's overall workforce participation rate in 2005 from 64.4 to 65.5 per cent (PC 2006e forthcoming). The effect of these adjustments is to lift Australia's ranking within the OECD from 10th to 5th place. On this adjusted basis, Australia's overall participation rate, remains behind Iceland, New Zealand and Canada by 4.2, 2.0, and 1.4 percentage points respectively (figure 10.3).

These international comparisons indicate the potential for raising Australia's workforce participation rates. It is apparent that government policies across a diverse range of areas — including those targeted by the human capital stream of the NRA — can influence observed participation rates (see, for example, Borland 2005; Burniaux, Duval and Jaumotte 2003, 2004; and Jaumotte 2004). It is also apparent that there are much larger variations in participation rates between Australia and other OECD countries for some age groups, covering men and women alike, than those evidenced by examining data for men and women as a whole or for the workforce as a whole.

Figure 10.3 **Adjusted OECD total workforce participation rates, 2005**[a]



a Preliminary estimates by the Commission that adjust for variations in the treatment of defence personnel, institutionalised populations, missing data for some age brackets and paid maternity leave between OECD countries. **b** OECD unweighted average.

Sources: Productivity Commission estimates based on ABS (*Australian System of National Accounts, 2005-06*, Cat. no. 5204, Canberra*, Labour Force, Australia, Detailed – Electronic Delivery*, Mar 2006, Cat. no. 6291.0.55.001); CIA (2006); EOWA (1998); IISS (2006); OECD (2006e); UN (2005a, 2005b); and USCB (2005).

This examination points to the need for more detailed analysis of the factors underlying variations in participation rates for sub-groups of the Australian workforce exhibiting relatively low participation rate outcomes (chapter 13).

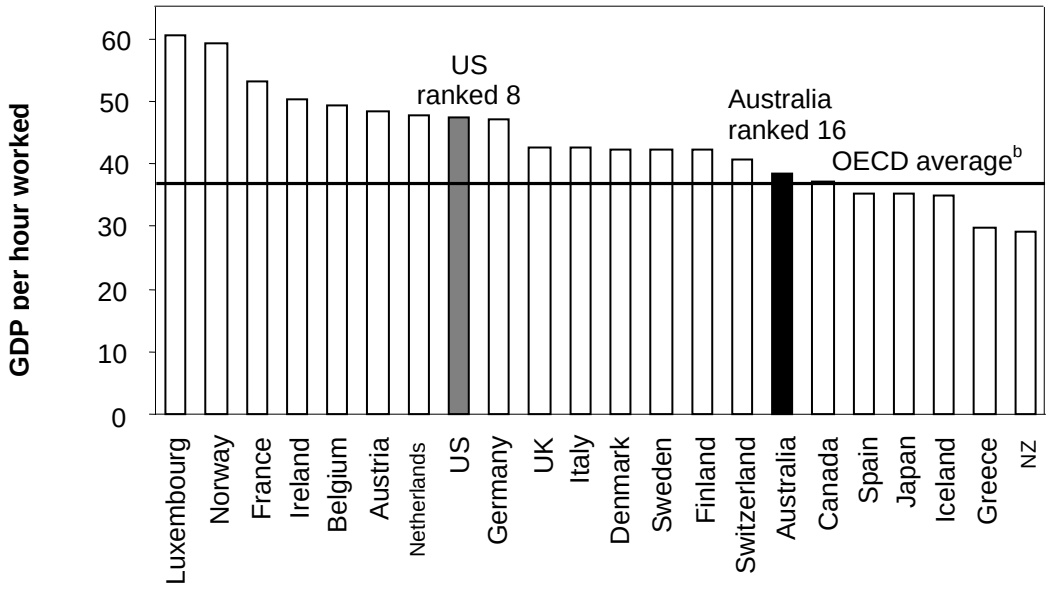
Labour productivity levels — how does Australia compare?

It is well known that Australia experienced a productivity growth surge in the 1990s relative to its performance in earlier years and those of many OECD countries. Productivity growth has slowed somewhat since. Despite that, Australia's absolute levels of productivity remain well below those of many other OECD countries. In a recent assessment, the OECD commented that:

> Productivity measures consistently show that output per hour worked in Australia, while rising briskly, remains well below that in technologically leading countries. This suggests that there is further scope for catch up (OECD 2005b, p. 16).

In 2004, the level of Australia's GDP per hour worked — a standard measure of labour productivity — was $US38.5, above the OECD average of $US36.9, measured on a purchasing power parity basis. Even so, Australia's labour productivity measured on this basis was below that of 15 other OECD countries, including the United States and the United Kingdom (figure 10.4).

Figure 10.4 **Labour productivity for selected OECD countries, 2004[a]**
$US purchasing power parity



a Labour productivity is measured as GDP divided by the total number of hours worked in a given year. The GGDC's preferred definition is actual hours worked per employed person each year. This definition includes paid overtime but excludes hours paid but not worked (such as paid sick and recreation leave). In compiling the database, the GGDC tries to obtain, for each country, the data that most closely match its preferred definition. The index is calculated in 'purchasing power parity' terms. **b** OECD unweighted average.

Source: Groningen Growth and Development Centre and the Conference Board (2006).

The high labour productivity of many European countries, listed at the top of the rankings in figure 10.4, is 'bolstered' by a number of non-technological factors. Policy and institutional settings in these European countries have led to a decrease in hours worked and lower employment rates, such that higher levels of productivity have been traded-off against lower levels of labour utilisation. Furthermore, these policy and institutional settings (such as high minimum wages) have shifted demand towards relatively skilled workers and away from labour towards capital, boosting labour productivity.

It has been suggested that, after adjustment for differences in labour utilisation across countries, only two European countries — Luxembourg and Norway — have noticeably higher productivity levels than those in the United States (Dolman, Parham and Zheng 2006). Since Luxembourg has a small and specialised economy and Norway's productivity level reflects a relatively large reliance on oil extraction, these countries are not considered relevant comparators for Australia. The United States, however, has institutional arrangements and labour utilisation rates similar to Australia and therefore is a more appropriate comparator for analysis of relative labour productivity levels.

Australia's level of GDP per hour worked is currently around 80 per cent of the United States. Several studies have investigated the possible explanations for the Australia–United States productivity gap, although measuring the relative importance of these factors is difficult (box 10.2). While many factors are at work, key explanations of the productivity gap include industry mix and population density.

Although international comparisons are not prescriptive, they do provide two broad insights relevant to the assessment of the potential benefits from the NRA. First, in the context of labour quality, education and training outcomes are likely to be important. To the extent that the productivity of the workforce could be improved above what it would otherwise be through cost effective education and training, there is scope for such improvements to raise Australia's productivity performance. Second, the assessment of the potential impact of the human capital stream of reforms will need to take into account the implications for labour productivity. An important issue in this context is the extent of any trade-off between increased workforce participation and the aggregate labour productivity outcome.

As is the case for workforce participation, it is apparent that international comparisons can do no more than provide a rough 'first take' on the productivity possibilities associated with the human capital stream of the NRA. This highlights the importance of the supporting analysis element of the analytical approach in developing the participation and productivity possibilities for use in the demographic modelling element of the framework.

Box 10.2 Australia–United States labour productivity comparisons — scope for Australia to catch-up?

There are many possible explanations for the Australia–United States productivity gap.

- *Measurement issues* are likely to be some part of the explanation. Despite considerable effort to improve the comparability of productivity estimates — and Australia and the United States have closer conventions than many if not most other pairings of countries — measurement differences remain.
- *Industry mix and performance*. The overall productivity gap can be due to a different mix of industries with different productivity levels in the two economies, or to different productivity levels in the same industries. Industry performance is an important factor contributing to the productivity gap. For instance, Australia is less than 50 per cent of US productivity levels in the major sectors of manufacturing, wholesale trade and retail trade. And, while Australia is on a par with, or ahead of, other US industries, the differences do not involve magnitudes that could reverse the gap resulting from industries that are left behind.
- *Geography*. There is mixed evidence on the impact of geographic isolation on the Australia–United States productivity gap. Battersby (2006) attributed nearly 45 per cent of Australia's productivity gap with the United Sates to Australia's geographical isolation from large markets. Dolman, Parham and Zheng (2006), on the other hand, found that, in terms of average incomes, Australia appears to have largely offset the tyranny of distance. They do note, however, that the sparseness of settlement and the size of Australian cities could constrain Australia's ability to close the gap.
- *Education and skill levels of the workforce*. Higher average education levels in the United States relative to Australia results in two opposing influences on the Australia–United States productivity gap. First, to the extent that a better educated US workforce has been a source of their labour productivity advantage in the past, the productivity gap seems likely to narrow as Australia is set to catch-up with US education levels over the next few decades. Second, higher education and skill levels in the United Sates may result in a higher rate of innovation and take up of new technologies. This effect will widen the productivity gap for some time to come.
- *Product and labour market regulations*. Several studies suggest that differences in product and labour market regulation and institutions, which may constrain competition and efficient outcomes in the economy, may account for as much as one-sixth of the productivity gap (see, for example, Gust and Marquez 2002, Rahman 2005, and Scarpetta and Tressel 2002).

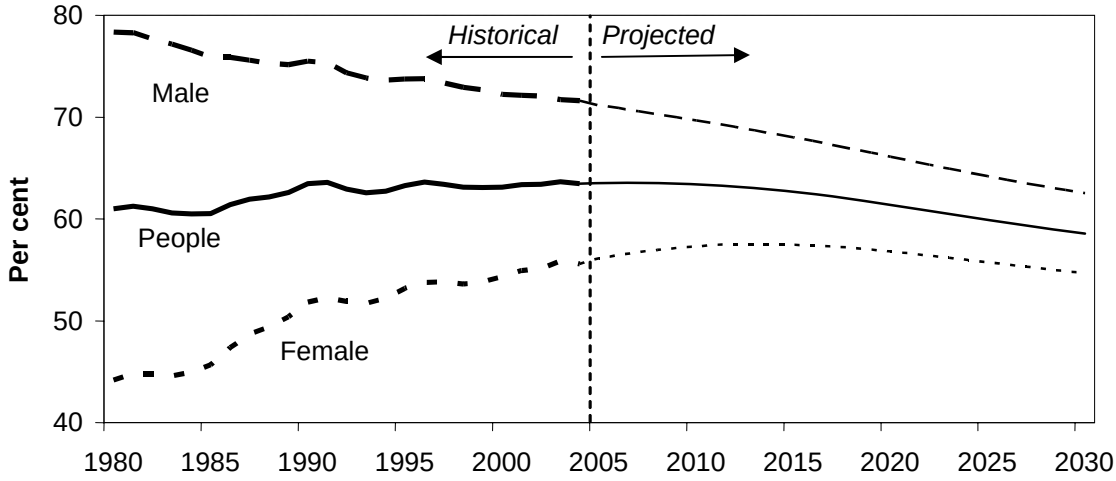
Broad historical and projected baseline trends in workforce participation and labour productivity

To provide a backdrop to the study of the potential impacts of the human capital stream and the consolidated reporting of the Commission's estimates of the impact of the NRA in chapter 14, it is useful to compare the projected baseline outcomes for workforce participation and productivity by 2030 with historical values for these variables. For example, are the projected baseline values for these variables (excluding any effects from changes to human capital arising from NRA initiatives) likely to be markedly different from their recent or historical values?

Workforce participation

Despite a great deal of change in the economy over the last 25 years, the aggregate workforce participation rate has remained fairly stable at around 63 per cent (figure 10.5). Even so, there has been much change in the composition of the workforce. Participation rates have steadily declined for men and risen for women.

Figure 10.5 **Aggregate participation rates, historical and projected, 1980 to 2030**



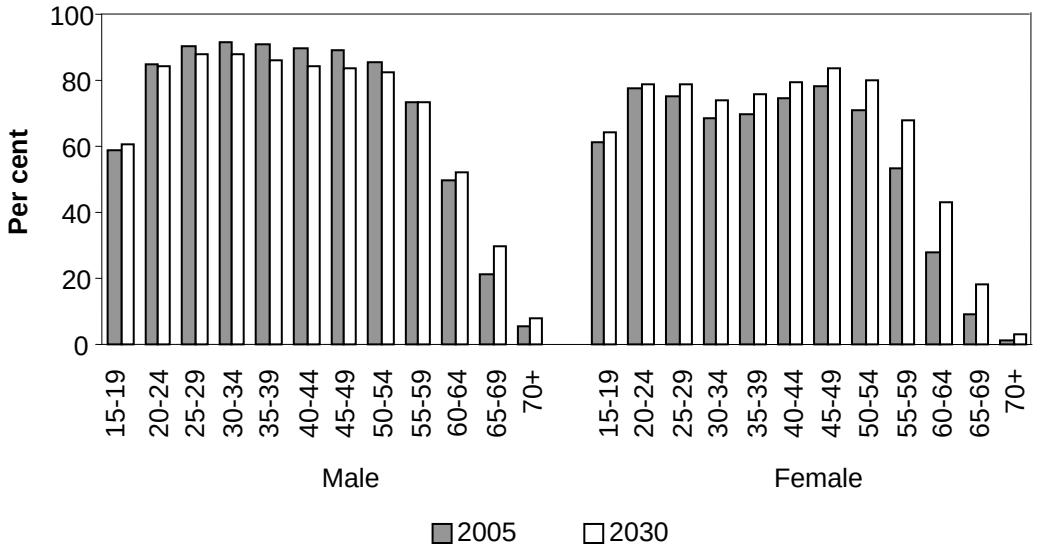
Sources: Estimates for 1980–2004: ABS (*Australian System of National Accounts, 2005-06*, Cat. no. 5205, Canberra); Projections for 2005–2030: PC (2005f).

Against this background, the demographic model uses trends in labour market outcomes for different cohorts to project future participation rates. Over the next 25 years, the baseline participation rate for women is projected to increase initially and then decline. The projected eventual decline is expected to arise because a lower participation rate for older females is projected to more than offset the positive

effect of increasing levels of education on women's participation in the workforce. Men's participation is projected to continue to decline due to population ageing, which increases the share of older men, and lower participation rates among older men. As a result, the overall participation rate is projected to decline from around 63 per cent in 2005 to around 59 per cent by 2030, all other things remaining equal.

Although the aggregate baseline participation rate is projected to decline, differences in participation rates are expected across cohorts of the workforce (figure 10.6). Participation rates for men aged 20–59 are projected to continue to decline. The large increase in participation rates projected for men aged 65–69 is not expected to be sufficient to offset the projected reductions in participation among other age groups, as well as the shift in population towards older age groups with relatively low participation rates. The projected effects of rising education on female participation can be seen in figure 10.6, but this is also offset by an expected shift in the age profile of the female population, again towards the older age groups.

Figure 10.6 **Current and projected baseline participation rates by cohort, 2005 and 2030**



Source: PC (2005f).

Labour productivity

Productivity growth reflects changes in technology, diffusion of new technologies and changes in the composition of the economy. The rate of innovation and adoption of new technologies is particularly important for productivity growth in the long run.

Labour productivity growth is a combination of multi-factor productivity growth and capital deepening — the amount of capital available per worker. Labour productivity is conventionally measured as average real output per hour worked.

Over the past 30 years, labour productivity for the economy as a whole has been growing by about 1.75 per cent per year on average (PC 2005f, Commonwealth Treasury 2002). This growth rate reflects multi-factor productivity growth of around 1 per cent per year, with capital deepening explaining the remainder.

Over the next 25 years, in these benchmark studies, labour productivity is assumed to continue increasing by 1.75 per cent per year. The assumed rate of improvement includes the effects of continuing productivity growth *and* capital deepening. It also reflects ongoing improvements in health, education and training separate and distinct from any changes, at the margin, that might arise from human capital changes under the NRA. If this historical experience were to be replicated over the next 25 years, baseline labour productivity would be 54 per cent higher by 2030 than it was in 2005.

Against this backdrop, the assessments of the broad potential economic effects of the health, education and training, and work incentives substreams of the NRA are presented in chapters 11, 12 and 13 respectively. The nature of the assessment varies across these chapters. For health promotion and disease prevention, a case-study approach covering the six chronic diseases targeted by the NRA is applied. For education and training, the approach focuses on identifying the relevant target groups and performance benchmarks. Finally, for work incentives, the focus is on identifying opportunities for workforce participation rates of the nominated groups to rise and considering the implications for workforce productivity.

The participation and productivity possibilities identified in these chapters are drawn together in chapter 14, which presents a consolidated analysis of the potential direct impacts on the workforce for the human capital stream as a whole relative to the baseline projections outlined above. This approach has enabled the Commission to more effectively isolate the potential workforce effects which could flow from NRA initiatives.

11 Health promotion and disease prevention

Key points

- The health promotion and disease prevention component of the NRA focuses on ways of moderating disease risk factors and reducing the chronic disease burden.
- Six case study diseases — mental health, type 2 diabetes, serious injury, cardiovascular disease, cancer, and musculoskeletal disease — account for around 70 per cent of the disease burden for the working–age population.
- Assessing the potential impact of additional (or more effective) health promotion and disease prevention is difficult.
  - Many factors influence health and quantifying the effects of health initiatives is not straightforward.
  - There can be long time lags before improvements stemming from health initiatives become evident.
  - Results from small controlled trials may not be readily replicated in the broader community.
  - The proportion of chronic disease that may be potentially 'avoidable' varies markedly across diseases.
- Reductions in the prevalence of chronic disease are likely to have relatively small workforce effects.
  - An outer-envelope scenario suggests that by 2030, NRA consistent health initiatives could increase the participation rate by around 0.6 of a percentage point.
  - On average, these new entrants to the workforce are likely to be around 80 per cent as productive as existing members of the workforce.
- Despite the relatively small workforce effects, cost-effective improvements in health promotion and disease prevention are likely to lead to significant gains in the quality of life for many individuals.

Health promotion and disease prevention forms an important part of the human capital stream of the NRA. Indeed, as stated by the COAG National Reform Initiative Working Group:

> Good health underpins the wellbeing of Australians. It enables people to lead active lives and determines their capacity to participate and be productive in the workforce. Too many Australians fail to reach their potential because of debilitating disease, which, in many cases, could have been better managed or prevented.

> It is important that all people are encouraged and supported to realise their potential through good health (COAG 2006d, p. 18).

Indicative outcomes for the health promotion and disease prevention component of the NRA set out in the Communiqué to the February meeting of COAG included:

- a reduction in the proportion of the working-age population not participating in the workforce due to illness, injury or disability;
- a reduction in the prevalence of key risk factors that contribute to chronic disease; and
- a reduction in the incidence of chronic disease (COAG 2006a).

At its meeting in July, COAG specified a further two indicative outcomes for this area, namely to:

- significantly improve the proportion of children born healthy (subsidiary outcome: the gap between indigenous and non-indigenous children is closed); and
- reduce the prevalence of key risk factors that contribute to chronic disease for school age children (COAG 2006c).

Reflecting COAG's emphasis on improving workforce participation and productivity outcomes, this chapter focuses on indicative outcomes for persons of working age (that is, persons aged 15 years and over).

For the working age population, COAG's indicative progress measures covering chronic diseases specify seven diseases: heart attacks, cancer, serious injury, depression and anxiety, type 2 diabetes, end-stage renal disease and musculoskeletal disease (COAG 2006c). These diseases and their associated risk factors are the focus of health promotion and disease prevention under the NRA.

Accordingly, this chapter employs a case study approach to identifying the outer-envelope workforce participation and productivity improvements that might be achieved through additional and/or more effective health promotion and disease prevention. Estimates of the potentially achievable improvements are indicative and conditional on the associated assumptions. As end-stage renal disease can effectively be treated as a complication of type 2 diabetes, the case studies cover the remaining six diseases identified above (with anxiety and affective disorders analysed in the broader context of mental health).

The subsequent analysis does not posit views on the merits of particular measures or the relative costs and benefits of different ways of achieving improvements in this area. As noted in the guidance for this study, these are matters for COAG to resolve

(see appendix A). The chapter does include some broad observations on the cost implications associated with achieving the indicative outcomes as well as the likelihood of considerable time delays prior to pay-offs from new initiatives.

11.1 Health promotion and disease prevention

Health promotion and disease prevention initiatives are designed to promote, protect and sustain the health of the population and include 'actions to reduce or eliminate the onset, causes, complications or recurrence of disease' (AIHW 2004b, p. 496). A useful categorisation developed by the National Public Health Partnership (NPHP 2001) distinguishes between:

- primary prevention measures — aimed at promoting healthy lifestyles and reducing the key risk factors contributing to chronic disease (eg public health awareness campaigns);
- secondary measures — aimed at early detection and more effective pre-cautionary treatment of chronic disease (eg breast cancer screening and lifestyle interventions for people with 'pre-diabetes'); and
- tertiary measures — aimed at better treatment of established conditions to improve or maintain functional status (eg applying antipsychotic treatment to people in early stages of psychoses).

Health promotion and disease prevention focuses on modifying and ameliorating risk factors that influence the development or progression of chronic disease. Risk factors can be broadly grouped into two categories: behavioural risk factors (including, eg poor diet and nutrition, physical inactivity, risky alcohol use, tobacco smoking); and biomedical risk factors (including, eg excess weight, high blood cholesterol, high blood pressure, depression).

In this chapter a range of health promotion and disease prevention initiatives targeting both behavioural and biomedical risk factors have been used to identify the potential benefits from the NRA.

Existing programs — a quick guide

Over the last 40 or so years, Australian governments have funded an array of programs aimed at reducing modifiable risk factors and the incidence of chronic disease. Since the early 1960s, for example, 35 programs have been funded by the Commonwealth Government to target coronary heart disease alone (DHA 2003). Australia currently has in place a wide range of promotion and prevention programs such as the National Mental Health Plan, the National Injury Prevention and Safety

Promotion Plan and Eat Well Australia: An Agenda for Action in Public Health Nutrition (NHPAC 2006). With regard to chronic diseases, Australian governments endorsed a national chronic disease strategy in 2003.

In 2003-04, government expenditure on health promotion and disease prevention in Australia amounted to $1.3 billion or 2.5 per cent of recurrent health expenditure by all governments (AIHW 2006b).[1] Of this, the Commonwealth Government spent $657 million, while the States and Territories spent $609 million.

COAG health outcome related initiatives

Details of the nature and scale of NRA health promotion and disease prevention initiatives have not been determined. At this stage, a set of high-level indicative outcomes have been agreed by COAG (COAG 2006a, 2006c). Beyond NRA, COAG has agreed on two new public health initiatives — the Australian Better Health Initiative and the National Action Plan on Mental Health. The Australian Better Health Initiative comprises five elements: promoting healthy lifestyles; supporting early detection of lifestyles risks and chronic disease; supporting lifestyle and risk modification measures; encouraging active self-management of chronic disease; and improving integration and coordination of care. This initiative will involve spending $500 million over four years commencing from 1 July 2006.

The new National Action Plan on Mental Health focuses on: promotion, prevention and early intervention; improving mental health services; providing opportunities for greater recovery and participation in the community and employment; providing better coordinated care; and building workforce capacity. It is envisaged that around $3.5 billion will be spent over five years, including $383 million in new spending on promotion, prevention and early intervention.

These initiatives are expected to increase national expenditure on health promotion and disease prevention by around $202 million per annum over the next few years — an increase over 2003-04 spending of some 16 per cent.

COAG has also nominated diabetes in the first tranche of priority areas for the development of specific reform proposals for the human capital stream.

[1] This estimate includes expenditure on: communicable disease control, selected health promotion, organised immunisation, environmental health, food standards and hygiene, breast cancer screening, cervical screening, prevention of hazardous and harmful drug use, and public health research.

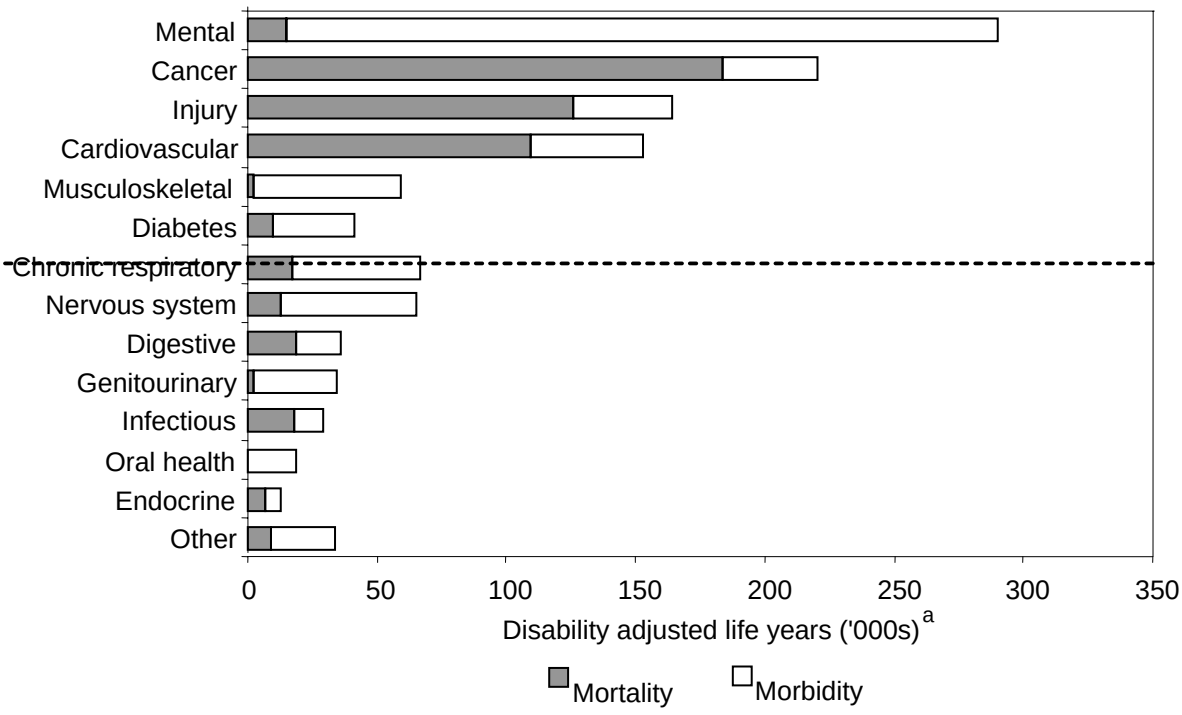
11.2 Adopting a case study approach

A case study approach is used to assess the extent to which promotion and prevention initiatives can reduce the risk and burden of chronic disease because:

- the COAG Communiqué specifies, as indicative progress measures, a reduction in the incidence of *specific* chronic diseases (COAG 2006c);
- scope for reducing the incidence of disease and improving workforce participation and productivity varies by disease; and
- most of the evidence on the effectiveness of promotion and prevention focuses on specific diseases. That said, the quality of information available on the impact of promotional and preventative initiatives varies across diseases.

The six case study diseases account for close to three-quarters of the total disease burden for those aged 15 to 64 (figure 11.1). Noticeably, for mental illness and musculoskeletal disease, the greatest proportion of the disease burden is due to morbidity, while for cancer, injury and cardiovascular diseases, the majority of the burden is due to mortality.

Figure 11.1 **Burden of disease in the 15–64 age group by major disease group, 1996**



a Disability adjusted life years refer to the number of healthy years lost (to premature death and ongoing disability) as a result of disease. Years lost to disability are adjusted to account for severity. Diseases that greatly inhibit a person's ability to operate normally are assumed to cause a larger burden.

Source: Mathers, Vos and Stevenson (1999).

A significant proportion of the disease burden is borne by those outside the 15 to 64 age bracket, mainly by those in older age groups — in excess of 40 per cent by those over the age of 64, compared with less than 10 per cent by those under 15. Cardiovascular diseases and cancers are the major diseases affecting those over 64 (accounting for over half of their burden), followed by nervous system and chronic respiratory disorders. In total, the case study diseases account for close to 70 per cent of the total disease burden for those aged over 15. For those under 15, chronic respiratory conditions (mainly asthma), mental disorders, neonatal conditions, congenital abnormalities and unintentional injuries account for the bulk of the disease burden.

Methodology

The broad methodology adopted to assess the possibilities for improving workforce participation and productivity through health promotion and disease prevention involves:

- identifying the groups of people at risk of developing a chronic disease (section 11.3);
- examining the evidence on the scope for improvement and making an assessment about the potential 'avoidable' prevalence or burden of disease (section 11.4);
- examining the link between potential health outcomes and improvements in workforce participation and productivity (section 11.5); and
- generating projections of the potential impact of health promotion and disease prevention on workforce participation and productivity 25 years ahead given anticipated changes in the prevalence of specific diseases over this period (section 11.6).

11.3 Effects of chronic disease on workforce participation and productivity

Workforce participation and productivity is the focus of the human capital stream of the NRA. Given this, those who are currently outside the workforce, or whose work is affected by chronic disease represent the best proxy for the target group for health promotion and disease prevention initiatives. Notwithstanding the narrower focus taken here, these initiatives have a much broader target which includes those at risk of developing chronic disease.

Chronic disease and workforce participation

People suffering from chronic diseases are less likely to participate in the workforce than the population more generally. That said, different diseases have different effects on a person's ability to participate in the workforce. This is due to the degree of disability, morbidity and the effect of treatment.

Mental illness was found to have the most significant effect on workforce participation. Sufferers were found to have participation rates of almost 35 per cent, that is close to 30 percentage points lower than that for the general population of 65 per cent in 2005 (based on data presented in Waghorn and Lloyd (2005)). Serious injury, followed by cancer, were the next most significant diseases to affect workforce participation — with participation rates close to 13 and 6 percentage points lower than the population average, respectively.[2]

The workforce participation effects of the other diseases are smaller — for type 2 diabetes and musculoskeletal disease the participation rate is around five percentage points lower than the general population, while for cardiovascular disease it is estimated to be less than three percentage points lower (ABS 2001a and Access Economics 2005b, 2005c). For musculoskeletal disease, however, international studies have found that people with these conditions tend to have reduced average working life expectancy (see, eg Lacaille and Hogg 2001 and Chorus et al. 2000).

Workforce participation rates also vary *within* the chronic diseases, with people with more severe disorders less likely to participate. For example, while around 47 per cent of people with anxiety and affective disorders are estimated to not be in the workforce, for severe psychotic disorders around 64 per cent of sufferers are not in the workforce (Access Economics 2002, 2003a).

Similarly, for cancer sufferers, participation rates depend on the form and severity of the disease. Spelten, Sprangers and Verbeek (2002), in a review of various international studies, found that the overall rate of return to work for cancer sufferers was 62 per cent — equating to a greater than 20 per cent differential in participation rates relative to the general population — but across the various forms

[2] For *injury*, the estimate is based on data from the HILDA survey. People who reported an injury, and were hospitalised in the 12 months prior to the survey had a participation rate 13.0 percentage points lower than that of the general population. For *cancer*, the estimate is based on Jose, Ravindiran and Abello (2004) who estimated out of the workforce odds ratios for cancer sufferers which equated to a participation rate 6.6 percentage points below that of the general population. This is similar to (preliminary) Australian evidence which suggests a participation rate differential of between 5.1 and 7.2 percentage points (Floyd and Wade 2006 and preliminary work underway at the Productivity Commission).

of cancer the differential ranged from 30 to 93 per cent. People with head and neck cancer were found to experience the lowest return to work rates.

Chronic diseases not only affect the workforce participation of sufferers, but can also have an indirect effect through changes in participation rates for the informal carers who care for people with chronic diseases. Overall, in 2003, there were an estimated 2.6 million informal carers in Australia (ABS 2004b). Little information exists on the number of carers on a disease basis. Where information exists, the evidence suggests that carer rates vary. For example, around 10 per cent of type 2 diabetics reported having a carer (Dunstan et al. 2001), compared with an estimated 3 per cent for those with schizophrenia and bipolar disorders (Access Economics 2002, 2003b).

To estimate workforce participation losses attributable to chronic disease, differences in the workforce participation of people suffering from the six case study diseases and that of the general population were applied to the working age population affected by the diseases. Carer ratios[3] were also used to 'gross-up' the estimates of increased workforce participation for these diseases to account for likely changes in workforce participation of carers. The resulting estimate corresponds to the *gross* participation loss. The estimate does not account for:

- mortality rates associated with specific diseases — including cardiovascular disease and cancer which are the leading causes of death in Australia (ABS 2006d); and
- the fact that not all of the disease burden is avoidable.

Consequently, the estimate is not appropriate for use as the outer envelope for raising participation — this is described in section 11.4.

While the focus is on the working age population, there is some evidence to suggest that improvement in the health of mothers and their babies and young children up to the age of 3 years has the potential to lead to improvements in both overall health in the longer term and higher levels of workforce participation (box 11.1).

[3] The number of carers who would have been in the workforce if not for their caring responsibilities relative to the number of sufferers.

Box 11.1 **Improving the health of those aged between 0 and 3 years**

The Foetal Origins hypothesis (previously known as the Barker Hypothesis — Barker (1995)) contends that a baby's nourishment before birth and during infancy, 'programs' the development of health-related risk factors. Also, that poor nourishment leading to permanent changes in the embryo/foetus and a low birth weight can lead to a predisposition to chronic disease in adult life.

Studies over the past 10 years have shown the importance of events before birth for lifetime health in many populations (Barker et al. 1993; Stein et al. 1996; and Rich-Edwards et al. 1997). Both foetal growth and growth during early childhood have been found to be a major contributor in long-term health outcomes (Eriksson et al. 2001 and Barghava et al. 2004). The most unfavourable growth patterns appear to be thinness at birth and during early childhood followed by a rapid increase in body weight.

Sources: Barker et al. (1993); Barker (1995); Paneth and Susser (1995); Stein et al. (1996); Rich-Edwards et al. (1997); McCain and Mustard (1999); Eriksson et al. 2001; Barghava et al. (2004); SCRGSP (2005); and Eriksson (2006).

As shown in table 11.1, the largest estimated participation losses (including carers) are for mental illness — 236 000 full-time equivalent employees (FTE) or 3.4 per cent of the working age population. This result is partly driven by the relatively low participation rate for people with mental illness, but also because of the high prevalence of mental illness among the working age population. Unlike other chronic diseases, mental illness is most common among people under the age of 65 — 70 per cent of sufferers are below 65 years of age (ABS 2006c). Mental illness is also different from other chronic diseases in that it causes relatively few deaths — most of its burden is in the form of ongoing disability.

Musculoskeletal conditions are estimated to be the second largest target group — 100 000 FTE or 1.5 per cent of the working age population — with cardiovascular diseases the third largest. Despite the relatively small differential in the workforce participation rate for people with musculoskeletal and cardiovascular disorders, they are high prevalence disorders, affecting around 31 and 18 per cent of the population respectively (ABS 2006c). Hence, the relatively large number of people not participating in the workforce as a result of these conditions.

Conversely, for cancer, while sufferers have relatively high rates of non-participation, relatively low prevalence levels compared to other chronic diseases and the age incidence of this disease — 82 per cent of cancer sufferers are over the age of 45 — means that this target group is relatively small (6 000 FTE or 0.1 per cent of the working age population).

Table 11.1 **Gross participation loss estimates, 2005[a]**

Chronic disease	*Participation rate difference*[a]	*Carer ratio*[b]	*Full-time equivalent employees*[c]	*Proportion of population aged 15 years or more*
	% points	%	no.	%
Mental health	29.0	0.03	236 000	3.4
Cardiovascular disease	2.8	0.04	32 000	0.5
Type 2 diabetes	5.0	0.04	13 000	0.2
Injury (serious)	13.0	—	12 000	0.2
Cancer	6.6	0.03	6 000	0.1
Musculoskeletal[d]	5.4	—	100 000	1.5
Total[e]			**399 000**	**5.8**

[a] Differences between those reporting a particular disease and the general population. [b] No reliable carer information is available for serious injury and musculoskeletal conditions. [c] Calculation based on average hours worked in 2005. As such, total full-time equivalent employees is less than the total number of people outside the workforce [d] Based on an employment rate differential of 5.1 percentage points from Access Economics (2005b), and assuming the same unemployment rate as the general population. [e] Does not account for co-morbidities.

Source: Productivity Commission estimates.

The age distribution of type 2 diabetics is also a significant contributor to the relatively small target group for this disease — 13 000 or 0.2 per cent of the working age population. Around 90 per cent of type 2 diabetics are over the age of 45 (ABS 2006c).

Summing across the six diseases, the target population for the NRA reforms is estimated to be around 399 000 full time equivalent employees or 5.8 per cent of the working population in 2005 (table 11.1).

Chronic disease and productivity

Chronic diseases can also lower the productivity of sufferers participating in the workforce. Lower productivity is manifested through increased absenteeism and 'presenteeism' (defined as reduced productivity associated with employees attending work while ill and lacking the motivation or health to be fully productive).

Productivity losses vary by disease. Not surprisingly, the more severe disorders — *mental illnesses* and *cancer* — have been shown to have the greatest impact on productivity. For example:

- a study in the United States found that the number of presenteeism days attributable to *mental illness* averaged around 0.3 per month per worker (Kessler and Frank 1997). An Australian study (Lim, Sanderson and Andrews 2000) estimated that full time workers with mental disorders lose 3 days a month per

worker due to reduced 'at-work' efficiency and that a full time worker with a mental disorder is likely to lose 1 day a month due to absenteeism.

- *cancer* sufferers in the United States were estimated to have an average work loss of almost 6 days per month due to absenteeism and presenteeism (Kessler et al. 2001). Cancer was found to lead to the greatest level of presenteeism and absenteeism compared to other chronic diseases due to morbidity effects from treatment.

For *musculoskeletal conditions*, Australian and international studies indicate that they have the potential to impair a person's productivity while they are at work. Estimates of lost work days for musculoskeletal conditions range from 8 to 19 days per year (Yelin and Callahan 1995, Kessler et al. 2001).

For the other three chronic diseases, the evidence suggests that productivity losses are relatively small. For example:

- for *injuries*, a study in the United States (Ebel et al. 2004) found that people surviving motor vehicle accidents lost on average just over 1.5 days of work per person. The BTE (2000b) estimated that motor vehicle accidents that resulted in serious injuries lead to a loss in productive work days of three times the average length of stay in hospital (which equated to 6 days in 1997), with minor injuries having no effect on productive work days.
- for *cardiovascular diseases*, Access Economics (2005c) estimated that sufferers spent 0.3 per cent more time off work than the average Australian. A recent study in the United States (Lamb et al. 2006) also found that for coronary heart disease an average of 2 days per year are lost due to absenteeism and 6 hours per year due to presenteeism.
- for *type 2 diabetes*, little effect on absenteeism has been found. However, where complications arise, Ng, Jacobs and Johnson (2001) estimated that sick days were around 3 days per year higher than the general population. There is, however, some evidence to suggest that a lack of glucose absorption can affect the productivity of individuals at work. Lavigne et al. (2003), for example, found that, on average, every year that an individual has type 2 diabetes, productivity is decreased by around 1 hour per week.

Using estimates of presenteeism, absenteeism and the number of people employed with particular chronic diseases, estimates of productivity losses for each of the six diseases were derived (table 11.2).

The overall productivity losses are estimated to be relatively small — just over 2 per cent of total hours worked. The largest productivity losses arise where people suffer from mental illness and cancer.

Table 11.2 **Labour input loss estimates, 2005**

Chronic disease	*Days lost per month per employed person with disease*	*Hours of work lost per year per employed person with disease*[a]	*Per cent of total hours worked*
	days	hours	%
Mental health	1.9	195	0.67
Cardiovascular disease	0.2	19	0.14
Type 2 diabetes	0.1	5	0.01
Injury (serious)	0.9	41	0.05
Cancer	5.7	473	0.60
Musculoskeletal[b]	1.6	133	0.61
Total[c]			**2.08**

[a] A specific adjustment was made for those with mental illness who were working in order to take account of the high proportion of part-time work. This, however, was not done for the other diseases as limited information on the extent of part-time, as distinct from full-time, work was available. Thus, for these diseases, an economy wide part-time/full-time adjustment was used. [b] Based on estimate of 1.6 days lost per month for arthritis. [c] Based on estimated working population with these conditions.

Source: Productivity Commission estimates.

11.4 Scope for improvement

The case study diseases, which broadly correspond with the national health priority areas (AIHW 2005b), represent those where opportunities exist to reduce the burden of these chronic diseases. Because these diseases have modifiable risk factors (both behavioural and biomedical), it is claimed that a proportion of the burden can be avoided through changes in lifestyle, detection of health problems and early treatment. For example, according to the Australian Chronic Disease Prevention Alliance (2004), up to one-third of all health problems are attributable to known and preventable risk factors including smoking, physical inactivity, obesity, poor nutrition and high blood pressure. The WHO (2005, p. 112) also claims that 'a small shift in the average population levels of several risk factors can lead to a large reduction of the burden of chronic diseases'.

Evidence from Australia and overseas

How Australians score on the common risk factors associated with chronic diseases provides some indication of the scope to further reduce the prevalence of these diseases. Data from the National Health Survey (ABS 2006c) suggest that there is some scope for improvement. For example, in 2005:

- 49 per cent of Australian adults were considered overweight or obese;

- around 13 per cent of adults engaged in risky levels of alcohol consumption; and
- only 11 and 16 per cent of males and females respectively consumed the recommended five serves of vegetables per day.

But, it is also known that not all chronic disease can be avoided by eliminating modifiable risk factors. There are non-modifiable risk factors associated with chronic diseases such as age, sex, ethnicity, family history and genetic make-up. Further, the risk of chronic disease in adulthood is understood to be associated with risk exposures across the life span; hence, the argument for a 'whole of life' approach to promotion and disease prevention. What this means is that by the time people reach say 40 or 50 years of age, a 'footprint effect' is already in place. This clearly reduces the scope for promotion and prevention measures to reduce the prevalence of chronic disease in the current working age population. Early treatment is therefore important for moderating or ameliorating the effects of chronic disease.

The prevalence of risk factors is not uniform across different groups within Australian society. It is likely that the nature of health promotion and disease prevention initiatives would need to be tailored for certain groups to take account of relevant characteristics such as differing environmental factors. For indigenous Australians, for example, the prevalence of chronic disease and risk factors are greater than in the overall population due to a combination of factors. Any new initiatives would need to take such factors into account if they were to be successfully applied to these groups (box 11.2).

A comparison of Australian mortality rates for chronic diseases with nine developed nations[4] also gives some insight into the scope for further improvement (AIHW 2006b). In the area of colorectal cancer, Australia had the third highest mortality rate in 2005. Also, in the areas of coronary heart disease, suicide, diabetes, asthma and chronic obstructive pulmorary disease, Australia sat near the middle among the countries examined. However, for stroke, lung cancer and chronic kidney diseases[5], Australia ranked in the top three (lowest levels of mortality).

4 France, Germany, Italy, Japan, New Zealand, Spain, Sweden, the United Kingdom and the United States.

5 In the case of kidney disease, rates of kidney transplant and dialysis are used as an indicator rather than mortality rates (for which there is limited information).

Box 11.2 **Risk factors and chronic disease among Indigenous Australians**

Indigenous Australians suffer from a greater burden of ill health than other Australians. Close to 70 per cent of Indigenous Australians die before the age of 70, compared with just over 20 per cent for other Australians.

Indigenous Australians are more likely to smoke, consume alcohol at hazardous levels and be categorised as obese, all of which are risk factors for chronic disease. For example, in 2004-05, the prevalence of diabetes was 3.4 times higher among Indigenous Australians than other Australians. Also, Indigenous Australians with type 2 diabetes often develop the disease earlier than other Australians and often die at younger ages.

Housing and living conditions may go some way towards explaining differences in health outcomes between Indigenous groups and other Australians. As the AIHW states '…adequate housing is a major factor affecting health, and many Indigenous people live in housing conditions that are overcrowded and that are unacceptable by general Australian standards because they do not satisfy the basic requirements of shelter, safe drinking water and adequate waste disposal' (AIHW 2006a, p. 231).

In 2001, 22 per cent of Indigenous Australians were estimated to be living in over-crowded accommodation (defined as having more than two persons per bedroom). Using a similar measure, Jones (1999) estimated that 10 per cent of Indigenous households in major urban centres and 27 per cent in rural areas were over-crowded. The comparable proportions for other Australians were 4 and 3 per cent respectively.

