PRODUCTIVITY COMMISSION

Impact of Competition Policy Reforms on Rural and Regional Australia

Supplement to Inquiry Report

Modelling the Regional Impacts of National Competition Policy Reforms

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Contents

TABLES

Abbreviations and explanations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACA	Australian Communications Authority
ACCC	Australian Competition and Consumer Commission
ACT	Australian Capital Territory
ACTEW	ACT Electricity and Water
ADC	Australian Dairy Corporation
AN-NRC	Australian National-National Rail Corporation
ANZSIC	Australian and New Zealand Standard Industrial Classification
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASGC	Australian Standard Geographical Classification
ASIC	Australian Standard Industrial Classification
BIE	Bureau of Industry Economics
BNSF	Burlington Northern and Santa Fe Railway Company
BTR	Bureau of Tourism Research
CoAG	Council of Australian Government
CN	Canadian National
CoPS	Centre of Policy Studies, Monash University
CPI	Consumer Price Index
CSO	Community service obligation
DEA	Data envelopment analysis
ESAA	Electricity Supply Association of Australia
ETSA	Electricity Trust of South Australia
FIFO	Fly-in-fly-out

fob	Free-on-board
GATT	General Agreement on Tariffs and Trade
GBE	Government business enterprise
GDP	Gross domestic product
GNE	Gross national expenditure
GWh	Gigawatt hours
IC	Industry Commission
IDD	International direct dialling
IOCC	Input-Output Commodity Classification
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
KCS	Kansas City Southern Corporation
KSM	Knopke, Strappazzon and Mullen
MCRT	Ministerial Council for Road Transport
MENSA	Multiple Energy Systems of Australia (ABARE model)
MFP	Multifactor productivity
MRES	MONASH Regional Equation System
MRTC	Ministerial Council for Road Transport
NCC	National Competition Council
NCP	National Competition Policy
NECA	National Electricity Code Administrator Limited
NEMMCO	National Electricity Market Management Company
NRTC	National Road Transport Commission
NSW	New South Wales
na	Not available
NT	Northern Territory
OECD	Organisation for Economic Cooperation and Development
PC	Productivity Commission
PTC	Public Transport Corporation
PMV	Passenger motor vehicles
QR	Queensland Rail

SA	South Australia
SCNPMGTE	Steering Committee on National Performance Monitoring of Government Trading Enterprises
SMA	Statutory marketing authority
SMHEA	Snowy Mountains Hydro-Electric Authority
SPF	Stochastic production function
SRA	State Rail Authority
STD	Subscriber trunk dialling
TCF	Textile, clothing and footwear
TFP	Total factor productivity
Vic	Victoria
WA	Western Australia
WSAA	Water Supply Association of Australia

1 Overview

1.1 Introduction

The terms of reference for the inquiry into the impact of competition policy on rural and regional Australia asked the Commission, among other things, to report on the:

- effects of competition policy reforms on the structure and competitiveness of rural and regional Australia; and

- other influences on rural and regional Australia, including international trade, investment and globalisation.

To assist in addressing these issues, the Commission has undertaken a quantitative analysis of the effects of major National Competition Policy (NCP) reforms and selected national economic forces — first examining their effects on the national economy, and then disaggregating the effects through to rural and regional Australia. This allows some indication of the likely contribution of each to ongoing changes at the regional level.

Model framework

In order to quantify the effects of NCP reforms and national economic forces on regions, the Commission has used MONASH-RR, a version of the MONASH model. This is one of the few models available that has the detailed commodity and industry structure appropriate to analysing the effects of NCP reforms, and is the only model that goes beyond the State level to provide detailed regional results. It can provide results down to 57 'statistical divisions' (see box 1.1).

These regional areas are defined in more detail in appendix A. Eleven are metropolitan — eight contain a State or Territory capital and three (Hunter, Illawarra and Barwon) are centred on Newcastle, Wollongong and Geelong, respectively. The remaining regions fall within the Commission's definition of rural and regional Australia.

Box 1.1   **The regional disaggregation facility of the MONASH model**

The regional facility of MONASH adopts a 'tops down' approach to regional analysis. Under this approach, national results are generated for each industry. These results are then subdivided into State effects (based on the industry mix of each State's activity), and then further subdivided to give impacts at the statistical division level (again based on the industry mix of each statistical division's activity).

In projecting national results to the regional level, a distinction is made between *national* industries and *local* industries. National industries are those producing commodities that are highly tradable on inter-regional markets (eg most agricultural, mining, and manufacturing commodities). Conversely, local industries are those producing commodities that are predominantly traded in either State or regional markets (eg many services and perishable commodities) and whose fortunes are tied largely to general activity levels in the State or region.

The presence of local industries whose fortunes are tied to State activity introduces State multiplier effects. If a State has a concentration of fast-growing national industries, then the effect on its overall State growth is multiplied through fast growth of associated local industries. Similarly, the presence of local industries whose fortunes are tied to regional activity introduces multipliers at the regional level.

The regional classification is based on the statistical division classification of the Australian Standard Geographical Classification (ASGC, ABS Cat. no. 1216.0), in which a statistical division is defined to be

> a relatively homogeneous region characterised by identifiable social and economic links between inhabitants and between the economic units within the region, under the unifying influence of one or more major towns or cities. (ABS 1995, p. 18)

Thus, even the rural and regional 'regions' in the model contain a major urban conurbation. As such, most contain a substantial mix of primary and ancillary service activities. For example, some may contain a number of different types of agricultural activity as well as mining and manufacturing.

The effects of NCP on any one region would depend on the activity mix of the region and the implications for each activity of the implementation of NCP. The MONASH model disaggregation facility captures these effects. Through its input-output linkages, the facility also captures the effects of changes in the demand for and supply of goods in one region on all other regions. Nevertheless, there would be less regional variation in the estimated impact of NCP, based on these relatively well-diversified statistical divisions, than there would be on smaller and more highly specialised regions.

The model can produce estimates of the impact of NCP on *gross regional product*, a measure of the income generated within a region, and often used as a measure of

output or activity. It can also produce estimates of the impact of NCP on regional *employment*. In this exercise, they are long-run snapshot estimates, at some point in time in the future, showing how gross regional product or employment would differ from what they otherwise would be, had the modelled NCP reforms not occurred. The model has not been used to generate year-by-year projections, though in principle it could do so. An 'ideal' treatment of NCP reforms, and the historical economic factors driving rural and regional Australia, is outlined in box 1.2. This indicates some of the limitations of the current exercise.

NCP reforms are expected to improve the efficiency of the economy, by moving resources to more productive uses. As a result, regional incomes, either in total or on a per worker basis, are expected to improve in most if not all regions. However, reaping these rewards may entail a relocation of jobs between regions. The model's estimates are made on the presumption that workers are fully regionally mobile in the longer run. In reality, while job relocation would offer significant benefits to many in terms of higher incomes, it could pose adjustment problems for others. Farmers may wish to forgo higher incomes in order to pursue a rural way of life. Older workers may not wish to move. And in declining regions, mobility may be inhibited by depressed real estate prices or the inability to find a house buyer.

In the analysis to follow, gross regional product, either in total or on a per worker basis, is used to indicate the potential regional income gains from NCP reforms. Estimated employment changes are used to indicate possible adjustment problems. In particular, instances are identified where employment is projected to be lower than otherwise as a result of NCP reforms in regions already experiencing actual employment declines. However, it needs to be stressed that the adjustment problems are potential, and could be transitory. The income gains would be permanent.

Changes in regional employment in the model are based on 'place of employment' information as recorded in the Australian census of population and housing. According to place of employment definitions, as far as practicable, employees are classified according to the locality of employment. For many people, the statistical division of employment would coincide with the division of residence. For those working according to fly-in, fly-out (FIFO) and other remote working arrangements, the division of employment, the subject of modelling using MONASH, may not coincide with the division of residence. This is one qualification on the results.

> **Box 1.2   Ideal modelling of NCP reforms**
>
> The ideal modelling exercise would start with a 'bottoms up' regional model, able to handle some of the regional variation in NCP reforms. To date, 'bottoms up' regional models suffer from a lack of suitable regional and industry detail. For example, MONASH-MRF covers only eight States and 12 sectors (Peter et al. 1996). Models such as FEDERAL include more industry detail, but at the cost of restricting the analysis to two regions (eg Giesecke, Madden and Pant 1998).
>
> The ideal 'bottoms up' regional model would also have the capacity to make year-by-year projections of the impact of NCP reforms around an explicit underlying base case. Currently, there are two problems with developing such a facility.
>
> - The base case for such projections is typically developed from an historical tracking exercise. While the MONASH model has been used successfully to track economic history at the national level, it has not yet been used to track regional history. A full regional validation exercise is proposed over the next two years.
>
> - Developing a year-by-year picture of the impact of NCP reforms requires a clear idea about the timing of the implementation of the reforms. No such clear implementation timetable exists.
>
> Finally, to elaborate on adjustment costs, the model would require a plausible story about the dynamics of capital and labour mobility — between regions as well as between industries (and occupations, in the case of labour). Work has begun on developing a more formal adjustment cost index, measuring adjustment costs along the designated adjustment path in MONASH, but is still far from complete.

Another important qualification is that, while the model captures the current distribution of economic activity and makes its regional output and employment projections based on this information, the model does not fully capture economic geography. To do so, it would need to capture the balance between:

- factors such as transport costs that lead to dispersion in the location of production activities, typically towards either markets or significant input sources; and

- factors such as economies of scale, scope or agglomeration that may make it economic to concentrate production in a particular plant or geographic location.

While the model contains a well-articulated story of transport costs, it does not contain economies of any form that would encourage geographic concentration. This makes the model less well suited to modelling certain types of NCP reforms, as will be noted shortly.

Neither does the model handle the introduction of new goods and services. This is particularly relevant for telecommunications reform, one of the NCP reforms

considered. The model projects the impact of reforms to basic telecommunications services. It does not model the impact of the extension of new technologies such as satellite and the internet, even though the economies of such alternative technologies would be affected indirectly by basic telecommunications reform.

A final important qualification is that the 'tops down' nature of the model, which makes it well suited to capturing the regional implications of national reforms, but less suited to capturing all of the regional implications of reforms that themselves have a regional dimension. The nature of these limitations is spelt out below.

NCP reforms

The NCP reforms examined here are those of most relevance to rural and regional Australia. They include reforms of major infrastructure — electricity and gas, telecommunications, road, rail and water — and reviews of Commonwealth and State statutory marketing arrangements (SMAs). These reforms are summarised in table 1.1.

Competitive neutrality is also of concern to rural and regional Australia. There are two aspects. One is its impact on the operations of State and local government business enterprises. Here the main effects are captured within the reforms of major infrastructure. The other aspect is competitive tendering, but here the scope of NCP reforms is actually quite limited. Local governments are not required by NCP reforms to competitively tender for their own work, although they may be required to do so by State government edict. Only where local governments want to make a bid for outside work using an in-house team do competitive neutrality principles apply. To the extent that the failure of an in-house team to win a contract means that the external work is awarded to an out-of-region contractor, the regional impact involves the sort of economic geography not well captured in the model.

The details of the NCP reforms are spelt out in chapter 2 while detailed estimates of the effects of each reform are presented in chapter 3. The key point to note here is that the scenarios reflect the 'outer envelope' of these NCP reforms, or the maximum possible effect they could have. The results assume full implementation of the reforms, a good deal of which has yet to occur. And they give projected results once the economy has had a chance to adjust fully to that implementation.

Table 1.1   **Initial effects of selected NCP reforms**

Area of activity	Reform	Direct impact
Electricity & gas	Establish an interstate electricity transmission network, allow free trade in bulk electricity for private generating companies, public utilities and consumers, allow competitive sourcing of generation capacity.	Competitive pressures improve labour productivity by 50 per cent and capital productivity by 4 per cent as all States move to best practice. Competitive pressures reduce replacement cost of new generating capacity by 20% (eg as States move towards gas-fired power stations).
	Prices surveillance, cost-reflective pricing.	Reduce purchasers' price of electricity relative to supply price to large users (eg pulp, paper and paperboard, cement, non-ferrous metals) by 6 per cent. Increase purchasers' price of electricity relative to supply price to domestic and rural customers (households, agricultural and forestry industries) by 20 per cent. Reduce purchasers' price of electricity relative to the supply price to other industries by 9 per cent. Reduce rate of return in gas industry by 3 percentage points.
	Remove barriers to interstate trade in gas.	Interconnection makes gas prices 4% lower than otherwise by 2005.
	Remove restriction on use of gas (eg for electricity generation).	Reduce unit requirements of black coal by 1% and brown coal by 36%, and increase unit gas requirements by 95% by the electricity supply industry.
Rail transport	Remove statutory monopoly on transport of some commodities.	No direct cost saving modelled. Impact reflected in value of model parameters capturing ease of substitution between transport modes.
	Continue corporatisation and moves to best practice.	Improve capital, labour and materials productivity by 8.25%.
	Prices surveillance, recognition of CSOs and competitive neutrality in pricing.	Prices reflect full recovery of best-practice costs in bulk freight operations, 81% recovery of best-practice costs in non-bulk freight and 61% recovery of best-practice costs in passenger rail (modelled as a 7% price reduction for grain freight, 30% price reduction for other bulk, no price change for *Iron ore* and *Oil, gas and brown coal*, 12% price increase for non-bulk freight and 15% increase for passenger rail).

Table 1.1   *continued*

Area of activity	Reform	Direct impact
Road transport	Adopt NRTC proposals dealing with heavy vehicle charges, transportation of dangerous goods by road, mass limits, vehicle operations, vehicle registration, driver licensing, and compliance and enforcement.	Reduce administration costs of road transport operators by 0.46%, improve labour, capital and materials productivity of road transport operators by 2.89%, increase government expenditure on road and bridge construction 0.51%, decrease government expenditure on administration by road agencies by 0.06%.
Telecommunications	End of legislated duopoly by 1997.	Improve labour productivity by 45% and capital productivity by 22% by moving to international best practice.
Water	Eliminate cross-subsidies, achieve positive rate of return, and adopt best practice in urban water. Recoup operating and maintenance costs in rural water.	Improve labour productivity by 16% and capital productivity by 5% across the entire water industry. Increase rate of return by 1.07 percentage points. Reduce the purchasers' price to commercial and industrial users by 40.2% and 1.3% respectively, relative to the supply price. Increase purchase price to residential and other users relative to the supply price by 7.5% and 31.5% respectively. No change in purchasers' price relative to the supply for agricultural and forestry industries.
Statutory marketing authorities	Remove quantitative restrictions on sugarcane, rice and potatoes.	Reduce quota rents received by primary producers so that domestic output prices fall by 23%, 13% and 3% respectively.
	Removal of State and Commonwealth marketing arrangements on market and manufactured milk.	Reduce quota rents received by primary producers so that domestic prices of all dairy products fall by 37%. Reduce export prices by 20%.

Source: PC analysis.

The assumptions about the nature of the adjustment are spelt out in appendix A. The key assumptions are that, first, sufficient time has elapsed for capital and labour to have moved between activities and regions in response to the economic reforms. Second, the Commission has chosen to assume that all labour market gains from NCP reforms are taken in the form of real wage increases rather than higher employment. The sensitivity of the results to this assumption is tested later in this chapter. Finally, it is assumed that any revenue gains by government from NCP reforms are handed back to consumers in the form of lower income tax rates.

In addition, the modelling assumes some reforms that are not necessarily required under NCP. For example, it includes the removal of cross-subsidies between different classes of user in electricity, rail and water, even though NCP does not preclude the retention of such cross-subsidies. Similarly, the key Commonwealth

and State statutory marketing authorities are modelled as being dismantled, although NCP allows their retention if a public interest case can be made.

In many respects, the modelling is similar to a previous, more comprehensive analysis of NCP reforms in IC (1995a), updated to take account of new studies in particular areas that have become available in the meantime. In one respect, however, the analysis differs. In the previous exercise, there was explicit interest in the revenue implications of NCP reforms. Thus, the revenue gains were not assumed to be handed back to households. In addition, the way in which the reforms could be modelled was constrained in some cases. For example, reform of SMAs was not modelled using the tax equivalents of the administrative arrangements, because there would have been inappropriate effects on government revenue. The current modelling is not so constrained. In addition, the earlier modelling included reforms to the financial structures of State government business enterprises (GBEs), something that is dispensed with in the current exercise. Any mismeasurement of revenue implications here is offset by the assumption that any revenue gains to governments are handed back to households in the form of reductions in income tax rates.