Sources: Jones (1999); SCRGSP (2005); and AIHW (2006a).

Assessing the scope for improvement is not straightforward

In terms of reducing the burden of chronic disease in Australia, how much of that burden might be avoided by further health promotion and disease prevention is a contentious issue. Attempting to quantify the link between health outcomes and such health initiatives is not straightforward. Key challenges associated with linking health outcomes to health promotion and disease prevention are summarised in box 11.3.

Attempting to assess the scope for improving health outcomes (including possible changes in participation and productivity), in the context of existing initiatives, adds another layer of complexity. A further complication arises because details on the nature and scale of the NRA's health promotion and disease prevention have yet to be provided. The initiatives announced to date (Australian Better Health Initiative and National Action Plan on Mental Health) amount to around 16 per cent of existing spending on health promotion and prevention.

Box 11.3 Challenges associated with linking health outcomes to health promotion and disease prevention

The challenge of linking health outcomes to health promotion and disease prevention is complicated by a range of issues.

- *Gaps in knowledge about the drivers of chronic disease*. While there are well-known risk factors for chronic diseases, there are also people who exhibit no or few risk factors for chronic disease who nevertheless develop them. The presence of risk factors also does not necessarily translate into chronic disease. These gaps in understanding make it difficult to be confident about the potential health improvements from modifying risk factors associated with chronic diseases.
- *Gaps in data*. In order to assess the impact of specific health promotion/prevention programs on behaviour, data are needed on behavioural changes with and without the programs. While data exist for some behavioural changes, such as changes in tobacco consumption, only limited data are available for other risk factors (eg cholesterol levels, body weight and physical exercise).
- *Long lag in effects.* Health promotion and prevention strategies are typically not 'quick fixes', but involve considerable time lags before beneficial effects become evident. Preventative interventions and vaccinations, for example, target populations before the onset of a condition, which may not otherwise have occurred until many years in the future (if at all). That said, in some cases, the gains from early treatment can be realised within a relatively short time frame. For example, evidence suggests that people at high risk of developing type 2 diabetes, by improving their diet and level of physical activity, can prevent the onset of the disease in a relatively short space of time.
- *Applicability of trial results*. Trial results applying to small groups may not be readily replicated in the broader community.
- *Difficulties distinguishing between the effects of particular initiatives*. It can be difficult to distinguish between the effects of programs specially designed to reduce the risks of a particular disease (eg heart disease) and programs aimed at generally promoting healthy eating and physical activity.
- *Difficulties linking behavioural changes and outcomes.* The 'stickiness' of human behaviour has been identified as a challenging element for program design and an inhibitor to the success of programs.
- *Relationships between risk factors and health conditions.* A variety of risk factors shape a person's susceptibility to chronic disease. Many of these risk factors are common to several diseases. Consequently, the relationships between risk factors and health conditions is often interdependent and may not be independently additive.

Source: DHA 2003.

Another complication arises in identifying the groups of people that are likely to be the target of health promotion and disease prevention. There is likely to be a range of outcomes based on the severity of the disease. For mental illness, where severity is likely to be a key driver in outcomes, the range of disease severity was estimated from data in the ABS Survey of Disability, Ageing and Carers (ABS 2004b). For other diseases (with the exception of injury) the effect of the range of severity is more difficult to assess, due firstly to a lack of data, but also because the initiatives prevent the disease from developing in the first instance (as opposed to improving outcomes for sufferers).

For type 2 diabetes, for example, the severity of the condition could play a role in determining the outcomes from improved promotion and disease prevention. Despite this, because of the low number of people reporting a profound or severe disability due to diabetes, and a lack of specific data on type 2 diabetes, this was not explicitly assessed. For injury conversely, the focus was on those who had a serious injury event as milder forms of injury are unlikely to lead to any long-term participation effects. Serious injuries were defined as those which required hospitalisation.

These issues necessarily complicate the analysis. Nonetheless, *indicative* and *conditional* estimates (indicative given the quality of the evidence base and conditional because, in most cases, there are a range of assumptions that must be made to generate assessments) can be made about the potential impact of additional health promotion and disease prevention.

Estimates of changes in prevalence

Estimates of the avoided burden need to take into account changes in the prevalence of specific diseases over time. Projections of disease prevalence were made based on current policy initiatives and the level of effective treatments for each disease. Using estimates reported in Vos et al. (2004a), the future number of sufferers with each condition was determined (table 11.3).

For cancers, cardiovascular diseases and mental disorders, disease prevalence (that is, the number of sufferers as a proportion of the population) is expected to fall. Small increases are expected in the prevalence of injuries and musculoskeletal disorders linked to population growth and ageing. The greatest change is expected for diabetes, where prevalence is projected to increase by close to 70 per cent, leading to an increase in the number of sufferers of close to 229 per cent. In effect, these estimates provide a baseline of expected changes in disease incidence in the absence of the NRA health promotion and disease prevention initiatives.

Table 11.3 **Estimated changes in the number of sufferers[a]**

Chronic disease	*Base (2001)*	*2030*	*Projected increase*
	no.	*no.*	*%*
Mental health	1 544 000	1 779 000	15
Cardiovascular disease	3 409 000	4 108 000	21
Type 2 diabetes[b]	894 000	2 941 000	229
Injury (serious)[c]	2 242 000	2 967 000	32
Cancer	357 000	629 000	76
Musculoskeletal[d]	1 403 000	3 171 000	126

a Assuming no change in trend patterns of behaviour or health promotion and disease prevention initiatives over the projection period. **b**Diabetes numbers were estimated as twice the number of cases in the National Health survey based on evidence that close to 50 per cent of sufferers are unaware they have the condition (Dunstan et al. 2002). **c** Injury projections based on average five year trend in years lost due to injury over period 1991-2001 and increases in population using ABS projections. **d** Numbers reported for arthritis only.

Sources: ABS (*National Health Survey: Summary of Results*, Cat. No. 4364.0, Canberra); Vos et al. (2004a); and Productivity Commission estimates.

What works: the evidence behind the assumptions

In order to estimate the potential effects of the health promotion and disease prevention component of the NRA, the extent to which the case study diseases can be avoided or their impacts lessened, given current technologies, needs to be known.

Across the six case study diseases there is an extensive range of research to indicate that lifestyle behaviour changes, detection and early intervention have the potential to prevent or delay the onset of disease as well as reduce progression and complications. But, making an assessment about the scope for these interventions to reduce the burden of disease is far from straightforward. For example, while research into each of the diseases generally provides consistent results, in many cases there is a wide range of results. Also, for some diseases (eg specific cancers and serious injury), the evidence (particularly local evidence) is limited. In addition, there is the issue of the transferability of trial-based results to broader community outcomes.

Estimated 'avoidable' proportion varies across diseases

The evidence suggests that the proportion of 'avoidable' chronic disease varies markedly across the six diseases. The range extends from around 75 per cent for some mental disorders to around 3 per cent for some types of musculoskeletal conditions.

- For *mental illness*, while it is recognised that prevention of these diseases is often not possible, Australian studies suggest that the early application of optimal evidence based treatments has the potential, on average, to reduce the burden of the disease by 50 per cent (Hickie, Groom and Davenport 2004). For depression, however, the estimated increase in the disease burden averted is close to 75 per cent (Andrews et al. 2000; Issakidis et al. 2004; and Vos et al. 2004b), while for schizophrenia, it is around 45 per cent (Andrews et al. 2003). Waghorn et al. (2005) also estimate that, with earlier treatments, between 50 to 90 per cent of people with anxiety disorders could potentially participate in the workforce.
- For *type 2 diabetes*, clinical trials on people with impaired glucose tolerance (IGT) undertaken in the United States, Finland and China indicate that measures in the form of improved diet and physical activity can reduce the incidence of the disease by around 50 per cent with smaller gains resulting from the use of drug based measures. Studies in the United States (Diabetes Prevention Program Research Group 2002, 2003a, 2003b) and Finland (Tuomilehto et al. 2001) demonstrated reductions in the incidence of 58 per cent over three years in people with IGT who received individualised diet and exercise programs compared with control groups. In the Da Qing study for China (Pan et al. 1997), diet and exercise programs for people with IGT resulted in a 42 per cent reduction in diabetes over six years. These results also held for those already diagnosed with type 2 diabetes.
- For *cardiovascular diseases*, the evidence suggests that 38 per cent of coronary events, 41 per cent of coronary deaths, 6 per cent of stroke deaths and events, and an average of 20 per cent of all other coronary events and deaths could be avoided with lifestyle changes (eg increasing physical activity and reducing smoking) and other preventative measures such as blood pressure and blood cholesterol lowering drugs (DHAC and AIHW 1998, p. 103; The Health Outcomes Prevention Evaluation Study Investigators 2000; PROGRESS Collaborative Group 2001; and The European Trial on Reduction of Cardiac Events with Perindipril Investigators 2003).
- For *cancer*, the evidence (in some areas quite thin) suggests that improved prevention programs focusing on behavioural risk factors have the potential to reduce the number of smoking related cancers and deaths by 15 per cent, the number of physical inactivity related cancers and deaths by 32 per cent (The Cancer Council Australia 2004), and the number of diet related cancers and deaths by between 36 and 68 per cent (Marks et al. 2001).
- For *injury*, the evidence suggests that improved prevention has the potential to lead to a fall in transport-related injury events and deaths by 10 per cent and a 20

per cent decrease in both falls and other injury events (based on indicative results from Day et al. 2001 and Ozanne-Smith et al. 2002).

- For *musculoskeletal* conditions, available evidence is limited. Clinical trials have, however, found that for overweight or obese people a reduction in body weight by five kilograms, or until their body mass index is within the recommended normal range, can lead to a 24 per cent reduction in knee-related osteoarthritis (Coggon et al. 2001). Reductions could be as high as 57 per cent if all sufferers who were overweight or obese reduced their weight to healthy ranges. While contributing to deaths, particularly within the falls category of injury, there was no evidence relating to the effectiveness of health promotion and disease prevention in reducing mortality from this disease group (musculoskeletal conditions accounted for 0.8 per cent of all deaths in 2004 (ABS 2006d)).

11.5 Linking improved health outcomes to workforce participation and productivity

Drawing on the preceding discussion relating to the scope for improvement, this section examines the flow on effects of improved health outcomes for workforce participation and productivity.

Recognising that there is an issue about the transferability of trial-based results to broader community outcomes, raw estimates have been adjusted to reflect potentially achievable outcomes. The raw estimates largely reflect the results from clinical trials. But, when applying these programs in 'real-life' situations, it is possible that the outcomes will not be achieved for the entire population of sufferers. Issues such as adherence to treatment regimes and the representativeness of the study population arise. The adjusted estimates attempt to better reflect such real-life outcomes. The broad assumptions behind the raw and adjusted estimates for each of the diseases are set out in box 11.4. Subsequently, only the adjusted figures are presented.

For all the chronic diseases except mental illness, the link between better health outcomes from improved promotion and disease prevention and workforce participation was made through the potential for new initiatives to reduce the incidence of specific diseases. Those not developing the disease were assumed to participate in the workforce in the same manner as the general population.

For mental illness, it was assumed that changes in the disease burden averted would lead to a proportional change in workforce outcomes (see box 11.4). That is, the

differential between the workforce participation rates of sufferers and the general population would change proportionally to changes in the disease burden.

Box 11.4 **Derivation of the participation gain possibilities**

Estimates of potential changes in workforce participation and productivity outcomes were based on the following assumptions.

- For *mental illness*, different assumptions for each type of disorder were used. To take account of the reduced effectiveness of early treatments (and thus employment possibilities) for those with severe levels of disability, effectiveness of treatments was arbitrarily assumed to fall with increased severity. Changes for those with mild or no restrictions were based on available evidence. For anxiety and affective disorders, it was assumed that for people with profound disorders the improvement in the disease burden adverted would be zero; severe disorders — 10 per cent; moderate — 50 per cent; and mild or no restriction — 70 per cent. For psychotic disorders, improvements for people with profound disorders were assumed to be zero; severe — 10 per cent; moderate — 20 per cent; and mild or no restriction — 50 per cent. The WHO, however, estimates that opportunities to apply cost-effective treatment strategies in the Western Pacific region (Australia's region) would be 50 per cent for depression, anxiety and bipolar disorders and 80 per cent for schizophrenia (Chisholm 2005). The adjusted estimate accounts for this coverage.
- For *type 2 diabetes*, clinical trials point to a possible 50 per cent reduction in the prevalence of the disease (including both for those newly developing the disease and for those who currently have the disease). Those who do not develop the disease as a result of improved preventative treatments are, on average, likely to participate in the workforce to the same extent as the general population. However, for lifestyle interventions, such as those recommended for type 2 diabetes, non-adherence rates have been estimated to range between 35 and 75 per cent (Rowley 1999). For the adjusted estimate, a 55 per cent non-compliance for lifestyle programs is assumed to better reflect 'real-life' outcomes.
- For *serious injury,* the raw estimate is based on clinical trial results and the fact that those people who are not seriously injured are, on average, likely to participate in the workforce in the same manner as the general population. However, due to the inconclusive nature of the results and limited evidence on the efficacy of further promotion type interventions in this area, the adjusted estimates assume a reduction of 50 per cent in the efficacy of outcomes.
- For the remaining diseases — *cardiovascular, cancer and musculoskeletal* — the raw estimates were calculated using results from clinical trials. The adjusted estimates assumed a 55 per cent non-compliance for lifestyle programs (based on results presented in Rowley (1999)).
- For mortality estimates, a gradual phase-in of improved or new promotion and prevention programs was assumed. Estimates of improved workforce participation from reduced mortality were based on a progressive build-up in effectiveness from 2021 to 2025, with full effectiveness from 2026 onwards.

Also, recognising that carers' workforce participation will be affected by improvements in health promotion and disease prevention, adjustments were made for mental health, cardiovascular disease, type 2 diabetes and cancer (for which carer information was available).

Page et al. (2006) state that close to 43 per cent of all deaths in Australian for those aged 0 to 74 between 1997 and 2001, would have been avoidable with enhanced promotion/prevention, with the greatest potential gains from cancers and cardiovascular disease. Reduced mortality was included in the estimates of improved workforce participation by 'tracking' those who survive due to improved promotion and disease prevention from programs established up to 2030.

11.6 Potential workforce participation and productivity effects

When applying adjusted estimates to calculate potential improvements from additional promotion and disease prevention initiatives across the six diseases, the results indicate the impact on future employment outcomes is relatively small. Focusing on the potential gains from reduced morbidity (inclusive of gains from a reduced need for carers), new and/or improved promotion and prevention initiatives could increase workforce participation by 0.6 of a percentage point — an increase of around 132 000 people by 2030 (table 11.4).

Table 11.4 **Estimated participation gain possibilities, 2030**

	Morbidity		*Mortality*		*Total*	
Chronic disease	*Additions*	*Participation*	*Additions*	*Participation*	*Additions*	*Participation*
	no.	% points	no.	% points	no.	% points
Mental health	98 000	0.46	3 000	0.00	101 000	0.46
Cardiovascular	5 000	0.02	25 000	-0.01	30 000	0.01
Type 2 diabetes	26 000	0.12	5 000	-0.05	31 000	0.07
Injury (serious)	3 000	0.02	5 000	0.01	8 000	0.03
Cancer	1 000	0.00	5 000	-0.01	6 000	-0.01
Musculoskeletal	1 000	0.00	0	0.00	1 000	0.00
Less double up[a]	2 000	0.01	—	—	2 000	0.01
Total	**132 000**	**0.61**	**43 000**	**-0.06**	**175 000**	**0.55**

[a] Adjustment made to take account of co-morbidities.

Source: Productivity Commission estimates.

Turning to the mortality side, some 97 000 avoided deaths are assessed as being possible through improved health promotion and disease prevention, increasing the workforce by an estimated 43 000 persons by 2030. Notwithstanding this, the

results point to a slight fall in the participation rate — some 0.06 of a percentage point by 2030. The estimated fall in the participation rate arises due to the lower, on average, age-specific participation rates of persons across the six diseases relative to the working age population in general. That said, there are differing effects across the disease groups arising from differences in the age distribution of sufferers. For serious injury, for example, as the age distribution is weighted towards those in younger age groups who have above average workforce participation compared with the average working age population, reduced mortality increases overall workforce participation. Conversely, for type 2 diabetes, the age distribution is weighted towards those in older age groups who have below average workforce participation, thus, depressing the overall participation rate (see box 11.5 for details).

Box 11.5 **Potential workforce effects from reduced mortality in 2030**

Between 1997 and 2001, 43 per cent of deaths in Australia were estimated to be avoidable through enhanced prevention, with the greatest gains being for cancers and cardiovascular diseases (Page et al. 2006). In the absence of specific policy proposals, however, it is difficult to assess potential workforce effects. Due to time lags between implementation and outcomes, and an uncertain implementation timeframe, assumptions on the timing of benefits are required through to 2030. Estimates of improved workforce participation from reduced mortality were based on an assumed stepping up of program effectiveness starting in 2021, with a progressive build up through to 2025, with full effectiveness from 2026 onwards. These estimates are based on improvements for the case study diseases only and do not reflect any potential spillover effects from better health to increased life expectancy for the population as a whole.

For mental illness and diabetes there was limited evidence relating to the number of avoidable deaths due to promotion and disease prevention measures. For mental health, it was assumed that the fall in the number of deaths was proportional to the averted burden — adjusted estimate of 17 per cent. For diabetes, changes were assumed proportional to the potential avoided cases.

Given the assumptions relating to program effectiveness, it was estimated that 97 000 deaths could potentially be avoided by 2030. If the current age distribution for these deaths remained, most lives saved would occur in the 70 plus age group — 35 per cent. Using the current age and sex distribution for each of the diseases, and forecasting participation rates from PC (2005f), an estimated extra 43 000 people would be part of the workforce by 2030. This figure is based on the cumulative effect of avoided deaths over the period 2021 to 2030 (taking into account changes in age).

Looking at the workforce effects in aggregate, these estimates point to an increase in Australia's workforce participation of around 0.6 of a percentage point by 2030. Such an increase corresponds to about an extra 175 000 workers.

As expected, due to the effectiveness of early treatments and size of the target population, the largest proportion of the gains from improved health outcomes occurs in the area of mental health. For type 2 diabetes, however, despite the small differential in workforce participation of sufferers and the general population, the gain from improved health outcomes is significant. This result is due to a large projected increase in numbers — close to 230 per cent (Vos et al. 2004a).

For both cancer and cardiovascular disease, avoided mortality represents the largest component of the additions to the workforce. For cardiovascular disease, the cumulative effect of reduced mortality in 2030 would lead to 25 000 new participants in the workforce after taking into account the likely age distribution of survivors.

Because preventative measures are likely to prevent the development of diseases, on average, those who 'enter', or do not leave the workforce (because they have not developed a chronic disease) are likely to be just as productive as the general population. The exception to this is people with mental disorders. It is likely that people with these disorders who enter the workforce as a result of early interventions/improved treatment may have a lower productivity rate than the general population — people currently employed with these disorders experience higher absenteeism and presenteeism than the general population (Kessler and Frank 1997; Kessler et al. 1999; and Lim, Sanderson and Andrews 2000). Given this, an adjustment to the workforce productivity of those entering the workforce due to improved mental health outcomes of 0.7 was made, with no adjustment for other diseases. The weighted average productivity adjustment (by entrants across all diseases) was around 0.8 in 2030.

11.7 Implications for indicative costs

In launching the NRA, COAG recognised that to realise the indicative health outcomes in this area, additional funding would be required. That said, an important motivation for investing in extra health promotion and disease prevention is an expectation by governments that reductions in the incidence of chronic disease will lessen future costs associated with meeting the health care needs of the chronically ill. Currently, chronic diseases place a considerable burden on Australia's health care system. For example, the direct health care cost across the six chronic diseases was estimated to be around $22.3 billion in 2000-01 (AIHW 2005c). A reduction in

the disease burden would also influence the cost of both formal and informal care provided by carers within the community.

There can, however, often be long lags between investment in promotion and prevention programs and changes in behaviour and subsequent health outcomes. Also, the size of any net budgetary impacts will depend on the extent to which such programs are successful in modifying behaviour and diminishing risk factors. Related to this are the costs of promotion and prevention programs relative to the subsequent savings in avoided acute care costs and avoided transfers (such as carer allowances and disability support pensions).

One side of this net-cost story can be illustrated by considering current average direct health costs per patient for each of the case study diseases (table 11.5) and calculating the potential gross cost savings from a reduced incidence of disease. Notwithstanding that this approach ignores increases in the real cost of health care delivery, for the case study diseases (excluding mental health), the reduction in the number of sufferers has the potential to yield a gross cost saving of close to $4 billion. For mental health, it is difficult to determine the potential cost savings, if any, through improved health measures as both a shift in the type of care, and contact with the health care system, is required.

Table 11.5 **Estimated average direct health cost savings**

Chronic disease	*Average cost per patient*[a]	*Cases avoided*	*Gross avoided costs*
	$	no.	$ million
Mental health	2 064	—	—
Cardiovascular	1 720	1 578 000	2 714
Type 2 diabetes	1 465	508 000	745
Injury (serious)	11 757	26 000	303
Cancer	9 374	15 000	142
Musculoskeletal	765	25 000	19

[a] Based on expenditure by disease (2000-01) and the number with a specific condition reported in the 2001 National Health Survey. Total number of deaths and hospitalisations were used for injuries.

Sources: ABS (*National Health Survey: Summary of Results*, Cat. no. 4364.0, Canberra); AIHW (2005c); AIHW (2005d); and Productivity Commission estimates.

Although promotion and disease prevention have the potential to generate a cost saving, there is likely to be an overlap period in which both the current health arrangements and expenditures, and expenditure on the new measures is required with no or only limited offset savings. This is due to the time lags before new spending has an effect on the prevalence of chronic disease. The extent of any reduction in prevalence will depend on both the nature of disease and the type of initiatives implemented. Further, the offset in health costs from improved health

promotion and disease prevention may 'shift' expenditure through time, as many who would have incurred costs due to specific illnesses, will now incur costs in later years due to old age.

To date, COAG has provided little guidance on the nature and scale of NRA health promotion and disease prevention initiatives. COAG has, however, announced additional funding over the next four to five years for two new initiatives — the Australian Better Health Initiative and the National Action Plan on Mental Health, although neither of these programs are formally part of the NRA. COAG has also nominated diabetes as an initial priority. The expectation is that COAG will work through the remaining four chronic diseases.

While there is no information available on the anticipated extra overall spending associated with health promotion and disease prevention, there is some cost information for some of the specific diseases. The initiatives set out in the National Action Plan on Mental Health, for example, amount to around $3.5 billion over the next five years. However, many of these initiatives are not new, although $383 million of new funding has been announced for promotion and prevention measures. That said, many of the initiatives are aimed at achieving better outcomes within the existing system, including for example, by changing incentive arrangements, improving access to services and improving the co-ordination of services for people with a mental illness. Importantly, a significant proportion of the potential gains identified in this area would involve changes to the current mix of services (that is, rearrangements of existing funding) to achieve outcomes closer to 'optimal treatment' guidelines.

In other areas, some rough guidance on indicative costs can be obtained from studies which have examined the cost of improving health outcomes in the National Health Priority Areas. For example, with type 2 diabetes, the incremental cost of an intensive lifestyle program in Australia (based on the design of the Finnish trial outlined in Tuomilehto et al. 2001) was estimated to be close to $800 per participant in 2003 (Segal, Mortimer and Dalziel 2005). A program targeted at those people at high risk of developing diabetes could involve a prospective cost of around $1.3 billion over a period of four years.[6]

[6] Based on prevalence of 'pre-diabetes', that is, those with impaired glucose tolerance and impaired fasting glucose tolerance, of 16.4 per cent (Dunstan et al. 2002) and a coverage rate of 50 per cent (based on the number likely to be diagnosed and thus receive treatment for their condition).

11.8 Summary of direct impacts

Linking improvements in health promotion and disease prevention to possible changes in workforce participation and productivity is challenging. Improved health promotion and disease prevention initiatives have the potential to expand the workforce by 175 000 individuals — representing an increase in workforce participation of around 0.6 of a percentage point (table 11.6). This gain comprises additions to the workforce arising from reduced incapacity and mortality and an associated reduction in the number of carers. The largest gains are expected to be in the areas of mental illness, type 2 diabetes and cardiovascular disease.

Table 11.6 **Estimated potential workforce effects from improved health outcomes, 2030**

Chronic disease	*Increased participation*		*Relative productivity*[a]
	no.	% points	%
Mental health	101 000	0.46	70
Cardiovascular	30 000	0.01	100
Type 2 diabetes	31 000	0.07	100
Injury (serious)	8 000	0.03	100
Cancer	6 000	-0.01	100
Musculoskeletal	1 000	0.00	100
Less double up[b]	2 000	0.01	—
Total	**175 000**	**0.55**	**83**

a The total is a weighted average **b** Adjustment made for co-morbidities.

Source: Productivity Commission estimates.

In terms of productivity, for most diseases, those entering the workforce are likely to be broadly as productive as the existing population. However, for mental illness, productivity will be somewhat lessened reflecting part impairment of the 'at-work' effectiveness of a proportion of the mentally ill undergoing treatment.

There is also the potential for new health promotion and disease prevention initiatives to improve the productivity of the existing workforce through reduced absenteeism and presenteeism. However, due to the relatively small number of people involved[7], the overall productivity effect from this source is likely to be small.

[7] The persons involved comprise those participating in the workforce who, in the absence of new health promotion and disease prevention initiatives, would otherwise have been affected by a chronic disease and remained working.

While the estimates of improved workforce outcomes are modest, additional cost-effective spending on health promotion and disease prevention could be expected to generate important non-workforce benefits for the community. Reductions in the burden of chronic disease in Australia, for example, would lead to a significant improvement in the quality of life of the affected individuals. Thus, such policies could be regarded as appropriate on grounds additional to benefits from increased workforce participation.

12 Education and training

Key points

- The education and training component of the NRA focuses on ways to improve educational attainment.
- Australia has high levels of educational attainment relative to many other OECD countries, but there is scope for improvement.
- A continuation of historical trend increases in educational attainment is likely to lead to higher workforce participation and productivity in the future.
- Additional increases in educational attainment achieved as a result of NRA initiatives are likely to translate into further enhancements to workforce participation and productivity, but with many years' lag in the case of some potential initiatives.
- If outer-envelope NRA-induced educational attainments could be achieved, it is estimated that by 2030:
  - workforce participation could increase by up to 0.7 percentage points; and
  - aggregate labour productivity could increase by up to 1.2 per cent.

Improvements in education and training outcomes for Australians of all ages are an important element of the NRA. As COAG noted:

> A healthy, skilled and motivated population is critical to workforce participation and productivity, and hence Australia's future living standards…Skills development helps realise the potential of citizens, and of the nation. Continuous and lifelong learning gives more people the tools to participate in work and underpins more successful and rewarding careers when they do so (COAG 2006a, pp. 2–3).

COAG's goals with respect to education and training primarily focus on children and young people and are reflected in the following NRA indicative outcomes:

- significantly improve the proportion of children acquiring the basic skills for life and learning (subsidiary outcome: the gap between indigenous and non-indigenous children is closed);
- increase the proportion of young people meeting basic literacy and numeracy standards, and improve overall levels of achievement;
- increase the proportion of young people making a smooth transition from school to work or further study; and
- increase the proportion of adult workers who have the skills and qualifications needed to enjoy active and productive working lives (COAG 2006c, pp. 6–7).

It is important to recognise that the scope of these indicative outcomes is confined primarily to discrete groups of potentially 'at risk' individuals. Hence, in their current form, the outcomes are not interpreted as seeking an across-the-board increase in overall levels of educational attainment and skills formation. 'Operationalising' the outcomes requires the specification of a confined set of potential target groups as the first step in estimating the potential effects of the education and training element of the NRA.

For the purpose of this study, it is assumed that new programs to improve children's basic skills, literacy and numeracy levels, transitions from school and adult skills and qualifications would not have been initiated in the absence of the NRA and that these new programs could afford a net increase in human capital.

These changes at the margin augment underlying ongoing changes in the provision of education and training services supportive of economic growth. In this context, labour productivity has increased on average by 1.75 per cent per year over the past 30 years. Continuation of this growth presupposes increases in education and training attainment across working age men and women.

In line with the focus of COAG's agenda, this chapter assesses the potential effects of improvements in education and training on workforce participation and productivity. Although increased levels of education and training are correlated with many other benefits — for example, rates of smoking, infant mortality and failure to use a seatbelt tend to fall as education rises (Leigh 1998) — these other effects are excluded from the analysis.

An outer-envelope approach to estimating the potential additional benefits of NRA is adopted. The benefits are expressed in terms of potentially achievable changes to overall levels of workforce participation and productivity, rather than the effects of specific policies. These outer-envelope changes assume full implementation of NRA-consistent reforms and achievement of reform outcome objectives.

As with other chapters covering the human capital stream, this chapter focuses on the potential impact of NRA over a 25-year horizon. Because it will be many years before the potential labour market effects of some of these initiatives are realised — especially in the area of early childhood development — some very tentative participation and productivity estimates for 2045 are also canvassed.

The estimation involved:

- identifying potential target groups for each COAG indicative outcome;
- identifying Australia's current performance on each outcome and the scope for improvement (the outer-envelope changes);

- examining the links between outer-envelope improvements and workforce participation and productivity; and
- making conditional projections of the potential impact of outer-envelope improvements to educational attainment on workforce participation and productivity.

The analysis does not consider the merits of particular outcomes or the relative costs and benefits of achieving the outcomes.

12.1 Target groups and scope for improvement

For the purpose of this analysis, population target groups that are likely to be directly affected, at the margin, by the NRA have been identified. These target groups, and the potential scope for improvement in their education and training outcomes, are described in this section.

Target groups have been defined in a way that permits analysis of the potential benefits of NRA. Where suitable data exist, the target groups closely reflect COAG's (2006c) indicative progress measures. In other cases, target groups are defined in a manner consistent with available data and the relevant NRA outcome.

Comparisons with OECD countries were used to set the outer envelope for improvements in educational attainment for each of the target groups. The countries most like Australia — New Zealand, Canada, the United Kingdom and the United States — tend to report similar or lower levels of educational attainment. In determining the scope for improvement, comparisons were made with economies that are not too unlike Australia with policies relevant to the COAG objectives.

Early childhood development (ECD)

There has been a growing interest in the effects of policy interventions in the years before school on a child's subsequent education and labour force outcomes.[1] The importance of this period in determining life outcomes is reflected in the COAG objective of increasing the proportion of children with basic skills for life and learning — both cognitive skills and non-cognitive skills (for example, motivation, perseverance and self-control).

[1] There is also a related interest in the potential effects of interventions in this area on a range of other outcomes, including, work-life balance, fertility and child disadvantage (OECD 2006f).

Analysis of the potential impact of this element of the NRA is not easy, however. Consistent national evidence for Australia is limited and evidence on the benefits of broadly based programs is weak.[2] Detailed data on labour market outcomes for people who participated in an intervention program when young are available from only a handful of international studies. And there is little empirical evidence on the extent to which ECD initiatives can substitute for, or complement, education and training initiatives later in life.

Conclusions about the potential effects of ECD initiatives on workforce participation and productivity therefore should be viewed with caution.

Target group

This section collates available information about the basic skill levels of young children to assess the potential scope for NRA initiatives to improve early childhood development outcomes.

Ideally, children who lack basic skills for life and learning would be identified through a test taken by all children, for example, on entering school. Unfortunately, nationally consistent data of this type do not exist. However, some insights into young children's skills can be drawn from the Longitudinal Survey of Australian Children (LSAC).[3]

LSAC researchers have developed indices of children's physical, social/emotional, learning and overall development.[4] The lowest-scoring 15 per cent of children are classified as 'poor performers', or as falling below the 'negative cut-off' (Sanson et al 2005). Data for 4–5 year olds are plotted against parental income and maternal education, two factors noted in the literature as predictive of children's cognitive and social development (see, for example, NICHD 2006). Children whose parents' income falls within the bottom 40 per cent of the income distribution, or whose

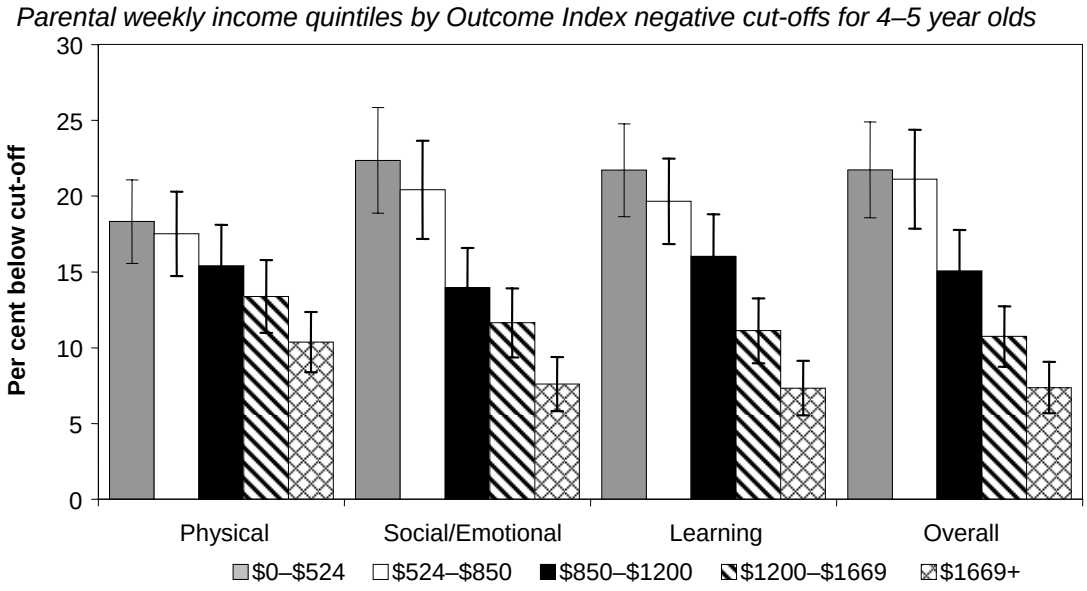
[2] For example, Wise et al (2005), in a comprehensive analysis covering both Australian and international ECD programs, concluded that '[t]he dearth of evaluation data on interventions generally…makes it impossible to comment on the usefulness of early childhood interventions as a general strategy to sustain improvements for children in the long term' (p. 48).

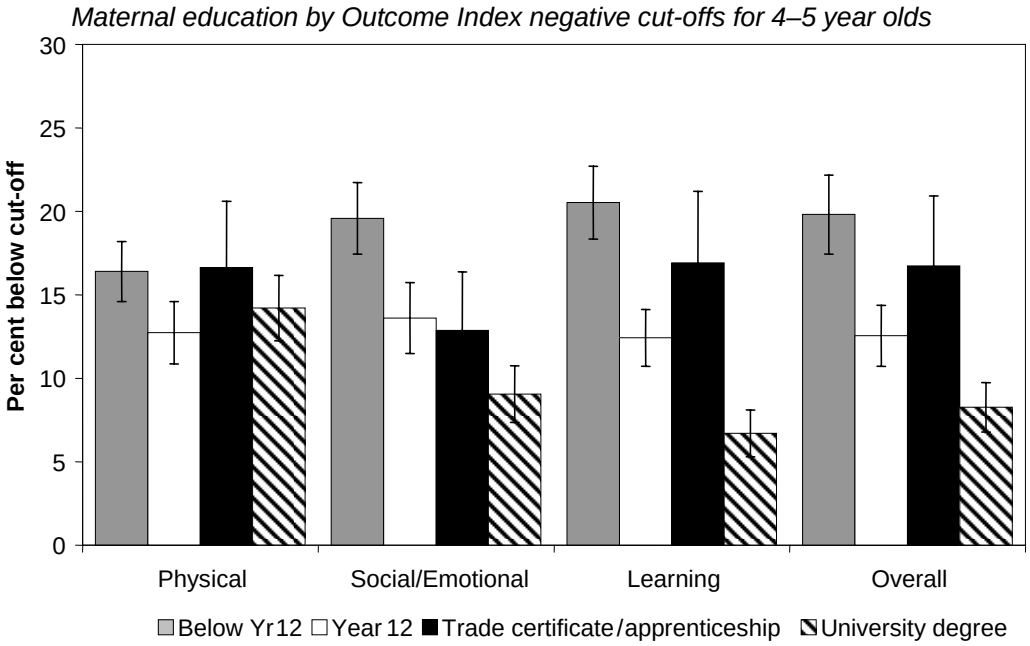
[3] The Australian Early Development Index contains data relevant to this exercise, but does not cover the whole country.

[4] For 4–5 year olds, the physical index includes data on children's body-mass index, parental ratings of children's overall health and assessments of children's motor coordination and general health. The social/emotional index comprises information about children's strengths and difficulties in areas including their peer relationships, capacity to concentrate and interactions with other children. The learning index includes parent and teacher ratings of reading skills, teacher ratings of writing and numeracy skills, and test results of children's knowledge of the meaning of spoken words and receptive vocabulary.

mothers have a relatively low level of education, are over-represented among the poor performers (figure 12.1). However, children with relatively high income parents, and/or well-educated mothers, are also found among the lowest-scoring 15 per cent. This suggests that, while disadvantage is a relatively good indicator of the risk of poor development, not all disadvantaged children are poor developers, and not all children from higher income and/or better educated backgrounds achieve the highest scores.

Figure 12.1 **Parental income, maternal education and children's development outcomes, Australia, 2004**





Note: Error bars represent the 95 per cent confidence interval associated with each point estimate.

Source: Unpublished data provided by the Australian Institute of Family Studies.

An alternative approach to determining how large the target group might be, is to assume that students who enter school with low basic skills perform poorly on literacy and numeracy tests during their early years of schooling. This assumption is supported by evidence that children from disadvantaged backgrounds are more likely to have low basic skills and to perform poorly in literacy and numeracy tests (Lokan, Greenwood and Cresswell 2001). As discussed below, around 7 per cent of grade 3 students, and 10 per cent of grade 5 students, do not meet national literacy and numeracy benchmarks (MCEETYA 2006).

Overall, these two approaches suggest that the target group for initiatives to improve the proportion of children with basic skills for life and learning is 10 to 15 per cent of children aged under five years.

Scope for improvement

Internationally comparable data on children's basic skill levels are not available. For this study, the scope for improvement in basic skills is estimated using information on education and labour market outcomes from early education programs. If an outcome, such as high school completion, is assumed to denote the success of an early childhood intervention program, then improvements in completions attributable to the intervention program could be a suitable indicator of the scope for improvement.

Studies of the effects of early education (that is, in the years before a child starts school) have consistently concluded that it can improve children's cognitive skills, although these benefits tend to fade as children age. The findings for early development of non-cognitive skills are mixed (see Karoly et al 1998 and Shonkoff and Phillips 2000).

Moreover, evidence on the longer-term effects of early education is sparse and also mixed. Five longitudinal studies from the United States form the main evidence base. In the main, these studies selected children from disadvantaged backgrounds and tracked their life outcomes at regular intervals relative to a cohort of similar children who did not participate in the intervention program. The findings of these studies are relevant to the assessment of the long-term effects of early childhood interventions (table 12.1). However, because the most rigorous of the studies are derived from relatively small intervention programs aimed at significantly deprived African-American children living in US cities in the 1960s, it is difficult to generalise their findings.

Results from the two most comprehensive programs (in terms of data collection) — the Perry and Carolina Abecedarian programs — suggest that interventions are

associated with increased high school completion rates and college attendance, and improved early adult employment rates. Evidence from the larger Head Start program is more mixed. When compared with a control group with similar characteristics, Head Start participants display only slightly higher levels of school completion and moderately higher rates of college attendance.[5]

Table 12.1 **Adult outcomes from intervention programs aimed at disadvantaged children**

Percentage point difference between treatment and control groups

	Sample[a]	*High school completion*	*College attendance*	*Employment rates*
	no.	% points	% points	% points
Perry program (Age 19)	123 (58)	18	17	18
Carolina Abecedarian (Age 21)	104 (53)	3	21	15[b]
Early Training Program	65 (44)	16[b]		
Chicago Child Parent Center	1159 (762)	11		
Head Start program:				
Control group	1742 (489)	1	8	
Range of possible impact		*1 to 18*	*8 to 21*	*14 to 18*

[a] Numbers in brackets represent the number in the treatment group. [b] Not significant at 5 per cent level.

Sources: Barnett (1992); Blau and Currie (2003); Garces, Thomas and Currie (2002); Heckman (1999); Reynolds et al. (2001).

A recent UK study of children from across all socio-economic groups found that those who started school before the compulsory starting age of five had better educational outcomes than those who did not (Goodman and Sienesi 2005). The study also found weak (marginally significant) evidence of positive participation and wage effects at age 33 for early school starters. In the case of pre-school attendance, the study concluded that 'there do not seem to be any long-lasting effects…on education and labour market outcomes', with the exception of a small (and marginally significant) effect on wages at age 33 (p. 543).[6]

In summary, the evidence suggests that broad-based early education programs improve cognitive skills (although the effects fade over time), but they may not be beneficial for non-cognitive development. Interventions can improve the education and labour market outcomes of disadvantaged children, but evidence of benefits for the broader population is weak. To the extent that high school completion results from the Perry Program can be replicated more broadly, it could be concluded that

5 The 'control' characteristics include: maternal/paternal education, family income, family size, birth order and birth weight.

6 In this analysis, pre-school attendance includes participation in both formal, centre-based care and more informal care, for example, playgroups.

the outer envelope for improvements in outcomes is 18 per cent of the target group. That is, an extra 18 per cent of children with low basic skills might complete high school as a consequence of initiatives to improve those skills. On the other hand, the results from the Head Start program suggest that the scope for improvement is minimal.

Literacy and numeracy

Literacy and numeracy skills are a core element of education. From a workforce perspective, people who do well in school are more likely to participate in the labour force and earn more later in life. (Higher levels of education can also provide people with opportunities outside those connected with employment.) Through the NRA, COAG is seeking to increase both the proportion of young people meeting basic literacy and numeracy standards, and levels of overall achievement.

Target groups

In line with the indicative performance measures adopted by COAG (2006c), the following target groups for policies to improve literacy and numeracy outcomes are considered:

- school-age children who do not achieve at or above a minimum benchmark literacy or numeracy standard; and
- school-age children who do not achieve at or above a proficient literacy or numeracy standard.

Children who do not achieve a minimum literacy or numeracy standard

Evidence on reading and numeracy skills is available from learning outcomes data for grade 3, 5 and 7 students reported annually to the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). Data are reported against benchmarks — defined as the minimum standards of performance below which students could have difficulty progressing satisfactorily at school. The benchmarks have, however, been criticised as being too low (Twaddell 2005). In addition, these data are not comparable with international data, and evidence on proficient levels of attainment is not currently reported.

Internationally comparable data by level of attainment are available from the Programme for International Student Assessment (PISA), but only for 15 year olds. On the assumption that children who perform poorly during the early years of school also are likely to perform poorly in later years, PISA data are useful to an assessment of literacy and numeracy levels among all school-age children.

MCEETYA learning outcomes and PISA data are presented in table 12.2. In the 2003 PISA data, around 12 per cent of Australian 15 year olds could at best complete the most basic reading tasks in familiar settings, and 14 per cent did not achieve a level of mathematics ability described by the OECD as consistent with skills that would permit them to actively use mathematics. In other words, these students performed at Level 1 or below on the PISA reading literacy or mathematical literacy scales. Given the high correlation between the two measures, it can be concluded that around 10 per cent of Australian 15 year olds perform at a very low level in both reading and mathematical literacy.

Table 12.2 **Proportion of students with very low reading and numeracy skills by type of assessment, 2000 to 2004**

Type of assessment	*Reading*			*Numeracy*		
	2000	*2002*	*2004*[a]	*2000*	*2002*	*2004*[a]
	%	%	%	%	%	%
Learning outcomes data — students below minimum benchmark						
Year 3	7.5	7.7	7.0	7.3	7.2	6.3
Year 5	12.6	10.7	11.3	10.4	10.0	8.8
Year 7	na	10.9	9.0	na	16.5	17.9
PISA 2003 — students at or below level 1						
	na	na	11.8	na	na	14.3

na not available.

a The data for Year 3, 5, and 7 national literacy and numeracy benchmark are for the reference year, while the data for PISA are for 2003.

Sources: MCEETYA (2006); OECD (2004a).

Children who do not achieve at or above a proficient literacy or numeracy standard

While indicative of achievement of *basic* standards, the PISA data do not identify a level of performance consistent with proficiency. For national reporting purposes, Australia has defined PISA Level 3 for reading literacy as a proficient level.[7] For the purposes of this analysis, PISA Level 3 is used for mathematical literacy in comparing Australia with other OECD countries.

In 2003, 30 per cent of Australian 15 year olds did not achieve at least a PISA Level 3 score for reading literacy, and 33 per cent did not achieve at least a Level 3 score for mathematical literacy (OECD 2004a).[8]

7 Department of Education, Science and Technology, personal communication, October 2006.

8 The use of PISA Level 3 to indicate a proficient level of literacy or numeracy skills is supported by analysis of data from the Longitudinal Survey of Australian Youth that finds that, in 1995, 32 per cent of 14 year olds did not achieve mastery (defined as 'competence in the basic skills

Overall, the target groups for initiatives aimed at improving the proportion of students meeting minimum benchmarks are 12 per cent and 14 per cent of school students for literacy and numeracy, respectively. These students are a subset of the target groups to improve overall levels of literacy and numeracy skills — around 30 and 33 per cent of all students, respectively.

Scope for improvement

In 2003 (the latest year for which data are available), Finland was ranked highest among OECD member countries on the PISA measures of reading and mathematics performance (table 12.3).

Table 12.3 **Reading and numeracy abilities of Australian and Finnish 15 year olds, PISA, 2003**

	Reading		*Numeracy*	
Percentage of cohort that achieve	*Australia*	*Finland*	*Australia*	*Finland*
	%	%	%	%
At or below PISA Level 1	12	6	14	7
Below PISA Level 3	30	20	33	23

Source: OECD (2004a).

The key policy related reasons underlying Finland's success in the PISA test relative to Australia's performance appear to be intensive support for poor performers and an emphasis on high quality teaching (OECD 2004a, Välijärvi et al 2002). Even though Finland differs from Australia in many respects, including the structure of its education system and relative size of its immigrant population, to illustrate the implications of improvements in literacy and numeracy on workforce participation and productivity, it was assumed that Australia could attain Finnish levels of literacy and numeracy. Hence, Finland's levels of literacy and numeracy are adopted as the outer envelope for assessing the potential improvement in literacy and numeracy in this study.

Based on the Finnish experience, the outer envelope for improvements in basic skills is around 6 percentage points and for improvements in overall literacy and numeracy outcomes, around 10 percentage points. In other words, by 2030, it is assumed that an additional 6 per cent of Australian students could achieve above

necessary for active participation in society') in reading comprehension, while 27 per cent did not achieve mastery in numeracy (Marks and Ainley 1997).

PISA Level 1 in literacy and numeracy and an additional 10 per cent could achieve at or above PISA Level 3.[9]

Transitions from school to work or further study

Compared with people who complete Year 12 or equivalent, early school leavers tend to be less likely to work and tend to earn less when they are employed. In recent years, Australian governments have implemented a range of initiatives to assist those who leave school early and those at risk of leaving early, but 'the past two decades have seen little change in the proportion of young people not engaged full-time in education, training or employment' (NRIWG 2006, p. 34).

Through the NRA, COAG is seeking to increase the proportion of young people making a smooth transition from school to work or further study. At an individual level, the evidence suggests that two factors play a critical role in this transition: educational attainment and early labour market experiences (DSF 2005, Marks 2006).

Target group

The target group for this outcome could be defined with respect to either 'school attainment or early labour market experiences, as both measures are highly correlated.[10] As internationally comparable data are available for the former, the target group adopted is:

- 20–24 year olds who are not in education and without at least upper secondary education.[11]

For this study, following the International Standard Classification of Education, upper secondary attainment is defined as completing Year 12 or equivalent or a qualification at a Certificate III level or above. Data for the OECD indicate that in

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[9] It was suggested during consultations for this study that the outer envelope could be identified through comparison with OECD countries on other levels of PISA for example, Level 4 PISA rather than the Level 3 as adopted. Adoption of either benchmark would yield similar results. More importantly, the area for improvement lies in the lower tail of the distribution where Australian students are over-represented relative to their benchmark Finnish counterparts.

[10] COAG has adopted three indicative progress measures for this objective (COAG 2006c). The target group adopted in this analysis reflects one of these. The other two measures are: the proportion of young people engaged full-time in employment, education and/or training six months after school; and the proportion of 18–24 year olds participating in post-school education or training at or above AQF Certificate III.

[11] This is similar to one of the indicative performance measures for this objective adopted by COAG (2006c).

2003, the target group for initiatives to improve transitions from school represented 17 per cent of Australians aged 20–24 years (OECD 2005c).

Scope for improvement

Among OECD countries, Norway has the lowest incidence of 20–24 year olds not in education and without at least upper secondary education (table 12.4).

Table 12.4 **Youth transitions in Australia and Norway, 2003**

	Australia	*Norway*	*OECD average*
	%	%	%
Percentage of 20–24 year olds not in education and without upper secondary education	16.9	4.3	18.0

Source: OECD (2005c).

Transitions from education to work or further study have been a focus of policy in Norway. A range of policies was put in place in the mid-1990s, aimed at preventing early school leaving and remediating the situation of early school leavers. There are, nevertheless, a number of differences between Australia and Norway which might affect the transition process, including the design of the broader education systems, labour market structures and military service requirements. There are also significant differences in the economic profile of the two countries. While these are important differences, for the purposes of estimating the outer-envelope effects of improved transitions from school on workforce participation and productivity that might be achieved through implementation of the NRA, it is assumed that Australia could achieve similar outcomes to Norway.

Based on the Norwegian experience, the outer envelope for improvements in transitions from school is 13 percentage points. In other words, it is assumed that an additional 13 per cent of Australian 20–24 year olds could complete at least upper secondary education.

Adult learning

Compared with other OECD countries, a relatively high proportion of young Australians have degrees, but older Australians are less likely to have an upper secondary qualification. This reflects the large expansion in tertiary education over the past two decades in Australia.

Through the NRA, COAG is seeking to 'increase the proportion of adult workers who have the skills and qualifications needed to enjoy active and productive working lives' (COAG 2006a, p.3). This objective involves both qualification attainment and the acquisition of skills relevant to employment. Adults can acquire job-relevant skills in a number of ways, for example, by fully or partially completing a formal qualification, participating in a non-accredited short course, or through on-the-job training. It is assumed that policies flowing from this element of the NRA will focus on formal education and training. This is consistent with the focus on formal education in the indicative progress measures adopted by COAG at the July 2006 meeting.

Target group

In line with the indicative progress measures adopted by COAG (2006c), the target groups for initiatives to improve educational outcomes for adults are defined as:

- persons aged 25–64 years who have not attained at least upper secondary education; and
- persons aged 25–64 years not participating in a course of study leading towards a Certificate III level qualification or above.

Internationally comparable data on qualification attainment are available from the OECD (2005c). According to this data, 38 per cent of Australians aged 25–64 years have not yet completed at least upper secondary education (OECD 2005c, p. 36). These people represent the target group for initiatives to increase the proportion of adults with at least upper secondary education. However, internationally comparable data on adult participation in formal education and training that include Australia are not available. Australian data are therefore used to determine the size of the second target group. In 2005, only 6 per cent of 25–64 year olds were enrolled in a course of study leading towards a qualification at or above Certificate III level. The target group for initiatives to increase the proportion of persons aged 25-64 years in a course of study is therefore 94 per cent of 25–64 year olds (ABS 2005c).

Scope for improvement

In theory, data for the OECD could be used to estimate the scope for improvement in the proportion of Australian 25–64 year olds with at least upper secondary education. In 2003, the United States was the best performing OECD country on this measure — only 12 per cent of adults in the United States had not completed at least upper secondary education. However, the OECD data do not indicate whether adults gained their qualifications while young. An ideal dataset would contain

information on the extent to which adults up-skill. It would also indicate the level of proficiency achieved by students against a recognised international benchmark. No data of this type have been located.

In the absence of such information, a set of assumptions about adult qualification attainment are used to illustrate the potential impact of improvements in adult learning on workforce participation and productivity (table 12.5).[12] For example, it is assumed that over the next 25 years, 24 per cent of people aged 25–34 in 2005 who did not have an upper secondary qualification, could obtain a vocational education and training (VET) qualification. The very small improvements for the young reflect that they will not be adults for much of the study time frame.

Table 12.5 **Assumed improvement in adult qualification attainment by 2030**

	For persons in 2005 aged						
Improvements in educational attainment: from	*Under 5 years*	*5–14 years*	*15–24 years*	*25–34 years*	*35–44 years*	*45–54 years*	*55–64 years*
	%	%	%	%	%	%	%
Below upper secondary to VET	1	7	22	24	18	11	3
Year 12 to VET	1	7	22	23	17	11	3
VET to Degree	0	2	7	8	4	1	0

Source: Productivity Commission estimates.

The scope for improvement in the proportion of people aged 25–64 participating in a course of study leading towards a Certificate III level qualification or above is not estimated for two reasons. First, internationally comparable data on adult participation in education and training that would support an exercise of this type do not exist. Second, even if data of this type were available, it would be beyond the scope of this study to pursue it. To the extent that participation leads to attainment of a qualification, its potential effect on workforce participation and productivity could be captured in the impact of improvements in qualification attainment suggested above. But many adults study only those subjects that are of immediate use to them and do not complete a qualification. Examination of the potential labour market effects of this activity is not possible with available data sources.

12 The assumed levels of improvement were chosen to illustrate the potential effect of this NRA outcome. The assumptions have been exposed to expert scrutiny through the consultation process that has accompanied the NRA project and have not been criticised as being unrealistic.

12.2 Potential workforce participation and productivity effects

In the following analysis, initiatives flowing from the NRA to improve children's basic skills and raise literacy and numeracy levels are assumed to impact on workforce participation and productivity via increases in educational attainment at upper secondary and higher levels. Specifically, interventions to improve school transitions are assumed to result in a higher proportion of young people obtaining a Year 12 or equivalent qualification, with some of these going on to obtain higher qualifications. ECD and literacy and numeracy initiatives are assumed to result in a larger proportion of higher level qualifications.

The approach means that some interactions between education initiatives at one stage of the life cycle and educational outcomes at other stages are modelled.[13]

This approach does not capture effects that ECD and literacy and numeracy may have on workforce participation and productivity other than those reflected in higher qualification attainment. These effects may be quite important, particularly for ECD. Individuals with stronger non-cognitive skills (like motivation, perseverance and self-control), may have a higher probability of employment, and may be more productive, than those with less developed skills, other characteristics being equal.[14] It would be very difficult to disentangle these effects and data that would support such an analysis are not currently available.

Potential workforce participation and productivity effects of the NRA

The potential effects of NRA education and training initiatives on future workforce participation and productivity were estimated in two steps.

- Projections of the future qualifications profile of the population were developed.

[13] Potential interactions between ECD initiatives and literacy and numeracy attainment are also likely, but are not explicitly modelled. The effects of any such interaction are captured within the literacy and numeracy outer envelope.

[14] At any qualification level, it is likely that individuals with higher levels of literacy and numeracy have higher rates of workforce participation and productivity. Australian evidence on these relationships that could have supported analysis of the NRA is not available (future research could address this issue). However, because basic literacy and numeracy skills are generally acquired in the course of schooling (OECD 1997), their potential effects on workforce participation and productivity are captured, in the main, in the effects of education variables. It is therefore likely that the approach of raising educational attainment with improvements in literacy and numeracy captures most of the potential effects of these improvements on workforce participation and productivity.

- Information on the relationship between qualifications and participation and productivity was used to determine how these key labour market outcomes might change as educational attainment increases in the future.

Potential changes in wages were used to approximate changes in productivity. This approach has the limitation that it only measures the returns to individuals from improvements in educational attainment. Alternative approaches to measuring potential changes in productivity are discussed in box 12.1.

Box 12.1 **Economy-wide productivity effects of improving education**

A more educated and skilled workforce supports innovation, the implementation of technological advance and the accumulation of physical capital (for a review of the literature see, for example, Parham 2004). Increases in educational attainment may therefore translate into increases in aggregate productivity that exceed changes in the productivity of individual workers that are reflected in wage changes.

Quantifying the overall effect of increases in educational attainment on productivity, however, is notoriously difficult. The empirical evidence is controversial and mixed. International studies have found that an additional year of education may raise the level of productivity by between about 3 and 6 per cent for a country with Australia's current average education level (OECD 2003a). Dowrick (2003), in a review of the literature, concluded that an increase of 0.8 in the average years of schooling of the labour force given prevailing levels of education, would lead to an increase of one third of a percentage point in the annual growth rate from what would otherwise be achieved.

It is estimated that NRA could increase the average level of schooling by up to 0.25 years over the next 25 years. This leads to estimates of NRA-induced productivity increases by 2030 of:

- 0.7 to 1.6 per cent using the OECD's analysis; and
- around 1.3 per cent using Dowrick's approach.

These estimates are consistent with the results from the modelling of the impacts of achieving NRA education and training objectives — that is, an increase in productivity of around 1.2 per cent (see below).

The future education profile of the population

Educational attainment has risen markedly in Australia over the past two decades. In 1995, 14 per cent of 25–34 year olds had at least a Bachelor Degree. In 2005, the figure was 29 per cent (ABS 2005c). Because people with higher education are more likely to participate in the workforce, recent Australian research has projected that workforce participation would be higher in the future as a consequence of rising educational attainment in the population (Gruen and Garbutt 2003, PC 2005f).

With or without NRA, therefore, the population of the future will be much more highly educated as current levels of achievement flow through the age structure over time. It is also likely that participation and productivity will be higher as a result. In making projections of the qualifications profile of the population, it was therefore important to distinguish between changes that are likely to occur anyway (the base case) and those that may be attained through achievement of NRA outcomes.

Projections of educational attainment were made for six age cohorts and men and women separately. Four scenarios were developed — first the base case and then the potential impact of interventions to improve: transitions from school; children's basic skills and literacy and numeracy levels; and adult learning. The key assumptions made in deriving the projections of educational attainment are described in box 12.2.

The projections for those in the 25–34 year cohort at 2005, the base year for the analysis, are illustrated in table 12.6. This is the age cohort for which NRA stands to have the largest labour market effect in 25 years time. Given current levels of school retention and VET and higher education enrolments, 25–34 year olds in 25 years time are expected to have much higher levels of education than 25–34 year olds today (the base case). As a result of NRA, their attainment is projected to be significantly higher again.

Table 12.6 **Current and projected distribution of educational attainment for 25–34 year olds, 2030**

	2005		*2030 – Base case*		*2030 – with NRA*	
Levels of attainment	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*
	%	%	%	%	%	%
Below upper secondary	20	27	17	24	6	6
Year 12	18	22	13	10	13	11
VET (Cert III & above)	37	23	37	20	46	32
Degree	25	29	33	46	37	51

Source: Productivity Commission estimates. (2005 data based on the Household Income and Labour Dynamics in Australia Survey).

Box 12.2 Key assumptions for projections of educational attainment

Base case: Reflecting the fact that some jurisdictions have policies in place to improve school retention, a one percentage point increase in the 15–19 year olds still at school is assumed for 2030. Because school retention rates have increased over the past 5 years — for males (3 percentage points) and females (2 percentage points) — it is assumed that by 2030 the percentage of the cohort aged 15–19 that has not completed upper secondary education will fall by 3 and 2 percentage points respectively for males and females. Estimates of future attainment for other age groups were based on current attainment patterns.

Transitions from school: Initiatives to improve school transitions are likely be the first to impact on labour market outcomes. Among the first cohorts to benefit, it is assumed that 80 per cent obtain upper secondary qualifications through VET, with females and males equally affected. As cohorts who have experienced L&N and ECD initiatives come through school, it is assumed that a higher proportion of young people gain a year 12 or equivalent qualification and then go on to VET and higher education in the same proportions as today. It is assumed that transition initiatives will target 12–17 years olds, start to take effect in 3 years and be fully effective in 10 years with no impact on current 15–19 year olds. This implies that: the full impact is first experienced by persons currently aged 2 and under; and the outer envelope of 4 per cent of 20–24 year olds with below upper secondary attainment is achieved by 2030.

Literacy and numeracy and ECD: Improvements in children's basic skills and literacy and numeracy (L&N) are assumed to lead to 80 per cent of those who would not have stayed in education in the absence of NRA obtaining upper secondary qualifications through the school system and going on to further education.[15] It is assumed that L&N initiatives are implemented up to Year 8, early interventions are more effective than later interventions and that the effects of interventions are cumulative. Initiatives are assumed to be fully effective in 10 years and to begin to impact in schools after 3 years. This means no impact on the educational attainment of cohorts currently aged 10–19, a small impact for those aged 5–9, and a moderate effect on those aged 0–4. The full effect is on children born in five years time and who enter school when the policy regime is fully effective. These children will be 19 in 2030. ECD initiatives are assumed to target children under the age of 5, begin to impact in 3 years and be fully effective in 10 years. Hence, the first labour market effects of policies in this area will be felt for children who will be under 25 years of age in 2030. The first cohort to feel the full effects of these initiatives will be born in 10 years time.

Overall: Attaining the outer envelope for school transitions means that an additional 13 per cent of any cohort obtains an upper secondary qualification. Attaining the outer envelope for L&N means an improvement in skills for around 10 per cent of any cohort. For ECD, assuming the Perry program results could be replicated, an additional 2.7 per cent of any cohort would obtain an upper secondary qualification.

15 This assumption is supported by unpublished data from the Longitudinal Survey of Australian Youth, provided by the Australian Council for Educational Research.

The relationship between qualifications and participation and productivity

A positive association between educational attainment and workforce participation is well-established in the literature. It is estimated, for example, that an additional year of schooling increases the workforce participation rate by around 0.5 per cent for males and 4 per cent for females (Chiswick, Lee and Miller 2003).

Microeconomic studies of the association between education and earnings allow two inferences to be drawn regarding education and productivity.[16] First, for every additional year of education, the earnings of an Australian worker increase by between 5.5 and 11 per cent, all other things being equal. Second, substantial increases in the wages of workers appear to accompany the attainment of post-high school formal qualifications — for example, Breusch and Gray (2004) find that females with a degree earn about 40 per cent more than those who have not completed Year 12.

In the following analysis, results from Breusch and Gray (2004) are used in estimating the potential impact of improvements in educational attainment on workforce participation and worker productivity. Although Breusch and Gray include information on employment, rather than participation, their analysis: used recent and accessible Australian data; covered employment and wages; and presented results for men and women. Accordingly, estimates from the Breusch and Gray (2004) study have been used to project participation.[17]

Breusch and Gray (2004) find that higher levels of education are associated with higher wages and probability of employment. For example, women who complete Year 12 are 14 per cent more likely to be employed, other things equal, than those who do not and to earn, on average, 8 per cent more.

Estimates of future workforce participation and productivity

Changes in employment and wages to 2030 were projected for six age cohorts and for both males and females. A demographic model (described in chapter 10 and

16 See, for example, Lee and Miller (2004); Leigh and Ryan (2005); McNabb and Richardson (1989); Miller, Mulvey and Martin (2005); Rummery, Vella and Verbeek (1999); Voon and Miller (2005).

17 It was anticipated that, because employment accounts for 95 per cent of the participation rate, this approach would deliver a reasonable estimate of changes in participation. Preliminary research undertaken by the Productivity Commission indicates, however, that use of an employment equation may over-state participation gains from improvements in educational attainment. This is because, when comparing groups with different levels of education, differences in the proportion of people employed are typically greater than differences in participation rates.

appendix C) was then used in estimating the aggregate changes, at the margin, in workforce participation and productivity that could flow from NRA-consistent education and training initiatives.[18] Model estimates suggest that participation could increase by up to 0.7 percentage points and productivity by up to 1.2 per cent (table 12.7).[19] Over the study timeframe, initiatives to improve transitions from school are estimated to have the largest effect on participation. Adult learning and transitions initiatives have similar effects on productivity. Reflecting the lags between intervention and labour market outcomes, ECD and literacy and numeracy initiatives do not impact as strongly on either participation or productivity.

Table 12.7 **Estimated potential workforce effects from improvements in educational attainment, 2030**

Area of improved attainment	*Increased participation*		*Productivity*
	no.	% points	%
Transitions from school	81 500	0.38	0.45
ECD and literacy and numeracy	17 000	0.08	0.27
Adult learning	48 000	0.22	0.43
Total	146 500	0.69	1.16

Source: Productivity Commission estimates.

This approach assumes that the links between educational attainment and participation and worker productivity do not change over time. For example, it assumes that, like today, women who complete Year 12 in 2030 are 14 per cent more likely to be employed than those who do not complete Year 12.

Many factors could mean that the relationship between educational attainment and employment status could change over time.

- Future wages relativities by level of educational attainment will be a function of future demand and supply for people with different skill levels and are therefore likely to be different from wage relativities today.
- Peoples' preferences for participating may change. There is evidence that participation rates fell among younger males and rose among younger females between 1981 and 2001, irrespective of the level of educational attainment (Kennedy and Hedley 2003).

[18] It is assumed that people who enter the labour force in the future because of higher levels of education and training will have the same average productivity as incumbent workers of the same age and sex.

[19] Using projections of educational attainment 40 years ahead and the Breusch and Gray analysis, participation gains of 1.02 percentage points and a productivity increase of about 1.9 per cent are found for 2045.

- It is possible that some of the people who obtain a qualification in the future as a consequence of an expansion in educational attainment could be less academically able than those who currently hold qualifications and that, therefore, they may not enjoy the same labour market outcomes as current qualification holders (PC 2005f).

In addition, as noted above, potential effects of ECD and literacy and numeracy initiatives on workforce participation and productivity beyond those captured in increases in qualification attainment have not been modelled.

There are several other sources of possible benefit from increased emphasis on education and training under the NRA, for which available information does not support estimation.

- The estimate for productivity does not take into account improvements in educational attainment that do not result in a qualification. For example, 56 per cent of people aged 25 and over (or 316 000 people) who completed VET during 2004 only completed part of a qualification (NCVER 2005). Of these, 65 per cent reported that their training was highly or somewhat relevant to their current job.

  The main sources of information upon which to base estimates of the potential impact of NRA education and training initiatives relate to data that examine full qualification attainment. However, it would be expected that people who engage in work-related education and training would also obtain skills that improve their productivity.
- The analysis also does not consider the potential effects on participation and productivity of people acquiring additional qualifications at or below the level of their highest qualification.
- It is also possible that the educational attainment of children and young people who are not targeted through the reform process could change as a consequence of changes in their peers' outcomes. For example, the in-class behaviour of children targeted through policy initiatives might improve, leading to a more conducive learning environment for all students. On the other hand, inclusion of some relatively low performers in classes may temper the attainment levels of the remainder of students.

Examination of these complex issues, and how they could impact on workforce participation and productivity, would be worthwhile but has not been possible in the timeframe of this study.

12.3 Implications for indicative costs

To date, specific policies have not been proposed, precluding the provision of indicative costs of the reform agenda. The cost calculations presented in this section are intended to be only broadly illustrative of some of the specific types of costs that could be involved in raising educational levels and some magnitudes of such costs based on existing programs. Extrapolation or development of these calculations to provide an estimate of the cost of achieving NRA objectivies and outcomes would require information about specific implementation plans and the links between education and training programs, outcomes and workforce participation and productivity.

Early childhood development

The possibility of an 18 percentage point increase in the proportion of children with low basic skills who complete high school as a consequence of the full achievement of the NRA outcome objective on children's basic skills was canvassed. Interventions to improve the proportion of children acquiring basic skills for life and learning take many forms and could differ in terms of their: coverage (small groups or entire populations); focus (child or parent); funding (private or public); delivery (centre-based or home–based); frequency (length of program and intensity of attendance); as well as quality. Provision of an indicative cost estimate for this element of COAG's reform agenda would require further information on the types of policies to be implemented, including the choice of intervention.

Literacy and numeracy

An indicative estimate is presented based on the potential costs of intensive literacy and numeracy support for one cohort of students for one year.

Evidence on the cost of intensive support indicates that programs like Reading Recovery cost around $4 600 per student per annum, of which the cost of special training for teachers represents a significant proportion (MCEETYA 2006). Assuming that:

- children receive separate interventions to improve literacy and numeracy skills,
- numeracy interventions involve a similar unit cost to literacy interventions, and
- the cost of raising skills from below basic to basic and from basic to a proficient level is the same,

an indicative cost of additional intensive support for one age cohort (currently around 260 000 children) for one year at current levels of attainment (30 per cent below PISA Level 3 in reading skills, or 78 000 children; 33 per cent below PISA Level 3 in numeracy skills, or 85 800 children), could be of the order of $750 million.

Transitions from school to work or further study

An indicative cost estimate is presented based on the costs of retaining early school leavers within the education and training system for an extra year. Assuming that:

- 50 per cent of potential early leavers are retained in secondary school and 50 per cent within the VET sector, and
- the unit cost of a secondary student is $12 000 per annum, while the cost of a VET certificate III qualification is estimated to be around $8 500,

the indicative cost of putting an additional 13 per cent of a cohort (or around 33 800 persons in 2005) through an extra year of secondary or VET education is estimated at around $350 million.

Adult learning

An indicative estimate of the costs for one year of increased education and training effort by adults, consistent with the levels of qualification attainment described in table 12.5, is presented in this section. Assuming that:

- a larger proportion of the improvements in attainment set out in table 12.5 occur when the members of each age cohort are younger,[20]
- VET qualifications require 600 hours of study at an average cost to governments of around $14.00 per hour — amounting to around $8 500 per annum per student, and
- the cost of a degree to the Commonwealth Government is around $20 000[21] over three years (DEST 2005) — or $6 666 per annum per student,

[20] It is assumed that 1.5 per cent of the cohort aged 25–34 that do not have an upper secondary qualification completed a VET qualification. On average, across the 25 years to 2030, 0.96 per cent of this group will obtain a VET qualification.

[21] Estimate based on 2004 Commonwealth Government recurrent expenditure on higher education and domestic student numbers.

and using data on the highest level of educational attainment in the population by age cohort (ABS 2005c), the indicative cost for one year of improving the qualifications profile of the current adult population is around $445 million.

12.4 Summary of direct impacts

Australia has high levels of educational attainment relative to many other OECD countries, and it is likely that the increases in attainment that have occurred over the past couple of decades will contribute to higher participation and productivity in the future. In the normal course of events, it would be expected that average educational attainment would continue to increase over time and that this would be underpinned by continually evolving policy development. Indeed, within this study, it has been assumed that labour productivity could increase at an annual rate of 1.75 per cent per year to be 54 per cent above current levels by 2030.

The NRA identifies four areas in which further advances in educational attainment could be made over what could otherwise be achieved. Assuming higher levels of attainment than otherwise would be achieved, the full implementation of the education and training component of the NRA could translate into higher workforce participation and productivity, although with many years' lag in some cases. The potential increase in participation from outer-envelope changes to educational attainment stemming from the full achievement of NRA outcome objectives is projected to be 0.7 percentage points, while the outer-envelope productivity increase is up to 1.2 per cent, over what could otherwise be achieved (table 12.7).

The largest gains in participation are expected to come from initiatives to improve transitions from school, while initiatives in this area and those to improve adult learning outcomes are estimated to have a similar impact on productivity (table 12.7)

13 Work incentives

Key points

- Around 5.5 million people over the age of 15 are not in the workforce, including 1.5 million in the key groups nominated by COAG for higher workforce participation.
- By changing work incentives, there may be scope to draw on the key groups to increase participation by around 600 000 people — a four percentage point increase in aggregate participation. However, this outer-envelope estimate:
  - is a binary measure (people participate or they do not) and therefore is silent on whether 'incumbents' might work more or fewer hours;
  - includes people whose status might change from 'not in the workforce' to 'unemployed'; and
  - is based on market activity (such as increased workforce participation) but not non-market activity (such as offsetting reductions in unpaid child care, carer activity and volunteerism).
- Those who may be induced to participate in the workforce are likely to be less productive on average than the incumbent workforce.

Indicative outcomes for the work incentives substream of the NRA, set out in the February meeting of COAG, include 'a reduction in the proportion of the working-age population not participating in the workforce due to illness, injury or disability';[1] and 'encourage and support increased workforce participation among key groups' (COAG 2006a). The ensuing July meeting added a rider that improved participation be 'consistent with the long-term interests of the individual and the economy, giving due regard to productivity' (COAG 2006c). In relation to the 'key groups', the February Communiqué notes only that '… international benchmarking suggests that the greatest potential to achieve higher participation is among people on welfare, the mature aged and women' (COAG 2006a, p. 4).

This chapter focuses on identifying the outer-envelope workforce participation rate that might be achieved through unspecified changes to work incentives. It does not, however, offer views on the merits of particular policy changes. Important caveats to the approach used to estimate the outer-envelope participation rate include:

1 While primarily a health substream matter, workforce incentives are relevant (section 13.4).

- workforce participation is defined as binary — people either participate in the workforce or they do not. Hence the estimates do not take account of whether changing work incentives might induce people to work more (or fewer) hours;
- workforce participation does not necessarily equate to employment as it includes unemployed people; and
- an assumption that any policy changes would apply to incumbents and new entrants alike. This is consistent with the view canvassed by the OECD that tighter eligibility requirements (such as the recent welfare to work reforms) should extend to all program beneficiaries (OECD 2006d).[2]

Identifying an outer-envelope participation rate does not necessarily imply that such an outcome would improve welfare. It is for COAG to determine the costs and benefits of policy changes to increase participation (and employment) and for people to respond according to their preferences and market conditions.

This chapter provides a framework for examining the possibilities to improve workforce participation through changing the work incentives environment. It describes how the key groups identified by COAG were refined to NRA–consistent populations (section 13.2), estimates the outer-envelope participation rates for these populations (sections 13.3–5), discusses the productivity implications of an influx of new participants (section 13.6) and summarises these findings (section 13.7).

13.1 Operationalising the key groups

The report of the National Reform Initiative Working Group on Human Capital Reform (NRIWG 2006) provides the context needed to develop NRA-policy relevant categories for the broad cohorts — such as the 'mature aged' and 'women' — specified by COAG. The report highlights, for instance, the interaction of tax and welfare, rules governing pensions and superannuation, and the cost and availability of child care[3] — all predominantly Commonwealth Government responsibilities. It notes that 2.7 million Australians of working age receive income support and that many would consider working, or working more, if they faced

[2] This is relevant for estimating the potential for increased workforce participation among the current populations of the key groups, but has little impact when projecting participation out to 2030 (see chapter 14).

[3] For child care, State and Territory Governments have a role in, among other things, planning, regulation and licensing. The Commonwealth Government has the primary role in relation to work incentives through the Child Care Tax Rebate and Child Care Benefit (see section 13.3).

lower effective marginal tax rates (EMTRs).[4] Indeed, of the myriad influences on participation, many are shaped by government, including, to a lesser degree, State and Territory governments (table 13.1).

Table 13.1 **Influences on workforce participation decisions**

Influence	*Policy*
Attitudes	
• Employer attitudes to flexible work practices, maternity leave, gender, age, Indigenous people, people with disabilities and those from culturally diverse backgrounds • Individual's attitudes to: combining work and family responsibilities; and retirement	• Equal employment and anti-discrimination legislation • Leadership (such as government workplaces conducive to employing older workers)
Financial incentives	
• Interaction of welfare and tax systems (including effective marginal tax rates) • Supporting people from welfare to work • Deferring early retirement • Eligibility rules for welfare benefits • Access to retirement income	• Family taxation arrangements • Age and Disability Support Pensions • Child care subsidies and child benefits • Commonwealth and State concession benefits • Access to public housing • Access to superannuation
Institutional impediments	
• Workplace flexibility • Constraints on particular work options for particular groups of workers	• Labour market and workplace institutional environment • Occupational licensing, OH&S, workers' compensation regulation and mutual recognition (labour mobility)
Support services	
• Employment and support services • Quality child support services • Health services (chapter 11) • Education and training (chapter 12)	• Jobsearch network • Child care places and standards • Targeted support services — people with disabilities (eg Workforce Modifications Scheme), language barriers and addiction • Relocation incentives

Source: Adapted from NRIWG (2006).

To capture the salient features of workforce incentives, it is necessary to refine COAG's key groups based on the priorities identified by the NRIWG report. Hence:

1. The mature aged group is defined as *people aged 55–64 not participating in the workforce*. The NRIWG identified the marked decline in participation from the age of 55 — well before the pension age.

[4] Effective marginal tax rates reflect the effects of additional income tax and reduced government benefits as income rises.

2. The women group is defined as *women aged 25–44 not participating in the workforce* to capture the barriers to participation in paid employment identified by the NRIWG — parenting and the role of women as primary carers, access to and the cost of child care, and the impact of EMTRs on work decisions.
3. Those not participating due to illness, injury or disability are defined as *people of working age in receipt of a disability support pension* (DSP). The NRIWG identified the DSP as a key non-health influence on participation decisions.

In relation to 'people on welfare', the interaction of the tax and welfare systems affects participation in all key groups — for example, women (family tax benefits), mature aged (pensions) and people with disabilities (DSP). In 2004-05, the major income support payments were: age pension ($20 billion) of which only a small component was paid to people under 65 years of age; combined family tax benefit, child care benefit, and parenting payment ($21 billion); DSP ($8 billion); and Newstart ($5 billion) (ABS 2006g). Hence, from a welfare expenditure perspective, the redefined groups capture the key work incentive payments apart from unemployment benefits. As noted, the unemployed are classified as participating in the workforce.

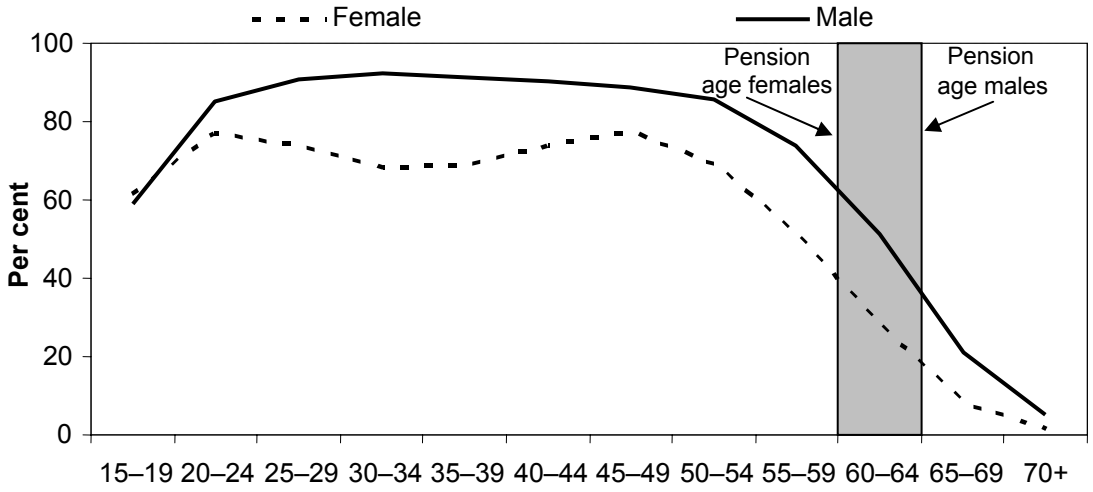
The low workforce participation rate of the 450 000 people who identify themselves as Indigenous Australians is noted in the February Communiqué but not elaborated in the NRIWG report. Notwithstanding particular issues in remote areas, Indigenous Australians are represented in the three redefined groups. Indeed, the aim is not to develop mutually exclusive groups that comprise the sum of all people not participating in the workforce, but to capture COAG's key target populations.

13.2 Mature aged participation

The mature aged cohort adopted in this study includes people aged 55–64 not participating in the workforce. A pronounced decline in participation commencing well before the pension age is evident from figure 13.1. For example, in 2005 the participation rate for men aged 50–54 was 86 per cent falling to 74 per cent for 55–59 year olds.

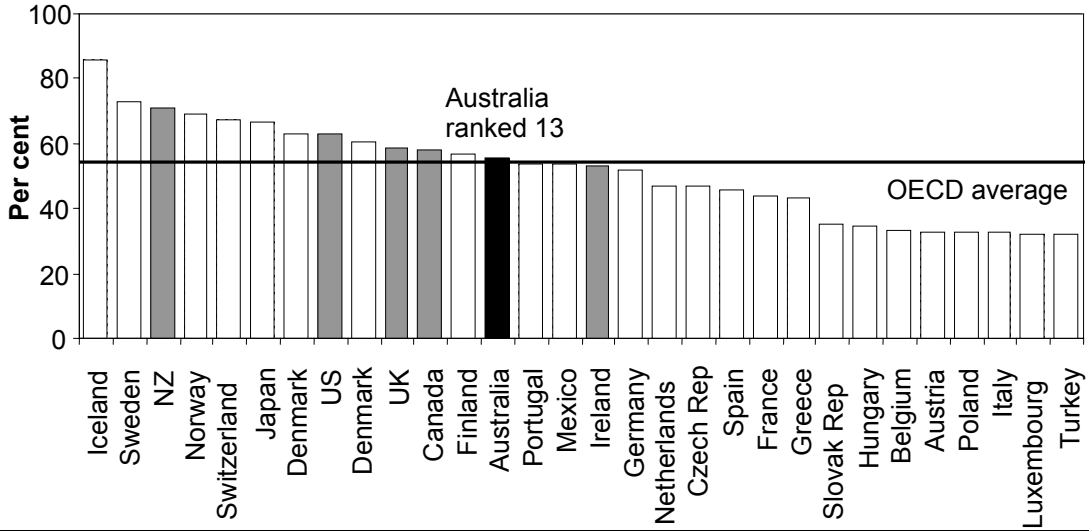
Australia's participation rate for 55–64 year olds, at nearly 56 per cent, was slightly above the OECD average in 2005 (figure 13.2). (However, by March 2006 the Australian participation rate had increased by two percentage points to 58 per cent.) Countries that might reasonably be compared to Australia include New Zealand (71 per cent), the United States (63 per cent), the United Kingdom (58 per cent), Canada (58 per cent) and Ireland (53 per cent).

Figure 13.1 **Participation rate by age cohort, 2005**



Source: ABS (*Persons Not In The Labour Force, Australia*, Cat. no. 6220.0, Canberra).

Figure 13.2 **Experimental standardised participation rates for people aged 55–64 for OECD countries, 2005[a]**



a Preliminary estimates by the Commission that adjust for variations in the treatment of defence personnel, institutionalised populations, missing data for some age brackets and paid maternity leave between OECD countries.

Sources: Productivity Commission estimates based on ABS (*Persons Not In The Labour Force, Australia*, Cat. no. 6220.0, Canberra; *Labour Force, Australia, Detailed – Electronic Delivery*, Mar 2006, Cat. no. 6291.0.55.001); CIA (2006); EOWA 1998; IISS (2006); OECD (2006e); UN (2005a, 2005b); USCB (2005).

Determinants of mature age participation

There is a useful survey of the literature on the determinants of aged employment outcomes in Borland (2005). Key findings include the importance of:

- *Health*: Poor health and disability increases with age which lowers the probability of mature age workforce participation.
- *Education*: Participation is lower among those with low educational attainment and the gap in participation between education groups increases with age.
- *Partner activity*: Australian evidence points to inter-dependencies between mature age family members and participation. Borland (2005) reports:

  > … older females are more likely to participate … if their husband works … similarly, older males are more likely to participate if their wife is working (Evans and Kelley 2002a; 2002b). Descriptive evidence also shows that a quite large proportion of the mature age population who are out of the labour force are involved in carer roles (p 20).[5]

- *Attitudes*: A substantial literature points to employer attitudes (that older workers have outdated skills, are harder to train and prone to health problems) as a barrier to employment (Bittman, Flick and Rice 2001; Encel 1998; Encel and Studencki 1996; HRSCEEWR 2000; Pickersgill et al 1996).
- *Wealth and the inclination to continue to work*: Miller (1983) contends that much of the substantial decline in participation by men aged 60–64 in the 1970s in Australia was due to large increases in asset prices.

Survey data on early retirement shed further light on mature age participation:

- An ABS survey (ABS 2006f) reported that the most common reasons for people aged 45 and over retiring from work in the last 20 years were: reaching retirement age/eligible for superannuation (34 per cent); sickness, injury or ill health (26 per cent); retrenchment/dismissal (11 per cent).
- A study of the retirement intentions of mature age workers, based on the Household, Income and Labour Dynamics in Australia (HILDA) survey, found that 62 per cent of retirees under 60 left employment involuntarily (Knox 2003).
- The Workforce Circumstances and Retirement Attitudes Survey (Wallis Consulting 2000) reported that people aged 55–64 left their job because of: illness, disability or caring for sick relative (28 per cent); redundancy or dismissal (23 per cent); job-related, such as restructuring (21 per cent); to live off investments or income support (16 per cent); and personal (13 per cent).

[5] More recent evidence from the Australian Bureau of Statistics' work on Australian Social Trends indicates an increase in the number of mature age people with caring responsibilities for elderly parents and young grandchildren. This can impact on mature age participation.

Citing evidence such as this, the NRIWG (2006) contended that around two-thirds of people aged 55–60 leave the workforce involuntarily. As Borland (2005) notes '… policies for promoting employment of older workers are likely to be operating in an environment where other factors are also having very large effects on incentives to supply labour and on demand for older workers' (p. 27).

Incentive effects ('pull' factors)

Influences driving work and retirement decisions can be categorised as 'pull' and 'push' factors. Many push factors such as health, education and employer attitudes are noted above. In relation to factors that 'pull' older workers into retirement, the NRIWG flagged access to pensions and superannuation as important. The OECD (2006c, p. 53) notes:

> Studies based on micro-data at the individual country level (Gruber and Wise 1999 and 2004; Schils 2005) as well as cross-country studies using aggregated national data (Blondal and Scarpetta 1998; Burniaux, Duval and Jaumotte 2003; Duval 2003) concur that financial incentives embedded in both public pensions and in other formal and informal early retirement schemes play an important role in determining retirement decisions. These decisions will be influenced by the age at which (early) retirement benefits can be first accessed, the generosity of replacement rates and the implicit tax on continuing to work in terms of changes in the present value of net pension wealth from working an additional year (Cremer and Pestieau 2003). Early retirement schemes and other de facto early retirement schemes such as unemployment and long term sickness and disability benefits have also played an important role in some countries in facilitating early retirement. … a number of studies point to the importance of joint retirement decisions among couples, thereby leading to some coordination in the timing of retirement of each partner (Gustman and Steinmeier 2004; Blau and Riphahn 1999; Jimenez-Martin, Labeaga and Granado 1999).

International experience indicates that changes to pull factors can have significant and rapid effects on mature age participation. For example:

- In 1938, New Zealand lowered the eligible pension age from 65 to 60 years of age. Participation of men aged 60–64 had fallen over 13 percentage points by 1945. Johnson (2000) notes that:

  > Since 1908, Australia's [pension] eligibility rate for men has been 65. Its system is thus highly similar to that New Zealand had prior to 1938. … whilst participation rates were comparable in the 1930s, after 1938 the New Zealand participation rate was consistently around ten points lower than that in Australia (p. 37).

- In 1991, New Zealand introduced changes to restore the pension eligibility age to 65 by 2001. Participation by men aged 60–64 rose by nearly 20 percentage points from 1990 to 1997 and increased for both sexes in the 55–59 age group.

- In 1979, Denmark reduced the pension age from 67 to 60. The participation rate for men aged 60–64 fell from around 79 per cent in 1978 to just below 60 per cent in 1979 (Johnson 2000).