Putting NCP reforms in context

NCP reforms are designed to improve economic efficiency, and so should increase output on average. Where efficiencies are reaped by labour shedding, however, NCP reforms need not always increase employment in any one region. Of prime interest is to see how the projected output and employment effects of NCP reforms are distributed across Australia's regions.

The employment effects can be put in context by comparing them with actual employment changes by region over the last decade or so, available from the ABS Population Census. But actual output or value added data are not available below the State level. So one way of putting the output effects of NCP reforms in context at a finer regional level is to compare them with model-generated output projections of the effects of national economic forces affecting rural and regional Australia. Modelling some selected national economic forces — historical movements in terms of trade, in agricultural and mining investment and productivity, tourism development — has the added advantage of helping to identify which particular historical developments have contributed most to the economic fortunes of particular regions. The details are given in chapter 4.

1.2　Effects of selected NCP reforms

National effects

At the national level, the selected NCP reforms are estimated to raise real Gross Domestic Product (GDP), a measure of output, by around 2.5 per cent a year above what it would otherwise be. This is equivalent to what would be delivered by almost one year's average economic growth (table 1.2). However, the effect of NCP reforms would be a once and for all increase in output. It would be realised progressively as the reforms are implemented and resources relocated between activities.

Table 1.2　**Comparison of change in GDP from mid-1980s to mid-1990s with the estimated effects of selected NCP reforms**

	Estimated increase from NCP reforms	Annual average growth from mid-1980s to mid-1990s
	%	% per year
Real GDP	2.5	3.0
Real consumption	2.8	3.0
Post-tax real wages	3.4	na

Source: MONASH-RR estimates; ABS (*Australian National Accounts, National Income, Expenditure and Product Accounts*, Cat. no. 5206.0).

The estimated gain in real household consumption is higher, at 2.8 per cent. This is in contrast to the pattern of gains from NCP reforms projected in IC (1995a), where the gain in real consumption was less than the gain in real GDP. As noted, there the revenue gains from NCP reforms were assumed to be retained by governments, whereas here they are assumed to be returned to consumers in the form of income tax cuts. As a measure of labour market gains, post-tax real wages are estimated to be 3.4 per cent higher than otherwise. This reflects the assumption that all labour market gains are taken as real wage increases rather than higher employment.

Regional output effects

At the regional level, implementing NCP reform is estimated to make output (as measured by gross regional product) higher than otherwise in all statistical divisions across Australia, except Gippsland in Victoria (chapter 3). This is despite output being lower than otherwise in several key agricultural industries, particularly the milk cattle and dairy processing industries (reflecting the particular influence of

SMA reform — see chapter 2). Thus, even at the 57 region level, there is sufficient regional economic diversity for nearly all regions to benefit from NCP reforms, rather than be dominated by one or a few adversely affected industries. This is not to deny that the negative output effects of some reforms on some activities may dominate in smaller geographic regions or localities.

While the estimated impact of NCP differs between regions, there is no apparent bias against rural and regional areas, at least in output terms. After account is taken of all changes in industry activity levels, and the activity mix of regions, some country divisions are estimated to be among the largest beneficiaries of the NCP reforms examined (figure 1.1). Country regions benefiting most tend to be in Queensland and Western Australia. On the other hand, regions that have concentrated on agricultural activities directly subject to water pricing and dairy industry reforms — located in the southern areas Queensland, the northern and southern areas of New South Wales, and much of Victoria — are estimated to benefit least in output terms.

Figure 1.1   **Estimated regional output effects of selected NCP reforms**

- Lowest third
- Middle third
- Highest third
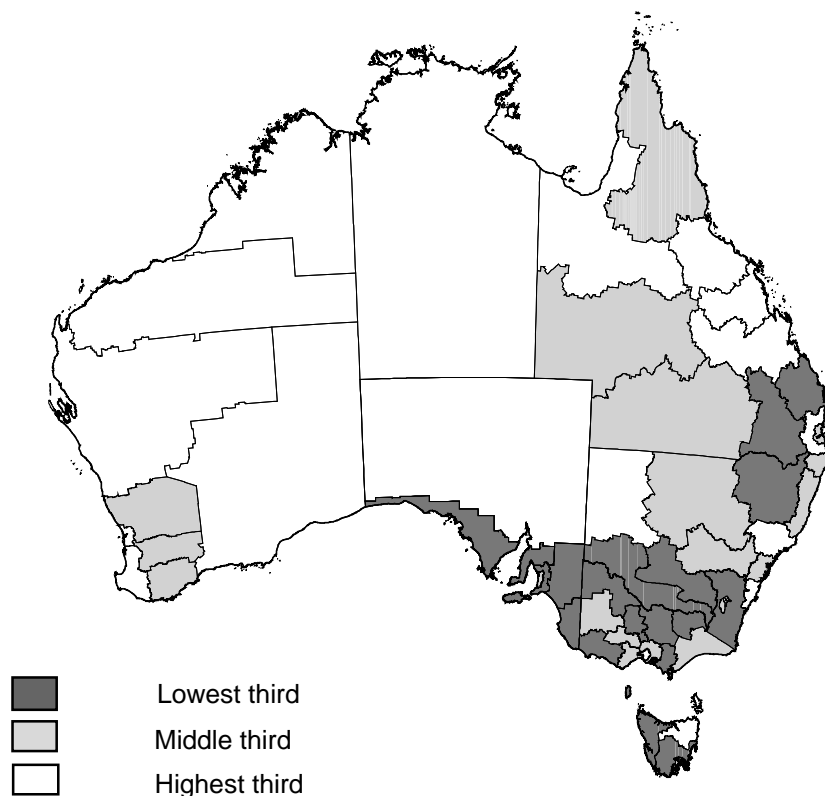
Data source: MONASH-RR estimates.

The estimated decline in activity in the Gippsland region (included in the lowest growth group in figure 1.1) is due to the cumulative negative effects of electricity and gas, rail, water and SMA reforms, which more than outweigh the positive effects of road and telecommunications reforms (chapter 3).

Regional employment effects

It is assumed that NCP reforms have no influence on aggregate employment — it is the same as it would otherwise be. This is because it is unclear where in the economic cycle Australia will be as the reforms are implemented — whether the unemployment rate would be above or below the so-called natural rate. In addition, NCP reforms do not encompass reforms to labour markets, social policies or training policies, which might influence the natural rate itself in the longer term.

Assuming that the national level of employment is determined by non-NCP factors, higher output from the implementation of NCP requires higher productivity of labour. With no change in aggregate employment, there would be some relocation of labour between activities and regions to achieve the higher productivity.

After all relocations are taken into account, employment in 33 of 57 regions is projected to be lower than otherwise in response to NCP reforms — even though value added is higher than otherwise in all but one of those regions. Conversely, employment is higher than otherwise in 24 regions. Most metropolitan regions are estimated to make small gains in employment, whereas many country regions are estimated to make small losses.

The regional employment effects differ between reforms. With the assumption that the national level of employment is determined by other (non-NCP) factors, there are two main forces at work in determining regional differences.

First, the location of activities directly affected by individual NCP reforms differs. When reforms have a substantial labour-saving component, employment opportunities would be directly reduced in the regions where the activities are located. When there is not a sufficiently diversified industrial base in the region undergoing reform, NCP-induced declines in employment in a particular industry could translate to net employment declines at the regional level.

For example, reform of electricity generation has a substantial labour-saving component. Regions specialising in this activity include Gippsland (incorporating the LaTrobe Valley) in Victoria and the Hunter region of New South Wales. In Gippsland, electricity reform (all other things being equal) is estimated to reduce employment opportunities by 6.4 per cent (chapter 3). However, an increase in

employment is estimated for the Hunter region of New South Wales, where the employment-generating effects of electricity reform in downstream using industries are projected to offset the labour saving productivity improvements in electricity generation.

Second, there are indirect and general equilibrium employment effects associated with each reform, as labour is relocated between activities. For example, gas and electricity reforms are estimated to increase output in all regions across Australia (except Gippsland) and to increase employment opportunities in 26 of the 57 statistical divisions. As electricity and gas reforms affect a wide range of industries, the indirect and general equilibrium effects will be not be concentrated in one region or State. For example, overall employment opportunities in Queensland are expected to increase with reform. Within this State, employment opportunities are estimated to increase in seven statistical divisions (including Fitzroy and North West), but decline in the remaining four.

In many statistical divisions, the positive and negative employment effects of individual reforms tend to average out (chapter 3). For these divisions, the size of estimated changes with the full implementation of NCP is not dominated by the effects of individual reforms.

For a few regions, however, the employment effects accumulate (in either a positive or negative direction) across reforms. For example, in Mid-North Coast (New South Wales), Goulburn (Victoria), Central West (Queensland), Yorke and Lower North (South Australia) there is a cumulative negative effect (see chapter 3). On the other hand, for other regions the positive effects of reform tend to accumulate, as in Hunter (New South Wales), Mackay (Queensland), and Goldfields-Esperance (Western Australia). These regional impacts are examined in more detail later in the chapter.

Regional effects on income per person employed

One measure indicating changes in living standards within regions is changes in gross regional product per person employed. High regional employment growth with little or no output growth, would reduce labour productivity and average incomes for the region. However, either increases in regional output or the relocation of labour away from slow-growing activities could raise labour productivity and incomes consequently could be expected to rise.

At the national level, NCP is projected to raise real gross product per person (by around 2.5 per cent). When the combined effects of estimated changes in output and employment from NCP reform are taken into account, output per person employed

is projected to increase in all regions. Country regions are well represented among those with above-average increases (figure 1.2).

In addition, regions with the largest employment declines due to the direct effects of labour-saving NCP reforms tend to have the highest increases in output for each person employed in the region. For example, Gippsland in Victoria is estimated to have the largest employment decline from the levels otherwise attainable, but the highest increase in output per person employed.

Figure 1.2   **Estimated increase in gross regional product per person employed due to selected NCP reforms[a]**

Lowest third

Middle third

Highest third

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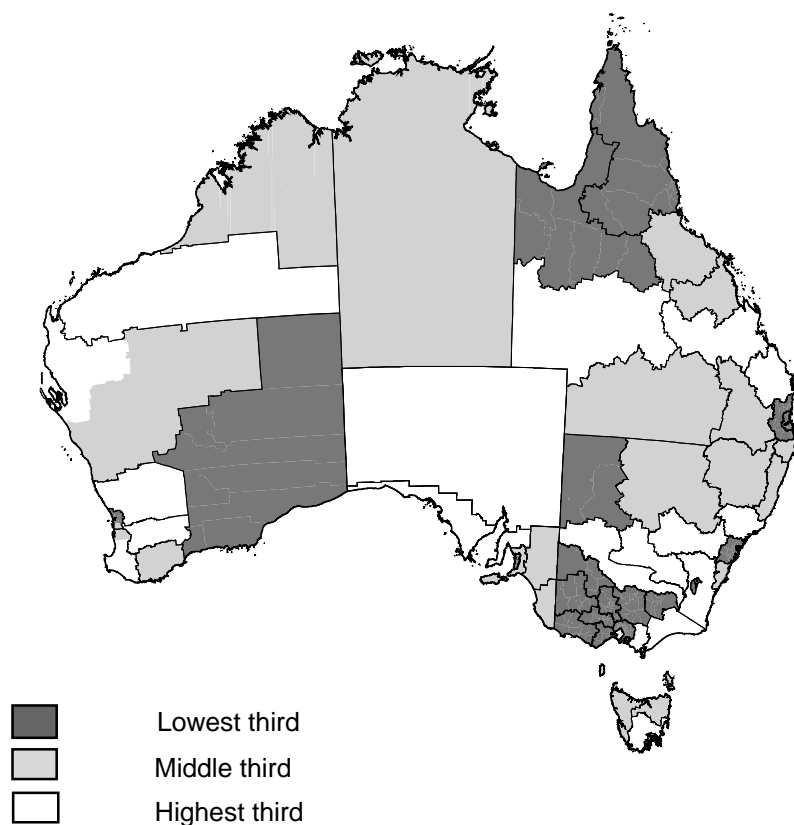
a Increase in gross regional product per person is estimated by deducting estimated increase in employment from estimated increase in output for each statistical division.

Data source: MONASH-RR estimates.

On the other hand, the progressive expansion of more labour-intensive activities (or the increasing labour intensity of some capital-intensive activities) to absorb labour relocating in the reform process means that increases in output per person employed will be smaller in some regions than others. For example, the Goldfields-Esperance division in Western Australia is estimated to have the largest increase in employment but the smallest increase in output per person employed.

Overall, there is little systematic relationship between the estimated changes in regional employment and regional output per person employed as a result of NCP reforms. Figure 1.3 plots the relationship separately for the 11 metropolitan (including regions surrounding Newcastle, Wollongong and Geelong) and 46 non-metropolitan regions.

Because the metropolitan regions have the most diversified economies, they tend to be in the 'middle of the pack', in terms of both projected employment changes and projected changes in regional output per person employed.

There is a much larger range of outcomes, both positive and negative, for employment in the non-metropolitan regions. And there are non-metropolitan regions that experience both higher and lower outcomes for regional output per person employed than the metropolitan regions. The obvious outlier — accounting for the worst employment outcome but best outcome for regional output per person employed — is Gippsland.

Sensitivity analysis

It is by assumption that NCP reforms are estimated to relocate jobs rather than create additional employment. As noted, it is unclear where Australia will be in the economic cycle as NCP reforms proceed. If unemployment is above the natural rate, there may be scope for some of the labour market gains from NCP reforms to be taken in the form of higher employment rather than higher real wages. If for some reason NCP reforms themselves manage to reduce the natural rate, this too could be a reason for aggregate employment gains.

Unemployment is currently 7.2 per cent, a fraction below the Murphy model's estimate of the natural rate of 7.5 per cent. If at some point in the future, unemployment were again at 11 per cent, but further implementation of NCP reforms brought this down to the natural rate of 7.5 per cent, this would be equivalent to aggregate employment being 3.93 per cent higher than otherwise as a result of NCP reforms.

Figure 1.3 **Estimated effects of selected NCP reforms on regional employment and gross regional product per person employed** (per cent)

Non-metropolitan regions

Metropolitan regions
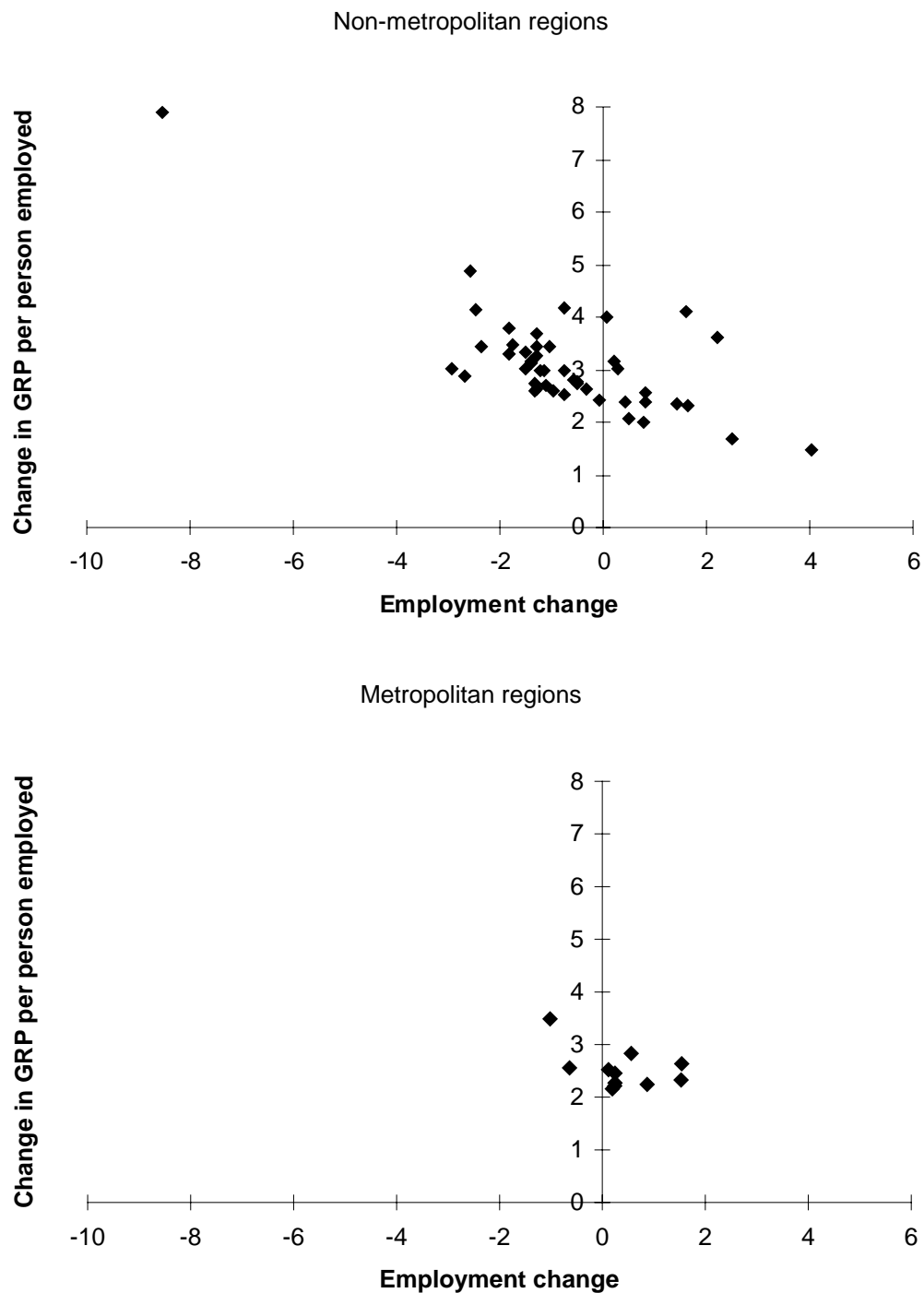
Data source: MONASH-RR estimates.

As another example, if NCP reforms were to reduce future unemployment from 9 per cent to 7.5 per cent, this would be equivalent to employment being 1.65 per cent higher than otherwise as a result of NCP reforms.

Finally, if NCP reforms were to reduce future unemployment from 9 per cent to 6.5 per cent, say because they also produced a one percentage point reduction in the natural rate, then employment would be 2.75 per cent higher than otherwise as a result of NCP reforms.

The NCP reforms have been modelled under these alternative assumptions that they are associated with employment being 1.65, 2.75 or 3.93 per cent higher than otherwise.

Under the largest aggregate employment expansion, all regions except Gippsland are projected to gain in employment terms from NCP reforms. In Gippsland, employment is still projected to be 4.8 per cent lower that otherwise (chapter 3). The 3.93 per cent increase in aggregate employment is projected to be spread relatively evenly across the regions. In terms of figure 1.3, the outcome is not unlike moving the vertical axis four percentage points to the left, so that all regions except Gippsland lie in the positive quadrant.

With a moderate 2.75 per cent expansion in employment, all but 5 regions are projected to gain in employment terms from NCP reforms. With a 1.65 per cent increase in aggregate employment, all but 10 regions are projected to gain in employment terms. This compares with all but 33 projected to gain in the base case.

1.3   Comparing effects of NCP with national economic forces

In order to assess the relative impact of NCP reforms and national and region-specific factors on the fortunes of individual regions, the Commission has also examined the effects of the following national economic forces:

- changes in general economic conditions — population, employment, general productivity and border assistance;

- changing terms of trade (analysed as a change in real export prices) for selected agricultural and mining commodities;

- increases in net investment in mining activities;

- improvements in productivity in selected agriculture and mining activities;

- increases in international inbound visitor (including tourist) expenditure; and

- increases in the level of government expenditure.

The estimated net effect of these selected national economic forces accounts for around 2.2 percentage points of the average annual national output growth of around 3 per cent from the mid-1980s to the mid-1990s (chapter 4). As would be expected, the combined effects of increases in national population and employment levels, general improvements in productivity levels and reductions in border assistance are estimated to increase output and employment in all 57 regions across Australia. However, the regional output and employment effects of the other factors vary substantially, and are spelt out in detail in chapter 4.

Overall, for 43 of the 57 regions considered, adjustment to NCP is estimated to occur against a background of generally growing regional employment and either:

- positive additional employment effects from NCP reform; or
- negative NCP employment effects equal to less than five years of historical employment growth (chapter 4).

In 36 of these cases, any negative NCP employment effects would be absorbed by less than one year of historical employment growth. This group of regions includes each capital city statistical division, coastal divisions and many inland (ie rural and remote) statistical divisions.

There are 12 regions that had a net decline in employment from the mid-1980s to the mid-1990s. These tended to be rural and remote regions, for which the negative effects of declining real export prices of agricultural commodities outweighed the positive effects of rural industry productivity improvements. At the same time, these regions did not capture a sufficient share of national growth to maintain or increase local employment levels.

In all but one case, the likely effect of NCP would be to raise output above levels that would otherwise be achieved. Nevertheless, due to the relocation of labour to achieve higher productivity in all regions across Australia, employment is projected to be lower than otherwise because of NCP reforms in 9 of these 12 statistical divisions.

Some NCP reforms that have already been implemented may be contributing to some of the observed changes in employment. For example, electricity reforms are already affecting labour productivity and employment in the LaTrobe Valley locality of Gippsland, Victoria. But many of the observed employment declines in these regions so far can be traced to other factors, noted above and outlined in more detail in chapter 4.

There are other regions that have experienced employment growth due to national or region-specific factors, for which NCP also is estimated to lower future employment below levels that otherwise would be achieved. As noted, however, because of the magnitude of annual growth and the fact that NCP-induced employment changes are one-off changes, it is unlikely that the NCP reforms would lead to lower regional employment in absolute terms.

For example, employment grew at an annual average rate of 1.6 per cent in the Ovens-Murray region of Victoria from the mid-1980s to the mid-1990s. With the full implementation of NCP, employment would be 0.7 per cent lower than otherwise. In this case, six months' average growth (based on recent experience) would offset the negative effects of NCP on regional employment.

Overall, the negative effects of NCP on employment would be less than one year's growth for half of the statistical divisions that had employment increases in the recent past (chapter 4). Nevertheless, there are five rural and remote statistical divisions — Northern in New South Wales, Mallee and East Gippsland in Victoria, and South East and Murray Lands in South Australia — in which employment has been growing relatively slowly in the recent past and in which five or more years of growth would be needed to offset the estimated negative effects of NCP on regional employment.

Thus, there are 14 regions for which NCP is estimated to have a negative effect on employment and where employment has been either:

- declining; or

- would require five or more years' average annual growth to offset the negative employment effects of NCP reform.

The regions in this group are located in rural and remote Australia and their recent slow growth has tended to be associated with the negative effects of declining terms of trade for agricultural commodities and below-average improvements in industry productivity (figure 1.4). Collectively these regions account for about 25 per cent of Australia's land area, but only 6 per cent of national employment.

Figure 1.4 **Regions experiencing declining or slow growing employment from mid-1980s to mid-1990s and projected employment declines due to selected NCP reforms**
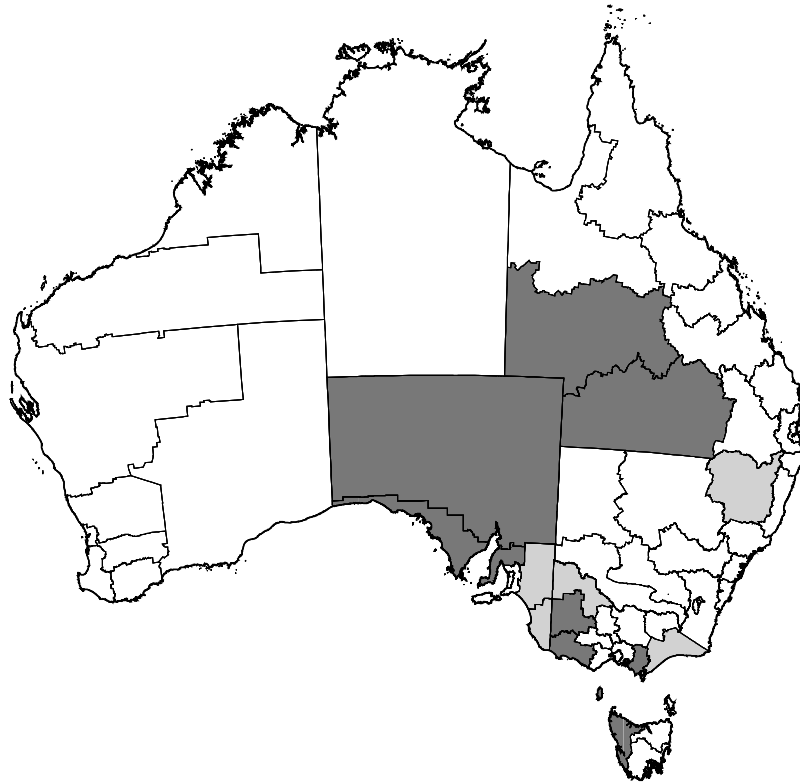
Declining employment and estimated decline with

Slow growth and estimated decline with NCP

Higher employment growth

List of regions with declining or slow employment growth and estimated decline with NCP

New South Wales
Northern
Victoria
Western District
Wimmera
Mallee
East Gippsland
Gippsland
Queensland
South West
Central West

South Australia
Yorke and Lower North
Murray Lands
South East
Eyre
Northern
Tasmania
Mersey-Lyell

Data source: MONASH-RR estimates.

Relocation of labour has costs both to the individuals and society. At a personal level, peoples lives can be disrupted. Although this section points out the net relocation with the implementation of NCP is in most cases well within normal experience, some may argue that some NCP-related relocations are an additional impost that is better avoided. The current analysis indicates some of the economic costs of not proceeding with reform. The first cost would be the forgone permanent increase in national output, estimated to be equal to about one year's growth.

The second cost would be incurred by the region subject to reform. As the analysis of increases in output for each worker within regions shows, the greatest benefits tend to accrue to regions that are subject to the direct impacts of individual reforms and which encounter the largest adjustment in terms of employment. Avoiding reform in such regions would lower regional output and incomes relative to other regions by an amount equal to the potential income gains from reform. For example, in an independent study of NCP-related reforms, Madden (1995) examined the implications of individual regions opting out of the reform process. The analysis showed that if Victoria did not participate in utility reform, its increase in gross state product from this type of reform would be reduced by about one third and its real consumption gain would be nearly halved.

In addition, if other regions undertake reform, incomes in the non-reform region would again be lowered relative to other regions. These losses would be added to any regional output and income disparities that exist for other reasons, such as changing terms of trade and slower than average productivity growth.

The third cost would arise from the loss of dynamic gains from reform. Part of the gains over time from reform would come from raising the base from which output and income will grow into the future. Estimates presented in this analysis suggest that this base will be higher for all regions per person employed and higher for all regions (except Gippsland) in output terms. Dynamic gains can also arise from concentration in faster growing activities. It is an empirical question whether maintenance of existing arrangements (ie non-implementation of NCP) would focus industry effort on faster growing or slower growing activities. To the extent that existing arrangements focus attention on traditional markets or ways of doing things, the potential to select the fastest growing business alternatives would be restricted. For these reasons, the loss of future output and income to regions is likely to be higher than indicated in this analysis.

Overall, a strategy of non-implementation of reform on a selective basis is likely to raise rather than lower regional income disparities. It is also likely to lower rather than raise productive opportunities in regions.

1.4   Summing up

Estimated effects of NCP derived from modelling are no more than broadly indicative. Nonetheless, they suggest there will be net benefits for Australia as a whole from NCP. Output is estimated to be higher than otherwise in nearly all regions under NCP. Income per person employed is estimated to be higher than otherwise in all regions. There is much wider variability of outcomes for employment and income per person employed in country regions than in metropolitan regions. Nonetheless, the effects on most, but not all regions of the NCP reforms are likely to be less significant than those resulting from the broad economic forces that are continually reshaping economic and social conditions in Australia.

2   Nature of National Competition Policy reforms

This chapter outlines the National Competition Policy (NCP) reforms that are analysed in chapter 3 using the regional version of the MONASH model — MONASH-RR. Rather than just considering the progress made to date in implementing NCP, this study considers the prospective regional costs and benefits of NCP reforms. However, not all NCP reforms have been considered. The reforms assessed here are those most relevant to rural and regional Australia. For reasons mentioned below, the resulting estimates should be considered as representing the 'outer envelope' of effects from these selected major NCP reforms.

There are two drawbacks to using MONASH–RR to trace regional effects. One is its 'tops down' methodology. This makes it well suited to tracing the regional effects of truly national reforms, but less well suited to tracing the regional effects of reforms that are themselves region-specific. At worst, the model can project the national effects of some 'national average' reform, and project this average down to the regional level. But often, the model can do better, particularly where the reforms are associated with particular industries or commodities (which are represented at the national level) as much as with regions (which are not). The model also benefits from having agricultural industries that have a regional flavour (see appendix A).

A second drawback is that the current version of MONASH–RR has a commodity and industry classification that is too broad to properly capture some reforms, particularly those relating to statutory marketing authorities. In general, this means that the projected regional impacts are not as highly concentrated as might be expected.

2.1 Electricity and gas

Electricity

Background

Individual jurisdictions have been reforming their electricity sectors since the 1980s. The first coordinated action on electricity reform commenced in October 1990 — long before it fell under the ambit of the Council of Australian Governments (CoAG) in June 1993 (NCC 1998, pp. 45–58).[1] Since then, the electricity industry Australia-wide has undergone substantial reform, often extending well beyond the strict letter of NCP. It is therefore difficult to isolate the effects of NCP on the electricity industry from those of pre-1993 reforms and from post-1993 changes that go beyond strict NCP requirements. For this reason, all reforms to electricity that have occurred since 1990-91 have been collectively referred to as 'NCP-related' reforms.

In essence, the strict NCP-related electricity reforms seek to establish a competitive national electricity market covering eastern Australia — New South Wales, Victoria, Queensland, South Australia and the ACT. Although the topic was discussed as early as October 1990, CoAG did not agree to the establishment of a national electricity market until April 1995 (NCC 1998, p. 55). The national market was to be established by interlinking the various State grids from 1 July 1995 — subsequently amended to 1998. To achieve this, these States (except Queensland, which is not yet connected to the grid), have overcome numerous technical and administrative difficulties to interconnect their electricity grids and establish a national market. Given the natural monopoly characteristics of the transmission networks, all States have separated their transmission networks (the pylons and high-voltage wires used to carry bulk electricity) from their vertically integrated monopolies. As a precursor to introducing external competition from interstate and private sector operators, the States have also separated the generation and distribution (the sale of electricity to households and most businesses) activities — often into a number of units (ESAA various).[2] The National Electricity Market Management Company (NEMMCO) runs the national electricity market under the oversight of the regulator — the National Electricity Code Administrator (NECA)

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[1] Employment in the New South Wales electricity industry, for example, has fallen every year since at least 1989-90 (ESAA various, SCNPMGTE various).

[2] South Australia has not split its electricity generator, Optima Energy, or its electricity distributor, ETSA Power, into smaller units. Similarly, the ACT has not split its distributor ACT Electricity and Water. (The ACT does not generate electricity.)

— using the various State transmission grids. Both NEMMCO and NECA are subject to overarching regulation by the Australian Competition and Consumer Commission (ACCC) and State regulators.

In addition to establishing a national electricity market, NCP-related reform will directly affect the electricity industry through:

- the application of Part IIIA of the Trade Practices Act dealing with third party access to the electricity transmission and distribution networks; and

- the application of Part VII of the Trade Practices Act dealing with any anti-competitive practices in the national electricity market.

The new arrangements allow wholesale or bulk electricity purchasers to progressively buy electricity directly from the national market, rather than from the government distributors as they had previously done. Customers can purchase electricity from, and generators supply electricity to, the national market in one of two ways: either via a spot market or via contracts administered by NEMMCO. These reforms have already led to significant savings for bulk electricity purchasers (ESAA 1998, p. 33). Further cost savings will occur as competition is extended into areas of the electricity market not already subject to competition (eg households) and as lower cost generators enter the market.

Impacts of NCP

The NCP electricity reforms seek to introduce competition into the various State electricity industries, which hitherto had been shielded from competition. Competition was expected to produce benefits for electricity consumers and taxpayers alike. Indeed, the reforms already implemented have delivered substantial labour and capital productivity improvements. Further productivity gains will be achieved as the remaining reforms are fully implemented and as generators, industry and the wider economy adjust. In order to assess the regional effects of electricity reform, this study takes the performance gap between the Australian electricity industry and international best practice (appropriately defined) to delineate the maximum gains possible through reform. This is consistent with the Industry Commission's earlier analysis of NCP reforms (IC 1995a). To the extent that the electricity reforms undertaken and those agreed to do not deliver international best practice, the analysis here will overstate the impacts of reform.