Thus, while the literature suggests constraints on the extent to which changing work incentives can influence mature aged participation, the international experience shows that policy changes can have a substantial impact. That said, it is important to recognise the cultural and institutional differences across countries.

Current domestic policy framework

The age pension

The age pension is paid at age 65 for men. Prior to 1995, it was paid at age 60 for women, but from that time the eligibility age is increasing until 2014 when it will reach 65. The age pension aims to guarantee a minimum standard of living, rather than being the main element of retirement income (as occurs in some Scandinavian countries). However, it is expected to continue as a major source of income for many Australians, even though higher superannuation balances will mean many will rely less on the age pension. The age pension is increased in line with a benchmark of meeting around 25 per cent of male total average weekly earnings.

Pension uptake is sensitive to income and assets tests. In the 1970s, the income and assets tests for people over 70 were abolished and full rate coverage increased to 90 per cent. The subsequent re-introduction of means tested entitlements in the 1980s reduced full rate coverage to around 70 per cent.[6] The OECD (2005d, p. 68) reports that:

> … 54 per cent of people of Age-Pension age receive a full-rate pension, another 28 per cent receive a part-rate pension and 18 per cent do not receive a pension at all. By 2050, these rates are expected to amount to 35 per cent, 40 per cent and 25 per cent respectively. The major reason for this … comes from a maturing of the Superannuation Guarantee that will further reduce the share of retirees eligible for an age pension.

Means testing pensions reduces the incentive to work in older ages owing to interactions with the effect of taxes when combining the age pension with work. (Other measures such as the Mature Aged Workers Tax Offset and Senior Australians Tax Offset aim to reduce this impact — see below). Burniaux, Duval

[6] The pension reduces by $3.00 for every $1000 of assets over the asset free range. From September 2007 the taper rate will fall to $1.50 allowing singles to have an additional $165 000, and couples an additional $275 000 (Costello 2006).

and Jaumotte (2003) report that a shift to actuarial neutrality in the Australian age pension could lift aggregate participation by one percentage point.[7] The Commonwealth Government introduced the Pension Bonus Scheme partially to address low mature age workforce participation in July 1998. The scheme provides a tax-free lump-sum to people who defer take up of the age pension (for up to a maximum of five years). The lump-sum is equivalent to 9.4 per cent of the rate of age pension multiplied by the square of the number of years of accruing membership. By June 2006 around 104 000 people had registered in the scheme since its inception (Department of Family, Community Services and Indigenous Affairs, personal communication, December 2006).

Superannuation guarantee

The introduction of the superannuation guarantee in 1992 has increased the proportion of covered workers from 40 per cent in 1986 to 90 per cent in 2004. Around 78 per cent of covered workers belong to accumulation schemes, 21 per cent to hybrid schemes and 1 per cent to defined benefit schemes (OECD 2005d, p. 71). The NRIWG (2006) observed that government defined benefit schemes encourage many workers to retire at their earnings peak.

Maturation of superannuation is a major determinant of retirement timing. The earliest age that people can draw on their superannuation is 55, increasing to 60 between 2015 and 2025. Workers with more generous superannuation tend to retire earlier. Bingham (2003) notes that 27 per cent of employees receive or make supplementary contributions (from employers or via salary sacrifice), but this increases to over 40 per cent of those with salaries over $60 000.

An inability to combine a superannuation income stream with work income before the age of 65 reduces the incentive to work. Accordingly, in July 2005, the Government allowed people in employment who had reached their preservation age to access their superannuation as a non-commutable income stream, thereby enabling older workers to supplement reduced earnings with superannuation entitlements.

In the 2006-07 Budget, the Commonwealth Government announced proposals to streamline superannuation from 1 July 2007. The Treasurer stated:

> The Government's plan for superannuation would encourage older Australians to remain in the workforce. Under the plan, superannuation benefits from taxed funds received after age 60 would not be included in a person's assessable income for tax purposes, which may reduce the tax paid on work income. Further, the assets test taper

7 Actuarial neutrality implies an effective increase in pension benefits from delaying retirement.

rate for the age pension would be reduced, removing the current disincentive towards working and saving stemming from the possibility of a person losing more age pension than they can earn from additional savings (Commonwealth of Australia 2006, p. 8).

Other work incentives

Around 25 per cent of people aged 55–59 are on income support, increasing to 45 per cent for those aged 60–64 (OECD 2005d, p. 74) — table 13.2. The NRIWG devoted considerable attention to the DSP, observing that it is a vehicle for early retirement (section 13.4). Of the remaining benefits, several are closed — the wife pension (in 1995), the widow B pension (in 1997) and the mature age and partner allowances (in 2003). A feature of these schemes was the absence of work activity tests. These changes should increase mature age participation.

Table 13.2 **Forms of income support for people aged 50–64, 2003**

Type of income support	*Men*	*Women*
	%	%
Disability support	58.3	25.5
Mature age allowance	9.7	0.7
Newstart allowance	17.6	5.4
Veterans pension	6.1	..
Wife/carer/partner pensions	6.4	28.5
Age pension	..	28.5
Other[a]	2.0	11.6

.. Not applicable. [a] Includes sickness allowance, widow benefit and parenting payments.

Source: OECD (2005d).

The Mature Age Workers Tax Offset is a recent measure to encourage individuals over 55 years to continue working. It provides an annual $500 tax rebate with the full offset available when earned income reaches $10 000 and phases out at 5 per cent for every dollar earned above $53 000 (OECD 2005d, p. 85). In addition, as part of the 2005 welfare to work reforms, a new Employment Preparation Service to assist mature age job seekers lacking recent labour market experience was introduced. The Commonwealth Government has also introduced workplace reforms which it considers will improve opportunities for higher workforce participation.

Scope to improve mature aged participation

As at March 2006 there were 1.3 million people aged 55–64 in the workforce, comprising 1.26 million employed and 44 000 unemployed. There were a further

945 000 people of that age not in the workforce. Focussing on the 945 000 people and removing those aged 55–64 in receipt of a disability support pension (275 000 people in 2004 — discussed in section 13.4) leaves around 670 000 — the relevant target group. The proportion of the target group that could be induced to participate in the workforce is discussed in box 13.1.

Box 13.1 **Outer-envelope participation rate for the mature aged**

- 2005 participation rate of 55–64 year old people: 56 per cent
- Comparisons (2005): Iceland (86 per cent); New Zealand (71 per cent); Denmark (63 per cent); United States (63 per cent); United Kingdom (58 per cent); Canada (58 per cent) and OECD average (55 per cent)
- Population of 55–64 year old people not in the workforce: 945 000 people
- Target group (55–64 year old people net of DSP recipients): 670 000 people
- Ceiling participation rate: 88 per cent — all target group participates
- Floor participation rate: 64 per cent — only the 131 000 people who 'want to work' given the current policy environment participate
- *Estimated participation rate:* 70 per cent — assume that 40 per cent of the target population participates

If only the 131 000 people[8] who say that they want to work (under current policies) could be induced to participate (after policy reforms), the mature aged participation rate would increase from 58 per cent (in 2005) to 64 per cent. However, if a reformed institutional environment induced the entire target group into the workforce, the participation rate might achieve an 'Icelandic level' of 88 per cent. While such a ceiling appears overly ambitious, the floor participation rate also seems too low, being based on people's choices shaped by current policies. COAG's indicative outcomes for mature age participation imply a change to the institutional environment.

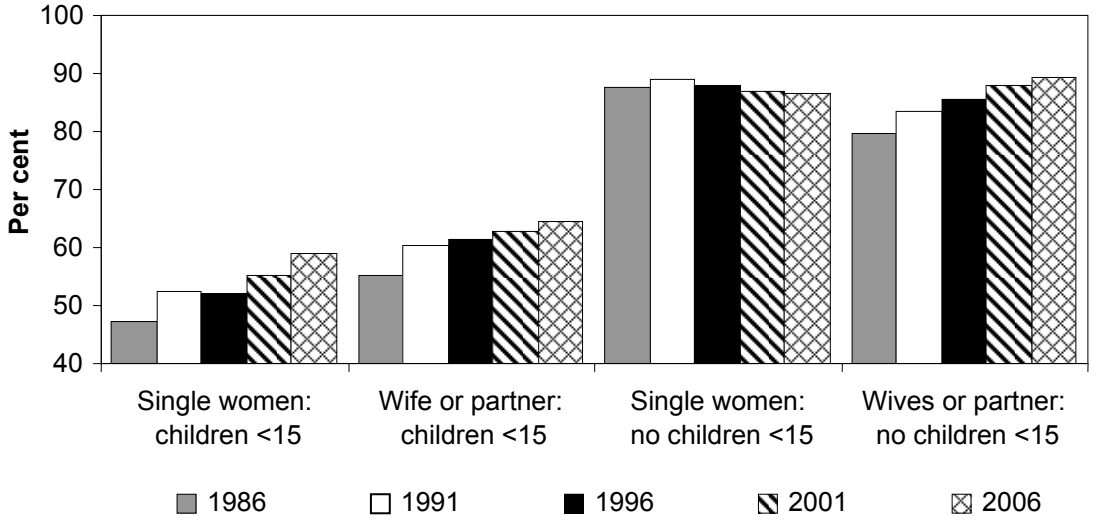
A more plausible, albeit arbitrary, assumption is that around 40 per cent of the relevant population (268 000 people) could be induced to participate. On this basis, the mature age participation rate would rise to around 70 per cent, equivalent to that of culturally similar New Zealand (but below Iceland and Sweden). This outer envelope would require a significant, but unspecified, change in work incentives.

8 Based on unpublished ABS *Survey of Persons Not in the Labour Force* data.

13.3 Participation of women aged 25–44

Women aged 25–44 offer significant potential for increased workforce participation. Although the participation rates of women without children in this age group are comparable with men of a similar age, participation is significantly lower for those with children, and lower again for such women without partners (figure 13.3).

Figure 13.3 **Workforce participation of women aged 25–44 by family structure, 1986–2006[a]**



a Data for 1986–2001 are based on average of monthly data over the calendar year. Data for 2006 are based on average of monthly data for January to May only.

Source: ABS *Labour Force, Australia* (unpublished).

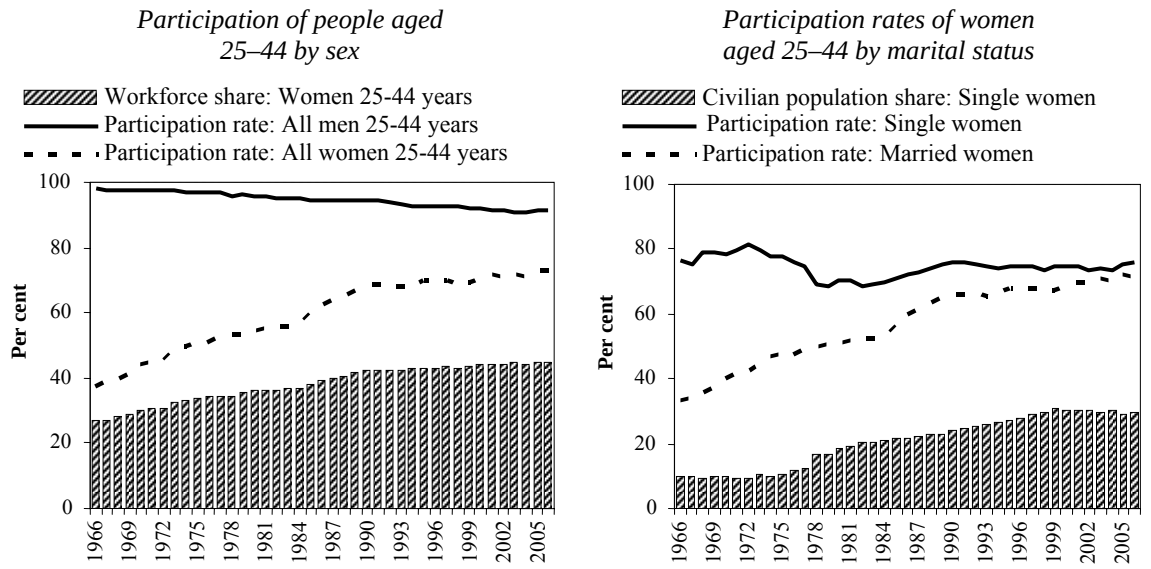
Many parents value time with their children highly — particularly during their formative years. As a result, many women choose to be absent from the workforce (Johnston 2005). Although not captured in official measures such as gross national product, the unpaid work of these women adds value to society.[9]

There have been significant increases in the workforce participation of women aged 25–44 over recent decades (figure 13.4a), particularly among married women (figure 13.4). These increases reflect many factors including changing views of the roles of women in society and the workplace (ABS 1998), the growth of the service sector with its demand for (and supply of) flexible working arrangements (ABS 2003a; OECD 2002), the diffusion of labour saving technology in the home

9 The ABS (2001d) estimated that the value of unpaid child care provided by employed and unemployed women was equivalent to between $20 billion and $22 billion in 1997 (or around 4 per cent of GDP).

(Guha 2005), and demographic changes across generations (including higher educational attainment and a delay in the age of marriage and first child) (Young 1990; ABS 2001c; PC 2005f).[10]

Figure 13.4 **Workforce participation of persons aged 25–44, 1966 to 2006[a]**



a Data for 1966 to 1978 are from ABS (1987). Data for 1979 to 2006 are from ABS (2006b). Data for 1979 to 2005 are based on 12 month averages. Data for 2006 is based on the average for January to April 2006.

Source: Productivity Commission estimates based on ABS (*Labour Force: Historical Summary, 1966 to 1984*, Cat. no. 6204.0, Canberra; *Labour Force, Australia, Detailed – Electronic Delivery*, Mar 2006, Cat. no. 6291.0.55.001).

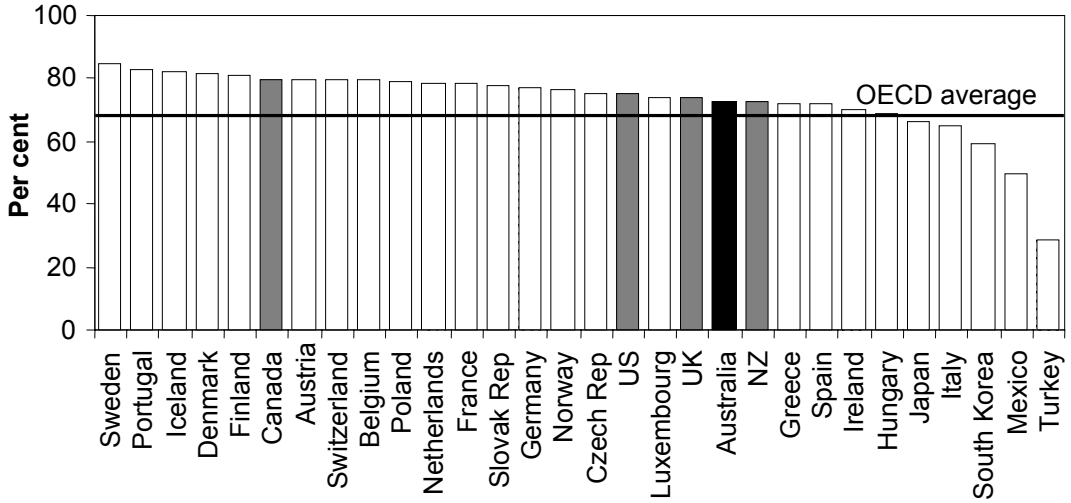
Despite these developments, workforce participation rates of women in Australia lag those in culturally comparable OECD countries (figure 13.5). For example, respective workforce participation rates for women aged 25–44 in 2005 were: Australia (74 per cent), Canada (80 per cent), the United Kingdom (75 per cent), the United States (75 per cent) and New Zealand (75 per cent).

Workforce participation rates may be lower than preferred. Approximately 53 per cent (405 300) of the women aged 25–44 who were not in the workforce at September 2005 indicated they wanted to work, but were not actively seeking employment (ABS 2005e). While this suggests scope for improving participation, the possible gains should not be overstated. An OECD case study on reconciling work and family in Australia, the Netherlands and Denmark noted:

10 Evans and Kelley (2004) suggest that such characteristics influenced female participation in Australia between 1984 and 2002. Research also suggests that increased female participation in OECD countries '… has been mainly autonomous and related to the fact that more recent cohorts of women are better educated than earlier cohorts and … tend to place greater priority on pursuing a career' (OECD 2006b, p. 128).

Female participation rates in Australia and the Netherlands are now 65 per cent, with a strong cohort effect, which suggests that further increases in participation will take place irrespective of government policy. Even with the extensive range of policies in place now for many years, the female participation rate in Denmark is 76 per cent. Assuming Denmark represents something of an upper bound on female participation rates, then the scope for further gains in participation rates in the other two countries are significant, but not dramatic (OECD 2002, p. 23).[11]

Figure 13.5 **Workforce participation of women aged 25–44, 2005[a]**



a Preliminary estimates by the Commission that adjust for variations in the treatment of defence personnel, institutionalised populations, missing data for some age brackets and paid maternity leave between OECD countries.

Sources: Productivity Commission estimates based on ABS (*Labour Force, Australia, Detailed – Electronic Delivery*, Mar 2006, Cat. no. 6291.0.55.001, *Barriers and Incentives to Labour Force Participation, 2004-05*, Cat. no. 6239.0); CIA (2006); EOWA (1998); IISS (2006); OECD (2006e); UN (2005a, 2005b); USCB (2005).

Determinants of women's participation

Women's work decisions reflect the trade-off between the relative benefits and costs of paid work, leisure and home production of goods and services (including child raising) (Elliott 1991). These decisions are made within the context of the prevailing labour market and the institutional environment (wages, working arrangements, taxation). Factors likely to affect participation choices include 'opportunities and preferences, family formation, parenthood, caring and intergenerational care arrangements, education, and work and earning opportunities later in life, and retirement prospects' (OECD 2002, p. 40).

11 Data were for women aged 15–64 in 2000. At September 2005, the participation rate of women in this age group for Australia was 69 per cent (ABS 2005e).

The influences on women's work decisions have attracted considerable attention in the Australian and international literature.[12] Jaumotte (2003; 2004) estimated the contributions of policies and other variables to women's participation rates across 17 OECD countries (including Australia). The major influences were:

- *Educational attainment* — Women's potential earnings and employment outcomes increased with their level of education. This also reduced the scope for specialisation in home production within couples. Both effects increased women's attachment to the labour market (see also chapter 12).
- *Labour markets conditions* — Labour market conditions affect women's participation:

  > … a high female unemployment rate tends to discourage female participation. On the other hand, a high male unemployment rate may stimulate female participation, as women join the labour market in order to compensate for the loss of family revenue due to their husband's unemployment (Jaumotte 2003, p. 14).

  The net effect was that good labour market conditions were positively related to women's workforce participation.
- *Cultural attitudes* — Attitudes about the role of women can significantly influence their attachment to the workforce. These include, for example, the extent to which traditional gender roles persist and perceptions regarding the effect mothers' workforce participation might have on children's development.

In addition to these broader influences, Jaumotte (2003) found that differences in women's participation rates across countries were associated with policies which influenced flexibility of working-time arrangements, support to maintain and care for children, and the structure of family taxation.

Flexibility of working-time arrangements

Flexible working time arrangements — in particular access to part time work — enable women to balance paid work and family responsibilities. Campbell and Charlesworth (2004) noted '… in the case of mothers with dependent children, reduced hours of paid work can free up more time to meet the particularly urgent needs of children when they are small' (p. 47).

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[12] Cartwright (2005) provides an overview of the Australian and UK literature. Gray et al. (2002) and Alexander (2005) confirm that influences on women's workforce participation decisions are similar across developed countries. The OECD *Babies and Bosses: Reconciling Work and Family Life* series looks at female participation and family friendly policies for Australia, Denmark and the Netherlands (OECD 2002); Austria, Ireland and Japan (OECD 2003b); New Zealand, Portugal and Switzerland (OECD 2004b) and Canada, Finland, Sweden and the United Kingdom (OECD 2005e).

It is sometimes argued, however, that part time work diminishes women's attachment to the workforce because it offers little in the way of career advancement (HREOC 2005a; IRV 2005). Similarly, it is argued that the demands for flexibility from employers (such as changes to rosters and overtime at short notice) can be more difficult to coordinate with child care arrangements (Thornthwaite 2002).

However, research also suggests that, on average, there is a high level of preference for part time work among Australian women with children, particularly those with young children (Thornthwaite 2002). Approximately 27 per cent of women aged 25–44 who were not in the workforce in 2004-05, but who wanted to work, indicated that they would prefer part time work (ABS 2006e).

The OECD (2005f) identified a relationship between countries with a high share of part time employment among female workers and higher women's participation:

> …policies that remove distortions against part time work will lead to an increase in female participation, though the magnitude of this effect is likely to depend on the extent to which women have a preference for such work. (OECD 2005f, p. 165)

Australia has a high proportion of women in part time work relative to other OECD countries. Approximately 39 per cent of women aged 25–44 were in part time work in 2004, ranking Australia second among OECD countries (OECD 2006c).[13]

Parental leave is also important for reconciling work and family for women with young children, with attachment to the workforce enhanced where this leave is paid (OECD 2002). Parental leave is associated with higher levels of full, rather than part time, participation. However, parental leave in excess of 20 weeks is associated with lower workforce participation rates (Jaumotte 2003).[14]

Commonwealth Government workplace legislation provides a statutory right to 52 weeks of unpaid parental leave to employees with at least 12 months continuous service with a current employer. According to DEWR (2006d), 46 per cent of women covered under federally-certified agreements are entitled to paid maternity leave.

[13] Compared with the United Kingdom (38 per cent), New Zealand (33 per cent), Canada (21 per cent), and the United States (14 per cent) (OECD 2006c).

[14] Research suggests extended parental leave may deteriorate labour market skills and damage future career paths and earnings, particularly for low-skilled workers (OECD 2005f).

Support to maintain and care for children

The Commonwealth Government offers a range of support for families.[15] The main form of income support is the Family Tax Benefit (FTB) which amounted to $14.2 billion in 2004-05 (ABS 2006f). The main forms of child care subsidies are the Child Care Benefit (CCB) and Child Care Tax Rebate (CCTR). The CCB amounted to $1.4 billion in 2004-05, (ABS 2006f), while the CCTR (introduced on 1 July 2004) was expected to cost a total of $915 million over its first four years (McIntosh 2005).

Income support measures (including tax allowances) such as the FTB raise household incomes but may reduce incentives for women to participate in the workforce (OECD 2005f). While this might suggest that participation can be improved by removing income support measures, it is important to recognise that governments often pursue multiple (possibly competing) objectives with family assistance measures. Commonwealth Government objectives for family assistance, for example, include social goals such as equity and reducing child poverty (FaCSIA 2006a; 2006b). The challenge is to achieve social objectives without unduly distorting workforce participation (OECD 2002).

Child care subsidies, on the other hand, reduce the cost of formal child care and raise the relative return to paid work, thereby encouraging women to substitute paid work for home production. However, there may be an income effect for women already using formal child care which could, at the margin, reduce the amount of paid labour they provide.[16]

Affordability is only one factor influencing access to child care:

> For parents to trust their young child to the care of others is not a decision taken lightly. Some parents will always prefer parental care to non-parental out-of-home care — whether formal or informal. But it is essential that parents who wish to maintain their labour force attachment are comfortable with both the quality of the child care available, as well as its price. (OECD 2002, p. 79)

Australian data suggest that cost and quality of child care were barriers to workforce participation for about 30 per cent of women aged 25–44 in September 2005, while a further 10 per cent could not access child care at all (figure 13.6). However, more than 50 per cent of women preferred to care for their own children.

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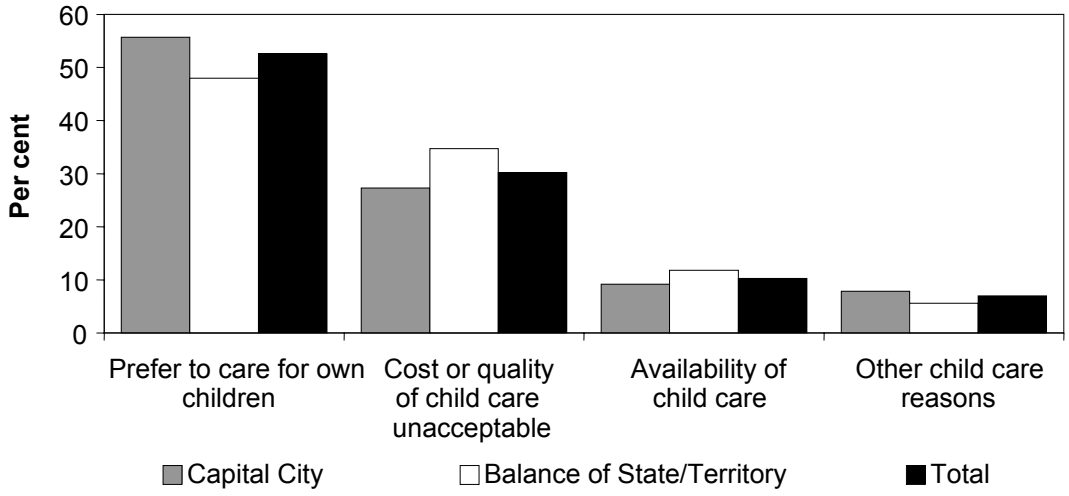
15 A chronology of Commonwealth Government payments for people caring for children is provided by Daniels (2004). See also FAO (2006), AIHW (2005e) and Whiteford, Stanton and Gray (2001).

16 Doiron and Kalb (2005) contend that formal and informal child care are substitutes for most Australian households.

The OECD (2005f) cites evidence of a positive relationship between higher workforce participation for women in countries with generous child care subsidies. Burniaux, Duval and Jaumotte (2003) for example, estimated that if Australia's expenditure on child care were increased to the OECD average, the participation rate of women aged 25–54 would increase by 3.0 percentage points. The evidence points to a stronger relationship for full time as opposed to part time participation (Jaumotte 2003).

Figure 13.6 **Main reason for not working, women aged 25–44 who care for children, 2005[a]**



a *Prefer to care for own children:* Includes women who responded 'children too young or too old', and who 'prefer to look after children'. *Cost or quality of child care unacceptable*: Includes women who responded 'cost or too expensive' and 'quality of child care unsuitable'. *Availability of child care:* Includes women who responded 'no child care in locality', 'no child care available at all' and 'booked out or no places at all'.

Source: Productivity Commission estimates based on ABS (*Survey of Persons Not in the Labour Force,* unpublished).

Australian research also suggests a (smaller) positive relationship between women's participation and government expenditures that lower child care costs. Doiron and Kalb (2005), for example, suggest that a 10 per cent decrease in the price of child care would raise the participation of married women by between 0.2 per cent and 0.5 per cent, and for single women by 0.5 per cent and 1.36 per cent.

Rammohan and Whelan (2006), using the Household, Income and Labour Dynamics in Australia dataset, estimated the elasticity of women's employment with respect to the cost of child care to be -0.06 for full time and -0.21 for part time participation. They concluded that:

> … our results suggest that lower child care costs do not have a statistically significant effect on the likelihood that women will be working, either full-time or part time. Moreover, disregarding the statistical significance of the estimated coefficient, it is also

> the case that the impact of lower child care costs is small and arguably economically insignificant. (Rammohan and Whelan 2006, p. 19)

The Australian results could, in part, be explained by child care availability. McNamara, Cassells and Lloyd (2005) found that child care availability was a problem for many Australian families, and that this was related to family characteristics such as 'having more than two children under 15 years of age, having a child younger than 2 years of age and residing in a capital city' (p. 24). While child care affordability was also a problem for families, McNamara, Cassells and Lloyd (2005) found no statistical relationship between affordability and family characteristics such as family structure or age and number of children.

Taxation, welfare and effective marginal tax rates

Women's decisions about whether to work and for how long are influenced by the pecuniary benefits from paid work, specifically 'what they will have in their pockets once they have earned wages; paid income tax, crèche fees, transport costs, etc; and have lost any entitlement to benefit income or subsidies' (Johnston 2005, p. 2).

Australian research suggests that families facing high EMTRs are predominantly those with dependent children. The taper rates — the rate at which benefits are clawed back as non-benefit income rises — of the Family Tax Benefit (Part A) were a key factor explaining the high EMTRs for 80 per cent of couples with children (Beer 2003).

The OECD (2005f) contended that the interaction of tax and welfare systems increases the EMTRs faced by some people and discourages participation. This disincentive is greater for women because of their lower workforce attachment. Burniaux, Duval and Jaumotte (2003) estimated that if the average tax rate on second earners were reduced to that of single income households in Australia, the participation rate of 25–54 year old women could be increased by 4.8 percentage points by 2025.

Costello (2006) notes that high EMTRs are a consequence of social objectives:

> The necessary implication of targeting benefits is that as these benefits are withdrawn, effective marginal tax rates are increased. The alternatives are either not to provide these benefits (thereby leaving beneficiaries much worse off) or else creating universal entitlement systems with higher spending, higher taxing and greater churning. (p. 12)

The CEDA (2006) cautions that a reduction in taper rates or an increase in the value or range over which a tax credit is paid has two opposing effects:

> It reduces EMTRs for existing beneficiaries. But families which were previously above the income threshold where benefits had ceased now become eligible for benefits. This

> increases their income (which some families will take as more leisure) and also increases the family's EMTR as the new benefit is clawed back from them with rising income. Both phenomena induce further reductions in labour supply. (p. 11)

Buddelmeyer, Freebairn and Kalb (2006), for example, modelled the effect of a $5 billion reform to lower taper rates for selected welfare payments (including the parenting payment). They found that, while the policy scenario reduced EMTRs for about 7.5 per cent of households, it raised EMTRs for another 15 per cent of households:

> The lower EMTR encourages a significant increase in the participation rates of sole parents and in aggregate the policy option is estimated to reduce the number of jobless households by about 26 000. However, the complementary zone of higher EMTR induces a large fall in the participation rate of married females. (p. 22)

These views highlight that EMTRs need to be considered within a context broader than workforce participation.

Scope to improve women's participation

Approximately 26 per cent (765 100) of women aged 25–44 at September 2005 were not actively participating in the workforce for a variety of reasons,[17] including those which are not directly relevant to family responsibilities.[18] Focusing on those women who were not participating in the workforce for family reasons provides a refined target population of 519 100 women (figure 13.7).

Within this refined population, there are women with varying degrees of attachment to the workforce. For example, approximately 54 per cent (279 800) do not wish to participate under existing policy arrangements. Work incentives are likely to be most effective for those who wish to work, but are also likely to influence the choices of those who do not want to work under current arrangements.

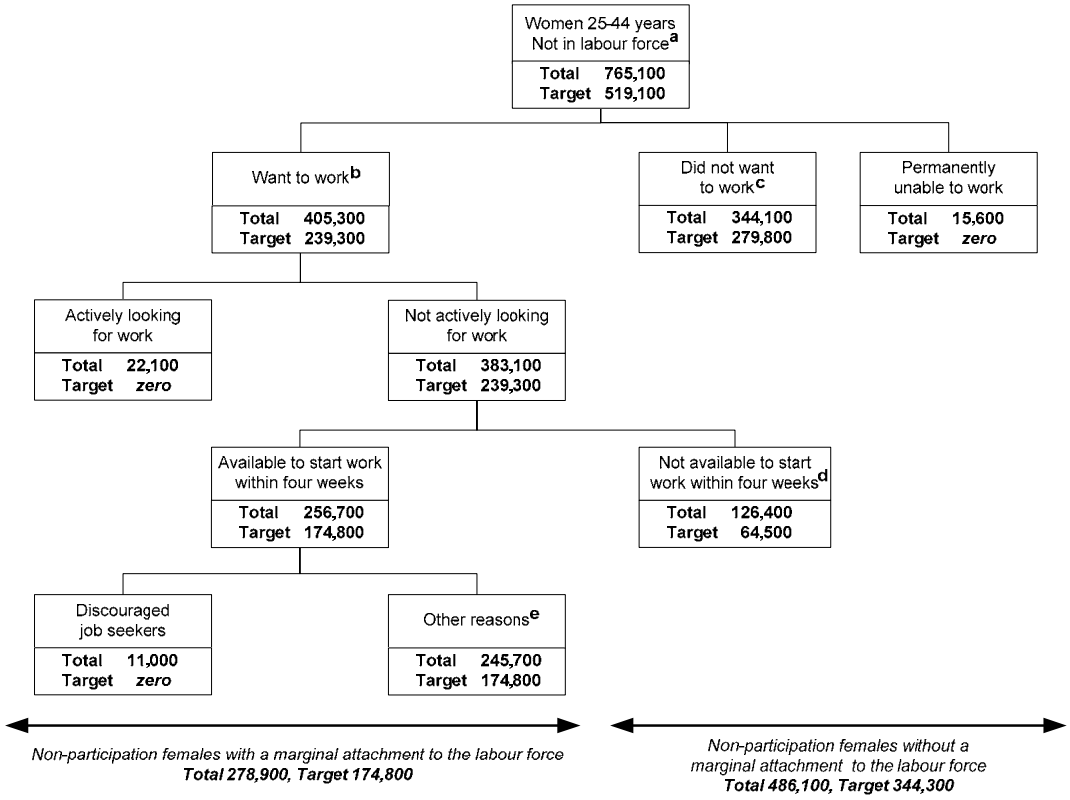
Addressing what proportion of the target group could be induced to participate in the workforce is difficult in the absence of specific reform proposals (box 13.2). An optimistic scenario would be that institutional reforms could induce the entire target population of 519 100 to enter the workforce. Under this scenario, the participation rate would increase from 74 per cent to 92 per cent, comparable to that of men of a similar age (figure 13.4), and exceeding that of women without children (figure 13.4). An alternate scenario would be that only the 127 900 women who

[17] For example, women: in institutions (such as boarding schools, hospitals and retirement homes); with a disability (section 13.4); with skill deficiencies (chapter 12); and poor health (chapter 11).

[18] For example, moving house, on holidays, or do not need to work.

want to work under current institutional settings would enter the workforce.[19] The workforce participation rate under this scenario would reach 78 per cent.

Figure 13.7 **Target population, 2005 basis**



[a] Unless otherwise stated, target populations are the sum of the populations of subcategories. [b] Includes 111 400 women who indicated that they would prefer to care for their own children under current policy settings. [c] Includes women who did not want to work whose main activity was 'home duties or caring for children', or 'looking after ill or disabled person'. [d] Includes women who wanted to work but were not actively looking for work and were not available to start work within four weeks for 'family reasons'. [e] Includes women who wanted to work but were not actively looking for work and were available to start work within four weeks 'family reasons'.

Source: Productivity Commission estimates based on unpublished ABS (*Survey of Persons Not in the Labour Force*, unpublished).

The ceiling scenario is likely to be overly ambitious — particularly when employment outcomes are taken into consideration. Similarly, the floor scenario ignores the likelihood that policy changes would encourage higher participation from those who currently do not wish to work — which would be inconsistent with COAG's policy intent for changing the work incentive environment. A middle ground scenario is to assume that unspecified reforms can encourage into the workforce 75 per cent of women who want to work and 30 per cent of women who

[19] This excludes from the 239 300 target population of those who indicated they wanted to work, those women who indicated that they would prefer to care for their own children (111 400).

do not want to work. This scenario further assumes that women with a preference to care for their own children are not induced to participate. Under this scenario, the participation rate of women aged 25–44 would increased to around 80 per cent. Based on data for September 2005, this represents around 180 000 additional women participating in the workforce.

Box 13.2 **Outer-envelope participation rate for women aged 25–44**

- 2005 participation rate of 25–44 year old women: 74 per cent
- Comparisons (2005): Denmark (82 per cent), Canada (80 per cent), United Kingdom (75 per cent), United States (75 per cent), New Zealand (75 per cent), Ireland (68 per cent), Japan (68 per cent) and the OECD average (69 per cent)
- Population of 25–44 year old women not in the workforce: 765 100 people
- Target group (25–44 year old with family/caring responsibilities): 519 000 people
- Ceiling participation rate: 92 per cent — all target group participates
- Floor participation rate: 78 per cent — only the 127 900 people who 'want to work' in the current policy environment participate
- *Estimated participation rate*: 80 per cent — assume that:
  - 75 per cent of the target population who want to work participates
  - 30 per cent of the target population do not want to work participates, and
  - exclude those who indicated that they prefer to care for their own children

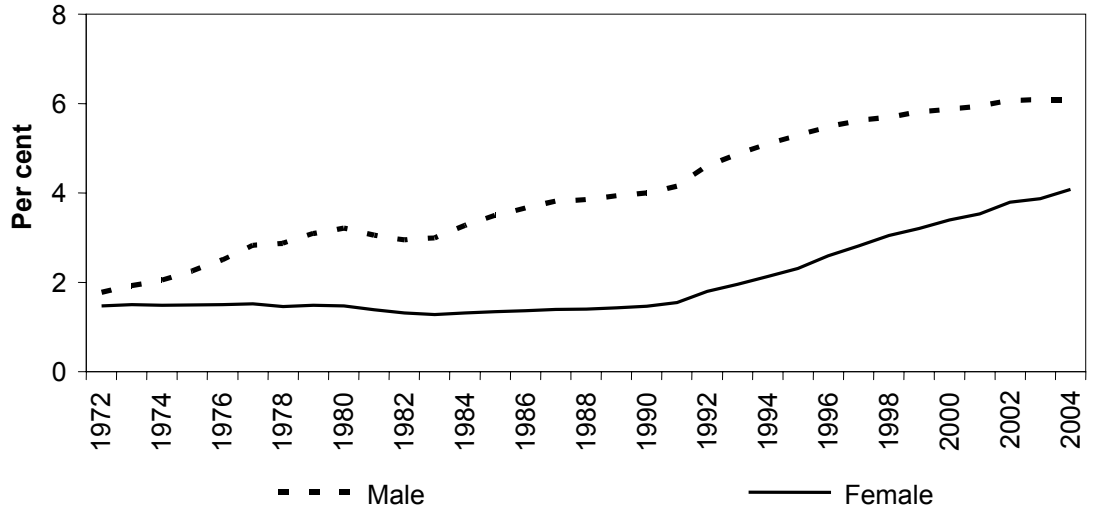
This outer-envelope estimate is consistent with research by the OECD which suggest that workforce participation rates of women aged 25–54 in Australia could be increased by between 3.0 and 6.4 percentage points by increased child care expenditure alone (Burniaux, Duval and Jaumotte 2003).[20] It is also consistent with the workforce participation rates of women achieved in culturally similar countries such as Canada in 2005, but below those of countries such as Denmark, Sweden and Iceland.

[20] More generally, the analysis by Burniaux (refer Dawkins, Lim and Summers 2004) considered the impact of: (i) for older workers — removing early retirement schemes, increasing the retirement age to 67 and actuarial neutrality of the age pension; and (ii) for women — equal tax treatment of second earners and individuals, increased public child care expenditures and an increase in incentives to work part time. The projected impact of these changes was that *aggregate* participation increased by between 3.4 to 4.1 percentage points from 2000 to 2025.

13.4 Disability Support Pension recipients

The Disability Support Pension (DSP) is paid to people whose physical, intellectual or psychiatric impairment prevents them from working at least 15 hours per week. Other eligibility criteria relate to income and assets tests (DEWR 2006a). The scope of the redefined group of DSP recipients is conditioned by the policy's boundaries. Hence, changes to its criteria drive the composition of the DSP and the workforce participation of its recipients. For example, the increase in recipients in 1991 followed changes to eligibility and impairment criteria (figure 13.8). That said, the increase in female recipients over the last fifteen years is also partly attributable to other policy changes, such as the increase in the qualifying age for the age pension and the closure of the widow B and wife pensions (ABS 2002; FaCS 2004).

Figure 13.8 **DSP recipients as a percentage of total population aged 15–64, 1972 to 2004**

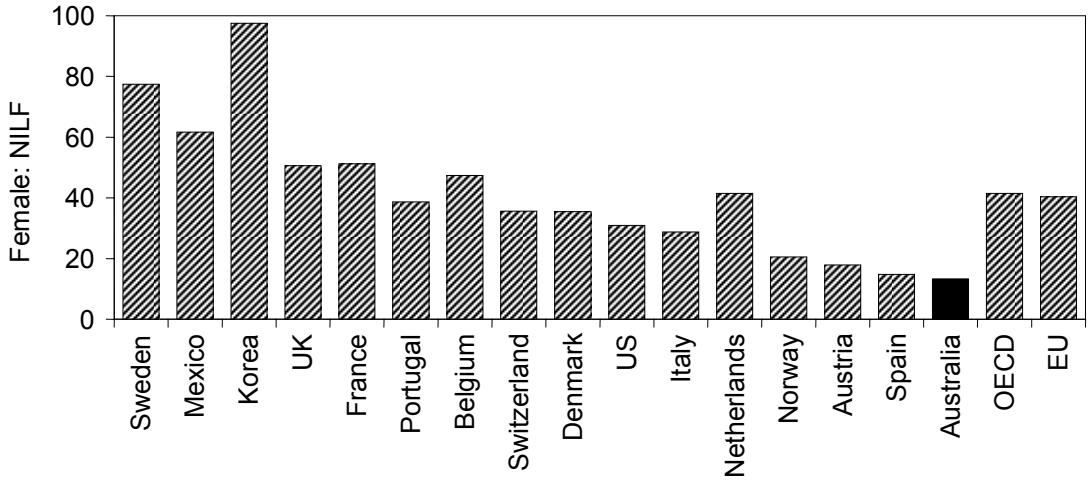


Sources: Productivity Commission estimates based upon FaCS (2004), ABS (*Australian Social Trends 2003*, Cat. no. 4102.0, Canberra) and ABS (*Population by Age and Sex*, Cat no. 3201.0, unpublished).

The participation rate for the working age disabled population in Australia is around 53 per cent. Moreover, the participation rate for the working age disabled population with profound or severe disabilities is around 30 per cent. In stark contrast, the participation rate of DSP recipients was 13 per cent in 2003.

The Australian participation rate is lower than that of other countries with disability support programs — United Kingdom (51 per cent), United States (31 per cent) and the OECD average (42 per cent). Notwithstanding that different cultural, economic and institutional arrangements across countries influence participation outcomes, Australia has the lowest participation rate of disability payments recipients in the OECD (figure 13.9).

Figure 13.9 **Participation rates of disability benefits recipients, across OECD countries[a]**



a Policies regarding eligibility for benefits vary substantially across countries.

Source: OECD (2003c).

The low DSP participation rate suggests that either the process for screening applications is very effective and largely admits only those whose disability constitutes a serious hindrance to work, or participation is impeded by barriers or disincentives to work. Given that the uptake of DSP has increased rapidly over the last twenty years, while the rate of disability appears to have remained relatively stable, the latter explanation appears credible (Lattimore forthcoming).

Factors affecting workforce participation of disabled people

The National Inquiry into Employment and Disability highlighted several factors that deter participation (HREOC 2005b). These include:

- increased costs that arise through greater use of transport, additional equipment and care requirements;
- disabled people facing discrimination, including a risk of inaccurate assessment of employment capacity;
- employment gains being diminished through the interactions of benefits and the tax system as income increases — DSP recipients are concerned about whether earned income will be sufficient to offset pension reductions or loss of concessions; and
- a lack of information regarding the 'financial impact of entering and remaining in the workforce'. Those seeking to employ people with a disability also

confront a lack of information about available support services to offset potentially higher costs and risks — employing disabled people can increase costs for insurance, workers compensation and occupational health and safety.

The literature confirms that disability often has negative implications for labour market outcomes (Ettner, Frank and Kessler 1997; Hum and Simpson 1996; Jones, Latrielle and Sloane (2003). Mental illness, in particular, has a negative effect on participation (Wilkins 2004).

Specific factors affecting the workforce participation of DSP recipients

Key features of the DSP population include:

- the majority of recipients are men (60 per cent in 2004), although the gap between male and female recipients is closing (figure 13.8);
- around 39 per cent of men and 42 per cent of women recipients have severe or profound limitations in performing core activities (for example, self care, mobility, and communication).[21] The proportion of recipients with core activity limitations decreases with age;
- the majority of recipients reported either a musculoskeletal (34 per cent) or psychological/psychiatric (25 per cent) condition in 2003 (FaCS 2004); and
- reflecting that the incidence of disability tends to increase with age (figure 13.10), around 40 per cent of recipients are aged 55 or over.