Some elements of NCP will work indirectly, among other factors, to improve the efficiency of electricity generation and distribution. For example, although Western Australia, Tasmania and the Northern Territory are not part of the national grid at present, NCP may place them under the competitive pressure to improve efficiency

to match the benefits provided to downstream users in other States.[3] A failure to do so is likely, over time, to erode the competitiveness of these States within the federal system. In keeping with the outer envelope approach, the modelling of NCP-related electricity reform in this study assumes that the benefits flowing from the establishment of a national grid are matched in States not connected to the national grid.

Best practice labour and capital usage

In its 1995 assessment of the likely impact of Hilmer and related reforms, the Industry Commission judged that capital and labour productivity improvements of 4 and 50 per cent, respectively, were possible within the Australian electricity industry (IC 1995a, pp. 256–8). These gains were derived by comparing the performance of the Australian electricity industry with those of broadly comparable operators overseas.

The electricity industry comprises electricity generation, transmission and distribution activities. The potential for productivity improvements in each of these components is discussed below.

With respect to electricity generation, considerable over-investment during the 1980s led most Australian generators to have considerable excess generating capacity. The Industry Commission assessed that substantial efficiency gains were possible within the Australian electricity industry by bringing its excess capacity into line with overseas practice.[4] The Industry Commission chose a capital benchmark of a reserve plant margin of 25 per cent, a figure comparable with the US average of 26 per cent, but higher than the 20 per cent used in an earlier report (IC 1991a).[5] This implied a 4 per cent improvement in capital productivity based on the average reserve plant margins for 1990-91 to 1992-93 (or 8 per cent based on the 1989-90 reserve plant margin) (IC 1995a, p. 257).

Different generating technologies result in different levels of labour productivity. Hydroelectric and nuclear generators can produce a given amount of electricity using substantially less labour than thermal generators, which form the bulk of the Australian system. In assessing the scope for labour productivity improvements in the Australian industry, predominantly hydroelectric generators were excluded from

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[3] NCP canvasses the possibility of including Tasmania in the national electricity grid via the proposed Basslink.

[4] Some excess capacity is needed to handle abnormal demand, outages and maintenance.

[5] The reserve plant margin measures the difference between the installed generating capacity and peak demand expressed as share of peak demand multiplied by 100 (ESAA 1998, p. 74).

the choice of international benchmarking partners. Based on an international benchmarking exercise undertaken by the BIE (1994), the Industry Commission (IC 1995a) estimated that productivity gains of up to 50 per cent were achievable to bring the labour productivity of Australian generators into line with Tohoku in Japan and Consolidated Edison in the United States.

Some authors subsequently cast some doubt on the magnitude of these capital and labour productivity gains (eg Quiggin 1997). One concern was that the benchmarking partners chosen used large components of hydro and nuclear power, and were not comparable with Australian operators. However, Tohoku, the generator with the third best labour productivity identified in IC (1995a), generates 80 per cent of its electricity using thermal technology and would therefore appear to be an appropriate benchmarking partner.

These productivity estimates are supported by the findings of a number of studies subsequent to IC (1995a). A BIE International Benchmarking study (BIE 1996) identified that Australian labour productivity was substantially below that of the Albertan electricity supply industry in Canada (which is 94 per cent thermal) in 1993-94 — some three years after the Industry Commission's original estimates, despite all of the intervening reform (table 2.1). In fact, the labour productivity of the best Australian generating system, Victoria, was substantially below that of the least efficient Canadian non-hydroelectric system of Prince Edward Island. The more recent BIE estimates imply that, even after three years of reform, it may be possible to increase labour productivity by more than the 50 per cent used in IC (1995a). Similarly, the 4 per cent improvement in capital productivity is substantially less than that implied by the BIE benchmarking study (table 2.1). BIE (1996) also provided estimates of the difference in multifactor productivity between Australian and US investor-owned utilities. These results are broadly consistent with the scope for MFP improvement implied by the labour and capital productivity estimates used by the Commission.

Quiggin (1997, p. 258) did not favour international benchmarking as an appropriate way of measuring the extent of possible efficiency gains as, 'in most cases, this comparison is invalid because the enterprises are not comparable'. Instead, Quiggin advocated the use of frontier production functions developed by Schmidt (1976) to measure the extent of these gains. Subsequent work by Whiteman (1998, 1999) directly addressed Quiggin's concerns by estimating the possible gains using a stochastic production function (SPF). However, Whiteman was less convinced than Quiggin of the superiority of SPF estimates over those of an alternative technique — data envelopment analysis (DEA). Whiteman, therefore, estimated the potential for productivity improvements in the Australian electricity supply industry, on the basis of 1994-95 data, using both techniques (box 2.1).

Table 2.1   **Australian and Canadian labour and capital productivity in predominantly thermal electricity systems,[a] 1993-94**

System	Sales per employee	Load factor	Capacity factor	Reserve plant margin
	GWh	%	%	%
Australia				
New South Wales	2.8	64.9	44.8	48.2
Victoria	4.3	69.9	55.4	24.6
Queensland	3.7	74.5	63.6	27.5
Western Australia	2.4	64.0	48.5	36.7
South Australia	3.4	47.1	44.5	19.7
Northern Territory	2.3	63.6	41.2	54.2
Canada				
Alberta	8.8	78.0	65.8	21.0
New Brunswick	4.6	55.8	38.5	34.0
Nova Scotia	4.5	58.9	47.6	21.0
Ontario	5.5	62.2	44.7	34.0
Saskatchewan	6.6	70.2	62.9	24.0

a Excludes Tasmania, the Snowy Mountains Hydro-Electric Authority (SMHEA) and Canadian hydroelectric generators owing to differences in generating technology and Prince Edward Island owing to its small size.

Source: BIE (1996, pp. 126 & 128).

Box 2.1   **X-inefficiency and electricity supply**

Whiteman (1998, 1999) measured the scope for productivity improvements by estimating the so-called level of X-inefficiency in Australian electricity generation.

X-inefficiency measures the extent to which a firm can increase its level of output given its mix of inputs. It is a measure of the extent to which output is less than that which is socially optimal and can arise when firms are sheltered from competition, enabling them to pursue goals other than profit maximisation (eg cost padding).

X-inefficiency can also loosely be taken as a measure of the extent to which firms can reduce their inputs used to produce the same level of output. However, this interpretation will only be strictly correct if there are constant returns to scale present in production (where a 10 per cent increase in all inputs increases output by 10 per cent).

Prior to the introduction of NCP, Australian electricity suppliers were government authorities sheltered from competition. These suppliers were often vertically integrated monopolies covering all aspects of electricity supply — generation, transmission and distribution. There was little or no competition, either between States or with private sector suppliers.

One of the aims of the NCP electricity reforms is to introduce competition into the electricity industry, thereby reducing (or eliminating) X-inefficiency.

In updating his 1998 study, Whiteman (1999, p. 16) concluded that, while the level of X-inefficiency varied between States, the level of inefficiency in the Australian electricity supply industry lay between 17 per cent (using DEA) and 30 per cent (using SPF) (table 2.2). These were equivalent to potential 20.5 and 43 per cent increases in multifactor productivity, respectively.

Even four years after 1991, Whiteman concluded that substantial capital and labour gains were possible in the Australian electricity industry compared with international operators employing similar generating technologies and fuel mixes (thermal and hydro). Although Whiteman's implied labour productivity estimate of 20.6 per cent is lower than that used by the Industry Commission as being achievable in 1991, his 20.4 per cent capital productivity improvement is considerably higher than that used by the Industry Commission. Nevertheless, the average productivity improvement across both capital and labour is similar. Given that, from a 1991 starting point, the scope for labour productivity improvement was likely to have been greater than capital productivity gains, the Commission has used its more asymmetric IC (1995a) estimates.

Table 2.2   **Estimated X-inefficiency of electricity suppliers, 1994-95**
              (per cent)

Utility	SPF model	DEA model
New South Wales	40	25
Victoria	29	11
Queensland	25	14
Western Australia	3	7
South Australia	16	16
Tasmania[a]	30	14
Northern Territory[a]	17	0
Australia	**30**	**17**
Average (all suppliers)	28	13

[a] Year ended June 1995.

Source: Whiteman (1999, pp. 11–12).

Overall, numerous studies indicate considerable scope for productivity gains in electricity generation irrespective of the methodology chosen — international benchmarking (IC 1995a, BIE 1996), multifactor productivity (BIE 1996), data envelopment analysis (BIE 1996, Whiteman 1998, 1999) and stochastic production function estimation (Whiteman 1998, 1999).

The scope for efficiency improvements in the electricity transmission and distribution (as opposed to generation) sectors is currently a contentious issue. London Economics (1999) found substantial scope for productivity gains in New

South Wales using a variety of different measures — partial productivity indicators, data envelopment analysis, stochastic production frontiers and total factor productivity. However, other studies indicate less scope (eg UMS Group 1999) or have cast doubt on London Economics findings (eg Lawrence 1999). In the absence of clear consensus on the scope for efficiency improvements, this study adopts an outer envelope approach and assumes that the productivity gains identified for the generation sector also apply to the transmission and distribution sectors.

In summary, this study models a 4 and 50 per cent improvement in capital and labour productivity, respectively, to assess the regional effects of NCP reform of the electricity industry (the same as in IC 1995a).[6] However, unlike IC (1995a), the Commission has not explicitly specified an accompanying price reduction — the model determines the resulting price reduction implied by the productivity increases. As noted in IC (1995a), this change in treatment does not influence the results significantly.[7]

Elimination of existing cross-subsidisation and reduction in overall prices

Prior to the introduction of NCP, there was substantial cross-subsidisation between electricity users — residential consumers benefited from lower prices at the expense of commercial and, to a lesser extent, industrial consumers. In some jurisdictions, there was also cross-subsidisation between urban and rural users within each of these groups as the price charged did not reflect differences in the cost of provision. Rural customers generally paid similar prices to urban users, despite generally higher costs of provision.

Some elements of the NCP reform process will reduce the ability of suppliers to cross-subsidise users without direct government funding. Among other things, the implementation of NCP electricity reform will involve giving electricity consumers a choice between electricity suppliers. Indeed, competition has already been introduced at the bulk end of the market in many States. This freedom to choose between distributors or for consumers to purchase electricity directly from the national electricity market will reduce the ability of suppliers to cross-subsidise

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[6] As in IC (1995a), these productivity improvements were also rescaled to correct for differences between the capital and labour cost shares for electricity in the model's database, and independent estimates that labour and capital accounted for 15 and 51 per cent, respectively, of total industry costs.

[7] Whiteman (1999, p. 15) has criticised this treatment on other grounds. He noted that the ex ante productivity improvements fed into the model are not the same as the ex post productivity improvements, because of implied changes in the effective relative prices of capital and labour. Whiteman believed the productivity targets should be imposed ex post. While he is strictly speaking correct, the differences are not large.

activities between different consumers. Governments may explicitly decide to continue to use cross-subsidies to assist certain consumers, but under NCP these should be explicitly recognised as community service obligations (CSOs).

In assessing the effects of increased competition on electricity prices, this study adopts an outer envelope approach by assuming that increased competition eliminates cross-subsidies between different types of residential, commercial and industrial users. However, because of the 'tops down' nature of MONASH-RR, it cannot eliminate cross-subsidies between urban and rural users of the same type (eg residential). It therefore assumes the continuation of such strictly geographic cross-subsidies (often referred to as 'postage stamp pricing').

The changes in relative electricity prices needed to eliminate cross-subsidisation between different types of users adopted here are the same as in IC (1995a, p. 263), and are shown at the end of this section in box 2.2.

The price scenarios modelled in IC (1995a) were based on estimates of the price changes required in New South Wales and Victoria to eliminate cross-subsidisation, while maintaining the amount of revenue constant. The New South Wales assessment was based on an assumed inflation rate of 2.3 per cent and a 4.5 per cent efficiency gain (the midpoint of a range being considered by the Government Pricing Tribunal of New South Wales). The New South Wales Independent Pricing and Regulatory Tribunal (IPART), the successor to the Government Pricing Tribunal of New South Wales, subsequently handed down a decision of a 3 per cent efficiency gain to be used in its pricing determinations (IPART 1997). Even with the downward revision to the X in the CPI-X pricing formula used by IPART, the price increases used in IC (1995a) are still broadly consistent with the weighted-average of the New South Wales and Victorian price increases.

The 6 per cent reduction in the relative price of bulk electricity, on top of a more than 20 per cent overall cost reduction, is consistent with the 26.8 per cent reduction in the average price paid by businesses following the introduction of the national electricity market (ESAA 1998, p. 33). Before NCP, bulk electricity users benefited more than commercial users from more favourable pricing polices; hence the smaller reduction attributable to NCP. The main industries benefiting from the reduction in bulk tariffs are the electricity-intensive basic chemicals, cement and iron and steel industries.

The changes in price relativities were modelled as a change in commodity taxes levied on the use of electricity by downstream using industries. The price of electricity sold back to the electricity industry was held fixed (reflecting sales from the generation to distribution sector), reflecting no additional reforms within electricity distribution.

These changes in price relativities are imposed on top of electricity prices that are projected to fall by more than 20 per cent as a result of productivity improvements. Thus, prices to domestic and rural consumers do not rise in absolute terms, even though they rise relative to those paid by other users.

Reduction in capital construction costs

Generators are coming under increasing financial pressures to limit capital costs. The Government Pricing Tribunal of New South Wales (1994, p. 20) cites US evidence that independent power producers have 10 to 15 per cent lower construction costs than regulated utilities. Substantial capital cost savings can be made by building new gas-fired power stations instead of coal-fired ones for non-base load power stations. This is borne out by new power stations proposals that indicate a preference for gas over coal-fired power stations in all of the States reported, except Queensland, which suffers from a shortage of base-load stations (table 2.3).

Table 2.3   **Proposed new power stations,[a] 1999 to 2003**

State	Coal		Gas		All other	
	No.	Capacity	No.	Capacity	No.	Capacity
		MW		MW		MW
New South Wales	1	120	5	1 380	0	0
Queensland	8	3 590 to 4 140	5	2 089	4	510
Western Australia	1	330	6	1 756	0	0
South Australia	0	0	2	270	2	50
Total	**10**	**4 040 to 4 590**	**18**	**5 495**	**6**	**560**

a ESAA (1998) does not publish proposals for Victoria, Tasmania and the Northern Territory.

Source: ESAA (1998, p. 73).

IC (1995a, p. 261) estimated that the cumulative effect of these factors, once fully implemented, would reduce construction costs within the electricity supply industry by 20 per cent. The modelling undertaken in this study has used this 20 per cent reduction in construction costs (modelled as an input-augmenting productivity improvement in capital creation for the electricity industry).

Modelling NCP electricity reform

The electricity reforms modelled here are summarised at the end of this section in box 2.2.

Gas

The implications of the NCP reforms of the gas industry, as agreed by CoAG in February 1994, are broadly similar to those for the electricity industry. The interconnection of the various State grids will enable competition between different gas basins. The third party access provisions may also engender further competition in gas supply. The reforms and their likely implications are discussed in IC (1995a).

In its 1995 study, the Industry Commission contracted ABARE to model the effects of gas and electricity interconnection using its Multiple Energy Systems of Australia (MENSA) model — a multiperiod mathematical programming model of the Australian energy sector. The Industry Commission then used the output of MENSA to determine the economy-wide effects using the HILORANI model. IC (1995a) discusses the MENSA modelling work in greater detail. The NCP gas reforms considered in this study are the same as those of IC (1995a, p. 289).

The MENSA model assessed the implications of gas and electricity interconnection on a State by State basis. Only the Australia-wide average response identified by MENSA has been modelled here, owing to the 'tops down' methodology embodied in MONASH-RR. On one hand, this Australia-wide averaging could overstate the gains in Western Australia and the Northern Territory, as they will not be connected to the proposed natural gas grid, and understate the gains arising elsewhere.

On the other hand, it has been argued that NCP facilitated the construction of the North West Shelf-Kalgoorlie gas pipeline that is expected to provide substantial benefits to the Goldfields-Esperance area of Western Australia. In addition, States which are unlikely to connect to the envisaged natural gas grid — Western Australia, Tasmania and the Northern Territory — will face competitive pressures to match the benefits provided to downstream users in those States connected to the national grid. For these reasons, and in keeping with the outer envelope approach, the modelling of NCP-related gas reform undertaken here assumes that the benefits flowing from the establishment of a national grid are matched in those States not connected to the national grid.

Gas interconnection is also expected to have significant implications for the electricity industry by making gas a more viable fuel source. The MENSA modelling indicated that interconnection was likely to lead to an increase in the share of Australian electricity generated from gas, albeit from a small base. The increased usage of gas would occur at the expense of both black and brown coal. This is in line with the latest ABARE energy forecasts in which, despite an increase in the amount of electricity generated from coal, the share of electricity generated from coal is expected to fall (table 2.4), and is consistent with current proposals for new power stations (table 2.3). The MENSA modelling indicated that the prospects

for switching to gas varied widely between States, with the greatest scope being in Victoria. The change in the fuel mix modelled here is the Australia-wide weighted-average of the State responses identified by MENSA.

Table 2.4   **Estimated fuel inputs into thermal electricity generation, Australia, 1995-96 and 2009-10** (per cent)

Fuel	1995-96	2009-10
Black coal	59.3	53.3
Brown coal	29.8	27.9
Natural gas	9.0	18.0
Petroleum	1.9	0.8
Total	**100.0**	**100.0**

Source: ABARE (1999, pp. 34 & 53).

Modelling of NCP gas reform

In common with the IC (1995a), a price reduction arising from interconnection is examined in this study. This reduction is modelled as a 4 per cent productivity improvement in the gas distribution industry and a weighted-average reduction in the output price of the oil, gas and brown coal industry. For reasons given above, these price reductions have been applied to activities in all States and Territories.

The detailed industry structure of Monash-RR has some limitations for modelling the likely substitution between inputs as a result of gas industry reforms. In particular, the NCP reforms considered here are likely to encourage a significant switch in the mix of natural gas and brown coal used in electricity generation. However, in the standard MONASH model commodity classification, these two fuels are combined into a single item 'oil, natural gas and brown coal'. The approach adopted to model this aspect of the reform process involves the application of a weighted average input-augmenting technical change in the use of oil, gas and brown coal by the electricity industry.[8]

This change has been applied to electricity generation in all regions in Australia, whereas in practice the change would only affect natural gas or brown coal-using activities. Overall, the averaging of the effects means an understatement of the output-reducing effects in brown coal-using regions (such as Gippsland) given

[8] The weights used reflect the share of electricity generated from oil, gas and brown coal in 1990 contained within the MENSA model (11, 9 and 25 per cent respectively) (IC 1995a, p. 285). The weighted-average productivity improvement in the use of oil, gas and brown coal by the electricity industry is 1.3 per cent.

traditional technologies, and an understatement of the beneficial effects in natural gas-using regions (such as the Pilbara).

In addition, the establishment of a national gas grid is expected to increase competition and reduce rates of return to gas distributors by 3 percentage points (IC 1995a, p. 284).

The NCP gas reforms modelled in this study are summarised in box 2.2.

Box 2.2 **Summary of the electricity and gas scenario**

Achieving international best practice in electricity:

Change in capital productivity	+4%
Change in labour productivity	+50%

Relative price changes from removing cross-subsidies in electricity:

Domestic and rural customers	+20%
Small to large business	-9%
Bulk supply tariff	-6%

Changing the construction cost of capital in electricity:

Change in capital construction costs	-20%

Interconnection of State gas markets & lifting of restrictions on the use of natural gas:

Change in price of natural gas	-4%
Change in share of electricity generated using black coal	-1%
Change in share of electricity generated using brown coal	-36%
Change in share of electricity generated using gas	+95%

Rates of return in gas falling into line with 'commercial rates of return':

Change in the average return on assets	-3 percentage points

Source: IC (1995a, pp. 263 & 289).

2.2 Rail transport

NCP reforms are likely to affect rail transport through:

- extending Part IV of the Trade Practices Act dealing with anti-competitive practices to all State rail authorities;

- establishing a legal right to negotiate access to rail infrastructure on commercial terms, where an effective access regime is not in place;

- applying the Prices Surveillance Act to those State rail authorities not subject to effective price oversight arrangements;

- applying competitive neutrality arrangements that seek to offset any net competitive advantages of government rail authorities arising purely from their public ownership;

- removing statutory monopolies with respect to the transport of some commodities;

- establishing the appropriate structure for a rail authority before the rail authority is exposed to competition from the private sector or before it is privatised; and

- removing any regulatory functions from the rail authority before it is exposed to competition.

In its 1995 report, the Industry Commission assessed the likely impacts of NCP reforms for the rail industry (IC 1995a). The scenario modelled here is essentially the same as IC (1995a), save some minor adjustments owing to differences in the model used. HILORANI, the model used by the Industry Commission in its earlier work (IC 1995a), had a more detailed industry breakdown than MONASH-RR. In particular, HILORANI had a number of different rail industries — grain, private iron ore, bulk, non-bulk and passenger rail transport — together with a separate industry representing railway fixed costs — the track and associated infrastructure. HILORANI was therefore well suited to recognising that a move to cost-reflective pricing would involve different price adjustments on the different rail tasks. However, HILORANI was not able to assess regional implications.

This study uses MONASH-RR, which has only one rail industry. Nevertheless, the model has been amended to allow for inter-modal substitution between rail, road and water transport, which was also a feature of HILORANI (see appendix A). In addition, it has been amended to allow for taxes on the margins usage of rail (ie rail used to transport other commodities from place of production to place of use), so that different pricing adjustments can be imposed on the different uses of rail transport.

Unlike other NCP reforms considered in this study, the Commission has explicitly assumed that cross-subsidies continue to exist for passenger and non-bulk rail transport, but not for bulk rail transport. The scenario modelled here adopts the 1995 assumption that the total value of cross-subsidies for the rail industry is 50 per cent

of total operating costs (IC 1995a and table 1.1 in chapter 1). The price reforms considered are those required to achieve full cost recovery on the remaining 50 per cent of these activities.

The capital, labour and materials productivity improvements represent the increases required to meet international best practice and are based on estimates provided by Travers Morgan for the Industry Commission's 1991 report on rail transport (IC 1991b). In IC (1995a), improvements for the different rail tasks could be modelled separately. Here, the productivity improvements are a weighted-average productivity improvement for the entire rail industry. The price and productivity shocks were adjusted to reflect the share of operating costs in total costs for the rail industry, on the assumption that no price or productivity improvements would be achieved in the fixed overheads (eg track construction) (table 2.5).

The extent to which NCP will apply to private sector railways is unclear. The third party access provisions to essential infrastructure do not preclude NCP applying to private sector railways, such as those operating in the Pilbara. However, a recent ruling by the Federal Court denied Robe River Iron Associates third party access to a private railway run by Hamersley Iron in the Pilbara. In light of this, the current study takes the conservative view that there is no reduction in the price of transporting iron ore by rail. To the extent that third party access to private railways occurs, the economy-wide gains and those for the Pilbara will be larger than those indicated here. Similarly, it has been assumed that no price changes flow through to the 'rail' transport of oil and gas, since gas is primarily transported by pipeline.

Table 2.5   **Australia-wide price and productivity changes in rail transport, 1993-94** (per cent)

	Share of operating costs		Share of total costs[a]	
Transport service group	Price change	Productivity change[b]	Price change	Productivity change[b]
Grain rail transport	-9	+17	-7	+13
Other non-private bulk rail transport	-39	+15	-30	+12
Private bulk rail transport (iron ore, oil gas and brown coal)	0	0	0	0
Passenger rail transport	+20	+12	+15	+9
Non-bulk rail transport	+15	+15	+12	+12
Rail transport	**-2.53**	**+10.72**	**-1.95**	**+8.25**

[a] Adjusted to reflect the share of operating costs in total costs (77 per cent). [b] Percentage increase in output given existing levels of labour, capital and intermediate inputs.

Source: PC estimates based on IC (1995a) and IC (1995a, unpublished).

Although not covering passenger rail, the most recent BIE rail benchmarking study indicated that Australian rail freight operating costs were 24 per cent higher than

world's best practice in 1993-94 (BIE 1995b, p. 76). Although using a more recent benchmark than IC (1995a), the BIE productivity estimates appear to be higher than those used here, even after adjusting for the share of operating costs in total costs. Thus, if anything, the Commission has been somewhat cautious in the productivity gains assumed here.

There has been substantial productivity improvements occurred in Australian rail transport throughout the 1990s. Despite a decade of productivity improvement, DEA estimates indicate that the (productive) efficiency of Australian freight rail operators was half that of the best North American operators and 63 per cent of the North American average in 1998 (table 2.6). Even after adjusting for the smaller scale of operations in Australia, the technical efficiency of Australia was in the order of 20 to 37 per cent lower that in North America.[9] The inclusion of passenger rail to achieve a whole-of-system efficiency estimate does not significantly change the conclusion based on the freight estimates that substantial productivity gains can still be achieved within the Australian rail industry (table 2.6). These estimates suggest that, if anything, the efficiency gains modelled in this study for the entire rail industry are somewhat conservative.

Modelling NCP rail reform

The price reforms were specifically tailored to individual commodities being transported by rail (table 2.5). These price changes were then applied uniformly across all destinations (industries and final demand) of the commodities transported by rail (table 2.7). As noted, there were no changes in the prices of rail transport used to transport iron ore or oil, gas and brown coal.

The net effect of a relatively large improvement in productivity and a relatively small reduction in price (on average) is a sizeable reduction in the operating deficit of the rail industry. This has been modelled as being absorbed via an increase in the 'other cost' component of the rail industry, a cost item that is net of government subsidies to the rail industry. Thus, an increase in other costs is equivalent to a reduction in government rail subsidies. Because the model does not count the revenue implications of these subsidies explicitly, the fiscal implications have been absorbed via an allowable $87.3 million increase in the fiscal deficit (table 2.8).

The rail reforms modelled here are summarised in box 2.3.

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[9] The measure of technical inefficiency presented in table 2.6 is likely to understate the possible gains in efficiency as some, but not all, of the factors influencing the scale of operations are within the control of State governments and the railways (eg the railways' prices will influence the volume of goods transported by rail).

Table 2.6 **Estimates of the relative efficiency of rail transport,[a] 1998**

| Type of efficiency | DEA score | | | Possible efficiency gain | |
| | Australia average[e] | North America | | | |
		best practice[f]	average[g]	minimum[h]	maximum[i]
				%	%
Freight rail (adjusted for locomotive power differences):					
Productive efficiency[b]	0.52	1.00	0.83	71	92
Technical efficiency[c]	0.73	1.00	0.88	23	37
Scale efficiency[d]	0.71	1.00	0.94	34	40
Freight and passenger system:					
Productive efficiency[b]	0.64	na	1.00	na	56
Technical efficiency[c]	0.69	na	1.00	na	45
Scale efficiency[d]	0.93	na	1.00	na	8

[a] North American data relate to 1997. [b] Measure of the overall loss in production and is equal to technical efficiency × scale efficiency. [c] Measure of the loss in production arising from not producing the maximum output from the inputs used (ie non-scale effects). [d] Measure of the loss in production arising from differences in the scale of operations. [e] Weighted by net tonne kilometres of Australian National-National Rail Corporation (AN-NRC), Westrail, Queensland Rail (QR), State Rail Authority (SRA) and Public Transport Corporation (PTC). [f] Burlington Northern and Santa Fe Railway Company (BNSF) and Canadian National (CN) for productive efficiency, and BSNF, CN and Kansas City Southern Corporation (KCS) for technical efficiency. [g] Weighted by net tonne kilometres. [h] Defined as the percentage increase needed for Australia to match the North American average. [i] Defined as the percentage increase needed for Australia to match North American best practice.

Source: PC estimates.

Table 2.7 **Estimated reduction in the price of rail transport services on selected commodities carried with NCP rail reform, 1993-94** (per cent)

Transport service group	MONASH-RR (commodity)	Change in price
Grain rail transport	Wheat (C3)	-7
	Barley (C4)	-7
	Other grains (C5)	-7
Bulk rail transport	Non-ferrous ore (C15)	-30
	Black coal (C16)	-30
	Other mining (C18)	-30
Private rail transport	Iron ore (C14)	0
	Oil, gas and brown coal (C17)	0
Passenger rail transport	Household consumption	+15
Non-bulk rail transport	All other	+12

Source: PC estimates based on IC (1995a).

Table 2.8   **Estimated initial effects of NCP rail reforms on the subsidy to rail transport[a]**

Total costs accounted for by labour and capital within the MONASH-RR rail industry	$2 074.7m
Improvement in capital and labour productivity	+8.25%
Effect of the productivity improvements on the subsidy to rail transport[b]	-$171.2m
Weighted-average price change for rail transport	-1.95%
Total cost of MONASH-RR rail industry	$4 301.0m
Effect of price reform on the subsidy to rail transport[b]	+$83.9m
Net effect on the subsidy to rail transport[b]	**-$87.3m**

a First round revenue effect only. **b** A positive number indicates an increase in the rail subsidy, while a negative number indicates a decrease.

Source: PC estimates based on the MONASH-RR database.

Box 2.3   **Summary of the rail transport scenario**

Achieving best practice rail costs:

Change in total factor productivity	+8.25%

Relative price change from rail reform:

Grain rail transport	-7%
Bulk rail transport	-30%
Private railway transport	0%
Non-bulk rail transport	+12%
Passenger rail transport	+15%

Reduction in subsidies to rail:

Allowable increase in the budget deficit	+$87.3m

Source: IC (1995a, p. 221).

2.3   Road transport

As part of Hilmer-related reforms, the Australian Transport Ministers agreed to implement a package of national road transport reforms in 1992 to improve the safety and efficiency of the Australian road transport industry (NCC 1998, p. 115). The Ministerial Council for Road Transport (MCRT) and the National Road Transport Commission (NRTC) are to oversee these reforms covering heavy vehicle charges, transportation of dangerous goods by road, vehicle operations, vehicle registration, driver licensing, and compliance and enforcement. The most significant

of these reforms is the implementation of a uniform approach to regulating heavy vehicles and uniform registration charges for vehicles over 4.5 tonnes.

These reforms are expected to increase the productivity of the road transport industry on an ongoing basis. In addition, they will result in one-off gains owing to increased government expenditure to implement the scheme (eg administration costs) and to undertake the necessary engineering works needed to handle heavier vehicles (eg widening and strengthening of bridges).

NRTC (1996) provided a detailed assessment of the likely impacts of these road transport reforms, supported by modelling work undertaken by Tasman Asia Pacific. The NRTC placed these reforms into two categories: those relating to the Mass Limit Review — reforms relating to an increase in the maximum allowable vehicle weight — and all other remaining reforms.

For each of these two categories, the costs and benefits were categorised depending on whether they were likely to provide one-off (the implementation phase) or long-term (the operational phase) benefits or costs. The NRTC's assessments are provided in table 2.9.

Modelling NCP road transport reform

The NRTC has made substantial progress in developing its package of road transport reforms since the Industry Commission looked at the matter in 1995 (IC 1995a). Of particular relevance to the modelling of these reforms, the NRTC has published net costings for the main reforms under consideration (summarised in table 2.9). In light of these new estimates, this study models the effects of road transport reform differently from IC (1995a).

In the absence of a detailed costing in 1995, the Industry Commission attempted to estimate the effect of changes in heavy vehicle registration charges (IC 1995a, chapter B8). The overall impact of the change in registration charges was the product of detailed calculations based on, among other things, the impact on particular vehicle types, the composition of the road transport fleet, the average distances travelled annually by different types of vehicles and the use to which these vehicles were put. Allowances were also made for productivity improvements arising from changes in mass limits and other reforms.

Table 2.9   **Estimated initial effects of NRTC road transport reforms, 1996**
($ million)

	Mass Limit Review	All other reforms	All reform package
One-off effects (Implementation phase):			
Agency establishment & set-up costs	16	123	139
Bridge / road construction costs	215		215
	231	123	354
Ongoing effects (Operational phase):			
Road transport operator cost savings	316	144	460
Operator administration costs	3	30	33
Road transport administration costs	1		1
Lower agency operating costs		-10	-10
Bridge / road construction costs	17	7	24
	337	171	508

Source: PC estimates based on NRTC (1996).