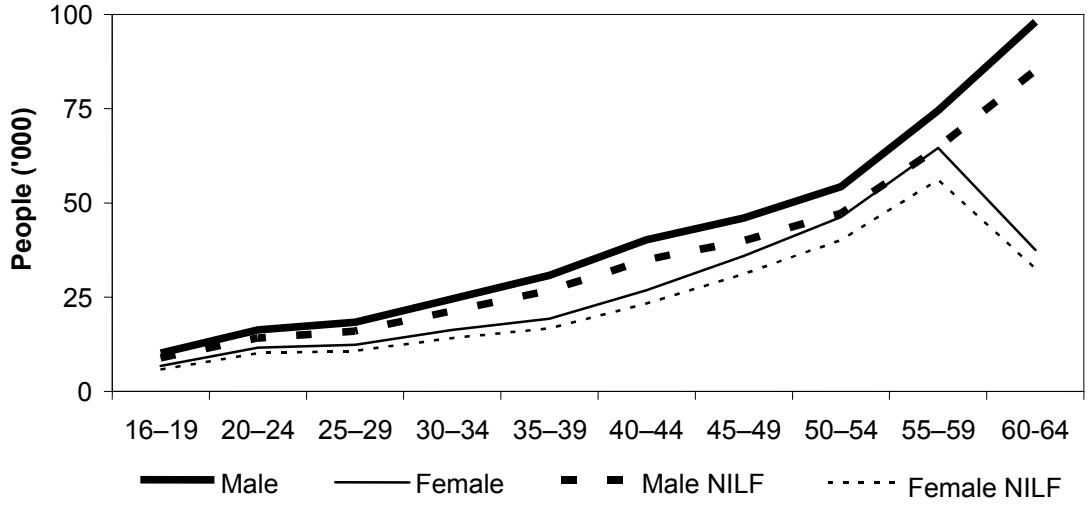
The benefits of the DSP relative to other options, the costs and risks associated with workforce participation, and the ability of an individual with a disability to find and maintain employment all affect the decision to take up the DSP (inflows) or of existing DSP recipients to participate in the workforce (outflows).

One factor encouraging DSP inflows is the scale of the program's benefits. Relative to Newstart (unemployment benefits), those on DSP:

- receive around $90 per fortnight (22 per cent) more with greater scope to earn other income;
- have greater access to other benefits, such as the pharmaceutical allowance; and
- are subject to less rigorous job search requirements (DEWR 2006b; 2006c).

[21] Commission estimates. A profound core activity limitation involves being unable to do, or to need help with, a core activity task. A severe limitation involves sometimes needing assistance to perform a core activity and/or having difficulty understanding or being understood (ABS 2004).

Figure 13.10 **Age profile of all DSP recipients , 2004**



NILF not in the workforce.

Sources: Productivity Commission estimates based on FaCS (2004); ABS (*Disability, Ageing and Carers: Summary of Findings*, Cat. no. 4430.0).

The higher DSP payments provide an incentive for those with limited employment prospects to take up the program. Cai and Gregory (2005) found a large proportion of recipients had previously experienced multiple spells of unemployment and that the probability of transition to DSP from unemployment increases with its duration. This is supported by Argyrous and Neale (2003) who found that the uptake of disability benefits is influenced by labour market conditions.

Frijters and Gregory (2006) examined the stock of male recipients in January 1995, and found that nine years later 78 per cent were still receiving the DSP, and 12 per cent had died.

In relation to such 'stubborness', the OECD points to institutional factors noting:

> In general, in the OECD, one-third of all disability benefit recipients are employed. In Sweden, Mexico and Korea more than one in two is employed but only one in nine in Australia, Austria and Spain. The low rate in Australia may be explained by the household-based means test which implies that disabled spouses of those in full-time employment will not, in general, be eligible to receive a disability benefit if they work themselves. (OECD 2005d, p. 82)

There has been some reform to the DSP. Before July 2006, applicants were eligible if they were unable to work 30 hours or more per week. New applicants assessed as able to work between 15 and 30 hours per week are generally placed on an enhanced Newstart allowance from July 2006. While a lower level benefit than DSP, enhanced Newstart recipients access additional support to find employment. The reforms do not, however, affect the vast majority of the stock of DSP recipients

— those in receipt of DSP before May 2005 will not be subject to part time work obligations.[22]

Scope for improved workforce participation among DSP recipients

There were around 690 000 DSP recipients (aged 15–64) in 2004 with around 90 000 (13 per cent) participating in the labour market, leaving around 600 000 DSP recipients not in the workforce. This group of non-participants is further refined based on the assumption that DSP recipients with profound or severe core activity limitations who are not already participating are unlikely to participate.[23] This leaves around 360 000 DSP recipients with mild or moderate disorders who are not participating in the workforce.[24] This is the target group (box 13.3). If the entire target group were to enter the workforce, this would lead to around 360 000 extra participants — a DSP participation rate of around 65 per cent.[25]

Box 13.3 **Outer-envelope participation rate for DSP recipients**

- 2003 participation rate of DSP recipients: 13 per cent
- Comparisons (2003): United States (31 per cent), United Kingdom (51 per cent), EU (40 per cent), OECD average (42 per cent)
- Population of DSP recipients (aged 15–64): 690 000 people
- DSP recipients not in the workforce: 600 000 people
- Target group (recipients not in the workforce with 'mild' disability): 360 000 people
- Ceiling participation rate (all of target group plus existing participants): 65 per cent
- *Estimated participation rate* (53 per cent of target participates): 41 per cent

[22] Those admitted to the DSP between May 2005 and June 2006 will be progressively reviewed and may become subject to the new obligations.

[23] In reality, around 30 per cent of the general disabled population with a profound or severe core activity restriction does participate in the workforce.

[24] Around 40 per cent of DSP recipients have profound/severe disabilities (ABS 2004). The working age disabled population with a profound or severe disability is around 155 000 and 361 000 people respectively. Government allowances/pensions are the principal source of income for 74 per cent of the profoundly disabled population and 58 per cent of the severely disabled. Assuming all those with a profound/severe disability for whom government payments are the principal source of income are on the DSP, then there are around 278 000 profoundly/severely disabled DSP recipients. Removing 13 per cent (as imputed participants) leaves around 241 000 profoundly/severely disabled non-participating DSP recipients.

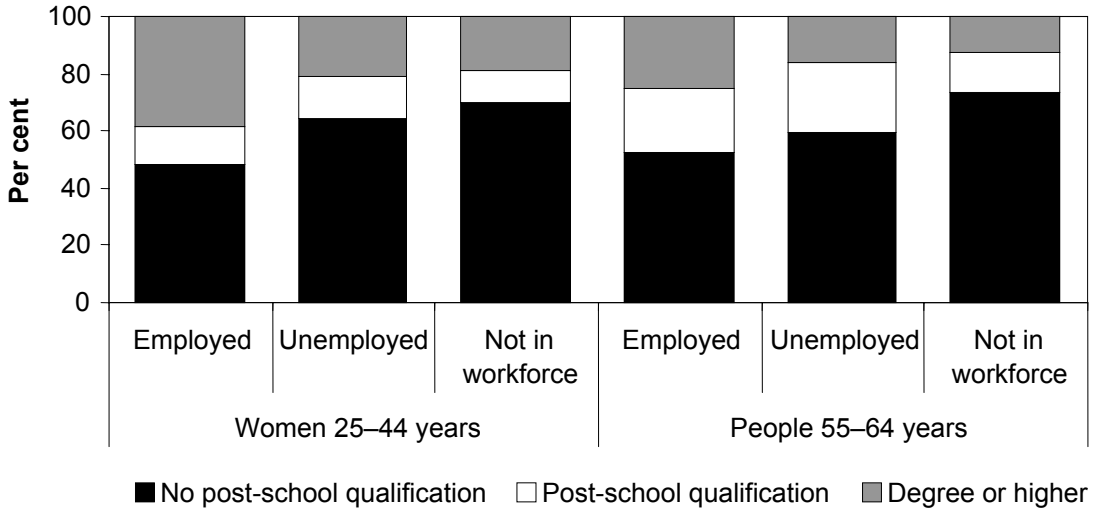
[25] The 360 000 new participants plus the 90 000 already participating.

A more plausible scenario is that the target group could achieve a participation rate of 53 per cent, the same rate as for all people with a reported disability (ABS 2004b). This would lead to an additional 195 000 workforce participants and an overall DSP participation rate of 41 per cent — in line with the OECD average. (This assumes, of course, that any NRA consistent policy changes are not solely quarantined to potential new entrants, as currently is the case.)

13.5 Potential productivity effects

Marginal workers are likely to be less productive than the incumbent workforce. In general people not in the workforce have lower educational attainment than their employed counterparts (figure 13.11). And, changing work incentives faced by the mature aged may not by itself be particularly effective in inducing high productivity individuals to participate. Many of these people will have enjoyed high earnings and have made a lifestyle choice, underpinned by superannuation benefits and investment income, not to work.

Figure 13.11 **Educational profile: women aged 25–44 and the mature aged (55–64), 2000-01**



Source: Productivity Commission estimates based on ABS (*Census of Population and Housing 2001*, unpublished).

There have been various approaches to assessing the productivity of marginal workers. For example:

- The Victorian Department of Treasury and Finance (DTF 2005) suggested that the ratio of marginal to average productivity is roughly the same as the ratio of minimum to average wages which yields a productivity ratio of 50 per cent.

- Bryant et al. (2004) using household economic survey data calculated GDP per hour worked for people in employment and imputed GDP per hour worked for people not in employment for various age/sex cohorts in New Zealand. This generally yields productivity ratios of between 65 per cent and 75 per cent.

While it is apparent that the productivity of marginal workers will vary according to the characteristics of the various populations from which they are drawn, an average productivity ratio of 75 per cent for marginal workers was adopted for this study.[26]

13.6 Implications for indicative costs

The outer-envelope estimates for workforce participation reflect unspecified policy actions consistent with areas being developed further in Intergovernmental Action Plans. It appears that this work covers five streams:

- *Child care* — Availability and cost of child care and how benefits are delivered.
- *Individual incentives* — Potentially assessing EMTRs, access to benefits such as superannuation and the age pension, and mutual obligation requirements.
- *Flexible work arrangements* — Important for (potential) employees seeking to match working hours with family responsibilities.
- *Regulation* — Governments have a role to harmonise workers compensation and occupational and safety regulation. The NRIWG (2006) found that prescriptive State and Territory occupational regulation impedes part time participation.
- *Support services* — Ensuring people not in the workforce gain employment may require an increased call on job placement and job readiness services. Increasing participation by disadvantaged groups may require special programs.

Some NRA-consistent reforms have already been introduced — raising the female pension age; closing schemes without work activity tests; pension and superannuation reforms to encourage mature age participation; the welfare to work reforms, such as mitigating DSP inflows; increasing child care places; funding for employment services; and reducing tax rates. These and future NRA reforms are

[26] This broad measure of the relative productivity of new workers is drawn from studies of the implications of aging (PC 2005f). In practice, the productivity of new workers is likely to vary with their educational attainment, age and other workforce characteristics. Preliminary results from research currently under way at the Commission indicate that productivity ratios for people currently on disability support pensions could be lower and conversely, higher for women aged 25─44. Chapter 14 consolidates the human capital streams including an aggregated productivity impact.

likely to complement the role of the market in responding to the labour supply implications of an ageing population.

In the absence of policy detail, all that can be said is that the net budgetary impact is likely to be determined by the mix of 'inducement' versus 'coercive' policy changes. For example, further recourse to mutual obligation could reduce expenditures. In contrast, measures to address the disincentive effects on participation from the interaction of tax and welfare are likely to increase net spending. Similarly, measures to improve employment outcomes for those not in the workforce or to reduce the cost of and/or increase the availability of child care would increase outlays.

13.7 Summary of direct impacts

As noted at the outset of this chapter, there are important caveats to the approach adopted to estimate the experimental outer-envelope participation rate. With these caveats in mind, at September 2005 there were around 5.5 million people over the age of 15 not in the workforce. There were around 1.5 million non-participants in the three key groups after accounting for overlaps with the DSP population and other adjustments. The estimated potential net addition to the workforce of 0.6 million is based on judgements about the effect of unspecified changes to work incentives (see sections 13.2 to 13.4). This implies that a four percentage point increase in the aggregate participation rate from 63.5 per cent to 67.5 per cent might be possible (table 13.3).[27]

[27] If this increase in the participation were applied to 2005, Australia would rank equal second with New Zealand in the OECD (behind Iceland) on adjusted workforce participation rates (see chapter 10, figure 10.3). However, such comparisons are not appropriate given that the estimate canvassed for Australia is a potential 'long term' outcome whereas measures for the other countries reported in figure 10.3 represent the current situation. These countries are not pursing a directly comparable suite of potential reforms and likely directions of longer-term change across the OECD is not subject to investigation in this study.

Table 13.3 **Summary of projected potential outer-envelope participation rates, 2005 basis**

Key group[a]	*Total population*	*Target population*	*Addition to workforce*	*Change in participation rate*
	number	number	number	%
Mature (55-64)	945 000[b]	670 000	268 000	58 → 70
Women (25-44)	765 000[c]	519 000	180 000	74 → 80
DSP (15-64)	600 000[d]	360 000	195 000	13 → 41
Total	**2 310 000**	**1 549 000**	**643 000**	**63.5 → 67.5**[e]

[a] Includes only persons classified as not in the workforce. [b] As at March 2006. [c] As at September 2005. [d] As at 2004-05. Excludes persons in receipt of the Disability Support Pension who were participating in the workforce. [e] Participation rate for persons aged 15 years and over.

Source: Productivity Commission estimates.

14 Consolidating the effects of human capital reform

Key points

- Analysis of the potential impacts of the human capital substreams of health promotion and disease prevention, education and training and work incentives, suggests that full implementation of the NRA could significantly increase workforce participation and productivity.
- Consolidation of the potential impacts of the NRA human capital substreams indicates that, by 2030:
  - workforce participation potentially could increase by around 8 per cent (or 4.9 percentage points) to 64 per cent — roughly offsetting the impact of ageing over this period. However, the new workers would tend to be less productive on average, than baseline workers; and
  - labour productivity of baseline workers could increase by around 2 per cent (or 1 percentage point). Employability of projected workforce participants would also be enhanced.
- With these changes, effective labour inputs could be around 8 per cent higher, than otherwise by 2030.
- Disaggregation of national changes suggests that projected impacts vary across the States and Territories, because some outcome objectives affect specific age–sex groups and jurisdictions have different demographic structures.
  - The projections are exploratory and conditional on numerous assumptions about likely population growth, demographic change and the impacts potentially available from the full implementation of the NRA human capital stream.

This chapter brings together the 'building blocks' developed in the preceding chapters on the scope to achieve, and the estimated effects of achieving fully, outcome objectives for the human capital substreams.

To recap, international comparisons indicate that there is scope to improve Australia's workforce participation and productivity (chapter 10). This 'first-take' is supported by subsequent analyses that estimate the scope for improvement from:

- more effective health promotion and disease prevention (chapter 11);

- initiatives targeting early childhood development, literacy and numeracy, transitions from school to work or study, and adult learning (chapter 12); and
- changes to the work incentives environment (chapter 13).

14.1 Consolidating the human capital substreams

The human capital stream of the NRA reflects an ambitious partnership by governments to enhance workforce participation and productivity. As participating governments are yet to settle on specific reforms, the assessment of the potential for change must occur within a heavily qualified framework. That said, the investigations in preceding chapters suggest that the indicative outcomes agreed for health, education and training, and work incentives could lead to an increase in workforce participation, albeit with varying impacts on productivity.

To arrive at a consolidated effect, it is necessary to account for interactions within and across the substreams and to contend with their divergent maturation periods. For example, the impact of changing work incentives could be observed relatively quickly, whereas changes to early childhood development might not be manifest for a generation.

Interactions *within* substreams generally have been reconciled in chapters 11−13. They include co-morbidities between chronic diseases that might lead to double counting and hence inflate the effect of health initiatives. Interactions *across* substreams are more problematic, as some groups might be targeted by more than one human capital outcome objective. In addition, it is possible that particular (as yet unspecified) reforms could spill over to other groups (refer appendix C). For example, changes to workforce incentives to encourage disability support recipients into work also might liberate their carers to participate (more) in the workforce.

The presence of such interactions and spillovers mean that the consolidated outcome for workforce participation and productivity might be greater, equal to, or less than that implied by adding the projected substream outcomes. Of course, adding the substream outcomes itself might involve double counting (overestimation), in which case failure to quantify the presence of positive spillovers (underestimation) would be a countervailing influence. Given the inherent problems associated with trying to account for these factors, the consolidated impacts in this chapter, in the first instance, build on the estimated effects from each substream.

The chapter applies a demographic model to compare, by 2030, a *baseline* outcome for workforce participation and productivity that assumes no human capital reforms,

with an outer envelope that incorporates the potential impacts of these reforms (see box 14.1). By projecting potential outcomes 25 years ahead, the analysis takes account of the substantial lags that are likely to occur between the implementation of any human capital reforms and the impact of those reforms on the broader economy. A 25 year horizon should capture sufficiently the effect of meeting the outcome objectives, with the possible exception of those relating to early childhood — these initiatives would probably require a longer time frame.[1]

Box 14.1 **Demographic and labour modelling framework**

The potential effects of achieving outcome objectives are measured by comparing two scenarios using a demographic model — a 'business-as-usual' baseline and a scenario where human capital objectives are assumed to be achieved.

The demographic model, developed for the report *Economic Implications of an Ageing Australia* (PC 2005f), projects future population size and structure and incorporates labour market assumptions for projecting labour supply and productivity. Although the labour market is not modelled, the parameters can be interpreted as providing plausible outcomes that might arise from a full modelling of economic behaviour in the labour market.

The current implementation of the model uses a standard set of assumptions drawn from PC (2005f, chapters 2–4) for the baseline:

- 'medium' life expectancy;
- fertility is stable at current levels; and
- net migration is fixed at 115 000 immigrants per year with an unchanging age–sex structure.

The labour market parameters are based on recent trends.

Significantly, to the extent that human capital stream objectives are achieved, this will occur against a backdrop of prospective demographic changes — most notably population ageing — that are expected to cause a decline in participation in paid employment, potentially reducing economic growth.

The chapter initially considers potential changes in workforce participation (section 14.2). As workforce participation is silent on employment outcomes, it is informative to also estimate the likely hours worked by additional participants and baseline workers (section 14.3). Similarly, estimates of the potential changes in labour productivity take account of the relative effects of NRA-induced

[1] This issue is explored in chapter 12, which discusses the potential participation and productivity effects of achieving NRA outcome objectives for education and training in 40 years time.

improvements in health and education on the productivity of additional participants and of baseline workers, respectively (section 14.4).

Having projected the effects on total hours (quantity) and on productivity (quality), it is possible to estimate the impact of achieving the human capital agenda on 'effective' labour supply (section 14.5). This section also explores the distribution of changes between States and Territories, taking into account projections of jurisdictions' demographic structure 25 years hence. A summary of the consolidated impacts on labour supply and productivity potentially available is presented in section 14.6. Appendix C describes the experimental framework used in this study.

A note of caution

In common with many other aspects of this study, the estimated impacts of achieving the human capital outcomes are experimental. They need to be interpreted with care, having regard to the underlying assumptions. In particular:

- projections of how the workforce might evolve over the next 25 years require assumptions about trends in population growth, international and inter-regional migration, education, health and other social factors;
- the potential impacts on workforce participation and productivity assume that labour market responses to potential changes in human capital will be similar in 25 years to behavioural responses today;
- the projections fully attribute deviations from the baseline to the achievement of the human capital objectives and do not separately quantify any complementary role that the market might play in responding to the labour supply implications of an ageing population — for example, participation might increase as a result of behavioural responses to changed work preferences, individual imperatives and market incentives;
- the projections abstract from possible changes in the economy, such as compositional shifts or movements in the terms of trade; and
- the disaggregation to the State and Territory level assumes that changes within jurisdictions are determined in line with national changes, after accounting for each jurisdiction's different demographic profiles.

Accordingly, the projections reported in this chapter, and in particular those relating to the States and Territories, should be interpreted with care.

Finally, it is important to reiterate that a robust assessment of policy initiatives associated with the human capital stream would need to consider workforce

participation and productivity outcomes within a wider cost–benefit framework (chapter 10).

14.2 Workforce participation

By 2030, possible improvements in health, education and training and work incentives associated with the NRA are projected to give rise to higher participation rates, relative to what would otherwise occur. The estimated outer-envelope impacts of the individual human capital substreams (chapters 11−13) indicate that, in terms of workforce participation, changes to work incentives (+4 percentage points) are likely to dominate the effects of meeting outcome objectives, compared with reform in health (+0.6 percentage points) and education (+0.7 percentage points).[2]

The work incentives substream is of a fundamentally different nature to the health and education substreams for two reasons:

- whereas improved health and education outcomes bear directly on the human capital attributes of the population, changes to work incentives do not; and
- the impacts from changing work incentives can arise relatively quickly (chapter 13), whereas achieving the health and education outcome objectives would require longer lead times.

Despite these differences, the substreams are complementary. A work incentives environment that is more conducive to higher participation outcomes needs to be underpinned by a more responsive — that is, healthier and more educated — population. For example, inducing people on the disability support pension (DSP) to participate in the workforce might require a greater call on health-related services. To support participation, additional training and re-training might also be required.

Potential improvements to workforce incentives (chapter 13) could lower impediments to paid work for some groups and provide positive incentives to others. Such initiatives have the potential to increase participation by 4.0 percentage points, with most of the increase likely to come from older men and women (42 per cent). The remainder could be fairly evenly split between women (aged 25–44) and DSP recipients.

The projected 0.6 percentage point increase in participation attributed to health initiatives derives primarily from preventing or improving the treatment of mental health and type 2 diabetes (chapter 11). Beyond this, improvements in health

[2] The individual substream estimates do not take account of consolidation issues (refer text).

promotion or early interventions could further increase life expectancy (through reduced mortality rates).

Achieving NRA educational outcomes might potentially increase participation by nearly 0.7 percentage points (chapter 12). Literacy and numeracy and transition from school programs might improve educational attainment, especially for women, eventually increasing workforce participation. However, these programs might also reduce participation among younger age groups (15–19 and 20–24 year olds) as they remain in education longer and attain higher formal qualifications before entering the workforce.

Collectively, the analysis suggests that such policies could raise the aggregate participation rate by 2030 to around 63 per cent of the working-age population compared with around 59 per cent in the absence of these initiatives (table 14.1). This suggests that achieving NRA outcome objectives could roughly offset the negative participation rate effects of population ageing.

Table 14.1 **Participation rate projections, 2030**

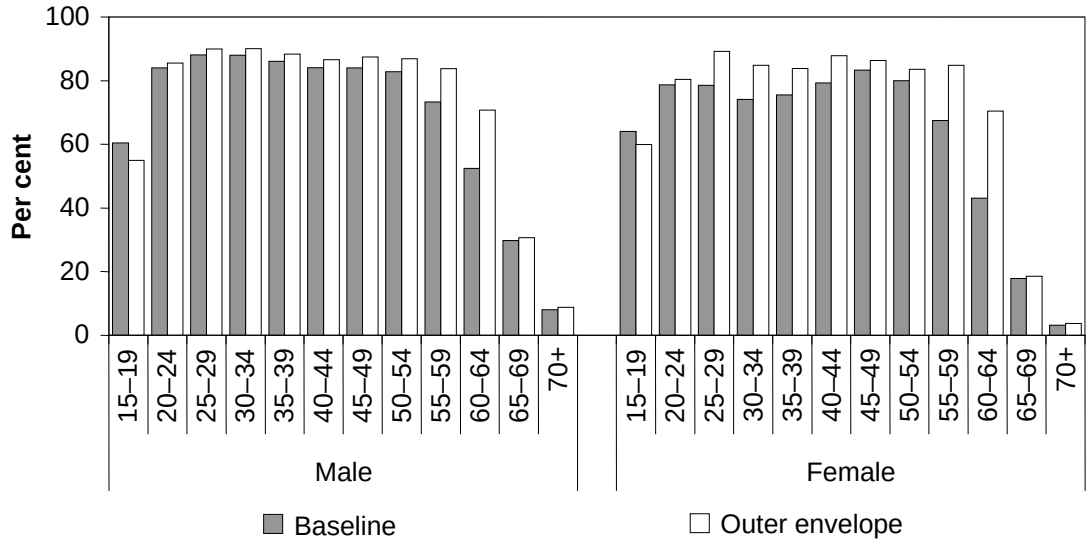
	2005	*Baseline 2030*	*Outer envelope 2030*	*Deviation*[a]
	%	%	%	% point
Male	71.6	62.8	66.1	3.3
Female	55.6	54.9	61.5	6.6
Persons	63.5[b]	58.8	63.7	4.9[c]

[a] Difference between outer envelope and baseline in 2030. [b] This participation rate is a projection from the demographic model and differs from the OECD outcome presented in chapter 10. This small variability in level does not pose a difficulty because it is the deviation from the baseline owing to NRA that is important. [c] The deviation in the participation rate is a consolidated projection that differs from the sum of estimates from chapters 11–13 as it takes into account the various adjustments (such as reduced mortality) noted in the text.

Source: Productivity Commission estimates.

Reflecting the targeting of specific groups in the population and the potential effects on participation varying between these groups, the benefits available from the implementation of the NRA are also likely to vary by population group (figure 14.1). Consistent with the sectoral analyses there is a projected increase in participation rates for all cohorts — except 15–19 year olds due to an increase in their number remaining at school. The largest increases are projected for people aged 55–64 and women aged 25–44 — the groups judged to be potentially most affected by the implementation of the NRA with respect to workforce participation.

Figure 14.1 **Participation rate projections by cohort, 2030[a]**



a Consolidated outer-envelope effect for human capital outcome objectives. Substream results are not shown due to the complexity of any interactions and spillovers that might exist between and within the cohorts.

Source: Productivity Commission estimates.

14.3 Hours worked

Workforce participation is a measure that relates to a state of being employed or of seeking employment. Given the skills profile of certain groups currently not in the workforce (chapter 13), not all of the additional people who choose to participate are likely to find work and hence contribute to labour inputs — conventionally measured as hours worked. And, those who do find employment would likely work fewer hours on average than incumbent workers (see below). Consequently, the effects of potential improvements in human capital on unemployment (indicated by the unemployment rate) and average hours per worker are important.

Potential impacts on the unemployment rate

The aggregate unemployment rate is influenced by many factors, including general economic conditions, labour market regulations, quality of labour and willingness to seek out employment. In the baseline for this study, unemployment rates for most age–sex groups are assumed to decline between 2005 and 2030. This reflects the view that, with an ageing population and the resultant 'scaling down' of the working age population:

- employers are likely to seek out additional workers; and

- as employment becomes more attractive, some who would otherwise be outside of the workforce opt for employment.

With implementation of the NRA, two influences affect aggregate unemployment. First, additional participants are assumed to have a greater propensity to be unemployed than baseline participants.[3] Second, and conversely, NRA-induced improvements to the health and educational status of baseline participants are assumed to act to improve their employment outcomes.

In the current analysis, the latter effect more than offsets the former so that, on balance, by 2030, the unemployment rate might potentially be 0.6 percentage points lower than the baseline. These projections abstract from any short-term cyclical variations in economic conditions and the level of unemployment.

Potential impacts on average hours per worker

Additional workers are assumed to work fewer hours than baseline workers of the same age and sex.[4] Therefore, it is also likely that achievement of the NRA human capital objectives would lower the estimated *average* hours worked per employee. In relation to this, a primary influence would be that additional workers potentially joining the workforce are concentrated in age–sex cohorts that tend to work part time, such as women aged 25–44 and older workers (chapter 13).

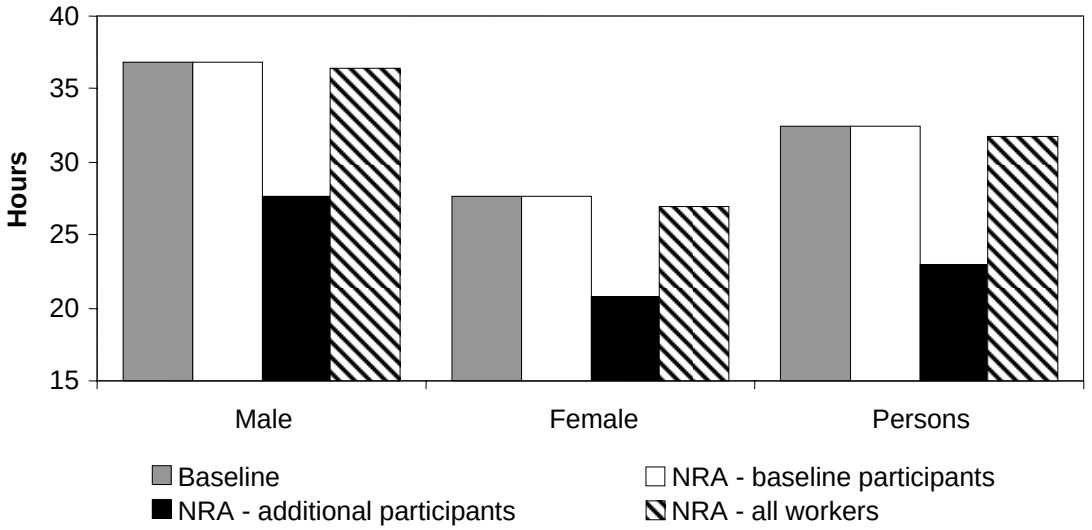
In addition, the average hours of baseline participants might vary from the status quo as a result of NRA-induced improvements in health and education. For example, potential improvements in health and education outcomes might increase the proportion of workers that seek to work full time. However, while recognising this in-principle potential, the information available to this study has not formally enabled the inclusion of this effect in the analysis. However, the analysis assumes that baseline participants could potentially increase *total hours worked* — by 0.7 per cent — as a result of the 0.6 percentage point decrease in the unemployment rate noted above.

[3] After adjusting for increased employment rates due to improvements in health and education, additional participants are assumed to be 2.5 per cent less likely to be employed than baseline participants of the same age and sex.

[4] There are two factors contributing to hours worked by additional workers. First, additional workers are assumed to be 30 per cent less likely to work full time than their baseline counterparts. Second, whether full time or part time, additional workers are assumed to work 15 per cent fewer hours than their baseline counterparts.

By 2030, average hours *per worker* potentially could decline by 2.3 per cent from 32.5 to 31.7 hours per week (figure 14.2).

Figure 14.2 **Potential impact on average hours worked per worker, 2030**



Source: Productivity Commission estimates.

Potential impacts on hours worked per capita

Hours worked per capita is a useful summary measure of labour utilisation, accounting for participation rates, unemployment rates and average hours per worker in a single estimate. It is also a good indicator of dependency since it takes account of actual employment and hours worked, rather than just the changing age structure of the population.

By 2030, paid hours worked per capita per week potentially could increase from 15.0 in the baseline to 16.0 as a result of improvements in health, education and training and changes to work incentives. Overall, the projected number of hours worked per capita aligns roughly with the current (2005) level — that is, 16.0 hours of paid work per capita per week.

14.4 Labour productivity

Changes in human capital can influence average labour productivity in two main ways.[5] First, the productivity of additional workers might differ from that of the rest of the workforce. In other words, if the average additional worker is less productive than the average baseline worker, average labour productivity could fall (other things remaining equal). Second, the productivity of the baseline workers might increase as a result of better health and education outcomes.

Average productivity of additional workers

Most of the potential to lift workforce participation arises from possible changes associated with the work incentives substream. The health and education substreams are projected to have a modest impact on the productivity of additional workers, but with a more pronounced effect on baseline workers (see next section).

The additional workers from the work incentives substream are likely to be less productive, on average, than baseline workers. This assessment reflects the likelihood that the additional workers would come from groups that would generally find it harder to get a job than incumbent workers. As noted in chapter 13, people not in the workforce tend to have lower educational attainment than their employed counterparts.

Considerations bearing on additional participants having lower average productivity than the baseline workforce are likely to include the following:

- Older men and women who might be induced to (or choose to remain in) the workforce as a result of changed work incentives could well include lower-earning, and hence lower productivity, individuals less able to fund a retirement lifestyle (chapter 13).
- DSP recipients who might enter the workforce are likely to be people with mild disabilities or low skill levels, some of whom tend to have lower productivity than other workers in the baseline workforce of the same age and sex (chapter 13).

[5] Achieving outer-envelope outcomes in human capital might also change multi-factor productivity growth. For example, improvements in education outcomes might increase the rate of innovation, and/or the rate of adoption of new technologies, ultimately flowing through to higher overall multi-factor productivity growth in the economy. Also, changes in the composition of the economy might shift the composition of the workforce to industries with higher productivity, or open up access to greater economies of scope and scale. These effects are not addressed in the demographic modelling. A more sophisticated modelling framework would be required to capture the full flow-on effects of such changes.

- Health initiatives are likely to induce some additional participants, mostly due to improved mental health outcomes. These additional workers are, however, likely to have lower 'at-work' effectiveness (chapter 11).

This does not, however, mean that all additional workers will be less productive than incumbent workers. Relevant considerations include the following:

- Professionals who re-enter the workforce might be more productive than the average baseline worker.
- It is likely that many women who might choose to return to the workforce as a result of improved childcare arrangements could have relatively high productivity (chapter 13).
- Education and training initiatives might increase the average productivity of potential additional workers — although they might still have lower average levels of education and productivity relative to those already in the workforce.

The overall impact of additional workers on labour productivity depends on two factors.

First, each substream chapter has assessed the relative productivity of additional participants *from that substream*:

- additional participants from improved health promotion and disease prevention are likely to be 80 per cent as productive as baseline workers (chapter 11);
- additional participants from improved education and training are assumed to be equally as productive as baseline workers of the same age (chapter 12); and
- a productivity ratio of 75 per cent was adopted for additional workers as a result of changed work incentives (chapter 13) — the same ratio used in the study of the implications of ageing (PC 2005f).

Second, the overall impact on labour productivity also depends on the age–sex structure of the additional participants from each substream. To account for this, the relativities from the chapters are converted to relativities comparing 'average with average' — that is, the average productivity of additional participants compared with the average productivity of all baseline workers.

Most additional workers are concentrated in older age groups. Older workers tend to be more productive, because they often tend to have more work experience, and work in more highly paid occupations. For example, although additional male workers aged 55–64 are significantly less productive than baseline male workers aged 55–64, the former are only slightly less productive than the *average* baseline worker across all age–sex groups.

Thus, when all of these considerations are taken into account, the average additional worker is assumed to be 90 per cent as productive on average as baseline workers — a productivity discount of 10 per cent.

Effect on the baseline workers

In the baseline, it is assumed that the productivity of workers will increase by 1.75 per cent per year, on average (chapter 10). This reflects a combination of increasing multi-factor productivity and capital deepening. Achievement of this increase implies ongoing improvements in the level of educational attainment and an ongoing improvement in the capacity of the workforce to employ higher levels of increasingly sophisticated capital equipment. For this study, it is implicit that the NRA does not diminish the capacity of the education and training system to support such change, but rather that it adds to the Australian economy's capacity to increase labour productivity through additional targeted reforms. Reforms targeting disadvantaged groups might also be considered to have broader social merit.

At the margin, NRA health initiatives are likely to further improve the productivity of baseline workers (chapter 11). Among the chronic diseases considered, mental health conditions and cancer account for most of the productivity losses that might be recouped via achievement of the health promotion and disease prevention objectives. Thus, NRA potentially could contribute to increase the productivity of baseline workers above levels that might otherwise be attained.

Improved educational attainment is also projected to increase productivity, at the margin (chapter 12). The largest effects are likely to stem from literacy and numeracy programs, which are assumed to increase the proportion of young people going to university. Initiatives designed to improve transitions from school are assumed to increase the proportion of young people continuing their education within the VET system. Combined with adult education, these programs might also increase the productivity of those already in the workforce.[6]

By 2030, projected improvements in health and education outcomes are estimated to increase the productivity of all cohorts, except for people aged 65 and over, who were not assessed in this part of the study. Possible improvements in education account for more than 75 per cent of the projected increase in productivity for people aged 15–34. For people aged 35–64, possible improvements in health outcomes account for most of the projected increase in productivity.

6 Improvements to work incentives (chapter 13) are targeted at those not in the workforce in the baseline, so these initiatives are assumed not to affect productivity of baseline workers.

Overall, it is projected that achievement of the NRA human capital outcome objectives could result in the productivity of baseline workers being almost 2 per cent higher than otherwise.[7]

Potential impacts on overall labour productivity

The lower potential productivity of additional participants is likely to be more than offset be the potential positive effect on the productivity of baseline workers. By 2030, average labour productivity could potentially increase by 1.3 per cent as a result of the human capital stream of the NRA.

Although not insignificant, this potential improvement should be considered in context — over 25 years, labour productivity is assumed to rise by 54 per cent in the absence of the NRA.

14.5 Implications for States and Territories

The guidelines for this study specify that 'to the extent possible, the analysis should separately identify the potential economic benefits derived by each of the States and Territories from the NRA…'. Liaison with the States and Territories during the course of this study reinforced the need to take account of jurisdictional differences (particularly demographic variations — box 14.2) when projecting the impacts of achieving a consolidated NRA outer-envelope outcome. By necessity, the approach adopted was 'tops-down' — that is, the national results were disaggregated to the State and Territory level.

It is apparent from the data cited in box 14.1 that the States and Territories have different participation rates, largely reflecting their different demographic structures. It follows that the distribution of NRA-induced changes between the States and Territories is likely to vary because some human capital reforms focus on specific age–sex cohorts and each jurisdiction has a different demographic structure. In particular, the largest projected effects on participation are projected for older age groups.

[7] This is a weighted average of the cohort specific increases in productivity shown in appendix C, table C.2.

Box 14.2 **Accounting for age in State and Territory participation rates**

The table shows that participation rates for 2004-05 vary by State and Territory. These divergences are moderated once participation rates are standardised for age.

	Unit	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Participation rate	%	62.5	64.2	65.8	61.7	66.5	59.3	69.3	72.0	64.2
Age-standardised participation rate[8]	%	62.9	64.3	65.2	63.6	65.4	61.1	63.0	68.6	64.2

In each jurisdiction, the age structure explains some or all of the difference between the national participation rate and each jurisdiction's participation rate. The analysis indicated that:

- over the past 25 years, the age-standardised participation rates of Victoria, Queensland, South Australia and the Northern Territory have been roughly equal to the national rate, but in New South Wales it is around a percentage point lower;
- the age-standardised participation rates in the ACT and Western Australia are higher than the national rate — this indicates that actual participation rates are higher than each jurisdiction's age structure might suggest; and
- the age-standardised participation rate in Tasmania is lower than the average — this indicates that factors other than age are important in the Tasmanian labour market. Thus, the 'tops-down' disaggregation might overstate Tasmania's participation rate (but not necessarily the potential for improvement).

Apart from the age structure of the population, a jurisdiction's age-standardised participation rate might differ from the national rate for a number of reasons. First, natural, physical and human capital endowments might differ and thereby affect the labour market opportunities people face. Second, the industry structure, opportunities for part-time work and 'family friendly' workplaces might play a role, particularly in relation to female participation rates. Third, people might move to another jurisdiction specifically to work. This is probably a significant reason for the higher participation in the ACT relative to other jurisdictions. Finally, other social and behavioural differences might also play a role.

Divergences between the national and a jurisdiction's age-standardised participation rate might suggest greater scope for improvement, or that underlying factors make it difficult to increase participation in that jurisdiction. Moreover, because differences between age-standardised participation rates and the national rate might change over 25 years, it is difficult to determine whether the *change* in participation potentially available under NRA will be larger or smaller than that suggested by the disaggregation to the State and Territory level determined in line with national changes.

Source: Productivity Commission estimates based on ABS (*Labour Force, Australia, Detailed – Electronic Delivery*, Mar 2006, Cat. no. 6291.0.55.001).

[8] Age-standardised participation rates were calculated by applying State-specific participation rates to national population shares.

The estimated effects of human capital reforms on participation rates and hours worked for each jurisdiction are shown in table 14.2. (The projected 8.4 per cent increase in the Australian participation rate is equivalent to the 4.9 *percentage point* increase described in section 14.2.)

Table 14.2 **Estimated potential impacts on participation and hours worked, increase relative to baseline, 2030**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
	%	%	%	%	%	%	%	%	%
Participation rate	8.4	8.4	8.4	8.7	8.4	8.9	7.3	7.8	8.4
Total hours worked	6.6	6.6	6.7	6.9	6.6	7.0	5.8	6.2	6.6

Source: Productivity Commission estimates.

Over the projection period (2005–2030), South Australia and Tasmania have older populations than the other jurisdictions. These States' older populations mean that their baseline participation rates are projected to be correspondingly lower than those for the other States and Territories. However, reforms targeting older workers might have a larger relative effect in these two States.

The projected effects on hours worked follow a similar pattern to the projected effects on participation rates. South Australia and Tasmania are projected to experience higher than average increases in hours worked, due to an older population. The two Territories are projected to have smaller increases, as both have a relatively young population (particularly the Northern Territory).

Average labour productivity is projected to increase in all jurisdictions (table 14.3). The jurisdiction with the largest potential increase in hours worked, Tasmania, also has the smallest potential increase in labour productivity. The two Territories, with smaller than average potential increases in hours worked, have larger than average potential increases in labour productivity.

Table 14.3 **Estimated potential impacts on labour productivity and effective hours, increase relative to baseline, 2030**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
	%	%	%	%	%	%	%	%	%
Labour productivity[a]	1.3	1.3	1.3	1.3	1.3	1.2	1.5	1.4	1.3
Effective hours of labour	8.0	8.0	8.0	8.2	8.0	8.4	7.4	7.7	8.0

[a] Labour productivity measures output per hour worked.

Source: Productivity Commission estimates.

A jurisdiction's productivity effect can be different to the average for two reasons:

- jurisdictions with the largest potential increase in hours source those hours mainly from additional workers, who are assumed to be less productive on average; and
- the potential increase in labour productivity of baseline workers is smaller for older age groups — jurisdictions with older populations therefore have smaller potential productivity gains for baseline workers (and vice versa).

Each reason explains roughly half of the difference between the national average and the increases in labour productivity in Tasmania, the Northern Territory and the Australian Capital Territory.

Combining the projected effects on participation, hours and productivity, the overall effects on 'effective' labour supply are also presented in table 14.3. In parallel with the potential effect on participation and hours, the potential increase in effective labour supply is largest in the two jurisdictions with older populations, South Australia and Tasmania. The two Territories, and the Northern Territory in particular, are projected to have smaller increases, again, because of their younger populations.

14.6 Summary of direct impacts

The consolidated analysis of the potential effects of reforms within the human capital stream of the NRA suggests that there is scope for:

- increases in aggregate participation potentially sufficient to offset the participation rate effects of population ageing;
- an expansion in hours worked, primarily owing to the increased workforce participation of people in target groups but also because of improved employment prospects for baseline participants;
- increases in overall labour productivity (output per hour worked) because of the projected improvements in the health and education of baseline workers; and
- increases in effective labour supply after taking account of changes in hours worked and the increase in labour productivity.

The changes canvassed are broadly in line with the bounds suggested by international comparisons (chapter 10). Nevertheless, the analysis also shows that the changes are sensitive to the demographic structure of the population and assumptions made about the potential for higher participation and productivity in each population group. To summarise the results of this study, the analysis is

disaggregated into changes associated with additional participants and baseline participants (table 14.4).

The increase in effective labour supply arises mainly from additional workforce participants (5.4 per cent), notwithstanding that they work fewer hours on average than baseline participants.[9] It is also likely that there will be a small contribution to increased labour supply owing to baseline participants becoming more employable as they benefit from more education and improved health.