In modelling the effects of NCP road transport reform, this study uses the costing provided in NRTC (1996). Although the range of reforms included in the 1996 schedule is wider than the reforms analysed in IC (1995a), the economy-wide impacts are likely to be similar. Where the NRTC publishes a range of costs, the Commission has used the mid-point in its calculations. The approach adopted here is broadly similar to that used by Tasman Asia Pacific (reported in NRTC 1996).

This study focuses on the on-going costs and benefits, rather than annualised effects of the one-off stimulus provided by the implementation phase (table 2.10).[10] Tasman Asia Pacific modelled a large number of very detailed shocks (NRTC 1996, p. 32), and modelled a number of essentially similar reforms differently (eg they split the productivity improvement accruing to road transport operators into that applying to industry's use of road transport and industry's use of transport for hire and reward). This study models these reforms together. In addition, the productivity improvements accruing to road transport operators have been restricted to the road transport industry. Unlike Tasman Asia Pacific, this study does not assess the operational phase of the package and does not differentiate between the mass limit review and the other transport reforms.

Overall, the results in this study are not strictly comparable with those contained in IC (1995a) owing to a wider range of reforms being considered and the different way in which the reforms are modelled.

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[10] Tasman Asia Pacific modelled the implementation phase using a short-run closure and the operational phase using a long-run closure. The overall benefits were obtained by adding the results.

The road reforms considered here are summarised in box 2.4.

Table 2.10   **Estimated net initial effect of NRTC road transport reform —
                 implementation phase**

Effect	How modelled	Value	Change[a]
		$m	%
Net effect on road transport operators:			
Lower administration costs	Labour productivity improvement in the road transport industry	33	0.4617
Lower operational costs	Productivity improvement in the road transport industry	460	2.8933
Net effect on government:			
Lower agency operating costs	Government expenditure on public administration	9	0.0577
Higher road construction costs	Government expenditure on other buildings	24	0.5103

a Based on values contained in the MONASH-RR database.

Source: PC estimates based on NRTC (1996).

Box 2.4   **Summary of the road transport scenario**

Net effect on road transport operators:

Change in administration costs   -0.4617%

Change in operational costs   -2.8933%

Net effect on government:

Change in administration costs   -0.0577%

Change in road construction costs   +0.5103%

Source: PC estimates based on NRTC (1996).

2.4   Telecommunications

Commonwealth telecommunications reform commenced in 1990 when the Government announced its liberalisation program (IC 1995a, p. 143). The reforms saw the end of Telstra's legislated monopoly over subscriber trunk dialling (STD), international direct dialling (IDD) and mobile phones.

In 1991, Telecom (Telstra) dominated the Australian telecommunications industry. With the introduction of competition, and as a result of advances in technology, new service providers have entered the industry, many offering new services. While

Telstra still dominates the industry, its influence is less than it once was. The modelling work undertaken here focuses on the effects of reforming the basic telecommunications provided predominantly by Telstra. It is not designed to pick up the growth in new operators and new services that may arise from technological change or other factors, even if they are a consequence of NCP. For example, the modelling does not pick up any dynamic efficiency gains arising from a more innovative and competitive industry that flows from NCP. Thus, the modelling does not take into account capital expenditure and associated increases in employment in new areas, which may offset the labour-saving effects of productivity improvements within basic telecommunications.

The scenario modelled here is essentially the same as IC (1995a, p. 155). The productivity estimates were derived from an international benchmarking study (BIE 1992) based on benchmarks obtained from operators in comparable countries — Sweden and the United Kingdom. From this, the Industry Commission estimated that the introduction of competition in the telecommunications industry could increase capital and labour productivity by up to 22 per cent and 45 per cent, respectively.

The benchmarks chosen for the IC (1995a) exercise relied on measures of capital and labour productivity measured in revenue per employee and revenue per line. Quiggin (1997) noted that these measures are sensitive to the amount of contracting out, as well as to the balance of telecommunications traffic between relatively lucrative international traffic and local traffic. Nonetheless, a more recent BIE (1995a) telecommunications benchmarking report showed that, on other measures, such as lines per employee and calls per employee, Australia continued to rank below most countries in the OECD. To match Canada, Australia would need to increase its lines per employee by 50 per cent and calls per employee by 200 per cent. The comparison with the United States on those measures was even more unflattering. The Commission's recent international benchmarking of Australian telecommunications services (PC 1999) also identified substantial productivity differences between Australian and overseas telecommunications systems.

The telecommunications scenario modelled in IC (1995a) also included a 20 per cent real price reduction. Rather than explicitly impose a price reduction, this study allows the productivity improvements to flow through to prices. The earlier results are essentially unaffected.

The limited evidence on the quality of telecommunication services to rural and regional Australia is mixed. Rural subscribers in non-remote areas had a higher proportion of faults fixed within the designated minimum service time than those in urban areas, but those in remote areas did not (ACA 1998). Given the mixed evidence on service quality, outlined in more detail in the report, gains associated

with productivity improvements have not been augmented (or discounted) to balance changes in telecommunications service quality.

The telecommunications reforms modelled here are summarised in box 2.5.

Box 2.5   **Summary of the telecommunications scenario**

Achieving international best practice in telecommunications:

Change in capital productivity   +22%

Change in labour productivity   +45%

Source: IC (1995a, p. 155).

2.5   Water

The aim of the NCP water reforms is to promote efficient water use and to develop an ecologically sustainable water industry. NCP reforms distinguish between metropolitan urban, non-metropolitan urban and rural irrigation. The reforms agreed to are similar for metropolitan urban and non-metropolitan urban, although there are timing differences.

The key NCP reforms relating to the water industry are:

- the adoption of consumption-based pricing principles, full cost recovery and (desirably) the removal of cross-subsidies that are not consistent with efficient and effective service, use and provision;

- for urban water services and metropolitan bulk-water suppliers, to generally earn a positive real rate of return on the written down replacement cost of assets;

- for rural irrigation, full recovery of operating costs and, where practicable, achieving a positive real rate of return by 2001; and

- for State governments to implement a comprehensive system of water allocations, and to facilitate trade in these entitlements.

After much discussion, CoAG extended reform to cover water resources in February 1994 (NCC 1998, p. 100). However, the idea was first placed on the CoAG agenda in December 1992 and was discussed again in June 1993. In light of this, the modelling undertaken here considers those reforms of the water industry undertaken since 1992-93 to be those relating to NCP.

While the NCP agreement sets out various guiding principles relating to water reform, the precise details are often unclear and/or, at times, ambiguous. While 'metropolitan urban' water authorities are expected to earn a positive real rate of return on the written-down replacement cost of their assets in the near term, non-metropolitan urban water authorities are expected to at least cover their operating costs over the same time horizon and, if practicable, also earn a positive real rate of return. In this study, the definition of metropolitan urban is based on 'businesses that provide services to 50 000 or more customers' (WSAA 1996, p. 15).[11]

Best practice labour and capital usage

In its 1995 report, the Industry Commission identified considerable scope for capital and labour productivity improvements to achieve Australian best practice (IC 1995a, pp. 329–33).

Capital productivity of metropolitan urban water service provision, as measured by the written down replacement value of capital per litre of water supplied and sewerage processed, differed significantly between metropolitan urban operators in 1992-93 (table 2.11). ACT Electricity and Water recorded the highest level of capital productivity in 1992-93 (equivalent to the lowest capital cost per litre). Although Melbourne Water changed the way its assets were valued in 1992-93 (SCNPMGTE 1996, p. 162), its 1991-92 capital productivity exceeded that of all other metropolitan urban operators in 1992-93 (other than ACT Electricity and Water).

Table 2.11   **Partial productivity indicators for metropolitan urban water, 1992-93**

Water authority	State	Capital[a]	Labour[b]
Hunter Water Corporation	NSW	15.7	8.3
Sydney Water Corporation	NSW	13.1	8.1
Melbourne Water Corporation	Vic	12.5[c]	5.1
Water Corporation (Urban)	WA	13.8	9.6
SA Water Corporation (Urban)	SA	13.8	8.2
ACT Electricity and Water (Water)	ACT	10.9	7.1
Power and Water Authority (Urban)	NT	na	7.5

a Written down replacement cost of total assets per gigalitre of water supplied and sewerage treated. **b** Number of employees per gigalitre of water supplied and sewerage treated. **c** Value for 1991-92 owing to a change in accounting practices that occurred in 1992-93 where assets were valued at historical cost.

Source: PC estimates based on SCNPMGTE (1994, 1998).

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[11] This definition is based on customers (households) and not on the number of residents. Under this definition, rural cities such as Wagga Wagga, Dubbo, Orange and Albury would be classified as non-metropolitan urban.

The labour productivity of Melbourne Water, as measured by the number of employees per litre of water supplied and sewerage treated, was substantially higher than for other authorities. While this may, in part, reflect greater use of contracting out by Melbourne Water, it is also likely to reflect more efficient labour utilisation. Given the inability to adjust the labour productivity measures for differences in contracting out, the labour productivity benchmark should be viewed as an outer envelope measure of possible achievements.

In assessing the potential effects of NCP, this study benchmarks the capital and labour productivity improvements that each metropolitan urban water authority needs to achieve to match that of Melbourne Water (table 2.12). This suggests that NCP may be capable of delivering capital and labour improvements of up to 7 per cent and 27 per cent, respectively. This is similar to the corresponding estimates of 10 per cent and 25 per cent used in IC (1995a). The difference in possible capital productivity gains reflects a different choice of benchmarking partner — Melbourne Water Corporation instead of ACT Electricity and Water.

The 10 per cent labour and capital productivity improvements used for irrigators is based on estimates in IC (1992, p. 296) and is identical to that used in IC (1995a). There is insufficient information available on potential productivity improvements in the provision of water services to rural household and commercial users. Likely productivity improvements from NCP reform thus are conservatively assumed to be zero for this analysis.

Weighted-average productivity improvements for the entire water industry were obtained from these individual productivity estimates using assets values as weights (IC 1992, p. 292). The estimated productivity improvements are in table 2.13.

Table 2.12 **Estimated productivity improvements needed to achieve best Australian practice in metropolitan urban water,[a] 1992-93** (per cent)

Water authority	State	Capital	Labour
Hunter Water Corporation	NSW	18	39
Sydney Water Corporation	NSW	10	37
Melbourne Water Corporation	Vic	0	0
Water Corporation (Urban)	WA	9	47
SA Water Corporation (Urban)	SA	10	38
ACT Electricity and Water (Water)	ACT	5	28
Power and Water Authority (Urban)	NT	0	32
Metropolitan urban water authorities		**7**	**27**

a Australian best practice is defined as having the same productivity as the Melbourne Water Corporation.

Source: PC estimates based on SCNPMGTE (1994, 1998).

Table 2.13 **Estimated productivity changes to achieve best Australian practice in the delivery of water services, 1992-93** (per cent)

Input	Metropolitan urban	Non-metropolitan urban	Rural irrigation	Total
Capital	+7	0	+10	+5
Labour	+27	0	+10	+16

Source: PC estimates.

Earning a positive real rate of return

The estimated changes in the rate of return required by NCP are the same as those in IC (1995a, p. 334). Metropolitan urban water authorities are expected to earn a positive real rate of return of 5 per cent on the written down replacement cost of their assets. Rural irrigators are expected to cover operating costs (earn a zero rate of return) and non-metropolitan urban operators are expected to earn a positive real rate of return. To achieve this, metropolitan urban water authorities would have to increase their rate of return by 1.51 percentage points and rural irrigators by 2 percentage points (IC 1995a, p. 334). The limited available evidence suggests that non-metropolitan urban operators were making a positive rate of return in 1992-93, although considerably less than their metropolitan counterparts (ARMCANZ 1993). The changes in the real economic rates of return are set out in table 2.14.

There was some evidence included in submissions to suggest that irrigation water prices had risen since 1992-93 in a program designed to cover the cost of supply and to recognise the relative scarcity of water for irrigation (see subs D272, D288, D301). These price increases would provide higher returns to water supply. To the extent that the actual returns to water supply exceed those reported in table 2.14, the price increases modelled to achieve higher returns would be understated.

Also, to the extent that non-metropolitan urban water authorities have to earn the same rate of return as their metropolitan counterparts, or that the target real rate of return exceeds the 5 per cent used here, the NCP-related increases in the required rates of return would be higher than those indicated here.

Table 2.14 **Estimated change in the real economic rate of return attributable to NCP, 1992-93** (percentage points)

	Metropolitan urban	Non-metropolitan urban	Rural irrigation	Total
Prior to introduction of NCP	+3.49	+1.00	-2.00	+2.01
After NCP	+5.00	+1.00	0	+3.08

Source: IC (1995a, p. 336).

Elimination of existing cross-subsidisation

The NCP water reforms clearly identify a number of pricing principles (NCC 1998, p. 103). Cross-subsidies should desirably be removed where they are 'not consistent with efficient and effective service, use and provision'. The changes in urban water prices to eliminate cross-subsidies considered here are the same as those in IC (1995a). The estimated changes in water price relativities needed to eliminate cross-subsidies are listed for each category of customer in table 2.15.

In line with an outer envelope assessment of the regional impacts of NCP, cross-subsidies between different classes of user are not retained. However, as discussed in the context of electricity prices, the modelling does assume the continuation of geographic average pricing for customers within a given category (eg remote consumers pay the same price as their rural counterparts).

Table 2.15 **Changes in water price relativities to eliminate cross-subsidisation, 1992-93** (per cent)

Customer type	Metropolitan urban	Non-metropolitan urban	Rural irrigation	Total
Residential	+20.1	+3.1	0	+7.5
Commercial	-51.8	-39.0	0	-18.1
Industrial	-6.1	+9.9	0	-2.1
Other (Government)	+90.0	-1.0	0	+31.5

Source: IC (1995a, p. 336).

Modelling NCP water reform

Like HILORANI, MONASH-RR has a single water industry and does not differentiate between metropolitan and non-metropolitan consumers. However, the model does differentiate between industrial (including agricultural) and domestic consumption.

The capital and labour productivity improvements modelled — 5 per cent and 16 per cent, respectively — represent the weighted-average productivity increases for the entire water industry. Similarly, the increase in the expected rate of return modelled was the weighted-average rate of return of 1.07 percentage points.

Unlike IC (1995a), the price increases modelled to eliminate cross-subsidisation were the weighted-average price increase for metropolitan and non-metropolitan consumers for each category of user. Commercial and industrial relative prices were modelled to fall by 40.2 per cent and 1.3 per cent, respectively, while the prices paid by government users (including the welfare sector) and households rose by 31.4 per cent and 7.5 per cent in relative terms, respectively. The price of agricultural water was held constant in relative terms. These relative price changes were implemented via changes to the commodity taxes on water. Note that, in absolute terms, all prices are also affected by productivity reforms and by the change in the rate of return.

The water reforms modelled here are summarised in box 2.6.

Box 2.6   Summary of the water scenario

Achieving best practice capital and labour usage in water:

Change in capital productivity	+5%
Change in labour productivity	+16%

Earning a positive real economic rate of return: +1.07 percentage points

Change in price relativities to eliminate cross-subsidisation in water:

Rural	0%
Residential	+7.5%
Commercial	-40.2%
Industrial	-1.3%
Government and other	+31.4%

Source: PC estimates.

2.6   Statutory marketing authorities

Background

NCP will affect Commonwealth and State statutory marketing authorities (SMAs) through the extension of Part IV of the Trade Practices Act to previously exempt

sectors and through the legislative reviews of anti-competitive legislation. SMAs restrict competition through a variety of means, including:

- production controls;

- compulsory acquisition;

- price fixing; and

- monopoly marketing arrangements.

Consistent with the outer envelope approach, no provision has been made for the way in which 'public interest' considerations could modify more competitive outcomes. This should be borne in mind in interpreting the results.

At the time of signing NCP, there were many Commonwealth and, more importantly, State SMAs (IC 1995a, p. 88). Many of the activities subject to regulation through SMAs are, or were, relatively minor in the context of the overall economy and not particularly suited to economy-wide modelling (eg sultanas, dried fruits, barley, and honey). The modelling work undertaken here to assess the regional impacts of SMA reform focuses on the more important Commonwealth and State SMAs affecting dairying, sugarcane, rice and potatoes.

Most of the reforms modelled here are similar to their counterparts in IC (1995a), using revised measures of assistance for 1992-93. Dairy, however, has been modelled in a different manner — the Commonwealth and State dairy arrangements have been combined and the impact of reform specified differently.