Table 14.4 Decomposition of potential impacts of improvements in human capital, change relative to baseline, 2030[a]

	Additional participants	*Baseline participants*
	%	%
Participation rate	8.4	0
Employment rate	..	0.6
Average hours per worker	-2.3	..
Labour productivity[b]	-0.6	1.9
Effective labour inputs	5.4	2.5

.. Approximately zero. [a] The decomposition presented in this table is used to illuminate the 'drivers' of the potential impacts of improvements in human capital. The results in the two columns are not strictly separable because they flow from a 'set' of potential changes that do not always target one group or the other. [b] Output per hour worked.

Source: Productivity Commission estimates.

In a similar vein, the tendency of additional participants to lower average productivity might be offset by the improved productivity of baseline participants as a result of better health and education.

The projected effects of this overall increase in labour supply and productivity for the States and Territories is presented in table 14.5 — again decomposed by additional and baseline participants. The disaggregation to the State and Territory level assumes that changes are determined in line with national changes, after accounting for their different demographic profiles, but do not account for other factors (see box 14.1). They therefore should be interpreted with additional care.

In sum, the potential changes in human capital outcomes, if realised, could substantially offset the effect of ageing in terms of hours worked in paid employment per capita. This represents a significant increase in hours in paid employment per capita relative to the baseline projections and potentially would contribute to a significant increase in measured production and consumption, other things remaining equal.

9 The additional 'survivors' resulting from improved life expectancy also increase the size of the workforce, but because of their older age structure, dampen the increase in the participation rate.

Table 14.5 **Estimated potential impacts of improvements in human capital, change relative to baseline, 2030[a]**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
	%	%	%	%	%	%	%	%	%
Additional participants									
Participation rate	8.37	8.41	8.41	8.71	8.36	8.92	7.25	7.81	8.40
Employment rate	0.05	0.05	0.06	0.06	0.06	0.07	0.06	0.06	0.06
Average hours	-2.27	-2.29	-2.27	-2.37	-2.27	-2.41	-1.94	-2.11	-2.28
Labour productivity[b]	-0.57	-0.57	-0.57	-0.59	-0.57	-0.60	-0.50	-0.53	-0.57
Total effective hours	*5.36*	*5.39*	*5.41*	*5.57*	*5.37*	*5.72*	*4.70*	*5.03*	*5.39*
Baseline participants									
Participation rate	–	–	–	–	–	–	–	–	–
Employment rate	0.62	0.62	0.62	0.62	0.62	0.63	0.58	0.59	0.62
Average hours	..	..	..	..	..	..	..	..	..
Labour productivity[b]	1.89	1.89	1.89	1.87	1.89	1.86	1.97	1.92	1.89
Total effective hours	*2.51*	*2.52*	*2.52*	*2.50*	*2.51*	*2.50*	*2.54*	*2.52*	*2.51*
Total									
Participation rate	8.37	8.41	8.41	8.71	8.36	8.92	7.25	7.81	8.40
Employment rate	0.67	0.67	0.68	0.68	0.67	0.70	0.63	0.65	0.67
Average hours	-2.27	-2.29	-2.27	-2.37	-2.27	-2.41	-1.95	-2.11	-2.28
Labour productivity[b]	1.31	1.31	1.31	1.27	1.31	1.24	1.45	1.37	1.31
Total effective hours	*8.01*	*8.04*	*8.06*	*8.21*	*8.01*	*8.36*	*7.36*	*7.67*	*8.03*

– Not applicable. .. Approximately zero. [a] The decomposition presented in this table is used to illuminate the 'drivers' of the potential impacts of improvements in human capital. The results for additional and baseline participants are not strictly separable, because they flow from a 'set' of potential changes that do not always target one group or the other. [b] Output per hour worked

Source: Productivity Commission estimates.

Owing to continuing increases in average lifespan, the demographic modelling used in this study projects that the baseline population in 2030 will be around 2.7 per cent larger than would be the case with no change in life expectancy. Actions under the NRA — such as measures to arrest the incidence of chronic disease — would be consistent with the achievement of this anticipated change in the baseline population.

It is also possible that actions under the NRA might lead to an increase in life expectancy above that anticipated in the baseline — for example, by delaying mortality for certain targeted groups. But, in the absence of a detailed assessment of all factors determining the baseline, it was not possible to specify the full extent of any such NRA-induced 'additional survivors' in 2030.

That said, the analysis undertaken in this study suggests that the influence of such increased longevity could lead to the population being larger than otherwise in 2030 — preliminary estimates suggest around 1 per cent of the projected baseline population.

Appendixes

A Study guidelines

Australian Government
The Treasury

OFFICE OF THE SECRETARY 27 April 2006

Mr Gary Banks
Chairman
Productivity Commission
PO Box 80
BELCONNEN ACT 2616

Dear Mr Banks Gary

ASSESSMENT OF POTENTIAL BENEFITS OF THE NATIONAL REFORM AGENDA

At its 10 February 2006 meeting, the Council of Australian Governments (COAG) committed to deliver a new National Reform Agenda, comprising human capital, competition and regulatory reform streams. The National Reform Agenda (NRA) is aimed at further raising living standards and improving services by lifting the nation's productivity and workforce participation over the next decade.

In order to inform COAG in implementing the new reform agenda, the Productivity Commission is requested to undertake an assessment of the potential benefits of the NRA. Please find attached terms of reference for the assessment, as agreed by relevant Australian, State and Territory government officials.

Yours sincerely

Ken Henry
Secretary to the Treasury

Terms of Reference for Productivity Commission Assessment of Potential Benefits of the National Reform Agenda

Introduction

The Council of Australian Governments (COAG) is committed to delivering a substantial new National Reform Agenda (NRA), embracing human capital, competition and regulatory reform streams.

The NRA is aimed at further raising living standards and improving services by lifting the nation's productivity and workforce participation over the next decade.

Purpose of study

The Productivity Commission is requested to investigate the potential economic and revenue impacts of the new NRA as outlined in the 10 February 2006 COAG meeting Communiqué (http://www.coag.gov.au/meetings/100206/index.htm), and to the extent possible, any Intergovernmental Action Plans developed over the course of the Commission's modelling exercise. The main purpose of this modelling will be to help governments better understand the scale and distribution of the reforms' anticipated broad economic and fiscal impacts.

It is noted that modelling the economic impact of the broadly defined Human Capital reform outcomes would only produce very general estimates of economic benefit and outer envelope estimates of what could potentially be achieved, and that the benefits may only accrue over a long period of time. The Commission is asked to give priority to completing modelling of the potential economic benefits of reforms within the Competition and Regulatory Reform streams of the NRA, noting that the modelling will provide outer envelope estimates of what could be achieved.

Scope of assessment

The Commission is requested to indicate the economic benefits potentially available from each broad area of the NRA, and where possible the benefits related to each IAP developed.

The Commission should provide, where practicable, for each broad category and each IAP developed under the NRA, estimates of the following:

1. the economic benefits potentially available from implementing proposed reforms and outcome objectives:-

   (a) in terms of the impact on national GDP and other important economic aggregates,

   (b) to the extent possible, the analysis should separately identify the potential economic benefits derived by each of the States and Territories from the NRA and the impact on different regions and income groups,

(c) to the extent possible, the analysis should also separately identify potential economic benefits generated by reforms and actions implemented by (i) the Australian Government and (ii) each of the State and Territory governments, and

(d) the analysis should recognise the different nature of the productivity based and human capital reforms and the likely time paths over which benefits are likely to accrue; and

2. the total revenue benefits expected to accrue to (i) the Australian Government and (ii) each of the State and Territory governments from the potential economic benefits generated by the NRA.

In calculating the potential economic and revenue benefits, the Commission should focus on the benefits potentially available from the implementation of the full range of NRA reforms and outcome objectives, abstracting from any cyclical factors.

It is recognised that, in undertaking the modelling of the impacts of reform, it will be necessary to include some broad, indicative scenarios of the cost of implementing such reforms. Decisions on the actual costs and funding of reforms will be made by COAG on a case by case basis.

The Commission is not required to report on matters relating to climate change technological innovation and adaptation.

Methodology

In its assessment, the Commission should provide an explanation of the methodology and assumptions used to derive the estimates. The Commission should also provide guidance as to the sensitivity of the results to the assumptions used.

To enhance understanding of how the estimates have been generated, the Commission is requested to provide an indication of the contribution of major components of the NRA to the potential economic benefits and to government revenues. This may include an assessment of any additional effects arising from the interaction of all reforms considered. The Commission should be cognisant of the objectives and goals identified in the COAG Communiqué of 10 February 2006 and in associated intergovernmental actions plans.

To the extent feasible, the Commission should provide an indication of the likely time path by which potential economic and revenue benefits accrue.

In the course of its study, the Commission should consult with Heads of Treasuries.

Timing

The Productivity Commission will present its assessment to COAG Senior Officials by 30 November 2006. The report will be published.

B The MMRF–NRA model

Box B.1 **Overview of the MMRF–NRA model**

The Monash Multi-Regional Forecasting (MMRF) model is a multi-regional applied general equilibrium model developed by the Centre of Policy Studies (CoPS) at Monash University. It models the six States and two 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;
- eight State and Territory Governments; and
- the Australian Government.

The model contains explicit representations of intra-regional, inter-regional and international trade flows based on regional input-output data developed at CoPS. It also includes detailed data on State, Territory and Australian Governments' budgets. Second round effects are determined on the basis of the model's input-output linkages, assumptions about the economic behaviour of firms and households, and resource constraints. Important elements of the theoretical structure of MMRF include the following:

- producers respond to changes in the competitiveness of Australian industry;
- demand for Australian exports responds to the export price of Australian products;
- producers alter their use of labour, produced capital and agricultural land in response to changes in the relative cost of these factors;
- households vary consumption of commodities in response to changes in household income and relative prices of goods consumed; and
- productivity improvements reduce resource costs.

MMRF-NRA is based on a post-GST database for the reference year 2001-02 and contains a more detailed treatment of government finances than do earlier versions of the MMRF model.

Key outputs from the MMRF model include projected changes in:

- national and state outputs as measured by gross domestic and state products; and
- revenues and expenditures for State and for Australia.

The basic model is described in Adams, Horridge and Wittwer (2002).

The Commission has used the Monash Multi-Regional Forecasting – National Reform Agenda (MMRF-NRA) model to quantify the economy-wide and the regional effects of the NRA. The MMRF-NRA model is an updated and expanded version of the MMRF model — a state-based form of the Monash model that has been used widely by the Commission and others to analyse the effects of public policy in Australia. Given that the MMRF model treats each State and Territory as a separate economy, it is suited to analysing policies with a strong regional focus.

A number of versions of the MMRF model are available for general use. To date, these have been based on input-output data that predates the GST and have aggregative modelling of fiscal balances. The model developers — the Centre of Policy Studies (CoPS) at Monash University — were engaged by the Commission to overcome these data limitations and enhance the MMRF model's usefulness for analysing the NRA. The ABS also accelerated the completion of its first post-GST input-output tables and made significant data refinements to support the model's updating and economy-wide modelling more generally.[1]

This appendix outlines the structure of the MMRF-NRA model and its database. It also reports on key features of how the model quantifies the economy-wide, regional and fiscal effects of the NRA.

B.1 The model

MMRF-NRA builds on the basic structure and operation of the original MMRF model, and includes facilities to account for:

- inter-fuel substitution in the generation of electricity;
- explicit modelling of the national electricity market;
- inter-modal substitution in road and rail transport; and
- modelling of government finances that aligns as closely as practicable to the ABS government finance data.[2]

Database

The core of the MMRF-NRA model is its database. The database can be thought of as being composed of:

[1] See ABS (*Australian National Accounts: Input-Output Tables - Electronic Publication, 2001-02*, Cat. no. 5209.0.55.001, Canberra).

[2] These developments are based in part on the MMRF-Green model, described in Adams, Horridge and Wittwer (2002).

- a production core comprised of eight input-output tables that are linked through interstate trade; and
- fiscal accounts comprised of a set of nine government accounts.

The production core of the MMRF model database shows how each industry in each state economy is linked to other industries within the state and in other states.

The database is based on input-output tables prepared by the ABS and on various ABS state publications. It provides a detailed description of the structure of production and demand in each State and Territory. The database shows for each state economy:

- the flow of industry outputs to other industries (termed 'intermediate inputs'), final demands by households (consumption), government, investment (for capital formation purposes) and exports; and
- the cost structures of industries in terms of intermediate inputs of commodities (goods and services supplied by domestic industries and by imports), primary factors of production (labour, capital and agricultural land), other costs to production and commodity taxes and subsidies.

It accounts for product taxes and subsidies on all transactions and includes margin services, which represent the costs associated with transferring products from the producer (or the port of entry in the case of imports) to final consumers and other users. Transportation and distribution margin services include gas supply, wholesale and retail trade, transport, storage and insurance costs. Product taxes and margin services represent the difference between the cost of production of a good or service (the basic price of the good) and the price paid by the user (the purchasers' price of the good). Import duties, other than excise on imported goods, are treated as a commodity tax on imports.

The database used has 58 industries in each region, each producing a single commodity (table B.1). The database has one representative household consumer and government in each state.

The database provides a representation of the Australian economy as it was in 2001-02, and does not reflect any structural changes in state or regional economies since then.

Table B.1 **MMRF-NRA industries, margin services and product taxes**

1. Livestock
2. Crops
3. Forestry
4. Fishing
5. Coal
6. Oil
7. Gas
8. Iron ore
9. Other metal ores
10. Other mining
11. Food, beverages & tobacco
12. Textiles, clothing & footwear
13. Wood products
14. Paper products
15. Printing
16. Petroleum products
17. Chemicals
18. Rubber & plastic products
19. Other non-metal mineral products
20. Cement & lime
21. Iron & steel
22. Other non-ferrous metals
23. Metal products
24. Transport equipment
25. Other equipment
26. Other manufacturing
27. Electricity generation — coal
28. Electricity generation — gas
29. Electricity generation — oil
30. Electricity generation — hydro
31. Electricity generation — other
32. Electricity supply[a]
33. Gas supply
34. Water & sewerage services
35. Construction services
36. Wholesale trade
37. Retail trade
38. Mechanical repairs
39. Hotels, cafes & accommodation
40. Road passenger transport
41. Road freight transport
42. Rail passenger transport
43. Rail freight transport
44. Pipeline transport
45. Port services
46. Transport services nec
47. Water freight transport
48. Ship charter
49. Air passenger transport
50. Air freight transport
51. Communication services
52. Finance
53. Business services
54. Ownership of dwellings
55. Government administration & defence
56. Education
57. Health
58. Other services

Transport and distribution margin services

Gas supply (part of commodity 33)
Wholesale trade (part of commodity 36)
Retail trade (part of commodity 37)
Road freight transport (part of commodity 41)
Rail freight transport (part of commodity 43)
Pipeline transport (part of commodity 44)
Port services (commodity 45)
Water freight transport (part of commodity 47)
Air freight transport (part of commodity 50)

Product taxes

Goods and services taxes:
- Intermediate input demand
- Investment demand
- Household demand

Other non-GST taxes less subsidies:
- Commonwealth and state taxes on intermediate use
- Commonwealth and state taxes on investment use
- Commonwealth and state taxes on households
- Commonwealth taxes on exports

a Transmission, distribution and retail.

Source: MMRF-NRA database.

Theory and parameters

The MMRF-NRA model uses standard economic theory to specify how producers, household and government consumers, exporters and foreign and local investors respond to relative prices, productivity improvements and other economic changes. It also has two government sectoral groupings — Commonwealth and State — for which revenue and expenditure behaviour are modelled separately. Important elements of the theoretical structure of MMRF-NRA include the following:

- Producers and household consumers respond to changes in international and interstate competitiveness. Producers and final consumers are modelled as substituting between domestically produced and imported intermediate inputs and final goods in response to changes in the competitiveness of local industries.
- Export sales are sensitive to changes in the international competitiveness of local industry. The demand for Australian exports is modelled as responding to changes in the export price of Australian products.
- Producers alter their relative use of the primary factor inputs of labour, capital and agricultural land in response to changes in the relative cost of these factors.
- Final consumers change their consumption of particular commodities as their aggregate incomes change and as they substitute between commodities in response to changes in the relative prices of goods consumed.
- Producers reduce their resource costs, and thereby the price of their outputs, in response to productivity improvements. Any productivity improvements may improve the efficiency of the use of all inputs (that is, total factor productivity) or selected inputs (such as labour and fixed capital).

In general, the theory and parameter values that are standard to the MMRF suite of models have been applied to the current application. Nevertheless, enhancements enabling the disaggregation of results to a sub-state level and a more flexible treatment of export sales have been made to better meet the study guidelines and to align with modelling conventions adopted in previous studies (eg PC 2005a). These enhancements are discussed in turn.

Disaggregation of results to sub-state regions

The Monash Regional Equation System (MRES) has been added to the MMRF model to gauge the impact of the NRA on rural and regional Australia.

The MRES adopts a ‘tops-down’ approach to regional analysis. In its standard form, MRES is used to disaggregate national results to the state and sub-state regional

levels.[3] In this study, results for the six States and two Territories are estimated directly in MMRF-NRA. The State results are then disaggregated to the regional level using the industry mix in each region. Using this approach, it has been possible to estimate the impact of economic change on output and employment in 54 sub-state regions, alongside the two Territories. The regions are closely aligned with ABS statistical divisions.

In projecting state results to the regional level, a distinction is made between 'national' and 'local' industries. National industries are those producing commodities that are highly tradable in inter-regional markets (eg agriculture, mining, and most manufacturing commodities). Conversely, local industries are those producing commodities that are predominantly traded in regional markets (eg many services and perishable commodities) and whose prospects are tied largely to general activity levels in the sub-state region in which they are located.

The presence of local industries whose prospects are tied to regional activity introduces regional 'multiplier' effects. If a region has a concentration of fast-growing national and state industries, then projections of its overall regional growth are multiplied through fast growth of associated local industries.

MRES apportions the effect of economic activity into the region in which it occurs. While this approach is generally suitable for regional employment, it does not take into account that some impacts may flow out of the region, such as to the owners of fixed capital located in the state capitals or overseas and to persons who travel between regions for work.[4]

Treatment of exports

The treatment of exports adopted in this study allows individual activities to be considered as responding directly to changes in their own competitiveness or export price, and the responsiveness of exports to changes in price — that is, a bottoms-up approach to modelling aggregate exports.[5] It is generally assumed that local producers of export commodities have little or no influence on the price of their commodities in world markets in the longer run. This approach avoids over

[3] A tops-down approach was also adopted to produce regional results in PC (2005a).

[4] The use of 'fly-in, fly-out' employment in mining industries whereby workers live in one region (eg Perth) and are routinely flown to work in another (eg Pilbara) for short periods is an example of where the approach taken in MRES may be inappropriate, as many of the consumer benefits may accrue to the regions in which the workers live.

[5] In contrast to this ideal, in the standard MMRF model framework, export demand is derived in aggregate for 'non-traditional' export commodities and disaggregated to regional industry using a tops-down methodology.

specialisation in mining and non-ferrous metal processing that can occur if export possibilities are limited to these 'traditional' export sectors. This was achieved by setting most of the export demand elasticities to -20.

The approach adopted in the current study conforms to that adopted in PC (2005a).

Treatment of the National Electricity Market

The model contains a stylised module covering the operation of the National Electricity Market (NEM). The demand for electricity (electricity supply) in each NEM State is determined within the core of the model in the same manner as for all other goods and services. For each participating jurisdiction, demand is modelled as being sourced from the NEM. Supply of electricity to the NEM is then modelled on the basis of initial supply patterns and relative electricity prices of generators in each participating jurisdiction. The generation of electricity in the model is disaggregated into five fuel types. The explicit modelling of the NEM enables substitution in generation between participating jurisdictions and between fuel types towards lower cost producers. However, as there is no explicit modelling of the transmission and distribution networks, the modelling does not take account of any capacity constraints within the system or time of use and day charging that may constrain the operations of the NEM.

Western Australia and the Northern Territory are not part of the NEM and electricity supply in these regions is determined on a state-of-location basis.

Treatment of changes in total factor productivity

The direct effects presented in chapters 4 through to 14 refer to changes in productivity. Productivity measures the output per unit of some specified physical input. However, the theory within MMRF is expressed in terms of technical change relating units of physical inputs to output, which is related to the inverse of productivity. To account for the resulting changes in output, the shock applied to the technical change terms are scaled using an equivalent of the power of the tax formula.[6]

Treatment of fiscal details

One of the key requirements in the guidelines to this study is to assess the revenue implications for State, Territory and Commonwealth governments. To meet this

6 An $x/100$ per cent productivity change is equivalent to $-(x/100)/(1+x/100)\times 100$ per cent technical change.

reporting requirement and improve the usefulness of the model for fiscal analysis, the fiscal detail in the model was expanded to link with the detail provided in the ABS *Government Finance Statistics* (Cat. no. 5512.0). Data from ABS *Government Finance Statistics* and ABS *Taxation Revenue Australia* (Cat. no. 5506.0) were used to compile data on a standardised basis across jurisdictions for the 2001-02 financial year.

The government finance module consists of three broad components (tables B.2, B.3 and B.4). First, the module details the various sources of tax and non-tax revenue received by each government. It identifies revenue from:

- income taxes (individuals, enterprises and non-residents);
- taxes on goods and services (the GST, excises and levies, taxes on international trade, gambling, insurance, use of motor vehicles and other);
- taxes on factor inputs (payroll tax and property tax);
- Commonwealth grants to the States (GST-tied and other current);
- sales of goods and services;
- interest received; and
- all other sources.

The expenditure component of the government finance module separates State, Territory and Commonwealth government expenditure into:

- gross operating expenses (depreciation, employee expenses and other operating expenses);
- personal benefit payments (unemployment benefits, disability support pensions, age pensions and other personal benefits);
- grant expenses:
  - for the Commonwealth: GST-tied grants to the States and Territories, other current grants to the States and Territories, grants to local government and grants to universities;
  - for State, Territory and Commonwealth governments: grants to the private sector;
- property expenses;
- subsidy expenses;
- capital transfers; and
- all other expenditure.

The final part of the government finance module draws together the changes in government revenue and government expenditure to report the net operating balance, net acquisition of non-financial assets and net lending or borrowing balance for each jurisdiction.

As far as practicable, changes in government revenue in the government finance module are indexed to changes in appropriate tax bases and the nominal tax base (table B.9). Government expenditure is generally indexed to changes in population, unemployment or real economic activity, changes in the prices faced by governments and, where appropriate, government benefit rates (table B.10).

The GST is treated in the same way as it is in the *Government Finance Statistics*; it is levied by the Commonwealth government and redistributed in entirety to the States and Territories through GST-tied grants. The distribution of GST revenue to the States and Territories in the model database reflects the payments actually made in 2001-02. These payments reflect the Commonwealth Grants Commission (CGC) relativities for that year and expected State populations as at 31 December 2001. As this part of the government finance module is expressed in percentage change form, changes in GST collections are distributed to each State and Territory based on the change in their share of national population. The equation determining the allocation of GST-tied grants to each State and Territory includes a region-specific shift-term to allow for changes in the CGC relativities. Thus, the distribution process in the model is a stylised version of that actually used by the Commonwealth (Commonwealth of Australia 2002, p. 45). The government finance module does not model the process by which the Commonwealth Grants Commission determines the GST (or any other) relativities.

In order to assess the revenue implications of NRA-consistent reform, the modelling requires assumptions to be made about how governments respond to the resulting changes in economic activity.

One approach is to allow aggregate government expenditure to move in line with changes in household consumption. Such an approach is consistent with that used by the Commission to assess the economic effects of infrastructure reform in NCP-related industries over the 1990s (PC 2005a).[7] Such an approach is not, however, neutral with respect to government revenue, as it explicitly assumes that some of the revenue gains from reform are utilised as increased government expenditure.

An alternative approach is to fix tax rates and real government expenditure and to allow the model to determine the resulting changes in government revenue and

[7] As PC (2005a) did not look at the revenue implications of infrastructure reform, it employed a different fiscal closure to that used in this study to assess the revenue implications of the NRA.

expenditure in line with changes in the underlying tax base and relative prices. This approach is consistent with that used previously by the Commission to model the revenue implications of Hilmer and related reforms (IC 1995), and is used in the current analysis.

To assess the revenue implications of reform, equations were added to the model to enable discretionary government expenditure to be fixed in real terms, as the government finance module is expressed in nominal terms — the IC 1995 treatment. Under this treatment, tax rates and real government current expenditure are fixed by assumption. The disposition of the additional revenue would be a matter for COAG and individual governments.

While most government expenditure is treated as discretionary, changes in the payments of 'other government benefit payments' across jurisdictions are treated as endogenous and modelled as moving in line with changes in State and Territory populations. The same treatment is applied to 'other current grants'. Because these outlays are Commonwealth payments to households, State and Territory government revenues are not directly affected.

The ABS *Government Finance Statistics* provide a consistent and comprehensive coverage of the Australian, State, Territory and local government finances. However, the inability to reconcile data from the ABS *Government Finance Statistics* with the government consumption and taxation data in the ABS Input-Output tables — the basis of the MMRF-NRA model — prevent the government finance module from being fully integrated into the model in a completely consistent manner. As a result, while the government finance module has been integrated as consistently as possible, some inconsistencies nevertheless remain, most notably in the area of government consumption.

To make the revenue implications of NRA reform more relevant to the current policy debate, the revenue estimates presented in this study are for the financial year 2005-06. These are obtained by applying the revenue and expenditure drivers in the GFS module (tables B.9 and B.10) to the ABS *Government Finance Statistics* data for the 2004-05 financial year (latest available), which are updated to reflect the abolition of certain state taxes as part of Commonwealth–State financial reform in July and August 2005. The adjustments made are detailed in table B.5. A number of other taxes are earmarked for abolition in the years ahead. The revenue implications reported in this study are based on actual revenue collections and do not take into account possible future changes. GST-tied grants to each State and Territory reflect actual payments made (Commonwealth of Australia 2003, p. 10), adjusted to accord with actual GST revenue collections for that year (to remove timing differences), thereby formalising the link between GST revenue collections, GST-tied grant expenditure by the Commonwealth and GST-tied grant income received by the

States and Territories. In a similar vein, income from other current grants is explicitly linked to other current grant expenditure by the Commonwealth. The full government finance data for 2004-05 used to assess the revenue implications of NRA reform are presented in tables B.6 (revenue), B.7(expenditure) and B.8 (fiscal balances). The resulting estimates for 2004-05 were updated to 2005-06 using the growth in the GDP deflator (based on ABS 2006a, p. 32).

Reforms under the human capital stream potentially involve significant changes in workforce participation and productivity as well as welfare payments. To more accurately model the resulting revenue implications, the government finance module contains the key welfare payments likely to be affected by the human capital stream — unemployment benefits (Newstart), disability support pensions (DSP) and age pensions — as well as a residual other personal benefit payments.[8] Additional workforce participation under the human capital stream involves changes in all three of these welfare payments. Given the complexity of administrative arrangement governing payments under each benefit, the modelling of the revenue implications of NRA reform is predicated on the simplifying assumption that the average payment rate under each benefit remains unchanged as a result of the NRA and that the proportion of self-funded retirees does not change, even in the face of large changes in the number of recipients.

The model distinguishes between two levels of government operating in each jurisdiction — the Australian Government and a combined State, Territory and local government. This treatment accords with local governments having no separate identity under the Constitution and the establishment of local government under State government legislation. State and Territory governments have the power to make laws on behalf of local government and oversee their operation. The definition of government includes general government (government departments and agencies) and the non-financial public sector (public corporations).

8 Other personal benefit payments is defined in this study as the GFS item *Personal benefit payments* not accounted for by unemployment benefits, DSP and age pensions.

Table B.2 **Government revenue in the MMRF-NRA database, 2001-02**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Taxation revenue	14 761	10 345	5 855	2 610	3 509	690	272	568	38 610	175 231
Taxes on goods & services	3 524	3 057	1 352	690	732	212	76	129	9 772	52 356
General taxes	0	0	0	0	0	0	0	0	0	791
GST	0	0	0	0	0	0	0	0	0	27 389
Excises and levies	0	0	0	3	0	2	0	0	5	20 489
International trade	0	0	0	0	0	0	0	0	0	5 214
Gambling	1 209	1 370	569	312	113	67	28	43	3 711	0
Insurance	1 239	738	273	223	267	52	16	29	2 837	0
Use of motor vehicles	1 545	947	780	324	493	98	36	69	4 292	0
Other[a]	-469	2	-270	-172	-141	-7	-4	-12	-1 073	-1 527
Factor inputs	11 237	7 288	4 503	1 920	2 777	478	196	439	28 838	3 843
Payroll	4 014	2 559	1 188	601	900	149	96	147	9 654	3 831
Property	7 223	4 729	3 315	1 319	1 877	329	100	292	19 184	12
Income taxes	0	0	0	0	0	0	0	0	0	119 032
Individuals	0	0	0	0	0	0	0	0	0	86 112
Enterprises	0	0	0	0	0	0	0	0	0	31 782
Non-residents	0	0	0	0	0	0	0	0	0	1 138
Commonwealth grants to states	16 015	11 434	9 510	4 581	5 331	1 751	1 748	959	51 328	0
GST-tied[b]	8 297	5 803	5 178	2 536	2 613	1 091	1 324	547	27 389	0
Other current[b]	7 718	5 631	4 331	2 044	2 718	661	424	412	23 939	0
Sales of goods and services	13 820	9 270	10 386	2 973	6 220	1 569	541	496	45 275	30 310
Interest received	682	878	194	628	525	233	47	69	3 256	3 368
Other	3 631	2 742	2 413	625	1 413	141	282	259	11 506	3 010
GFS Revenue	**48 909**	**34 669**	**28 358**	**11 417**	**16 998**	**4 384**	**2 890**	**2 351**	**149 975**	**211 919**

a Taxes not elsewhere classified adjusted for the difference in total taxation revenue between the ABS *Government Finance Statistics* and *Taxation Australia*. **b** Actual grants scaled to match the corresponding grant expenditure.

Source: MMRF-NRA database based on ABS (*Government Finance Statistics, 2001-02*, Cat. no. 5512.0, pp. 8, 10 and 19), ABS (*Taxation Revenue, Australia, 2003-04 (Reissue)*, Cat. no. 5506.0, pp. 12 and 16) and Commonwealth of Australia (2003, p. 10).

Table B.3 **Government expenditure in the MMRF-NRA database, 2001-02**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Gross operating expenses	38 718	27 786	23 347	9 295	14 004	3 306	2 366	1 809	120 631	68 988
Personal benefit payments[a]	0	0	0	0	0	0	0	0	0	63 035
Unemployment benefits[b]	0	0	0	0	0	0	0	0	0	6 325
Disability support pensions[c]	0	0	0	0	0	0	0	0	0	6 404
Age pensions[d]	0	0	0	0	0	0	0	0	0	17 406
Other[e]	0	0	0	0	0	0	0	0	0	32 899
Grant expenses	3 063	1 810	2 626	1 035	1 402	246	238	314	10 734	63 192
Commonwealth to state	0	0	0	0	0	0	0	0	0	51 328
GST-tied[f]	0	0	0	0	0	0	0	0	0	27 389
Other current	0	0	0	0	0	0	0	0	0	23 939
Local governments	0	0	0	0	0	0	0	0	0	490
Universities	0	0	0	0	0	0	0	0	0	4 327
Private sector	3 063	1 810	2 626	1 035	1 402	246	238	314	10 734	7 047
Property expenses	2 392	1 758	2 150	1 036	925	487	249	68	9 065	13 523
Subsidy expenses	277	47	13	68	11	70	47	4	537	4 570
Capital transfers	737	590	620	43	18	5	48	11	2 072	4 306
Other[g]	558	76	129	6	239	55	15	0	1 078	0
GFS Expenditure	**45 745**	**32 067**	**28 885**	**11 483**	**16 599**	**4 169**	**2 963**	**2 206**	**144 117**	**217 615**

[a] Other current transfers. State allocations based on the number of recipients at 30 June 2002 (Department of Families, Community services and Indigenous Affairs 2006, p. 3). [b] Newstart, Mature age allowance, Widow allowance and non-full-time students receiving youth allowance (ABS 2006g, p. 208). [c] Disability support pension (ABS 2006g, p. 208). [d] Age pension, Wife pension (partner DSP), Widow pension (partner age pension) and Widow B pension (ABS 2006g, p. 207). [e] The balance of other current transfers not accounted for by unemployment benefits, DSP and age pensions. [f] Tied to GST revenue collections to remove the effect of timing differences. [g] Taxes expenses plus other current transfers.

Source: MMRF-NRA database based on ABS (*Government Finance Statistics, 2001-02*, Cat. no. 5512.0, pp. 10 and 19) and ABS (*Taxation Revenue, Australia, 2003-04 (Reissue)*, Cat. no. 5506.0, pp. 12 and 16).

Table B.4 **Fiscal balances in the MMRF-NRA database, 2001-02**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Net operating balance[a]	3 164	2 602	-527	-66	399	215	-73	145	5 858	-5 696
Net acquisition of non-financial assets	2 617	1 616	1 227	-94	574	246	304	-8	6 482	-638
Net lending (+)/borrowing (-)	547	986	-1 754	28	-175	-31	-377	153	-624	-5 058

a GFS Revenue – GFS Expenditure.

Source: MMRF-NRA database.

Table B.5 **Revenue adjustments to reflect Commonwealth–State financial reform, 2004-05**

$ million

	NSW	*VIC*	*Qld*	*SA*	*WA*	*TAS*	*NT*	*ACT*	*State & local*
GFS Taxes on property	8 157	5 835	4 570	1 853	2 822	444	145	356	24 182
Adjustments									
Debits duty[ab]						-24			-24
Debits tax	[c]	-249[a]	-190[a]	-60[a]	-96[a]		-6[a]	-15[a]	-616[a]
Electronic banking duty[ad]							-2		-2
Vendor duty[e]	-266								
Total adjustments	-266	-249	-190	-60	-96	-24	-9	-15	-909
Adjusted GFS Taxes on property	**7 891**	**5 586**	**4 380**	**1 793**	**2 727**	**420**	**136**	**341**	**23 273**

a Abolished 1 July 2005. **b** Also known as credit card duty. **c** Abolished 1 January 2002. **d** Also known as electronic transactions duty. **e** Abolished 2 August 2005.

Sources: ABS (*Taxation Revenue, Australia*, 2004-05, Cat. no. 5506.0, p. 17); State budget papers (various); NSW Treasury (2006).

Table B.6 **Government revenue used to assess the fiscal implications of the NRA, 2004-05**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Taxation revenue	17 158	12 480	8 230	3 452	4 975	864	352	696	48 207	226 902
Taxes on goods and services	4 175	3 600	1 996	853	942	233	98	155	12 052	63 622
General taxes	0	0	0	0	0	0	0	0	0	1 164
GST	0	0	0	0	0	0	0	0	0	35 473
Excises and levies	0	45	0	5	0	0	0	0	50	22 812
International trade	0	0	0	0	0	0	0	0	0	5 548
Gambling	1 429	1 369	806	399	134	81	47	48	4 313	0
Insurance	1 445	997	370	282	299	49	21	38	3 501	0
Use of motor vehicles	1 852	1 222	1 033	385	684	119	36	85	5 416	0
Other[a]	-551	-33	-213	-218	-175	-16	-6	-16	-1 228	-1 375
Factor inputs	12 983	8 880	6 234	2 599	4 033	631	254	541	36 155	306
Payroll	4 826	3 045	1 663	747	1 211	187	109	185	11 973	292
Property[b]	8 157	5 835	4 571	1 852	2 822	444	145	356	24 182	14
Income taxes	0	0	0	0	0	0	0	0	0	162 974
Individuals	0	0	0	0	0	0	0	0	0	112 223
Enterprises	0	0	0	0	0	0	0	0	0	49 654
Non-residents	0	0	0	0	0	0	0	0	0	1 097
Commonwealth grants to states	17 712	12 947	12 144	5 226	6 511	2 083	2 076	1 077	59 776	0
GST-tied	10 190	7 295	7 348	3 216	3 542	1 444	1 755	683	35 473	0
Other current	7 522	5 652	4 796	2 010	2 969	639	321	394	24 303	0
Sales of goods and services	15 218	9 801	12 005	3 572	7 190	1 794	621	498	50 699	33 457
Interest received	1 513	812	3 805	681	644	298	96	62	7 911	3 179
Other	4 193	3 745	3 399	800	2 052	251	209	135	14 784	3 111
GFS Revenue	**55 794**	**39 785**	**39 583**	**13 731**	**21 372**	**5 290**	**3 354**	**2 468**	**181 377**	**266 649**

a Taxes not elsewhere classified adjusted for the difference in total taxation revenue between the ABS *Government Finance Statistics* and *Taxation Australia*. **b** Actual grants scaled to match the corresponding grant expenditure. **b** Adjusted to reflect the abolition of selected state taxes in July and August 2005 (see table B.5).

Sources: ABS (*Government Finance Statistics, 2004-05*, Cat. no. 5512.0, pp. 12 and 21; *Taxation Revenue, Australia, 2004-05*, Cat. no. 5506.0, pp. 11 and 17).

Table B.7 **Government expenditure used to assess the fiscal implications of the NRA, 2004-05**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Gross operating expenses	46 001	32 700	28 319	10 442	16 136	3 976	2 758	2 337	142 669	85 085
Personal benefit payments[a]	0	0	0	0	0	0	0	0	0	74 115
Unemployment benefits [b]	0	0	0	0	0	0	0	0	0	5 856
Disability support pensions[c]	0	0	0	0	0	0	0	0	0	7 911
Age pensions[d]	0	0	0	0	0	0	0	0	0	20 574
Other[e]	0	0	0	0	0	0	0	0	0	39 774
Grant expenses	3 962	2 374	2 873	789	1 816	437	324	400	12 975	73 389
Commonwealth to state	0	0	0	0	0	0	0	0	0	59 776
GST-tied[f]	0	0	0	0	0	0	0	0	0	35 473
Other current	0	0	0	0	0	0	0	0	0	24 303
Local governments	0	0	0	0	0	0	0	0	0	305
Universities	0	0	0	0	0	0	0	0	0	5 406
Private sector	3 962	2 374	2 873	789	1 816	437	324	400	12 975	7 902
Property expenses	1 954	1 568	2 168	1 153	1 153	523	267	103	8 889	11 308
Subsidy expenses	286	4	513	399	4	3	10	0	1 219	6 697
Capital transfers	445	1 098	493	56	212	28	55	5	2 392	4 448
Other	710	94	142	558	220	3	16	0	1 743	0
GFS Expenditure	**53 358**	**37 838**	**34 508**	**13 397**	**19 541**	**4 970**	**3 430**	**2 845**	**169 887**	**255 042**

a Other current transfers. State allocations based on the number of recipients at 30 June 2002 (Department of Families, Community services and Indigenous Affairs 2006, p. 3). **b** Newstart, Mature age allowance, Widow allowance and non-full-time students receiving youth allowance (ABS 2006g, p. 208). **c** Disability support pension (ABS 2006g, p. 208). **d** Age pension, Wife pension (partner DSP), Widow pension (partner age pension) and Widow B pension (ABS 2006g, p. 207). **e** The balance of other current transfers not accounted for by unemployment benefits, DSP and age pensions. **f** Tied to GST revenue collections to remove the effect of timing differences. **g** Taxes expenses plus other current transfers.

Sources: ABS (*Government Finance Statistics, 2004-05*, Cat. no. 5512.0, pp. 10, 12 and 21; *Taxation Revenue, Australia, 2004-05*, Cat. no. 5506.0, pp. 11 and 17).

Table B.8 **Fiscal balances used to assess the fiscal implications of the NRA, 2004-05**

$ million

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*State & local*	*Common –wealth*
Net operating balance[b]	2 436	1 947	5 075	334	1 831	320	-76	-377	11 490	11 607
Net acquisition of non-financial assets	3 239	1 935	3 500	219	1 277	115	100	-73	10 312	466
Net lending (+)/borrowing (-)	-803	12	1 575	115	554	205	-176	-304	1 178	11 141

a Adjusted to reflect the abolition of selected state taxes in July and August 2005 (see table B.5). **b** GFS Revenue – GFS Expenditure.

Sources: Tables B.6 and B.7.

Table B.9 **Drivers of government revenue in MMRF-NRA**

Source of government revenue	*Drivers*
Taxes on the provision of goods and services	
General taxes	Commodity tax rate, nominal value of usage in production, investment and household consumption
GST	GST tax rates on usage in production, investment, household consumption and exports; real usage and the basic price of goods and services in production, investment, household consumption and exports; shift term
Excises and levies	Commodity tax rates on food, drink & tobacco and petrol products; real usage and basic price of food, drink & tobacco and petroleum products used in production, investment and household consumption; shift term
International trade	Import duty rates; foreign currency price of imports; nominal exchange rate; import volumes; shift term
Gambling	Commodity tax rates on hotels & cafes and other services; real usage and basic price of hotels & cafes and other services used in production, investment and household consumption; shift term
Insurance	Commodity tax rates on finance; real usage and basic price of finance used in production, investment and household consumption; shift term
Use of motor vehicles	Commodity tax rates on transport equipment; real usage and basic price of transport equipment used in production, investment and household consumption; shift term
Other	Commodity tax rates; real usage and basic price of each commodity in production, investment, household consumption and exports; shift term
Factor inputs	
Payroll	Payroll tax rate; employment (hours); hourly wage rate; shift term
Property	Property tax rate; capital stock; unit income on capital; shift term
Taxes on income	
Income taxes levied on individuals	Labour income tax rates; employment (hours); hourly wage rate; shift term
Income taxes levied on enterprises	Non-labour income tax rates; capital stock; unit income on capital; quantity of land; unit income on land; other costs; unit income on other costs; shift term
Income taxes levied on non-residents	Real GDP; GDP price deflator; shift term
Commonwealth grants to states	
Current grants	
GST-tied	Commonwealth GST grant expenditure
Other	Commonwealth other current grant expenditure
Sales of goods and services[a]	Fixed by assumption
Interest received	Real GDP/GSP; GDP/GSP price deflator; shift term
Other revenue	Real GDP/GSP; GDP/GSP price deflator; shift term

a This item comprises revenue earned through the direct provision of goods and services by general government (government departments and agencies) and public enterprises. Because of the diverse nature of this item, it was not practicable to include it in the modelling, including the government revenue implications receipts from GBEs included in the item. For this reason, it was assumed fixed in all simulations.

Table B.10 **Drivers of government expenditure in MMRF-NRA**

Type of government expenditure	*Drivers*
Gross operating expenses[a]	Real government consumption; government consumption price deflator; shift term
Personal benefit payments	
Unemployment benefits	Unemployment benefit rate; labour supply; employment (persons); consumer price index; shift term
Disability support pension	Disability support pension rate; population; consumer price index; shift term
Age pensions	Age pension rate; population; consumer price index; shift term
Other personal benefits	Other personal benefit payment rate; population; consumer price index; shift term
Grant expenses:	
Commonwealth to states: Current	
GST-tied	Nominal value of GST revenue collections
Other current grants	Population; consumer price index; shift term
Commonwealth to local government[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
Commonwealth to universities[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
State, territory and Commonwealth government grants to private sector[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
Property expenses[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
Subsidy expenses[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
Capital transfers[a]	Real GDP/GSP; GDP/GSP price deflator; shift term
Other expenditure[a]	Real GDP/GSP; GDP/GSP price deflator; shift term

[a] Considered 'discretionary' in the fiscal modelling.

The economic environment (ie model closure)[9]

This study focuses on the growth and revenue implications of the NRA once these changes have had time to work through the economy. More specifically, the study asks the question 'how would the Australian economy of the early 2000s have differed had the NRA reforms prevailed?'

Accordingly, a longer-term environment is used. In this environment, the estimated effects reflect those that are likely to occur after there has been full adjustment of capital and labour between jurisdictions and industries. For reforms with long maturation periods, such as those relating to health and education and training in the human capital stream, the process of adjustment could be conceived of as commencing once health and education outcome objectives have been achieved and begin to impact on the production economy (periods of 25 or more years are

9 The term 'model closure' is used to refer to the assignment of the model's variables between those determined outside the model (ie exogenous variables) and those determined by the model (ie endogenous variables).

canvassed). The framework is comparative-static in the sense that it compares the economy pre- and post adjustment and does not trace out the adjustment path.[10]

The key elements of the longer-run economic environment adopted in MMRF-NRA are as follows.

- The model index of consumer prices is the numeraire. That is, all changes in domestic prices in the model can be interpreted as changes relative to the general level of prices in the economy. In all simulations, the nominal exchange rate is flexible.
- National employment by occupational group is also fixed while real pre-tax wages by occupational group in each state adjust, as does state employment in each occupational group. The number of households in each state and state populations are assumed to change in line with state employment, with the unemployment rate in each state held fixed.
- Each industry adjusts its capital stocks in order to equilibrate its expected and actual rates of return on capital. The base line expected rates of return are determined by values in the MMRF-NRA database. Industries' demands for investment goods are linked by an exogenous investment/capital ratio to changes in their capital stock.
- Nominal household consumption is determined by post-tax household disposable income, while the balance of trade as a ratio of GDP in local currency prices is allowed to vary. Regional household consumption is determined by regional post-tax household disposable income.
- Government tax rates are fixed so that revenue moves in line with the various tax bases.
- Real government consumption is fixed. Thus, nominal government expenditure moves in line with induced price changes.[11]
- The budget deficit is allowed to vary.

It is assumed that, apart from the consolidated human capital reforms, the NRA will not influence the national supply of labour — that is, after the full implementation of reform and adjustment, national labour supply will be the same as it would

[10] Dynamic simulations were not used. Also, no attempt was made to 'update' the database to reflect changes in the economy that may have occurred in the intervening period leading up to the period of implementation of the NRA.

[11] In the current implementation of the MMRF-NRA model, real regional government investment moves in line with total real regional investment.

otherwise be.[12] Higher national and regional output therefore depend on higher productivity of labour and the relocation of labour between regional industries. In the MMRF-NRA model, the base levels of national labour supply and employment by nine occupational groups are represented by levels in 2001-02.

During the consultation process, information was requested on the sensitivity of results to alternative assumptions. In response to this interest, this study re-estimated the impacts of the NRA using two alternative closures involving different assumptions concerning government spending and the fiscal balance.

- In the first sensitivity test, government consumption spending is assumed to move in line with household consumption and the government surplus (deficit) in each jurisdiction is allowed to vary (similar manner to the standard fiscal closure). That is, all government expenditure is considered non-discretionary.
- In the second sensitivity test, the first test is repeated with the additional assumption that tax rates vary uniformly to ensure that the net operating balance in each jurisdiction is fixed.[13]

In both sensitivity tests, the tax rates are fixed.[14]

The second sensitivity test is based on the model closure adopted in PC (2005a).

[12] If the modelled changes increase total employment, then the production gains would be higher than the estimates presented here.

[13] That is, the net operating balance in 2001-02 model data is held fixed.

[14] That is, it is assumed that all changes are contemporaneous and do not affect households across time (other than through modelled changes in the level of household disposable income and consumer spending).

Table B.11 **Components of GSP and GDP on the expenditure side in the MMRF-NRA database, 2001-02**

$ million

Components	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Australia*
Private consumption	154 817	110 336	75 599	31 796	40 992	8 942	4 063	8 176	434 721
Investment	52 319	43 975	31 707	10 447	20 334	3 111	2 878	2 919	167 690
Public consumption (state)	26 773	18 979	14 040	6 499	8 473	2 076	1 846	1 400	80 086
Public consumption (federal)	14 067	11 426	7 766	3 331	3 500	1 086	1 315	9 734	52 225
Stocks	-69	210	43	74	297	20	91	-1	665
Exports (foreign)	51 752	40 300	27 531	16 276	13 828	5 310	3 004	4 874	162 875
Imports (foreign)	-40 589	-32 821	-33 604	-14 641	-18 159	-7 198	-5 311	-10 551	-162 874
Exports (interstate)	37 611	33 322	27 555	9 446	34 564	2 739	3 137	657	149 031
Imports (interstate)	-48 044	-41 071	-24 958	-11 061	-16 633	-2 786	-1 567	-2 365	-148 485
NEM purchases less sales[a]	-837	-415	1 140	107	0	195	0	-190	0
Gross state/domestic product	**247 800**	**184 241**	**126 819**	**52 274**	**87 196**	**13 495**	**9 456**	**14 653**	**735 934**

a Net purchases from the national electricity market.

Source: MMRF-NRA database based on ABS, Australian National Accounts: Input-Output Tables - Electronic Publication, 2001-02, Cat. no. 5209.0.55.001; state and territory disaggregations based on CoPS calculations.

Table B.12 **Components of GSP and GDP on the income side in the MMRF-NRA database, 2001-02**

$ million

Components	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Australia*
Cost of labour	135 225	100 575	69 090	28 417	42 727	7 510	4 448	9 258	397 250
Cost of capital	71 598	50 316	35 671	14 142	26 999	3 394	3 066	3 544	208 730
Cost of land	2 456	2 163	1 449	902	1 493	178	235	14	8 890
Other Costs	16 784	14 643	9 792	4 113	9 565	1 073	1 036	685	57 691
Commodity tax (not GST) – production	4 040	2 700	1 770	749	1 098	201	120	212	10 890
Commodity tax (not GST) – investment	1 461	1 160	808	292	538	95	71	95	4 520
Commodity tax (not GST) – households	5 566	4 390	2 975	1 363	1 675	403	158	301	16 831
Commodity tax (not GST) – exports	140	385	-26	78	113	14	11	1	716
GST	9 520	7 049	4 783	1 975	2 702	567	278	492	27 366
Import duties	1 010	860	507	241	285	58	32	52	3 045
Gross state/domestic product	**247 800**	**184 241**	**126 819**	**52 272**	**87 195**	**13 493**	**9 455**	**14 654**	**735 929**

Source: MMRF-NRA database based on ABS (*Australian National Accounts: Input-Output Tables - Electronic Publication, 2001-02*, Cat. no. 5209.0.55.001); state and territory disaggregations based on CoPS calculations.

Table B.13 **Demographic data in the MMRF-NRA database, 2001-02[a]**

000 persons

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Australia*
Population	6 634	4 857	3 711	1 519	1 925	473	199	322	19 640
Working-age population[b]	5 253	3 867	2 883	1 223	1 510	374	143	251	15 503
Labour force	3 272	2 449	1 872	741	999	217	105	179	9 834
Employment	3 066	2 292	1 722	688	933	198	98	171	9 168
Unemployment	206	157	150	53	66	19	7	8	666
Unemployment rate (%)	6.3	6.4	8.0	7.2	6.6	8.8	6.7	4.5	6.8

a Monthly or quarterly average depending on frequency of release by ABS. **b** Total civilian population aged 15 and over.

Source: MMRF-NRA database based on ABS (*Australian Demographic Statistics*, Cat. no. 3101.0, Tables 4 and 12).

C The demographic modelling framework

This appendix outlines the demographic modelling framework used in this study. It describes the structure and key elements of the experimental framework and how it is applied to isolate the potential impacts of NRA initiatives on workforce participation and productivity.

The framework is used to project the effects of changes in human capital on workforce participation and productivity 25 years hence. The framework includes a baseline scenario and an outer-envelope scenario. These scenarios are not forecasts of what is expected to occur in the future. Rather, they are conditional estimates of changes that might occur under different sets of assumptions. The baseline characterises the evolution of the population and demographic changes within that population in a business-as-usual policy and economic environment. The outer-envelope scenario reflects the potential impacts on workforce participation and productivity of possible NRA initiatives. The demographic model projects possible:

- population size and structure;
- participation rates;
- employment rates;
- hours worked; and
- productivity.

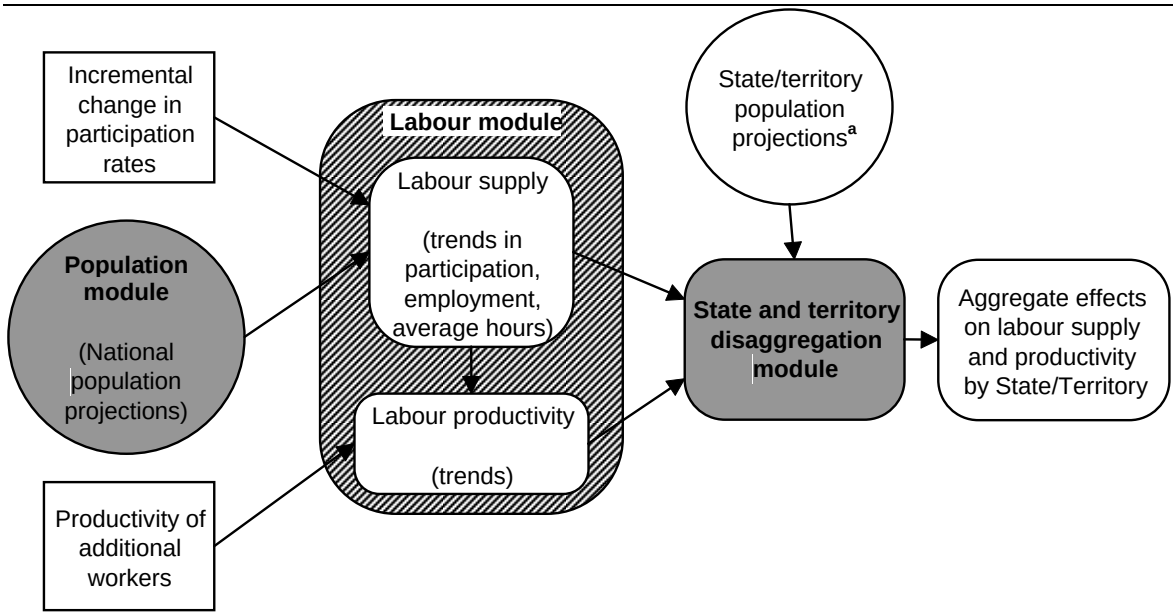
Although technically an annual model, the long maturation periods associated with changes in health status and education and training attainment mean that the projections are only presented for a snapshot year 25 years out — that is, 2030. The results abstract from the timing of any human capital changes to represent potential effects after 25 years.

C.1 Framework overview

The demographic model used here has been adapted from PC (2005f). The demographic model is split into two parts: a demographic projection module and a labour projection module, which consists of labour supply and productivity. For this

study, two further refinements have been made. A third module has been developed to disaggregate the national projections to the State and Territory level (figure C.1).

Figure C.1 **Demographic modelling framework**



a State population projections used were calculated by the ABS for Commission's assessment of the implications of ageing (PC 2005f).

Finally, a number of adjustments have been made to take account of overlaps and spillovers within and between the human capital substreams. Overlaps *within* substreams, such as co-morbidities between chronic diseases, were eliminated as part of the supporting analysis in chapters 11–13. There are also likely to be overlaps *between* substreams, such as interactions between health and education.

Spillovers occur when the potential effects on one age–gender group also leads to potential effects on another group. For example, changes in work incentives aimed at encouraging DSP recipients into the workforce might also allow carers to participate in the workforce or increase the paid hours they choose to work.

Spillovers also occur when changes aimed at improving participation rates have an impact on unemployment rates and productivity of people that were projected to work in the baseline. The potential spillovers for employment and productivity of the baseline workforce have been included. However, due to a lack of information, there is no spillover effect included for average hours.

It is difficult to measure and quantify all of the many complex overlaps and spillovers within the human capital stream. The consolidation in this study eliminates overlaps and includes spillovers where possible. Nevertheless, the overall

effect on workforce participation and productivity might be greater than, equal to or less than the potential effects of the human capital stream presented in this study.

The projected effects of consolidated changes in human capital presented in chapter 14 are based on the case studies and literature reviews reported in chapters 11–13. Preliminary econometric estimation indicates similar effects at the aggregate level (box C.1).

Box C.1 **Complementing the analytical reviews**

The projections in chapter 14 of the potential effects of the human capital stream are based on the case study and literature review approaches found in chapters 11–13. The information available for these chapters to draw on was often limited or speculative. Judgments were made to fill these gaps.

Exploratory work has also been undertaken to help inform these gaps. This includes estimating the effects of potential improvements in health and education on participation and productivity, as well as the potential productivity of additional participants, using an integrated model. This work was used to inform and corroborate some of the judgments made in chapters 11–13.

The aggregate effects of including these estimates in the demographic modelling are very similar to the projections in chapter 14 based on case studies and literature reviews. Both approaches suggest, by 2030, a potential increase in effective labour supply of around 8 per cent.

However there are some differences at a detailed level. The integrated estimation shows a higher contribution from participation, but a smaller contribution from productivity than in the results presented in this report. The age distribution of additional participants is also somewhat different.

The Commission proposes to continue this work through a variety of research projects

C.2 Model structure and assumptions

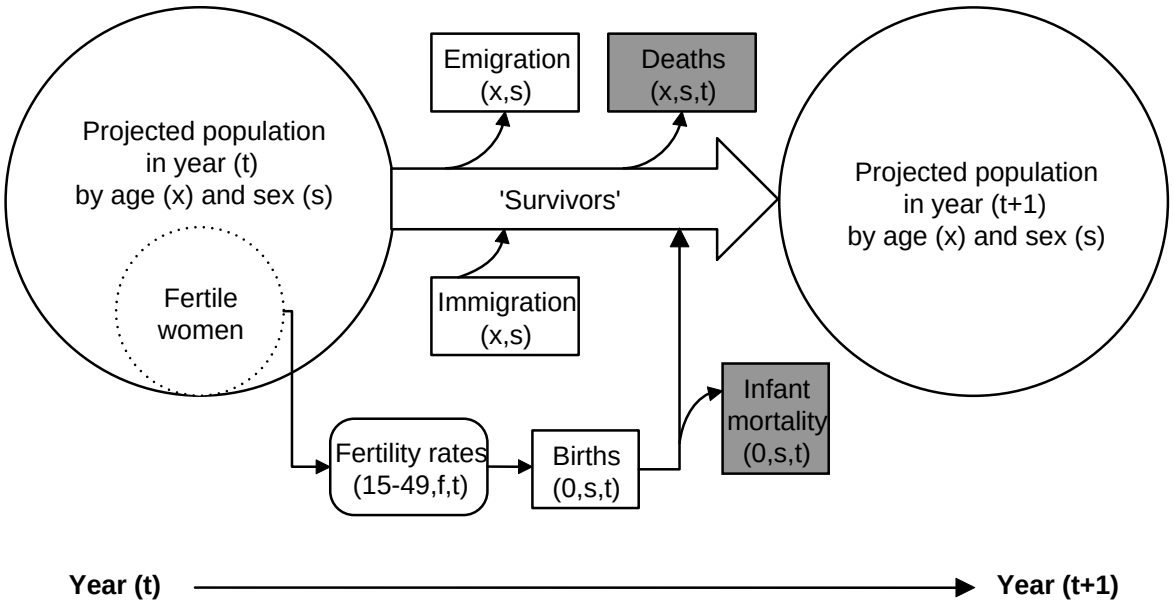
This section outlines the structure of each of the modules in the demographic model and the key assumptions made. More detail on the projection methodology for the demographic and labour supply outcomes is available in technical papers 1 and 3 from PC (2005f).

Population projection module

The population projection module is a cohort-component model. It uses a 'stock–flow' approach to project the Australian population by age–sex groups. Each year,

an age–sex cohort changes size according to inflows and outflows through migration and death, and birth for the group aged 0 (figure C.2). People who do not die or emigrate during the year are referred to as 'survivors'.

Figure C.2 **Population projection module**



The population projection module is used to project differences in national population size and structure after 25 years as a result of achieving improved health outcomes associated with implementation of the NRA. This effect is modelled by comparing the existing baseline with an outer-envelope scenario that combines lower mortality with baseline migration and fertility rates.

In the baseline, fertility is assumed to remain fairly stable over the next 25 years, with the total fertility rate increasing marginally from 1.76 in 2005, stabilising at 1.80 early in the projection period. Net overseas migration is assumed fixed at 115 000 per year throughout the projection period. The age–sex structure of migration is assumed fixed and is based on ABS estimates used in PC (2005f).

Improved health means that mortality rates are projected to decline over time in the baseline, increasing average life expectancy (table C.1)

Table C.1 **Average life expectancy projections, 2005 and 2030**
Years

	2005	*2030*
Male	78.4	82.5
Female	83.6	86.6

Source: PC (2005f, p. 18).

The fertility, migration and mortality parameters for each age–sex group and year determine the projected population size and composition used in the labour module to project labour supply and productivity.

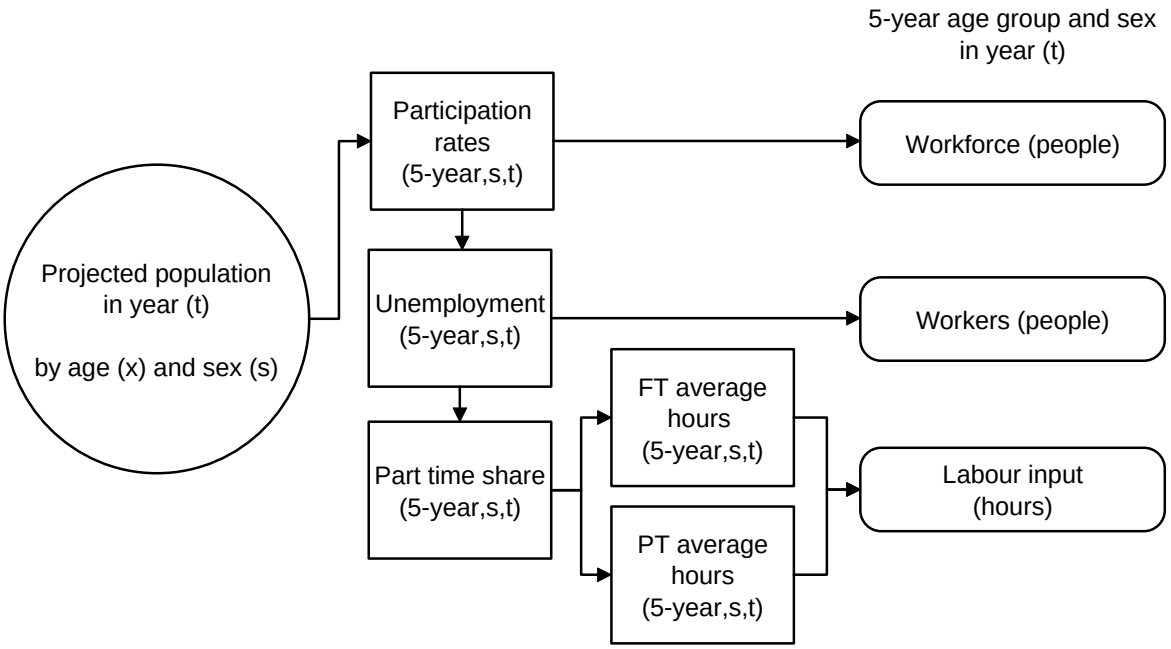
Labour projection module

This module uses population projections for each age–sex group (or cohort) from the demographic module and a variety of parameters to project labour supply and productivity for each 5-year age–sex cohort. Labour supply projections can be used to determine the labour utilisation rate — hours worked per person. The labour module calculates labour supply projections in three stages (figure C.3).

In stage 1, cohort-specific participation rates are applied to population projections to project workforce size and composition. Unemployment rates for each cohort are then used to convert workforce projections into employment projections in stage 2. Stage 3 uses parameters determining average hours per worker (part time share, full time average hours and part time average hours) to convert employment projections into projections of total labour inputs (hours) for each cohort.

The baseline labour supply parameters were estimated using cohort analysis methods and are based on recent trends (PC 2005f, technical paper 3).

Figure C.3 **Labour projection module — labour supply**



Participation rates

In the baseline, men's participation rates are projected to decline for most age groups. Women's participation rates are projected to increase for every age group (table C.2). Although the age-specific participation rates of all females increase, the aggregate female participation rate still falls. This reflects population ageing, which increases the share of females aged 60 and over. The aggregate participation rate is projected to decline from 63.5 per cent in 2005 to 58.8 per cent in 2030.

Table C.2 **Participation rates by age–sex cohort, baseline projections**

	Male		*Female*	
Age	*2005*	*2030*	*2005*	*2030*
Years	%	%	%	%
15–19	59.0	60.5	61.3	64.0
20–24	84.9	84.0	77.1	78.6
25–29	90.9	88.0	73.8	78.6
30–34	92.1	88.0	68.1	74.1
35–39	91.5	86.0	69.0	75.5
40–44	90.2	84.1	74.0	79.3
45–49	88.8	84.0	77.3	83.3
50–54	85.5	82.8	69.2	79.9
55–59	73.9	73.3	51.5	67.5
60–64	51.3	52.4	28.0	43.1
65–69	20.9	29.8	8.2	17.9
70 or more	5.3	8.0	1.5	3.1
Total	71.6	62.8	55.6	54.9

Source: PC (2005f).

Studies of substreams suggest that workforce participation might increase in the outer-envelope scenario. These effects are included as an incremental change to the baseline participation rates in 2030, for each age–sex cohort. These changes are assumed to take effect within the projection period, abstracting from implementation issues.

Unemployment rates

In the baseline, unemployment rates are assumed to fall slightly for most age–sex groups over the next 25 years, driven by increased aggregate demand for labour and a declining supply of people in the working age groups (table C.3). Ageing also results in a larger share of workers in cohorts with below-average unemployment rates. Therefore, the aggregate unemployment rate is projected to fall from 5.8 per cent in 2005 to 4.9 per cent in 2030.

Table C.3 **Unemployment rates by age–sex cohort, baseline projections**

	Male		*Female*	
Age	*2005*	*2030*	*2005*	*2030*
Years	%	%	%	%
15–19	16.3	15.5	15.1	14.2
20–24	9.2	9.2	8.5	7.8
25–29	6.3	5.7	5.8	5.2
30–34	4.2	4.0	5.4	5.0
35–39	4.3	3.4	5.3	4.2
40–44	3.9	3.1	4.9	3.9
45–49	3.8	3.3	4.0	3.7
50–54	3.3	3.3	3.2	2.6
55–59	4.2	3.5	3.5	2.2
60–64	4.0	3.8	1.8	1.6
65–69	1.3	1.6	0.9	1.1
70+	0.4	0.8	0.2	0.5
Total	5.6	5.0	6.0	4.8

Source: PC (2005f).

In the outer-envelope scenario, the aggregate unemployment rate can change for three reasons:

- change in the age–sex structure of the workforce;
- change in the age–sex specific unemployment rates of baseline participants; and
- additional participants fall into population cohorts exhibiting unemployment rates that are different from the average.

The change in the age–sex structure of the workforce is determined by demographic change, as well as participation rate changes. Improvements in health and education suggest that the unemployment rates of baseline participants might fall. In the outer-envelope scenario, this is modelled as changes in unemployment rates by age–sex cohort.

Additional participants aged under 65 are assumed to have 3 per cent lower employment rates, on average, relative to baseline participants.

Hours worked

A trend towards part time work leads to a small decline in projected average hours worked by men in each age group in the baseline. However, average hours worked by women in each age group are projected to remain fairly stable (table C.4).

Table C.4 **Average hours worked by age–sex cohort, baseline projections**

	Male		*Female*	
Age	*2005*	*2030*	*2005*	*2030*
Years	Hours per week	Hours per week	Hours per week	Hours per week
15–19	23.1	22.4	18.2	17.9
20–24	34.0	32.4	29.0	28.3
25–29	38.9	37.6	31.5	32.1
30–34	40.0	39.1	28.4	29.5
35–39	40.8	40.3	27.0	26.8
40–44	40.7	40.0	28.0	27.8
45–49	40.7	40.1	29.3	29.6
50–54	40.4	39.7	29.0	29.8
55–59	39.5	39.6	28.0	28.2
60–64	36.5	35.5	24.0	24.5
65–69	30.7	29.7	20.8	21.2
70+	26.1	24.5	16.4	16.7
Total	38.0	36.8	27.7	27.6

Source: PC (2005f).

In the outer-envelope scenario, additional workers are assumed to be 30 per cent less likely to work full time, and they work 15 per cent fewer hours whether full or part time, relative to those for the baseline workers. These values were used in PC (2005f) as part of a scenario in which participation rates increase to the 80th percentile of those in the OECD (PC 2005f, notes to table 5.3, p. 136).

Productivity

The labour module also uses projections of hours worked by each cohort and productivity parameters to project labour productivity (figure C.4). The effects on productivity of each cohort are aggregated to get an overall projection of labour productivity. This can provide an indication of possible changes in GDP as a result of changes in labour supply and productivity, all else equal.

Productivity change in the baseline consists solely of a positive trend in productivity based on the average trend over the past 30 years. This trend consists of a 1.75 per cent increase in labour productivity each year, or a 54 per cent increase after 25 years. This trend includes multi-factor productivity growth and capital deepening.

Under the outer-envelope scenario, the productivity calculations are implemented in three stages.

- Stage 1 applies the same underlying productivity growth trend from the baseline.

- Stage 2 incorporates a cohort-specific productivity index that accounts for changes in the productivity of baseline workers (table C.5).
- Stage 3 applies a productivity adjustment to hours worked by additional workers. On average, the average hour worked by these people is estimated to be 10 per cent less productive than an hour worked by the average baseline worker.

Figure C.4 **Labour projection module — labour productivity**

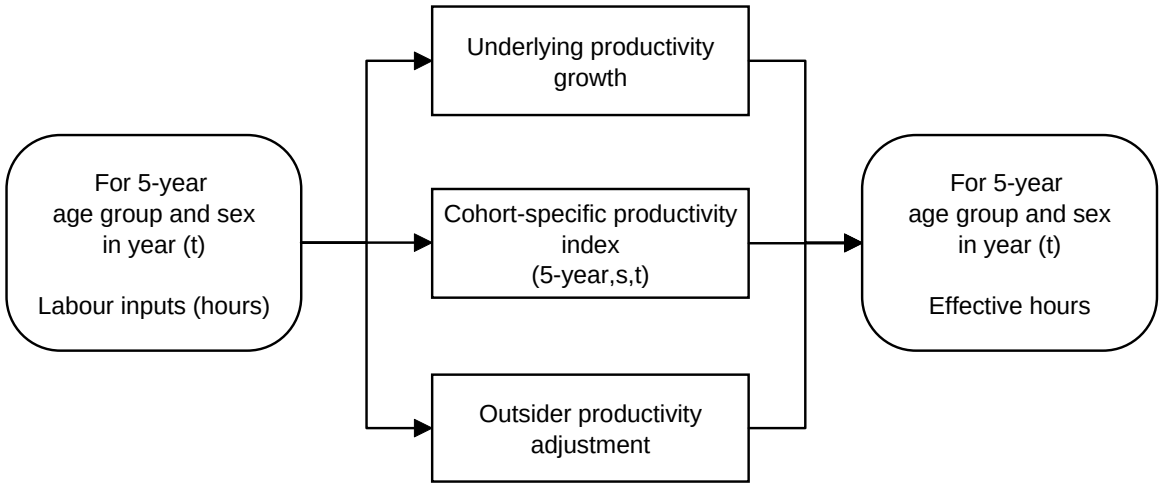


Table C.5 **Consolidated productivity increments from achieving human capital outcome objectives, 2030**

	Labour productivity[a]	
Age	*Male*	*Female*
Years	%	%
15–19	2.8	2.8
20–24	2.1	2.0
25–29	2.6	2.5
30–34	2.6	2.5
35–39	2.1	1.4
40–44	2.1	1.4
45–49	1.4	1.4
50–54	1.4	1.4
55–59	1.8	2.0
60–64	1.8	2.0
65–69	ne	ne
70 or more	ne	ne

ne Not estimated. [a] Output per hour worked.

Source: Productivity Commission estimates.

Table C.6 summarises the assumptions in the outer-envelope scenario about baseline participants and the additional participants.

Table C.6 **Treatment of workforce participants within the demographic model for the outer-envelope scenario**

	Employment rate	*Hours*	*Annual productivity trend (%)*	*Productivity adjustment*
Baseline participants[a]	+	0[b]	1.75	+
Additional participants[a]	–[c]	–[c]	1.75	–[c]

[a] Baseline participants are defined as people who participate in the baseline workforce. Additional participants are people who participate under the outer-envelope scenario only. [b] No effect included. [c] Adjustments are relative to the final levels for baseline participants: employment rate (97 per cent propensity for employment); average hours (70 per cent propensity for full-time work, 85 per cent of average hours); and productivity (90 per cent as productive).

State and Territory disaggregation module

The State and Territory module disaggregates the national projections for labour supply and productivity to the State and Territory level. This is achieved by applying national-level labour supply and productivity parameters for each cohort to the corresponding population in each State and Territory. This method implicitly assumes that individuals from a given cohort have the same labour supply and productivity characteristics regardless of geographical location. Further, differences between States and Territories in the effects of achieving human capital outcome objectives are due solely to differences in their demography.

Projecting population size and structure for the States and Territories is more difficult than for the national level, as patterns of interstate migration must be accounted for. The baseline uses a set of State and Territory population projections that are consistent with those at the national level. These projections were produced by the ABS for the ageing report (PC 2005f) and include the effects of interstate migration.

For the baseline and outer-envelope scenarios, each cohort's national labour supply and productivity parameters are applied to the corresponding State and Territory cohorts. Thus, in this module, labour supply and productivity projections are only affected by demographic characteristics of a State or Territory.

D Modelling the potential impacts of the NRA

To model the effects of NRA reform, some of the direct effects specified in chapters 4 to 9 and 14 need to be respecified in a form more conducive to modelling with MMRF-NRA. This appendix documents these conversions.

Some conversions respecify the direct effects in terms of related variables within the model. This usually involves a change of sign, as the variable in the model is, in level terms, the inverse of the direct effect. For example, the employment rate changes in the enhanced productive potential of base-line workers are modelled as unemployment rate changes by changing the sign on the direct effects. Similarly, the various productivity changes are modelled in terms of the corresponding input-augmenting technical change. As technical change is not strictly the inverse of productivity growth, all productivity shocks are converted to technical change shocks by multiplying them by $x/(100+x)\times 100$ to account for the associated changes in output. A change of sign ensures that, for a productivity improvement, fewer inputs are needed to produce a given level of output.

Other conversions involve respecifying the estimated direct effects in terms of proxy variables in MMRF-NRA. For example, in the energy scenario, the policy scenario considered specifies a potential impact on prices through reduced returns to generators. These direct effects are modelled through a reduction in the cost of capital per unit of output.

As some direct effects are specified in terms of activities that are a component of a broader MMRF-NRA industry, other conversions express the effects in terms of the broader industry. For example, the estimated direct effects for the container ports component of the ports industry are scaled to reflect the presence of bulk ports, which were not modelled, in the sector.

Tables D.1 and D.2 describe the conversions of the direct effects for the competition and regulatory reform and human capital streams, respectively.

Table D.1 **Modelling the direct effects of the NRA competition and regulatory reform streams**

Per cent (unless otherwise specified)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Electricity generation									
Direct effect:	Increase in total factor productivity	3.7	1.3	1.2	0.6	0.6	0.6	0.6	
How modelled:	Decrease in the use of all inputs per unit output[ab] (a1)	-4.16	-1.51	-1.35	-0.68	-0.68	-0.74	-0.67	
Direct effect	Increase in labour and financial services productivity	1.5	1.5	1.5	1.5		1.5		
How modelled:	Decrease in labour per unit output[abcd] (a1lab_o)	-1.5	-1.5	-1.5	-1.5		-1.5		
	Decrease in financial services per unit output[abcd] (a1o)	-1.5	-1.5	-1.5	-1.5		-1.5		
Direct effect	Decrease in the post-tax rate of return on assets	-2.4	-1.8	-2.4	-2.0	-2.0	-1.5	-1.9	
How modelled:	Decrease in the after tax rate of return on capital[d] (d_r1cap) (% points)	-0.43	-0.27	-0.36	-0.38	-0.41	-0.26	-0.19	
Direct effect	Decrease in economic rent	-2.2	-1.4	-2.2	-1.6	-1.6	-1.2	-1.5	
How modelled:	Decrease in the capital per unit output[d] (a1cap)	-2.18	-1.44	-2.20	-1.61	-1.63	-1.23	-1.53	
Electricity supply (transmission, distribution and retail)									
Direct effect:	Increase in total factor productivity in electricity retail	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1
How modelled:	Decrease in the use of all inputs per unit output[be] (a1)	-0.01	-0.05	-0.02	-0.03	-0.02	-0.01	-0.01	-0.02

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Table D.1 (continued)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Direct effect:	Decrease in post-tax rate of return on assets	-8.4	-8.0	-7.9	-8.2	-9.7	-5.5	-10.0	-10.3
How modelled:	Decrease in the after tax rate of return on capital[d] (d_r1cap) (% points)	-0.06	0.00	0.00	-0.10	-0.14	-0.02	0.15	-0.03
Electricity sector gov't administration costs									
Direct effect:	Increase in total factor productivity in government administration	25	25	25	25	25	25	25	-3.8[g]
How modelled:	Decrease in the use of all inputs per unit output[af] (a1)	-0.03	-0.04	-0.02	-0.04	-0.03	-0.03	-0.01	0.05
Gas supply[h]									
Direct effect:	Increase in total factor productivity	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
How modelled:	Decrease in the use of all inputs per unit output[a] (a1)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Direct effect:	Decrease in investment risk	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
How modelled:	Decrease in the after tax rate of return on capital[d] (d_r1cap) (% points)	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18
Gas pipeline transport									
Direct effect:	Decrease in investment risk	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
How modelled:	Decrease in the after tax rate of return on capital[d] (d_r1cap) (% points)	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07

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Table D.1 (continued)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Road and rail freight transport[i]									
Direct effect:	Increase in total factor productivity in road freight transport	5	5	5	5	5	5	5	5
How modelled:	Decrease in the use of all inputs per unit output (a1)	-5	-5	-5	-5	-5	-5	-5	-5
Direct effect:	Increase in total factor productivity in rail freight transport	5	5	5	5	5	5	5	5
How modelled:	Decrease in the use of all inputs per unit output (a1)	-5	-5	-5	-5	-5	-5	-5	-5
Ports and associated infrastructure[j]									
Direct effect:	Increase in total factor productivity in container port services	10	8	9	3	10	8		
How modelled:	Decrease in the use of all inputs per unit output of ports margin[akl] (a1)	-3.4	-2.8	-2.3	-0.9	-1.8	-2.4		
	Decrease in the use of all inputs per unit output of transport services nec[am](a1)	-0.75	-0.58	-0.51	-0.20	-0.35	-0.51		
Direct effect:	Decrease in the rental cost of capital in container port services	-25	-25	-25	-25	-25	-25		
How modelled:	Decrease in the rental cost of capital of ports margin[dl] (d_r1cap) (% points)	-0.14	-0.18	-0.14	-0.11	-0.06	-0.14		

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Table D.1 (continued)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Regulation[n]									
Direct effect:	Increase in business service productivity	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
How modelled:	Decrease in the use of business services per unit output[ao] (a1o)	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Direct effect:	Increase in labour productivity	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
How modelled:	Decrease in the use of labour per unit output[ao] (a1lab_o)	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Direct effect:	Increase in capital productivity	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
How modelled:	Decrease in the use of capital per unit output[ao] (a1cap)	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8

a Scaled to adjust for implied changes in output. **b** Converted from a net to gross basis. **c** Scaled by the share of labour and finance in generation (NSW: 10.3%; Vic: 13.1%; Qld: 8.7%; SA: 11.1%; Tas: 13.3%). **d** Converted using MMRF-NRA database. **e** Scaled to adjust for the share of retail in electricity supply (ranges between 11.4 and 26.25%). **f** Based on actual agency costs. **g** Weighted average of a 25 per cent improvement for the ACT and a 5 per cent decline for the Commonwealth. **h** Gas export volumes set exogenous as reforms only apply to domestic use of gas. **i** Road and rail transport exports set exogenous as reforms do not apply to exports of passenger transport. Iron ore activity set exogenous in WA, SA and Tasmania. **j** Agricultural and mining export volumes set exogenous as bulk ports are considered to be unaffected by reforms. **k** The MMRF-NRA commodity and industry ports covers the margin activity stevedoring and port handling services only. **l** Scaled to reflect the share of container ports in ports margin (NSW: 35.3%; Vic: 35.4%; Qld: 26.7%; SA: 31.8%; WA: 18.8%; Tas: 31.2%). **m** Scaled to reflect the share of non-margin container stevedoring and port handling services in transport services nec (9.1%). **n** Excluding ownership of dwellings. **o** Scaled to reflect the share of labour, capital and business services in GDP (98.6%).

Table D.2 **Modelling the direct effects of the NRA human capital stream**

Per cent (unless otherwise specified)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Health services delivery[b]									
Direct effect:	Increase in total factor productivity	5	5	5	5	5	5	5	5
How modelled:	Decrease in the use of all inputs per unit output[ac] (a1)	-4.65	-4.65	-4.65	-4.65	-4.65	-4.65	-4.65	-4.65
Potential additional workforce participation									
Direct effect:	Increase in the participation rate	8.37	8.41	8.41	8.71	8.36	8.92	7.25	7.81
How modelled:	Increase in the participation rate (r_labsup_wpop)	8.37	8.41	8.41	8.71	8.36	8.92	7.25	7.81
Direct effect:	Decrease in average hours worked	-2.27	-2.29	-2.27	-2.37	-2.27	-2.41	-1.94	-2.11
How modelled:	Increase in ratio of employment (persons) to hour worked (r_x1emp_x1lab)	2.27	2.29	2.27	2.37	2.27	2.41	1.94	2.11
Direct effect:	Decrease in labour productivity	-0.57	-0.57	-0.57	-0.59	-0.57	-0.60	-0.50	-0.53
How modelled:	Increase in the use of labour per unit output[a] (a1lab_o)	0.57	0.57	0.57	0.59	0.57	0.60	0.50	0.53
Direct effect:	Decrease in DSP payments[d]	-27.98	-27.91	-27.92	-28.11	-28.02	-28.11	-27.64	-27.69
How modelled:	Decrease in DSP payments (fgfse_220)	-27.98	-27.91	-27.92	-28.11	-28.02	-28.11	-27.64	-27.69
Direct effect:	Decrease in age pension payments[e]	-0.73	-0.73	-0.73	-0.72	-0.73	-0.73	-0.77	-0.72
How modelled:	Decrease in age pension payments (fgfse_230)	-0.73	-0.73	-0.73	-0.72	-0.73	-0.73	-0.77	-0.72

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Table D.2 (continued)

Definition and coverage (MMRF variable shocked)		*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Enhanced productive potential of baseline workforce									
Direct effect:	Increase in labour productivity	1.89	1.89	1.89	1.87	1.89	1.86	1.97	1.92
How modelled:	Decrease in the use of labour per unit output[a] (a1lab_o)	-1.86	-1.86	-1.86	-1.84	-1.86	-1.83	-1.93	-1.88
Direct effect:	Increase in employment rate	0.62	0.62	0.62	0.62	0.62	0.63	0.57	0.59
How modelled:	Decrease in unemployment rate (d_unro) (% points)	-0.59	-0.59	-0.59	-0.59	-0.59	-0.60	-0.54	-0.56

a Scaled to adjust for implied changes in output. **b** Health export volumes set exogenous. **c** Scaled to reflect the share of human health in health services (ie to exclude veterinary services) (97.6%). **d** Changes in DSP recipients outlined in chapter 13 expressed as a share of DSP recipients in the demographic modelling. **e** Changes in the proportion of people aged 65 and over not in the labour force, from the demographic modelling.

E Detailed results for competition and regulatory reforms

National, regional and sectoral changes

Table E.1 **Estimated potential longer-run macroeconomic effects of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Variable	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
Real GDP	0.05	0.36	0.02	1.31	1.74
Real GNE	0.05	0.28	0.02	0.94	1.28
of which					
Real consumption	0.06	0.33	0.02	1.12	1.53
Real investment	0.04	0.39	0.01	1.21	1.65
Export volumes	0.08	0.70	0.06	2.85	3.70
Import volumes	0.05	0.31	0.02	1.01	1.40
GDP deflator	0.02	0.02	0.00	-0.04	0.00
Terms of trade	0.00	-0.07	0.00	-0.18	-0.26
Real wages	0.12	0.32	0.03	1.19	1.66
Value added (at factor cost)					
Agriculture	-0.04	0.29	0.02	0.38	0.65
Mining	0.13	2.01	0.01	4.10	6.25
Manufacturing	0.09	0.28	0.05	1.54	1.97
Services	0.05	0.29	0.02	1.17	1.53
Employment (persons)					
Agriculture	-0.07	0.35	0.01	-0.46	-0.17
Mining	0.20	2.65	0.00	2.31	5.16
Manufacturing	0.04	0.12	0.02	0.24	0.42
Services	-0.01	-0.09	0.00	-0.06	-0.17

Source: MMRF-NRA estimates.

Table E.2 **Estimated potential longer-run State and Territory effects of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	1.62	1.14	1.97	1.27	3.41	1.40	3.15	0.66
Employment (persons)	-0.09	-0.47	0.20	-0.25	1.39	-0.13	0.53	-0.69
Value added (at factor cost)								
Agriculture	0.59	0.40	0.79	0.57	0.96	1.09	0.85	0.59
Mining	8.09	4.33	6.92	3.30	6.29	4.68	7.57	1.04
Manufacturing	1.80	1.27	2.38	1.57	4.10	2.74	2.47	0.94
Services	1.58	1.06	1.65	1.22	2.80	1.14	1.83	0.66
Employment (persons)								
Agriculture	-0.29	-0.51	0.03	-0.28	0.30	0.30	0.24	-0.28
Mining	6.30	2.58	5.69	2.53	5.23	4.02	5.61	-0.15
Manufacturing	0.31	-0.19	0.79	0.24	2.26	0.98	1.08	-0.28
Services	-0.19	-0.55	-0.04	-0.37	0.93	-0.40	0.09	-0.70
Value added per person employed	1.71	1.61	1.76	1.52	2.03	1.52	2.63	1.35

Source: MMRF-NRA estimates.

Table E.3 **Estimated potential longer-run State and Territory effects of NRA energy[a] reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	0.22	-0.10	0.01	-0.09	0.12	-0.26	-0.08	0.03
Employment (persons)	0.11	-0.12	-0.01	-0.08	0.06	-0.22	-0.09	0.03
Value added (at factor cost)								
Agriculture	-0.01	-0.07	-0.01	-0.05	-0.05	-0.11	-0.06	0.00
Mining	1.14	-0.30	-0.09	0.11	0.18	0.21	-0.14	0.06
Manufacturing	0.18	-0.06	0.15	-0.01	0.32	-0.12	-0.08	0.05
Services	0.23	-0.10	-0.01	-0.12	0.08	-0.33	-0.06	0.02
Employment (persons)								
Agriculture	-0.03	-0.12	-0.02	-0.08	-0.09	-0.15	-0.11	-0.01
Mining	1.05	-0.23	-0.09	0.10	0.24	0.18	0.05	0.04
Manufacturing	0.15	-0.10	0.09	-0.03	0.20	-0.16	-0.13	0.04
Services	0.10	-0.12	-0.02	-0.09	0.03	-0.23	-0.09	0.03
Value added per person employed	0.11	0.02	0.02	-0.01	0.06	-0.04	0.01	0.00

a Electricity and gas.

Source: MMRF-NRA estimates.

Table E.4 **Estimated potential longer-run State and Territory effects of NRA road and rail transport reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	0.21	-0.02	0.74	0.33	0.98	0.63	1.09	0.12
Employment (persons)	-0.13	-0.32	0.28	0.03	0.58	0.30	0.53	-0.07
Value added (at factor cost)								
Agriculture	0.19	0.06	0.39	0.26	0.65	0.66	0.65	0.09
Mining	3.98	0.49	3.71	0.84	1.36	1.16	2.01	0.30
Manufacturing	0.14	-0.17	0.80	0.22	1.12	1.36	1.05	0.12
Services	0.17	-0.01	0.55	0.34	0.91	0.51	0.81	0.11
Employment (persons)								
Agriculture	0.19	0.01	0.48	0.31	0.90	0.79	0.97	0.07
Mining	3.77	0.53	3.88	1.38	2.20	1.94	2.24	0.31
Manufacturing	-0.02	-0.29	0.58	0.14	0.92	1.05	0.95	0.07
Services	-0.19	-0.34	0.11	-0.03	0.35	0.09	0.33	-0.09
Value added per person employed	0.34	0.30	0.46	0.30	0.40	0.33	0.56	0.19

Source: MMRF-NRA estimates.