As discussed earlier in the context of modelling rail reform, HILORANI had a more detailed industry and commodity structure than the model used here to explore the regional effects of NCP. Unfortunately for showing regional effects, the agricultural activities likely to be affected through NCP are contained within wider, more generic industries or commodities within MONASH-RR. Thus, it is impossible to model the reforms directly. Rather, the reforms have been modelled indirectly by scaling down the commodity specific effect to reflect the share of the affected activity in the broader grouping. While the effects on the economy-wide results will be broadly similar, the regional effects could differ between the two approaches.

For example, rice, one of the commodities likely to be affected by the NCP reforms to SMAs, is included with maize, oats, sorghum, oilseeds and legumes in the MONASH-RR commodity 'other grains'. The reduction in rice prices that is likely to occur has been scaled down and modelled as a small reduction in the price of other grains. Because other grains are grown throughout Australia and rice is concentrated in the southern irrigation areas of New South Wales, the model will understate the effects of rice reform on the Murrumbidgee and Murray regions of

New South Wales. Correspondingly, the model will overstate the affect on regions producing grains such as maize and oats.

The following scenarios look at the effect of reforming domestic marketing arrangements. Where single desk export arrangements exist, the modelling work assumes their continued existence.

Dairy

Dairying was a highly regulated activity in Australia prior to the introduction of NCP. State SMAs controlled most aspects of production, distribution, retailing and marketing of fresh milk (market milk), while the Commonwealth assisted exports of manufactured dairy products (primarily cheese). While the Commonwealth support arrangements are less significant than the State arrangements for dairying, they are nevertheless significant in comparison with the marketing arrangements in other industries.

State support for market milk production

Historically, the States have regulated most aspects of the market milk sector, from farm gate to final consumer (IC 1991c, 1997a). The regulation is designed to ensure year round supply of fresh milk at stable prices, guarantee public health and milk quality standards, and to increase returns to dairy farmers.

While the arrangements varied somewhat between States, State SMAs purchased all market milk prior to the introduction of NCP. These 'vesting' powers, together with restrictions on supply, prevented farmers from undercutting the SMAs. In addition, New South Wales, parts of Queensland and Western Australia employed farm-level quotas to control market milk production, with penalties for under-production (IC 1991c). These quotas could, to some extent, be traded between producers to reduce the associated efficiency costs. Collectively, these controls effectively stifled intra and interstate trade in market milk and underpinned the commercial viability of some producers and otherwise uneconomic farming practices.

The assistance provided to dairy farmers varied across States, depending mainly on whether the price premiums from sales of market milk were returned to individual farmers in proportion to market milk supplied, or were averaged over all production. Dairy farmers in most States with individual farm production quotas — New South Wales, parts of Queensland and Western Australia — received the highest level of assistance for production of market milk, and among the lowest levels of assistance for production of manufactured milk.

The higher returns to the dairy industry came at the expense of processors and consumers who were subject to substantially higher domestic market milk prices — equivalent at the factory input level to just over 45 cents per litre (table 2.16) or 50 per cent of the pre-tax price in 1992-93 (table 2.18).

All States have reduced controls on the processing, vending and retailing sectors over recent years. However, all States continue to regulate the supply and farm-gate price of market milk.

Dairy deregulation would enable lower cost supply arrangements for market milk to evolve. It would permit competition between processing firms for consumers and market share and would involve considerably more interstate trade in market milk than has been permitted to date. The extent to which interfirm competition would shift the pattern of production between States would depend on the relative efficiency of dairy farmers in different States, the cost of transporting milk between regional markets and the rate at which individual producers are willing and able to adopt new agricultural practices. For example, the Victorian Department of Premier and Cabinet, in an information paper provided to the Inquiry, suggested that the Victorian dairy industry enjoyed a comparative advantage over counterpart activities in other States. Because of this, it suggests that, other things being equal, deregulation of the dairy industry would favour the Victorian industry.

Table 2.16   **State milk production, consumption and factory prices, 1992-93**

| | | | Typical factory input price paid | |
State	Total milk production	Market milk consumption	Market milk	Manufactured milk
	ML	ML	c/L	c/L
New South Wales	997	567	46.0	26.5
Victoria	4,456	447	41.7	28.5
Queensland	702	348	50.5	24.5
Western Australia	324	177	45.6	23.0
South Australia	434	155	42.6	24.1
Tasmania	413	51	39.7	23.9
Australian Capital Territory	0	33	na	na
Australia	**7,329**	**1,810**	**45.4**	**27.5**

Source: ADC (1998, pp. 13 & 17).

Commonwealth support

The Australian Dairy Corporation (ADC) is a Commonwealth SMA whose goal is to improve the profitability of the Australian dairy industry within the auspices of

the *Dairy Produce Act 1986* (ADC 1999). The ADC funds its activities through levies on farmers and through its own trading activities.

Under the 1986 Crean Plan, the ADC raised the domestic 'farm gate' price of manufactured milk by approximately 2 cents per litre above the world export price (ADC 1999, p. 1). The scheme was funded by a levy on all Australian milk production and implemented as a system of payments on exports of manufactured milk products (known as the Market Support Payment). The levy raised an estimated $380 million in 1992-93. The Crean Plan was not, however, compatible with Australia's international trade commitments under the Uruguay round of GATT. In response to this, the Commonwealth modified the marketing arrangements from 1 July 1995. The current scheme will terminate at the end of June 2000 (IC 1997a, p. 21).

The new arrangements are designed to:

> … ensure that industry receives the same net domestic benefit that would have occurred under the Crean Plan, but that this support be provided independently of export sales. (ADC 1999, p. 1)

In 1996-97, dairy farmers paid a levy to the Commonwealth of approximately 2 cents per litre on the domestic sales of market milk. Manufacturers pay a levy of roughly 4 cents per litre on milk used in manufactured milk sold domestically. Milk used in manufactured milk exports are exempt from the levy. These levies raised approximately $540 million (table 2.17).

Table 2.17 **Commonwealth levies on dairy products, 1991-92 to 1996-97**
($ million)

Year	Market milk	Manufactured milk	Total revenue
1991-92	410.5	145.5	556.0
1991-92	382.7	145.1	527.8
1992-93	259.2	120.8	380.0
1993-94	260.5	109.9	370.3
1994-95	319.2	118.2	437.4
1995-96[a]	322.6	150.2	472.9
1996-97[a]	383.9	153.8	537.7

a The assistance arrangements changed from 1 July 1995.

Source: PC estimates.

Overall, dismantling the Commonwealth and State arrangements would reduce domestic retail prices for market and manufactured milk and, notwithstanding the removal of the milk levies, the income of dairy farmers below that which otherwise would have occurred.

Modelling NCP dairy reform

In its earlier modelling of NCP (IC 1995a), the Industry Commission modelled separately the effects of removing anti-competitive practices associated with Commonwealth and State SMAs. While this approach was valid as the Commonwealth and State arrangements are technically separate, it is difficult to decompose the published price distortion (the overall measure of assistance afforded to producers) between the two schemes. This study, therefore, does not model separately the effect of the State and Commonwealth arrangements.

The domestic price of market milk (with suitable adjustments for surety of year round supply) and manufactured milk were, respectively, 50 per cent and 13 per cent above equivalent free-on-board (fob) export benchmark prices in 1992-93 (table 2.18). Using domestic sales shares as weights, domestic dairy prices were on average 37 per cent higher than world prices in 1992-93 (table 2.18). This represents an outer envelope of domestic price reductions that could be achieved by removing all of the domestic pricing arrangements. The price reduction was modelled via a reduction in the commodity taxes on all domestic consumption of manufactured dairy products.

Table 2.18 **Domestic dairy sales and estimated price distortions, Australia, 1992-93**

	Units	Market milk	Manufactured milk	All milk
Domestic production	$m	793	1,522	2,314
less exports	$m	27	1,105	1,132
Domestic sales	$m	766	417	1,183
Share of domestic sales	%	65%	35%	100%
Price distortion	%	49.72%[a]	13%	36.77%[b]

[a] Expressed as a proportion of the fob export price of manufactured milk (44 per cent $\times$ 1.13). [b] Weighted-average using domestic sales share.

Source: PC estimates based on ABARE (1997, p. 74), ABS (*Australian National Accounts, Input-Output Tables, Commodity Details*, 5215.0) and IC (1995b, p. 154).

In assessing the possible production effects of comprehensive dairy reform, this study also models the removal of the 20 per cent assistance on output that applied to Australian dairy exports in 1992-93.

The dominant factor driving the model results is the induced response of export volumes and domestic consumption to these relative price changes. Because the price responsiveness of manufactured milk exports is assumed to exceed the price

responsiveness of domestic demand, the net impact on the dairy industry is likely to be negative.

As noted above, the assistance provided to dairy production varies across States. The tops down nature of the current modelling means that interstate (and intrastate in Queensland) differences have not been be captured explicitly in the modelling. As a result, the 'average' modelling approach adopted here is likely to overstate the extent of adjustment in Victoria and Tasmania and understate it in New South Wales and Queensland.

Sugarcane

The main support afforded the sugar industry was provided through a land assignment system in Queensland and tariff assistance on sugar imports. Reforms relating to each form of assistance and the likely effects of reform are discussed below.

Prior to the introduction of NCP, the Queensland sugar marketing arrangements involved an assignment system whereby canegrowers had a right to deliver sugarcane grown on assigned land to a specified mill for payment. The Queensland Sugar Corporation had the right to purchase all raw sugar produced from cane grown on unassigned land for a nominal penalty rate of $1 per tonne of raw sugar in 1995. This compared with the weighted-average pooled price of approximately $372 per tonne for raw sugar produced on assigned land (Boston Consulting Group 1996a, p. 15). These arrangements restricted competition between mills and canegrowers, as well as reducing the amount of land devoted to cane growing and possibly resulting in generally shorter growing seasons.

Despite the lack of substantial progress on the contentious issue of land assignment, the land area devoted to sugarcane production has increased by 18 per cent since 1992-93 (table 2.19). The Boston Consulting Group claimed that a further 18 per cent increase in land area could occur if the land assignment system ended (Boston Consulting Group 1996b, p. A9.22).[12] These estimates suggest that the 35 per cent increase in land area associated with the end to the land assignment system, identified in 1992 (IC 1992) and based on an earlier and much larger 50 per cent identified by the Sugar Industry Working Party (1990), is not unrealistic.

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[12] The Boston Consulting Group (1996a, p. 19) also claimed that NCP reforms could increase the length of the growing season by 20–30 per cent. However, this increase would not be uniform across all growing regions.

Table 2.19   **Australian sugar production, 1990-91 to 1996-97**

Year	Area harvested	Cane crushed	Sugar production	No. 1 pool price	Exports
	'000 ha	kt	kt (94 nt)	$/t	kt
1990-91	339	25 200	3 514	344	2 649
1991-92	341	21 367	3 111	303	2 276
1992-93	339	29 461	4 256	309	3 127
1993-94	340	32 011	4 370	353	3 456
1994-95	365	34 943	5 080	392	4 112
1995-96	383	37 438	4 979	379	3 981
1996-97p	401	39 990	5 478	342	4 309

Source: ABARE (1997, p. 198).

The removal of restrictions preventing land being used for sugarcane production would see a switch in land use from beef cattle to sugarcane (table 2.20). The changes in land use assumed here are the same as those in IC (1995a, p. 99), adjusted for the different industry structure within MONASH-RR. The 35 per cent increase in land area for cane production is equivalent to a 19.95 per cent increase in land area devoted to 'other farming, export orientated'. There was an offsetting 0.11 per cent reduction in the amount of land used in the northern beef zone.

Table 2.20   **Estimated changes in land use arising from sugar reform, 1990**

Land use	Existing land area	Possible land area	Change in land area	Percentage change
	million ha	million ha	million ha	%
Sugarcane	0.36[a]	0.49	+0.13	+35.00%
Beef	112.89	112.76	-0.13	-0.11%

[a] Total area of land assigned for sugarcane production.

Source: IC (1995a, p. 99).

The tariff on sugar imports was phased down from $115 per tonne (since 1989) to $55 per tonne in 1 July 1992. In line with their commitments under NCP, the Commonwealth and Queensland Governments established the Sugar Industry Review in 1995 to examine the Queensland sugar industry and the need for a tariff on raw and refined sugar (Canegrowers 1999, p. 64). The Review's 74 recommendations were endorsed by the Commonwealth and Queensland Governments and are gradually being implemented. In order to maintain its single-desk selling arrangements, the Sugar Industry Working Party accepted the removal of the tariff applying to sugar imports from 1 July 1997 (Canegrowers 1999, p. 66). Despite recommending some minor modifications, the Review suggested that the land assignment arrangements should continue.

In addition, the NCP reform process would reduce assistance to exports. This aspect of reform has not been modelled, as the overall effect of the removal of export assistance is likely to be small.[13] Instead, exports of the downstream processing industry, 'seafood and sugar', have been held fixed. Exports of 'other farming, export orientated', of which raw sugar production is part, have also been held fixed.[14]

The State statutory marketing arrangements for raw sugar in Queensland, coupled with a specific rate tariff of $55 per tonne, allowed domestic prices to exceed export parity in 1992-93. The domestic price distortion on sugar was of the order of 23 per cent in 1992-93. Given that sugar sales account for 57 per cent of the 'other farming, export orientated' commodity, the resulting reduction in prices to domestic users is 13.11 per cent for the broader MONASH-RR commodity (table 2.21). This has been modelled as a reduction in the commodity tax on 'other farming, export orientated' sold to the downstream processing industry.

Reforms in Queensland, the largest sugar producer State in Australia, should flow through into sugar produced in New South Wales and Western Australia through increased domestic competition. Without reform, producers in these States will find it more difficult to compete with lower cost Queensland producers. Consistent with an outer envelope approach, the modelling undertaken here assumes that the benefits from SMA reform apply to all sugar production.

Rice

Statutory marketing arrangements in New South Wales allow the NSW Rice Growers' Co-operative Limited to vest and market all rice grown in that State.

Domestic rice prices were 13 per cent higher than export parity prices in 1992-93 (table 2.21). Given that New South Wales produces almost all the rice in Australia and that rice accounts for 27 per cent of the MONASH-RR commodity 'other grains', NCP reform of the rice marketing arrangements is expected to reduce the domestic purchasers' price of other grains by 3.51 per cent (table 2.21). This has been modelled as a reduction in the commodity tax on 'other grains' sold to the downstream milling industry.

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[13] The nominal rate of assistance from this in 1992-93 was only 5 per cent, and sugar, the subject of the export assistance, is only a component of a broader export commodity group 'seafood and sugar'.

[14] Reform of domestic sugar marketing arrangements is unlikely to increase Australian exports of cotton, apples, pears, sultanas, horse studs, etc.

The reforms would also reduce assistance to exports, but this has not been modelled here as the effect is judged to be negligible, since the nominal rate of assistance on rice exports was only 2 per cent in 1992-93. Instead, exports of the downstream processing industry, flour milling and other cereal products, have been held fixed.[15]

Potatoes

Input controls restricted the quantity of potatoes grown in Western Australia. Reform of the Western Australian Potato Marketing Authority would reduce potato prices and lower the returns to Western Australia potato growers. Western Australia accounts for 10.5 per cent of production and domestic prices were 29 per cent higher than export prices in 1992-93 (table 2.21). Therefore, ending the Western Australian marketing arrangements would be expected to decrease Australia-wide potato prices by up to 3 per cent. Given that potatoes account for only 8 per cent of the MONASH-RR commodity 'other farming, import competing', this translates into a fall in the producer price of the broader commodity group of 0.25 per cent. The NCP reforms to the Western Australian potato SMA modelled here are the same as IC (1995a, p. 101). The price reduction has been modelled as a reduction in commodity taxes on sales of 'other farming, import competing'.

Table 2.21 **Effects of SMA reform on producer prices, 1992-93** (per cent)

Commodity	Nature of reform	Domestic price distortion[a]	Share of MONASH-RR industry[b]	Share weighted price distortion
Sugarcane	removal of land assignment	23	57	13.11
Rice	removal of State arrangements	13	27	3.51
Potatoes	remove input quotas in Western Australia	3[c]	8	0.25

[a] Australia-wide price distortion. [b] PC estimates based on ABS (*Australian National Accounts, Input-Output Tables, Commodity Details*, 5215.0; unpublished commodity cards). [c] Western Australian price distortion of 29 per cent taking into account that Western Australia accounts for 10.5 per cent of national production.