Table E.5 **Estimated potential longer-run State and Territory effects of NRA ports and associated infrastructure reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	0.07	0.03	0.01	-0.07	-0.03	0.02	-0.03	-0.05
Employment (persons)	0.05	0.00	-0.02	-0.09	-0.05	0.00	-0.04	-0.06
Value added (at factor cost)								
Agriculture	0.04	0.02	0.01	-0.01	0.00	0.02	-0.01	0.00
Mining	0.04	0.04	0.02	-0.01	-0.01	0.06	0.01	0.00
Manufacturing	0.14	0.07	0.03	-0.10	-0.08	0.06	-0.10	-0.09
Services	0.07	0.02	0.00	-0.07	-0.03	0.02	-0.04	-0.05
Employment (persons)								
Agriculture	0.04	0.02	0.00	-0.03	-0.02	0.02	-0.01	-0.01
Mining	0.02	0.03	0.00	-0.02	-0.02	0.05	0.02	0.00
Manufacturing	0.09	0.03	-0.01	-0.12	-0.09	0.02	-0.10	-0.09
Services	0.04	0.00	-0.02	-0.08	-0.05	0.00	-0.04	-0.05
Value added per person employed	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.00

Source: MMRF-NRA estimates.

Table E.6 **Estimated potential longer-run State and Territory effects of NRA reduction in regulatory compliance cost reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	1.12	1.22	1.21	1.11	2.35	1.00	2.18	0.57
Employment (persons)	-0.11	-0.04	-0.05	-0.10	0.80	-0.21	0.13	-0.59
Value added (at factor cost)								
Agriculture	0.37	0.39	0.41	0.36	0.36	0.52	0.26	0.50
Mining	2.93	4.09	3.28	2.37	4.76	3.25	5.70	0.67
Manufacturing	1.34	1.43	1.41	1.46	2.73	1.44	1.61	0.86
Services	1.11	1.15	1.11	1.07	1.84	0.94	1.12	0.57
Employment (persons)								
Agriculture	-0.49	-0.43	-0.43	-0.49	-0.49	-0.36	-0.60	-0.33
Mining	1.46	2.25	1.90	1.08	2.81	1.84	3.30	-0.50
Manufacturing	0.09	0.17	0.12	0.25	1.23	0.08	0.36	-0.30
Services	-0.14	-0.09	-0.11	-0.16	0.60	-0.27	-0.11	-0.59
Value added per person employed	1.23	1.27	1.26	1.21	1.55	1.21	2.05	1.16

Source: MMRF-NRA estimates.

Table E.7 **Estimated potential longer-run industry gross output implications of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Industry	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
Livestock	-0.03	0.08	0.02	0.38	0.45
Crops	-0.05	0.42	0.02	0.32	0.71
Forestry	-0.04	0.97	0.02	0.91	1.86
Fishing	-0.06	0.26	0.02	0.68	0.90
Coal	0.23	4.28	0.02	3.14	7.68
Oil	-0.17	0.94	0.01	6.29	7.06
Gas	-0.09	0.73	0.00	3.48	4.13
Iron ore	-0.18	-0.42	0.00	4.64	4.04
Other metal ores	0.75	2.24	0.02	3.78	6.78
Other mining	0.11	2.58	0.01	3.62	6.32
Food, beverages & tobacco	-0.02	0.13	0.05	0.91	1.07
Textiles, clothing & footwear	-0.04	-0.38	0.02	0.72	0.31
Wood products	-0.03	1.13	0.05	1.27	2.43
Paper products	0.06	0.12	0.15	1.62	1.95
Printing	0.00	-0.12	0.04	0.98	0.90
Petroleum products	0.03	0.18	0.14	2.01	2.36
Chemicals	0.11	0.27	0.12	1.96	2.47
Rubber & plastic products	0.02	0.13	0.03	1.49	1.66
Other non-metal mineral products	0.03	0.59	0.01	1.49	2.11
Cement & lime	0.05	0.50	0.02	1.63	2.20
Iron & steel	0.21	0.62	0.05	1.89	2.77
Other non-ferrous metals	1.04	3.03	0.04	3.96	8.07
Metal products	0.05	0.21	0.04	1.49	1.80
Transport equipment	-0.04	-0.76	0.02	1.54	0.76
Other equipment	0.01	-0.19	0.06	1.58	1.46
Other manufacturing	-0.01	0.11	0.02	1.11	1.23
Electricity generation	1.73	0.30	0.00	1.33	3.35
Electricity supply	0.62	0.39	0.00	1.34	2.35
Gas supply	0.29	0.44	0.02	2.34	3.10
Water & sewerage services	0.05	0.15	0.01	1.17	1.38
Construction services	0.02	0.40	0.02	1.69	2.13
Wholesale trade	0.03	0.18	0.11	1.63	1.96
Retail trade	0.02	0.09	0.03	1.22	1.35
Mechanical repairs	0.03	-0.34	0.01	1.15	0.85
Hotels, cafes & accommodation	0.03	0.08	0.02	1.10	1.24
Road passenger transport	0.00	0.05	0.02	0.62	0.70
Road freight transport	0.00	7.48	0.03	1.32	8.83
Rail passenger transport	0.14	0.11	-0.01	1.25	1.48
Rail freight transport	0.15	6.92	-0.01	2.99	10.06
Pipeline transport	-0.17	0.45	0.02	2.17	2.48
Port services	0.14	n.a.	3.86	2.34	6.35
Transport services nec	0.02	0.12	-0.29	1.52	1.37
Water freight transport	0.09	0.89	0.45	2.47	3.90
Ship charter	-0.14	-1.51	1.60	3.26	3.21
Air passenger transport	0.01	-0.15	0.20	1.43	1.49
Air freight transport	-0.27	-1.45	0.72	2.67	1.68
Communication services	0.02	0.05	0.01	1.11	1.19
Finance	0.00	0.06	0.01	1.44	1.51
Business services	0.02	-0.10	0.01	0.68	0.60
Ownership of dwellings	0.09	0.60	0.04	2.17	2.90
Government administration & defence	0.03	0.01	0.02	0.43	0.49
Education	0.01	-0.05	0.00	0.53	0.48
Health	-0.01	-0.02	0.00	0.35	0.33
Other services	0.02	0.09	0.01	0.83	0.95

Source: MMRF-NRA estimates.

Table E.8 Estimated potential longer-run industry employment implications of NRA competition and regulatory reforms

Percentage change, real government spending assumed fixed

Industry	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
Livestock	-0.06	0.04	0.02	-0.40	-0.40
Crops	-0.08	0.52	0.01	-0.56	-0.11
Forestry	-0.06	0.96	0.01	-0.08	0.84
Fishing	-0.07	0.25	0.00	-0.36	-0.18
Coal	0.19	4.29	-0.01	1.69	6.16
Oil	-0.23	0.95	-0.01	4.68	5.39
Gas	-0.08	0.74	-0.02	1.87	2.52
Iron ore	-0.22	1.00	-0.01	3.20	3.97
Other metal ores	0.72	2.22	0.00	2.44	5.38
Other mining	0.09	2.52	0.00	2.22	4.83
Food, beverages & tobacco	-0.03	0.07	0.01	-0.28	-0.23
Textiles, clothing & footwear	-0.05	-0.39	0.00	-0.38	-0.82
Wood products	-0.04	1.03	0.01	0.06	1.06
Paper products	0.04	0.09	0.07	0.25	0.44
Printing	-0.01	-0.17	0.01	-0.21	-0.39
Petroleum products	0.01	0.10	0.06	0.54	0.71
Chemicals	0.10	0.22	0.06	0.69	1.07
Rubber & plastic products	0.01	0.11	0.01	0.31	0.45
Other non-metal mineral products	0.01	0.55	0.00	0.31	0.87
Cement & lime	0.02	0.45	0.00	0.31	0.78
Iron & steel	0.20	0.58	0.02	0.64	1.44
Other non-ferrous metals	1.01	2.97	0.01	2.54	6.52
Metal products	0.04	0.18	0.01	0.37	0.60
Transport equipment	-0.05	-0.82	0.00	0.28	-0.58
Other equipment	0.01	-0.21	0.04	0.47	0.30
Other manufacturing	-0.02	0.08	0.01	0.00	0.07
Electricity generation	-3.87	0.12	-0.02	-0.05	-3.82
Electricity supply	0.30	0.22	-0.01	0.00	0.51
Gas supply	-1.00	0.32	0.01	0.60	-0.07
Water & sewerage services	0.02	0.05	-0.01	-0.07	-0.01
Construction services	0.02	0.36	0.00	0.54	0.92
Wholesale trade	0.02	0.16	0.03	0.31	0.52
Retail trade	0.01	0.07	0.02	0.05	0.14
Mechanical repairs	0.03	-0.36	0.00	0.15	-0.18
Hotels, cafes & accommodation	0.03	0.04	0.01	0.03	0.12
Road passenger transport	-0.01	0.09	0.00	-0.61	-0.54
Road freight transport	-0.01	-4.18	0.01	0.09	-4.10
Rail passenger transport	0.12	0.10	-0.02	-0.01	0.18
Rail freight transport	0.13	-2.93	-0.02	1.73	-1.08
Pipeline transport	-0.52	0.44	0.02	0.90	0.84
Port services	0.12	n.a.	-3.06	0.81	-2.13
Transport services nec	0.01	0.10	-0.41	-0.01	-0.31
Water freight transport	0.08	0.87	0.05	1.22	2.22
Ship charter	-0.15	-1.53	1.18	2.02	1.51
Air passenger transport	0.00	-0.19	0.06	0.32	0.19
Air freight transport	-0.28	-1.48	0.59	1.56	0.38
Communication services	0.00	-0.01	-0.01	-0.22	-0.24
Finance	-0.01	0.01	0.00	0.35	0.36
Business services	0.00	-0.16	-0.01	-0.29	-0.46
Ownership of dwellings	0.05	0.51	0.03	1.71	2.30
Government administration & defence	-0.02	0.00	0.00	-0.62	-0.65
Education	0.00	-0.06	0.00	-0.33	-0.40
Health	-0.01	-0.02	0.00	-0.51	-0.54
Other services	0.01	0.07	0.01	-0.26	-0.17

Source: MMRF-NRA estimates.

Table E.9 **Estimated potential longer-run regional output implications of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Region	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
New South Wales					
Sydney	0.13	0.10	0.09	1.26	1.58
Hunter	1.00	1.08	0.08	1.53	3.69
Illawarra	0.54	0.62	0.08	1.37	2.62
Richmond-Tweed	0.08	0.17	0.07	0.96	1.28
Mid-North Coast	0.11	0.17	0.07	1.01	1.36
Northern NSW	0.10	0.33	0.06	0.79	1.28
North Western	0.29	0.52	0.06	0.94	1.82
Central West	0.49	0.61	0.07	1.10	2.27
South Eastern	0.73	0.16	0.06	0.95	1.90
Murrumbidgee	0.06	0.30	0.07	0.87	1.30
Murray	0.06	0.22	0.07	0.91	1.26
Far West	0.27	0.61	0.07	1.43	2.38
Victoria					
Melbourne	-0.08	-0.06	0.03	1.42	1.32
Barwon	-0.01	0.13	0.04	1.39	1.56
Western District	-0.01	0.19	0.04	1.07	1.29
Central Highlands	-0.06	0.03	0.04	1.16	1.17
Wimmera	-0.04	0.33	0.03	0.88	1.21
Mallee	-0.07	0.18	0.03	0.88	1.02
Loddon	-0.06	0.02	0.04	1.18	1.18
Goulbourn	-0.07	0.07	0.04	1.02	1.06
Ovens-Murray	-0.06	0.05	0.04	1.08	1.10
East Gippsland	-0.07	0.17	0.04	1.42	1.56
Gippsland	-0.98	0.03	0.04	1.65	0.74
Queensland					
Brisbane	0.07	0.52	0.00	1.24	1.83
Moreton	0.05	0.51	0.00	1.17	1.73
Wide Bay-Burnett	0.01	0.78	0.01	1.20	2.01
Darling Downs	-0.01	0.56	0.01	1.01	1.57
South West	-0.07	0.77	0.01	1.28	1.99
Fitzroy	-0.25	2.67	0.02	2.33	4.77
Central West	-0.05	0.53	0.01	0.80	1.29
Mackay	-0.52	2.91	0.01	2.46	4.85
Northern	0.03	0.86	0.01	1.31	2.21
Far North	0.09	0.50	0.02	1.15	1.77
North West	0.42	1.54	0.04	2.19	4.19
South Australia					
Adelaide	-0.11	0.30	-0.09	1.24	1.34
Outer Adelaide	-0.02	0.38	-0.07	1.09	1.38
Yorke and Lower	-0.31	0.42	-0.04	0.84	0.91
Murray Lands	-0.02	0.38	-0.06	0.96	1.26
South East	-0.03	0.60	-0.06	1.04	1.55
Eyre	-0.07	0.44	-0.04	0.81	1.14
Northern	-0.10	0.83	-0.04	2.00	2.69
Western Australia					
Perth	0.12	1.02	-0.04	2.33	3.42
South West	0.36	1.62	-0.06	3.08	5.00
Great Southern	0.02	0.80	-0.01	1.13	1.93
Wheatbelt	0.00	0.88	0.00	0.88	1.76
Goldfields-Esperance	0.04	1.26	-0.01	1.25	2.54
Mid West	0.45	2.51	-0.02	3.96	6.90
Gascoyne	0.19	1.49	-0.01	3.19	4.84
Pilbara	-0.08	0.54	-0.01	6.21	6.65
Kimberley	0.09	1.06	-0.01	4.20	5.33
Tasmania					
Greater Hobart	-0.08	0.51	0.02	0.98	1.43
Southern.	-0.99	0.59	0.02	1.00	0.63
Northern.	-0.12	0.99	0.03	1.20	2.12
Mersey-Lyell	-0.67	0.79	0.03	1.37	1.52

Source: MMRF-NRA estimates.

Table E.10 **Estimated potential longer-run regional employment implications of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Region	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
New South Wales					
Sydney	0.09	-0.23	0.05	-0.08	-0.17
Hunter	0.30	0.37	0.04	0.03	0.75
Illawarra	0.20	0.09	0.04	-0.02	0.31
Richmond-Tweed	0.06	-0.03	0.04	-0.32	-0.26
Mid-North Coast	0.08	-0.10	0.04	-0.28	-0.26
Northern NSW	0.02	0.04	0.03	-0.39	-0.29
North Western	0.07	0.15	0.03	-0.31	-0.05
Central West	0.13	0.06	0.04	-0.22	0.01
South Eastern	0.20	-0.11	0.03	-0.31	-0.19
Murrumbidgee	0.03	-0.07	0.04	-0.34	-0.35
Murray	0.04	0.04	0.04	-0.30	-0.18
Far West	0.17	0.08	0.04	-0.02	0.27
Victoria					
Melbourne	-0.09	-0.35	0.00	-0.02	-0.45
Barwon	-0.04	-0.27	0.01	0.02	-0.28
Western District	-0.06	-0.08	0.02	-0.15	-0.27
Central Highlands	-0.08	-0.39	0.01	-0.14	-0.60
Wimmera	-0.08	-0.05	0.01	-0.30	-0.42
Mallee	-0.10	-0.04	0.01	-0.30	-0.42
Loddon	-0.09	-0.32	0.01	-0.12	-0.52
Goulbourn	-0.10	-0.19	0.01	-0.21	-0.49
Ovens-Murray	-0.09	-0.19	0.01	-0.20	-0.47
East Gippsland	-0.09	-0.05	0.02	0.04	-0.08
Gippsland	-0.93	-0.17	0.01	-0.05	-1.15
Queensland					
Brisbane	0.04	0.10	-0.02	-0.09	0.02
Moreton	0.03	0.27	-0.02	-0.12	0.15
Wide Bay-Burnett	-0.01	0.30	-0.01	-0.16	0.12
Darling Downs	-0.04	0.22	-0.01	-0.26	-0.09
South West	-0.09	0.21	-0.01	-0.25	-0.13
Fitzroy	-0.24	1.14	-0.01	0.54	1.43
Central West	-0.11	0.01	-0.01	-0.30	-0.41
Mackay	-0.50	1.48	-0.01	0.60	1.57
Northern	-0.04	0.20	-0.01	-0.10	0.06
Far North	0.04	0.18	-0.01	-0.16	0.04
North West	0.24	0.56	0.01	0.47	1.28
South Australia					
Adelaide	-0.08	-0.03	-0.09	-0.08	-0.29
Outer Adelaide	-0.04	0.12	-0.08	-0.16	-0.16
Yorke and Lower	-0.20	0.22	-0.05	-0.34	-0.37
Murray Lands	-0.04	0.17	-0.07	-0.25	-0.19
South East	-0.05	0.42	-0.07	-0.18	0.12
Eyre	-0.08	0.12	-0.05	-0.35	-0.36
Northern	-0.11	0.17	-0.06	0.11	0.11
Western Australia					
Perth	0.04	0.47	-0.06	0.70	1.16
South West	0.22	0.92	-0.06	1.18	2.25
Great Southern	-0.02	0.59	-0.03	-0.06	0.48
Wheatbelt	-0.04	0.63	-0.02	-0.22	0.36
Goldfields-	-0.01	0.62	-0.02	0.03	0.61
Mid West	0.27	1.31	-0.03	1.68	3.22
Gascoyne	0.10	0.87	-0.03	0.77	1.70
Pilbara	-0.08	0.93	-0.03	2.53	3.35
Kimberley	0.00	0.49	-0.03	0.59	1.06
Tasmania					
Greater Hobart	-0.10	0.25	0.00	-0.33	-0.19
Southern.	-0.55	0.48	0.00	-0.28	-0.36
Northern.	-0.13	0.23	0.01	-0.11	-0.01
Mersey-Lyell	-0.41	0.39	0.00	-0.06	-0.07

Source: MMRF-NRA estimates.

Table E.11 **Estimated potential longer-run implications for regional output per person of NRA competition and regulatory reforms**

Percentage change, real government spending assumed fixed

Region	*Energy*	*Road & rail transport*	*Ports & associated infra-structure*	*Reduction in regulatory compliance costs*	*Total*
New South Wales					
Sydney	0.04	0.34	0.04	1.34	1.76
Hunter	0.70	0.71	0.04	1.49	2.94
Illawarra	0.34	0.54	0.04	1.39	2.31
Richmond-Tweed	0.02	0.20	0.03	1.28	1.54
Mid-North Coast	0.03	0.27	0.03	1.28	1.62
Northern NSW	0.07	0.29	0.03	1.18	1.56
North Western	0.22	0.37	0.03	1.25	1.87
Central West	0.36	0.55	0.03	1.32	2.26
South Eastern	0.52	0.27	0.03	1.27	2.10
Murrumbidgee	0.03	0.37	0.03	1.21	1.65
Murray	0.02	0.18	0.03	1.21	1.44
Far West	0.10	0.53	0.03	1.46	2.12
Victoria					
Melbourne	0.02	0.29	0.03	1.43	1.77
Barwon	0.04	0.40	0.03	1.38	1.84
Western District	0.04	0.27	0.02	1.22	1.56
Central Highlands	0.02	0.42	0.03	1.30	1.77
Wimmera	0.04	0.38	0.02	1.18	1.63
Mallee	0.02	0.21	0.02	1.18	1.44
Loddon	0.02	0.34	0.03	1.30	1.70
Goulbourn	0.02	0.26	0.03	1.23	1.54
Ovens-Murray	0.02	0.24	0.03	1.28	1.58
East Gippsland	0.02	0.21	0.03	1.38	1.63
Gippsland	-0.05	0.21	0.03	1.70	1.88
Queensland					
Brisbane	0.03	0.42	0.02	1.34	1.81
Moreton	0.02	0.24	0.02	1.29	1.58
Wide Bay-Burnett	0.02	0.49	0.02	1.36	1.89
Darling Downs	0.03	0.35	0.02	1.27	1.67
South West	0.02	0.55	0.01	1.53	2.12
Fitzroy	-0.01	1.53	0.03	1.79	3.34
Central West	0.06	0.53	0.01	1.10	1.70
Mackay	-0.03	1.43	0.03	1.86	3.28
Northern	0.07	0.66	0.02	1.41	2.16
Far North	0.05	0.33	0.03	1.32	1.73
North West	0.18	0.98	0.03	1.71	2.91
South Australia					
Adelaide	-0.03	0.33	0.00	1.32	1.63
Outer Adelaide	0.02	0.26	0.01	1.25	1.54
Yorke and Lower North	-0.11	0.20	0.01	1.18	1.28
Murray Lands	0.02	0.21	0.01	1.21	1.45
South East	0.02	0.18	0.01	1.22	1.43
Eyre	0.01	0.32	0.01	1.15	1.50
Northern	0.01	0.66	0.02	1.89	2.58
Western Australia					
Perth	0.07	0.55	0.01	1.63	2.26
South West	0.14	0.71	0.01	1.90	2.76
Great Southern	0.04	0.21	0.02	1.19	1.45
Wheatbelt	0.04	0.25	0.02	1.09	1.40
Goldfields-Esperance	0.05	0.64	0.02	1.22	1.93
Mid West	0.18	1.20	0.01	2.28	3.67
Gascoyne	0.09	0.62	0.02	2.42	3.14
Pilbara	0.00	-0.39	0.02	3.67	3.30
Kimberley	0.09	0.57	0.01	3.60	4.27
Tasmania					
Greater Hobart	0.02	0.27	0.02	1.31	1.62
Southern.	-0.44	0.11	0.02	1.29	0.98
Northern.	0.01	0.77	0.03	1.32	2.13
Mersey-Lyell	-0.25	0.39	0.03	1.42	1.59

Source: MMRF-NRA estimates.

Fiscal results

Table E.12 **Estimated potential longer-run government revenue implications of NRA competition and regulatory reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	14	14
Excises and levies	0	208	208
Taxes on international trade	0	69	69
Taxes on gambling	56	0	56
Taxes on insurance	47	0	47
Taxes on use of motor vehicles	68	0	68
Other taxes on goods and services	17	16	33
Payroll taxes	217	5	223
Property taxes	737	0	737
Income taxes on individuals	0	1 968	1 968
Income taxes on enterprises	0	1 000	1 000
Income taxes on non-residents	0	20	20
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	151	58	209
Other	280	57	337
Sub-total	**1 573**	**3 415**	**4 988**
GST receipts	0	506	506
GST-tied grant receipts	506	0	506
GFS revenue	**2 079**	**3 921**	**5 999**

[a] Fixed by assumption.

Source: MMRF-NRA estimates.

Table E.13 **Estimated potential longer-run government expenditure implications of NRA competition and regulatory reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	44	46	90
Unemployment benefits	0	1	1
Disability support pensions	0	-1	-1
Age pensions	0	-7	-7
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	0	0
Grants to private sector	-2	0	-2
Property expenses	-2	0	-2
Subsidy expenses	0	0	0
Capital transfers	0	0	0
Other	0	0	0
Sub-total	**40**	**39**	**79**
GST-tied grant payments	0	506	506
GFS expenditure	**40**	**544**	**585**

Source: MMRF-NRA estimates.

Table E.14 **Estimated potential longer-run government fiscal balance implications of NRA competition and regulatory reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	1 573	3 415	4 988
GST receipts (net of GST-tied payments)	506	0	506
Total operating revenues	2 079	3 415	5 494
Operating expenses (excl. GST-tied grant payments)	40	39	79
Operating balance (*net* government revenue)	**2 039**	**3 376**	**5 415**
Change in net acquisition of non-financial assets	200	9	209
Change in net lending/borrowing balance	1 838	3 368	5 206

Source: MMRF-NRA estimates.

Table E.15 **Estimated potential longer-run government revenue implications of NRA energy reforms[a]**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	0	0
Excises and levies	0	9	9
Taxes on international trade	0	3	3
Taxes on gambling	3	0	3
Taxes on insurance	3	0	3
Taxes on use of motor vehicles	4	0	4
Other taxes on goods and services	1	0	2
Payroll taxes	15	0	16
Property taxes	24	0	24
Income taxes on individuals	0	138	138
Income taxes on enterprises	0	-1	-1
Income taxes on non-residents	0	1	1
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[b]	0[b]	0[b]
Interest received	2	2	4
Other	9	2	11
Sub-total	**62**	**156**	**218**
GST receipts	0	15	15
GST-tied grant receipts	15	0	15
GFS revenue	**77**	**171**	**248**

a Electricity and gas reform. **b** Fixed by assumption.

Source: MMRF-NRA estimates.

Table E.16 **Estimated potential longer-run government expenditure implications of NRA energy reforms[a]**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	58	36	94
Unemployment benefits	0	0	0
Disability support pensions	0	0	0
Age pensions	0	-1	-1
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	1	1
Grants to private sector	2	1	3
Property expenses	1	2	3
Subsidy expenses	0	1	1
Capital transfers	1	1	1
Other	0	0	0
Sub-total	**61**	**41**	**102**
GST-tied grant payments	0	15	15
GFS expenditure	**61**	**56**	**117**

a Electricity and gas reform.

Source: MMRF-NRA estimates.

Table E.17 **Estimated potential longer-run government fiscal balance implications of NRA energy reforms[a]**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	62	156	218
GST receipts (net of GST-tied payments)	15	0	15
Total operating revenues	77	156	233
Operating expenses (excl. GST-tied grant payments)	61	41	102
Operating balance (*net* government revenue)	**16**	**115**	**131**
Change in net acquisition of non-financial assets	7	0	7
Change in net lending/borrowing balance	9	115	124

a Electricity and gas reform.

Source: MMRF-NRA estimates.

Table E.18 **Estimated potential longer-run government revenue implications of NRA road and rail transport reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	3	3
Excises and levies	0	0	0
Taxes on international trade	0	3	3
Taxes on gambling	13	0	13
Taxes on insurance	11	0	11
Taxes on use of motor vehicles	3	0	3
Other taxes on goods and services	5	4	8
Payroll taxes	35	1	36
Property taxes	168	0	168
Income taxes on individuals	0	381	381
Income taxes on enterprises	0	253	253
Income taxes on non-residents	0	4	4
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	44	13	57
Other	65	12	77
Sub-total	**344**	**674**	**1 018**
GST receipts	0	92	92
GST-tied grant receipts	92	0	92
GFS revenue	**435**	**766**	**1 201**

[a] Fixed by assumption.

Source: MMRF-NRA estimates.

Table E.19 Estimated potential longer-run government expenditure implications of NRA road and rail transport reforms

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	211	127	339
Unemployment benefits	0	1	1
Disability support pensions	0	0	0
Age pensions	0	-4	-4
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	1	1
Grants to private sector	1	2	3
Property expenses	0	2	3
Subsidy expenses	0	1	1
Capital transfers	1	1	2
Other	0	0	0
Sub-total	**214**	**133**	**347**
GST-tied grant payments	0	92	92
GFS expenditure	**214**	**224**	**438**

Source: MMRF-NRA estimates.

Table E.20 Estimated potential longer-run government fiscal balance implications of NRA road and rail transport reforms

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	344	674	1 018
GST receipts (net of GST-tied payments)	92	0	92
Total operating revenues	435	674	1 110
Operating expenses (excl. GST-tied grant payments)	214	133	347
Operating balance (*net* government revenue)	**221**	**541**	**763**
Change in net acquisition of non-financial assets	50	2	52
Change in net lending/borrowing balance	171	540	711

Source: MMRF-NRA estimates.

Table E.21 **Estimated potential longer-run government revenue implications of NRA ports and associated infrastructure reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	0	0
Excises and levies	0	5	5
Taxes on international trade	0	1	1
Taxes on gambling	1	0	1
Taxes on insurance	1	0	1
Taxes on use of motor vehicles	1	0	1
Other taxes on goods and services	0	0	0
Payroll taxes	5	0	5
Property taxes	9	0	9
Income taxes on individuals	0	38	38
Income taxes on enterprises	0	7	7
Income taxes on non-residents	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	1	1	2
Other	4	1	4
Sub-total	**22**	**55**	**76**
GST receipts	0	6	6
GST-tied grant receipts	6	0	6
GFS revenue	**27**	**60**	**88**

a Fixed by assumption.

Source: MMRF-NRA estimates.

Table E.22 **Estimated potential longer-run government expenditure implications of NRA ports and associated infrastructure reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	10	5	15
Unemployment benefits	0	0	0
Disability support pensions	0	0	0
Age pensions	0	0	0
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	0	0
Grants to private sector	0	0	0
Property expenses	0	0	0
Subsidy expenses	0	0	0
Capital transfers	0	0	0
Other	0	0	0
Sub-total	**11**	**5**	**16**
GST-tied grant payments	0	6	6
GFS expenditure	**11**	**11**	**22**

Source: MMRF-NRA estimates.

Table E.23 **Estimated potential longer-run government fiscal balance implications of NRA ports and associated infrastructure reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	22	55	76
GST receipts (net of GST-tied payments)	6	0	6
Total operating revenues	27	55	82
Operating expenses (excl. GST-tied grant payments)	11	5	16
Operating balance (*net* government revenue)	**16**	**50**	**66**
Change in net acquisition of non-financial assets	3	0	3
Change in net lending/borrowing balance	14	49	63

Source: MMRF-NRA estimates.

Table E.24 **Estimated potential longer-run government revenue implications of NRA reduction in regulatory compliance cost reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	10	10
Excises and levies	0	194	194
Taxes on international trade	0	62	62
Taxes on gambling	40	0	40
Taxes on insurance	32	0	32
Taxes on use of motor vehicles	60	0	60
Other taxes on goods and services	11	12	23
Payroll taxes	161	4	165
Property taxes	535	0	535
Income taxes on individuals	0	1 411	1 411
Income taxes on enterprises	0	740	740
Income taxes on non-residents	0	15	15
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	103	42	145
Other	202	41	244
Sub-total	**1 145**	**2 530**	**3 675**
GST receipts	0	394	394
GST-tied grant receipts	394	0	394
GFS revenue	**1 539**	**2 923**	**4 462**

a Fixed by assumption.

Source: MMRF-NRA estimates.

Table E.25 Estimated potential longer-run government expenditure implications of NRA reduction in regulatory compliance cost reforms

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	-235	-123	-358
Unemployment benefits	0	0	0
Disability support pensions	0	-1	-1
Age pensions	0	-2	-2
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	-2	-2
Grants to private sector	-5	-3	-9
Property expenses	-4	-5	-8
Subsidy expenses	0	-3	-3
Capital transfers	-1	-2	-3
Other	-1	0	-1
Sub-total	**-246**	**-140**	**-386**
GST-tied grant payments	0	394	394
GFS expenditure	**-246**	**254**	**7**

Source: MMRF-NRA estimates.

Table E.26 Estimated potential longer-run government fiscal balance implications of NRA reduction in regulatory compliance cost reforms

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	1 145	2 530	3 675
GST receipts (net of GST-tied payments)	394	0	394
Total operating revenues	1 539	2 530	4 069
Operating expenses (excl. GST-tied grant payments)	-246	-140	-386
Operating balance (*net* government revenue)	**1 785**	**2 670**	**4 455**
Change in net acquisition of non-financial assets	140	6	147
Change in net lending/borrowing balance	1 645	2 664	4 308

Source: MMRF-NRA estimates.

F Detailed results for health services delivery reforms

National, regional and sectoral changes

Table F.1 **Estimated potential longer-run macroeconomic and sectoral effects of NRA health service delivery reforms**

Percentage change, real government spending assumed fixed

Variable	
Real GDP	0.42
Real GNE	0.14
of which	
Real consumption	0.15
Real investment	0.24
Export volumes	1.61
Import volumes	0.25
GDP deflator	-0.20
Terms of trade	-0.13
Real wages	-0.02
Value added (at factor cost)	
Agriculture	0.03
Mining	1.24
Manufacturing	0.45
Services	0.40
Employment (persons)	
Agriculture	-0.01
Mining	1.19
Manufacturing	0.38
Services	-0.09

Source: MMRF-NRA estimates.

Table F.2 **Estimated potential longer-run State and Territory effects of NRA health service delivery reforms**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	0.26	0.47	0.46	0.22	0.78	0.23	0.75	0.51
Employment (persons)	-0.09	0.09	-0.04	-0.19	0.33	-0.22	0.07	0.12
Value added (at factor cost)								
Agriculture	-0.02	0.06	0.09	-0.02	0.01	0.07	0.01	0.22
Mining	0.51	1.08	1.17	0.42	1.51	1.12	1.78	0.13
Manufacturing	0.27	0.52	0.48	0.29	0.87	0.30	0.57	0.57
Services	0.28	0.48	0.46	0.24	0.66	0.23	0.47	0.54
Employment (persons)								
Agriculture	-0.08	0.04	0.09	-0.09	-0.04	0.04	-0.01	0.27
Mining	0.39	1.11	1.14	0.50	1.48	1.05	1.73	0.08
Manufacturing	0.22	0.47	0.41	0.25	0.73	0.20	0.52	0.57
Services	-0.14	0.01	-0.17	-0.31	0.18	-0.34	-0.09	0.12
Value added per person employed	0.36	0.37	0.50	0.41	0.45	0.45	0.67	0.40

Source: MMRF-NRA estimates.

Fiscal results

Table F.3 **Estimated potential longer-run government revenue implications of NRA health service delivery reforms**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	6	6
Excises and levies	0	106	106
Taxes on international trade	0	29	29
Taxes on gambling	11	0	11
Taxes on insurance	6	0	6
Taxes on use of motor vehicles	31	0	31
Other taxes on goods and services	2	7	9
Payroll taxes	39	0	39
Property taxes	125	0	125
Income taxes on individuals	0	-18	-18
Income taxes on enterprises	0	277	277
Income taxes on non-residents	0	3	3
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	16	7	23
Other	37	7	45
Sub-total	**267**	**424**	**692**
GST receipts	0	130	130
GST-tied grant receipts	130	0	130
GFS revenue	**397**	**554**	**951**

a Fixed by assumption.

Source: MMRF-NRA estimates.

Table F.4 **Estimated potential longer-run government expenditure implications of NRA health service delivery reforms**

$ million (2005-06), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	-2 210	-898	-3 108
Unemployment benefits	0	0	0
Disability support pensions	0	-1	-1
Age pensions	0	-2	-2
Other personal benefit payments	0	0	0
Grants to local governments	0	-1	-1
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	-11	-11
Grants to private sector	-28	-16	-44
Property expenses	-19	-23	-42
Subsidy expenses	-3	-14	-17
Capital transfers	-5	-9	-14
Other	-3	0	-3
Sub-total	**-2 268**	**-975**	**-3 243**
GST-tied grant payments	0	130	130
GFS expenditure	**-2 268**	**-845**	**-3 113**

Source: MMRF-NRA estimates.

Table F.5 **Estimated potential longer-run government fiscal balance implications of NRA health service delivery reforms**

$ million (2005-06), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	267	424	692
GST receipts (net of GST-tied payments)	130	0	130
Total operating revenues	397	424	821
Operating expenses (excl. GST-tied grant payments)	-2 268	-975	-3 243
Operating balance (*net* government revenue)	**2 665**	**1 399**	**4 064**
Change in net acquisition of non-financial assets	25	1	26
Change in net lending/borrowing balance	2 640	1 398	4 038

Source: MMRF-NRA estimates.

G Detailed results for workforce participation and productivity reforms

National, regional and sectoral changes

Table G.1 **Estimated potential longer-run macroeconomic and sectoral effects of NRA workforce participation and productivity reforms**

Percentage change, real government spending assumed fixed

Variable	*Potential additional participants*	*Enhanced productive potential of baseline workers*
Real GDP	6.07	2.72
Real GNE	4.34	1.97
of which		
Real consumption	4.79	2.18
Real investment	6.72	3.02
Export volumes	13.86	6.11
Import volumes	5.35	2.40
GDP deflator	-0.32	-0.14
Terms of trade	-0.90	-0.40
Real wages	-1.53	1.43
Employment (persons)	8.41	0.63
Value added (at factor cost)		
Agriculture	2.73	1.21
Mining	11.52	5.10
Manufacturing	7.40	3.29
Services	5.82	2.62
Employment (persons)		
Agriculture	6.96	-0.03
Mining	14.57	3.34
Manufacturing	10.00	1.32
Services	8.07	0.49

Source: MMRF-NRA estimates.

Table G.2 **Estimated potential longer-run State and Territory effects of NRA human capital reforms — potential additional participants**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	5.89	6.30	5.40	5.29	8.16	4.71	6.01	3.54
Employment (persons)	8.33	8.79	7.77	8.00	10.12	7.36	6.79	5.75
Value added (at factor cost)								
Agriculture	2.67	2.98	2.95	2.49	2.23	3.85	2.01	3.13
Mining	10.21	10.65	10.32	7.68	13.01	12.23	12.34	6.22
Manufacturing	6.97	7.49	6.53	7.07	10.16	6.87	6.54	4.92
Services	5.92	6.19	5.14	5.21	7.16	4.38	4.11	3.57
Employment (persons)								
Agriculture	6.81	7.36	7.16	6.75	6.33	7.85	5.82	7.27
Mining	12.77	13.90	13.28	11.73	16.12	14.98	15.36	8.74
Manufacturing	9.71	10.23	9.07	10.03	12.19	9.35	8.77	7.62
Services	8.15	8.50	7.42	7.59	9.40	6.88	6.00	5.73
Value added per person employed	-2.44	-2.49	-2.37	-2.71	-1.95	-2.65	-0.77	-2.21

Source: MMRF-NRA estimates.

Table G.3 **Estimated potential longer-run State and Territory effects of NRA human capital reforms — enhanced productive potential of baseline workers**

Percentage change, real government spending assumed fixed

Variable	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Real GSP	2.66	2.83	2.42	2.36	3.61	2.10	2.72	1.61
Employment (persons)	0.61	0.80	0.35	0.40	1.37	0.11	0.04	-0.48
Value added (at factor cost)								
Agriculture	1.19	1.33	1.31	1.09	0.99	1.70	0.92	1.40
Mining	4.51	4.72	4.55	3.38	5.74	5.34	5.62	2.81
Manufacturing	3.11	3.34	2.91	3.11	4.48	3.02	2.98	2.22
Services	2.68	2.79	2.31	2.33	3.18	1.96	1.86	1.63
Employment (persons)								
Agriculture	-0.09	0.15	0.07	-0.17	-0.31	0.31	-0.38	0.20
Mining	2.53	3.04	2.75	2.01	4.01	3.40	3.95	0.87
Manufacturing	1.21	1.43	0.92	1.27	2.28	0.95	0.96	0.37
Services	0.54	0.68	0.20	0.23	1.05	-0.09	-0.32	-0.48
Value added per person employed	2.04	2.03	2.07	1.96	2.25	2.00	2.68	2.09

Source: MMRF-NRA estimates.

Fiscal results

Table G.4 **Estimated potential longer-run government revenue implications of NRA human capital reforms — potential additional participants**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	58	58
Excises and levies	0	1 080	1 080
Taxes on international trade	0	338	338
Taxes on gambling	178	0	178
Taxes on insurance	166	0	166
Taxes on use of motor vehicles	335	0	335
Other taxes on goods and services	61	69	130
Payroll taxes	643	14	657
Property taxes	2 395	0	2 395
Income taxes on individuals	0	5 426	5 426
Income taxes on enterprises	0	3 914	3 914
Income taxes on non-residents	0	66	66
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	454	191	646
Other	902	187	1 089
Sub-total	**5 135**	**11 345**	**16 480**
GST receipts	0	1 840	1 840
GST-tied grant receipts	1 840	0	1 840
GFS revenue	**6 975**	**13 185**	**20 160**

[a] Fixed by assumption.

Source: MMRF-NRA estimates.

Table G.5 **Estimated potential longer-run government expenditure implications of NRA human capital reforms — potential additional participants**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	-2 031	-1 053	-3 085
Unemployment benefits	0	515	515
Disability support pensions	0	-2 322	-2 322
Age pensions	0	-160	-160
Other personal benefit payments	0	0	0
Grants to local governments	0	-1	-1
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	-18	-18
Grants to private sector	-43	-26	-70
Property expenses	-27	-38	-65
Subsidy expenses	-4	-22	-26
Capital transfers	-8	-15	-22
Other	-5	0	-5
Sub-total	**-2 118**	**-3 142**	**-5 260**
GST-tied grant payments	0	1 840	1 840
GFS expenditure	**-2 118**	**-1 301**	**-3 419**

Source: MMRF-NRA estimates.

Table G.6 **Estimated potential longer-run government fiscal balance implications of NRA human capital reforms — potential additional participants**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	5 135	11 345	16 480
GST receipts (net of GST-tied payments)	1 840	0	1 840
Total operating revenues	6 975	11 345	18 320
Operating expenses (excl. GST-tied grant payments)	-2 118	-3 142	-5 260
Operating balance (*net* government revenue)	**9 093**	**14 487**	**23 580**
Change in net acquisition of non-financial assets	625	28	653
Change in net lending/borrowing balance	8 468	14 459	22 927

Source: MMRF-NRA estimates.

Table G.7 **Estimated potential longer-run government revenue implications of NRA human capital reforms — enhanced productive potential of baseline workers**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
General taxes on goods and services	0	26	26
Excises and levies	0	486	486
Taxes on international trade	0	151	151
Taxes on gambling	81	0	81
Taxes on insurance	75	0	75
Taxes on use of motor vehicles	151	0	151
Other taxes on goods and services	27	31	58
Payroll taxes	288	6	294
Property taxes	1 087	0	1 087
Income taxes on individuals	0	2 432	2 432
Income taxes on enterprises	0	1 756	1 756
Income taxes on non-residents	0	30	30
Non-GST current Cwlth grants to states	0	0	0
Sales of goods and services	0[a]	0[a]	0[a]
Interest received	204	86	290
Other	404	84	489
Sub-total	**2 318**	**5 089**	**7 407**
GST receipts	0	834	834
GST-tied grant receipts	834	0	834
GFS revenue	**3 152**	**5 923**	**9 075**

[a] Fixed by assumption.

Source: MMRF-NRA estimates.

Table G.8 **Estimated potential longer-run government expenditure implications of NRA human capital reforms — enhanced productive potential of baseline workers**

$ million (2005-06 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating expenses	-908	-472	-1 380
Unemployment benefits	0	-535	-535
Disability support pensions	0	-1	-1
Age pensions	0	0	0
Other personal benefit payments	0	0	0
Grants to local governments	0	0	0
Non-GST current Cwlth grants to states	0	0	0
Grants to universities	0	-8	-8
Grants to private sector	-19	-12	-31
Property expenses	-12	-17	-29
Subsidy expenses	-2	-10	-12
Capital transfers	-3	-7	-10
Other	-2	0	-2
Sub-total	**-947**	**-1 061**	**-2 008**
GST-tied grant payments	0	834	834
GFS expenditure	**-947**	**-227**	**-1 174**

Source: MMRF-NRA estimates.

Table G.9 **Estimated potential longer-run government fiscal balance implications of NRA human capital reforms — enhanced productive potential of baseline workers**

$ million (2004-05 dollars), real government spending assumed fixed

Item	*States, Territories & local govt*	*Common-wealth*	*Total*
Operating revenue (excl. GST receipts)	2 318	5 089	7 407
GST receipts (net of GST-tied payments)	834	0	834
Total operating revenues	3 152	5 089	8 241
Operating expenses (excl. GST-tied grant payments)	-947	-1 061	-2 008
Operating balance (*net* government revenue)	**4 099**	**6 150**	**10 249**
Change in net acquisition of non-financial assets	280	13	293
Change in net lending/borrowing balance	3 818	6 138	9 956

Source: MMRF-NRA estimates.

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