Source: PC estimates based on IC (1995a, pp. 95 & 102).

Australian exports of potatoes are negligible. Hence, exports of 'other farming, import competing' have been held fixed.[16]

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[15] The ABS input-output classification system on which MONASH-RR is based treats processed rice (IOCC 21530040) as a sub-category of the broader 'flour mill and cereal food products' (IOCC 2105). Flour mill and cereal food products also include, among other things, flour, wheat flour, pasta and bread and cake mixes.

[16] The MONASH-RR industry 'other farming, import competing' also includes a range of horticultural products including, among other things, grapes, bananas, pineapples, oranges, lettuces, tomatoes, and cut flowers.

The reforms to Commonwealth and State statutory marketing authorities modelled here are summarised in box 2.7.

Box 2.7   **Summary of the statutory marketing arrangements scenario**

Dairy:

Change in the domestic price of all dairy products	-37%
Change in export price of all dairy products	-20%

Sugarcane:

Change in the producer price of sugarcane	-23.0%
Expansion of land used for cane growing	+35.0%
Reduction in land used for beef production	-0.1%

Rice:

Change in the producer price of rice Australia-wide	-13.0%

Western Australian potatoes:

Change in the producer price of potatoes Australia-wide	-3.0%

Source: PC estimates.

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3 Impacts of National Competition Policy reforms

This chapter reports on the modelling of the economy-wide and, more importantly, the regional effects of NCP reforms discussed in detail in chapter 2 — reforms to electricity and gas, rail transport, road transport, telecommunications, water and statutory marketing authorities. The reforms were summarised in table 1.1 of chapter 1.

The fortunes of a region can be measured in a number of different ways — by the value of its production, its population, its employment growth, income levels or by the standard of living. MONASH-RR produces two such measures of regional fortune — gross regional product, which measures the value of total production within a region, and total employment. From these two measures a third measure can be inferred — income per person employed. Each of these measures will indicate differences in the fortunes of particular regions and this study uses each of these measures to assess the regional effects of NCP. Again, the nature of the assumption about aggregate employment needs to be borne in mind in assessing the results.

The regional results obtained in a 'tops down' model reflect differences in the relative industrial structure between regions. In light of this, this chapter also presents detailed industry results, from which the model derives its regional estimates.

3.1 Effects of NCP reforms

Electricity and gas

Macroeconomic and industry effects

Of all the NCP reforms, those to electricity and gas provide the largest gains nationally, increasing real GDP by an estimated 1.1 per cent above what it otherwise would be (table 3.1). Real consumption and investment are expected to be 1 per cent

higher. These increases are expected to lead to a small 0.1 per cent appreciation in the real exchange rate.

Table 3.1   **Estimated macroeconomic effects of selected NCP reforms**
(per cent)

Variable	Electric and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Real GDP	1.09	0.21	0.23	0.83	0.04	0.12	2.52
Real GNE	0.82	0.22	0.21	0.77	0.03	0.21	2.25
Real consumption	1.02	0.27	0.25	0.96	0.04	0.26	2.80
Real investment	1.02	0.27	0.25	0.96	0.04	0.26	2.80
Real government spending[a]	0.00	0.00	0.02	0.00	0.00	0.00	0.02
Export volume	2.18	-0.03	0.27	1.31	0.11	-0.41	3.43
Import volume	0.72	0.00	0.17	1.01	0.04	0.05	1.98
GDP deflator	-0.21	0.01	-0.13	0.00	0.02	0.21	-0.10
Nominal exchange rate[b]	0.12	0.18	-0.01	-0.36	0.06	-0.59	-0.60
Real exchange rate[c]	0.10	-0.19	0.13	0.35	-0.08	0.38	0.69
Terms of trade	-0.15	0.04	-0.02	-0.53	0.00	-0.03	-0.69
Pre-tax real wage	0.17	0.12	0.02	0.88	0.20	0.66	3.06
Post-tax real wage	1.42	0.18	0.19	0.98	0.17	0.48	3.42

[a] Held fixed by assumption. [b] Defined as units of foreign currency per $A. [c] Defined as the change in import prices less the change in the GDP deflator. The consumer price index is defined to be the numeraire.

Source: MONASH-RR estimates.

Electricity-intensive industries, such as non-ferrous metals, iron and steel, pulp and paper, and basic chemicals, benefit particularly from lower electricity prices. This lowers their costs and increases their international competitiveness, which in turn flows through to their estimated output increases and into aggregate export volumes (table 3.4 at the end of this chapter). Output of the gas industry is estimated to expand by 20 per cent because of its greater use in electricity generation. Black coal benefits from being a major exporter and a significant input into iron and steel.

The expansion of activity in the energy-intensive and export-orientated mining sectors draws resources away from the agricultural industries, which are not energy-intensive. The manufacturing and service industries generally expand as a result of increased domestic activity and household spending. However, a few industries subject to significant import competition, particularly footwear, are adversely affected by the appreciation of the real exchange rate. This flows through to the local leather industry.

Regional effects

Electricity and gas reform is estimated to increase output — as measured by gross regional product — in all regions across Australia, except for the Gippsland region in Victoria.

MONASH-RR estimates that the strongest regional output gains flowing from electricity and gas reform are in those regions relatively dependent on mining — Fitzroy and North West in Queensland, Pilbara and Mid West in Western Australia, and the Far West of New South Wales — and minerals processing — Peel in Western Australia (table 3.6). The Goldfields-Esperance region centred around Kalgoorlie in Western Australia is estimated to have the largest increase in regional product owing to the high concentration of mining and minerals processing within the region — 22.5 per cent of its employment is in the mining and processing of non-ferrous ores, over 10 times the Australian average.

Generally, regional output is estimated to increase as a result of electricity reform — Gippsland in Victoria is the only region for which a decline in output is estimated, all other things remaining equal. For this region, the labour shedding associated with productivity improvements is estimated to reduce local demand for goods and services substantially. This reduction flows through the model's input-output linkages to lower activity in local industries, all other things remaining equal. Other regions estimated to benefit proportionately less from electricity reform are the predominantly agricultural rural areas in New South Wales, Queensland, South Australia and the Southern region of Tasmania.

The estimated regional employment effects are more mixed than those for output (table 3.7). The regions estimated to experience the strongest employment gain are generally those with the greatest output gains. To accommodate the increase in employment in these regions — with the assumption of no NCP-induced changes in aggregate employment — MONASH-RR estimates employment declines in those regions where increases in activity fall below the national average. Understandably, Gippsland is estimated to experience the largest employment decline — 6.4 per cent. The predominantly agricultural regions of the Southern division in Tasmania, the Wheatbelt in Western Australia, the Central West, South Eastern and Murrumbidgee divisions in New South Wales, and the Wide Bay-Burnett and Central West divisions in Queensland are estimated to have employment lower than otherwise.

All States are estimated to benefit in output terms from electricity and gas reform. Given the strong estimated increase in mining and minerals processing activities, it is not surprising that the Northern Territory and Western Australia are estimated to experience the biggest increase in gross regional product. Conversely, the ACT is estimated to experience the least expansion owing to absence of mining and

minerals processing and the high reliance on services industries in its economy. Despite this increase in output, not all States experience employment gains. Tasmania, South Australia, New South Wales and, to a lesser extent, Queensland are estimated to have employment lower than otherwise as a result of electricity and gas reform.

The net effect of changes in regional income and employment determines what happens to incomes per person employed. Income per person employed is estimated to increase in *all* regions as a result of electricity and gas reform (table 3.8). Perhaps not surprisingly, Gippsland, the region in which the greatest productivity improvement occurs, has the biggest estimated increase in income per worker (5.6 per cent). Other regions estimated to experience strong increases in incomes per person employed are the South West, Pilbara and Wheatbelt divisions of Western Australia, the Southern division of Tasmania, the Northern division of South Australia, and the Central West and South Eastern divisions of New South Wales. These results clearly indicate that employment changes can be an inaccurate barometer of the impact on incomes per person employed.

As discussed in chapter 2, the aggregation of natural gas and brown coal within MONASH-RR involves compromises to the way in which the electricity and gas reforms are modelled. As a result of these compromises, the output and employment gains in the gas-producing regions of Australia — the Pilbara (WA), East Gippsland (Vic), South West (Qld), Northern (SA) — could be larger than indicated here. Conversely, despite being a significant gas-producing region in its own right, the negative impact on Gippsland (Vic) could be greater than that indicated owing to its high reliance on brown coal. The overall impact of NCP reforms is unlikely to be sensitive to these regional allocation issues.

Rail transport

Macroeconomic and industry effects

NCP is expected to provide substantial reductions in the price of rail services to key primary industry export commodities. As the cost of rail transport constitutes a much larger proportion of the export price of black coal than it does for other commodities, the black coal industry is estimated to gain most from rail reform (table 3.4). While grain commodities are expected to benefit from larger rail price reductions, the lower share of rail costs in final-good prices means that the NCP-induced output increases for these commodities are not as large as they are for coal. Black coal output is estimated to increase by 9.0 per cent, other things being equal.

On the other hand, full implementation of NCP is expected to raise the price of passenger and non-bulk rail services. These changes are estimated to induce slight declines in output levels for the activities affected.

Overall, the more efficient structure of rail pricing leads to real GDP being 0.2 per cent higher than otherwise (table 3.1). Real GNE, consumption and investment are higher by similar amounts. However, the mixed price impact on commodities means virtually no expansion in aggregate export volumes, nor in aggregate import volumes.

Regional effects

NCP rail reforms are estimated to strongly benefit the black coal producing regions — Mackay and Fitzroy in Queensland, and the Hunter and Illawarra divisions in New South Wales (table 3.6). As a result, Queensland and New South Wales are expected to experience the strongest output increases from rail reform. Most regions benefit indirectly in output terms through the expansion in overall economic activity. Of the States, Victoria and South Australia benefit the least. A few regions are estimated to experience marginally lower levels of output than would otherwise occur. The largest output decline is estimated for the Pilbara — 0.22 per cent — arising from small reductions in the output of iron ore and oil, gas and brown coal. These results are influenced by the treatment of private rail services. As pointed out in chapter 2, the price of private rail services, a component of iron ore delivery costs, is assumed to be unaffected by NCP.

The regional employment effects resemble magnified versions of the output effects (table 3.7). The coal producing regions are estimated to experience proportionately larger employment increases, while relative declines in employment are estimated most other regions. Of the States, New South Wales is estimated to experience the strongest employment gains. The Northern Territory, Queensland and the ACT are also expected to gain in employment terms. South Australia and Victoria are expected to experience the largest declines in employment, all other things remaining equal. The declines in employment are spread fairly evenly across these States. The South West and Central West divisions in Queensland are also expected to experience marked declines in employment.

Almost all regions gain in terms of income per person employed, with Fitzroy and Mackay in Queensland estimated to have the largest increases (table 3.8). The Illawarra and Richmond-Tweed in New South Wales are expected to experience very marginal declines in incomes per worker from levels that would otherwise prevail, as a result of NCP rail reform. At the State level, Queensland is estimated to

record the strongest gain in income per worker — more than twice the increase in South Australia, the next best State.

Road transport

Macroeconomic and industry effects

Reflecting the widespread use of road transport throughout the economy, road transport reform is estimated to increase most areas of economic activity, with real GDP estimated to be 0.2 per cent higher than otherwise (table 3.1). More efficient road transport is estimated to reduce domestic costs and enhance Australian competitiveness. Export volumes are therefore estimated to increase by 0.3 per cent. Imports are also estimated to increase by 0.2 per cent to satisfy domestic absorption requirements and the model's macroeconomic constraints.

The benefits of road transport reform are spread relatively evenly throughout the economy, with almost all industries gaining to a similar extent (table 3.4). Some of the more notable gaining industries are residential construction, oil, gas and brown coal, other mining, sawmilling, iron and steel and many of the food processing industries.

Regional effects

NCP road transport reform is estimated to yield relatively uniform increases in output across regions, with most regions experiencing a 0.2 to 0.3 per cent increase in output (table 3.6). The only region to for which an output decline is estimated — and a marginal decline at that — is the ACT.

The employment effects also exhibit substantially less inter-regional variation than for other reforms (table 3.7). Although the changes are modest compared with other NCP reforms, the Pilbara and Peel (WA) and Northern (SA) are estimated to gain more in employment terms than other regions. The largest employment declines are in Tasmania, the South Eastern division of New South Wales and the Central West of Queensland.

Telecommunications

Macroeconomic and industry effects

Reflecting the importance of telecommunications to the Australian economy, NCP telecommunication reform is estimated to raise real GDP by 0.8 per cent above what it would otherwise be (table 3.1). Telecommunications reform favours international trade, increasing export and import volumes by 1.3 per cent and 1.0 per cent, respectively. The increase in domestic activity leads to an appreciation of the nominal and real exchange rates.

The substantial capital and labour productivity improvements associated with NCP reform are estimated to lower the price of telecommunications to households by about 21 per cent, and to benefit those industries using relatively substantial amounts of telecommunications services — finance, insurance, residential construction and the telecommunications industry itself. Indeed, most industries benefit in output terms from telecommunications reform (table 3.4).

Those industries that do not benefit from NCP telecommunication reform are a few agricultural sectors for which the real appreciation of the exchange rate outweighs the benefits of lower telecommunications prices.

Regional results

NCP telecommunications reform is estimated to increase output in every region across Australia (table 3.6). While Western Australia is estimated to benefit most, there is little interstate variation. Goldfields-Esperance and Perth in Western Australia, along with Moreton in Queensland, are estimated to have marginally higher output increases than other regions. The Goldfields-Esperance region benefits most from the increase in exports of non-ferrous metal ores. 'Other finance' is significantly more important in proportionate terms in Perth than in any other region, besides Sydney. Reflecting the strong growth in the Gold Coast region south of Brisbane, Moreton in Queensland has proportionately the highest employment in residential construction of any region and above average employment in the 'other finance' industry.

The employment gains are estimated to be strongest in those regions reliant on the non-telecommunications industries that are expanding (table 3.7). Accordingly, the regions estimated to experience employment declines are those proportionately more reliant on agricultural industries, as well as those adversely affected by the labour productivity improvements within the telecommunications industry itself — most notably Melbourne, Central Highlands and Loddon in Victoria and the South West

in Queensland. At the State level, the strongest employment gains are in South Australia, Western Australia and Tasmania. Queensland benefits more than New South Wales and Victoria from telecommunications reform by having proportionately less employment within the telecommunications industry.

NCP telecommunications reform is estimated to increase regional incomes per worker across Australia, with the strongest gains being in Victoria and New South Wales, especially in Melbourne, Sydney and the Central Highlands (table 3.8).

The remaining NCP reforms

Macroeconomic and industry effects

NCP reform of SMAs and water produce substantially smaller economy-wide gains than the other reforms. Collectively, these reforms are estimated to raise real GDP by 0.16 per cent (table 3.1). SMA reform contributes the bulk of this gain, with dairy being its single most important component.

The model indicates that the removal of the dairy marketing arrangements will affect the industry in two ways. Lower domestic prices arising from NCP reform would increase domestic demand for dairy products, thereby providing a stimulus to the domestic industry. Offsetting this, a substantial reduction in exports of processed dairy products is estimated, as primary producers are no longer able to subsidise production from higher domestic market prices. The net effect of these reforms, all other things remaining equal, is a contraction in the dairy industry, relative to what would otherwise occur. The reforms provide a significant benefit to domestic consumers.

As expected, dairy reform is estimated to have an adverse impact on the dairy processing industry (dairy), with flow-on effects to the milk producing industry (milk cattle and pigs). Output in these industries is estimated to decline by 25 per cent and 14 per cent, respectively, as a result of lower exports of processed dairy products.

Reforms of SMAs increase the output of most other industries slightly.

Regional effects

SMA reform benefits urban Australia and many regional areas in output terms (table 3.6). However, it has detrimental effects on output in those regions with higher concentrations of activity in the protected industries. Victoria and Tasmania

are estimated to have lower output than otherwise because of their greater reliance on dairying. The remaining States are expected to have higher output, although output in a number of regions in these States is estimated to be lower than otherwise. The South Australian rural regions estimated to decline — primarily Outer Adelaide, Murray Lands and the South East — are more reliant on milk cattle than most regions. The marginal decline in output estimated for Murray in New South Wales is attributable to the effects of rice reform.

The regions estimated to have the largest declines in regional output are the dairying regions of the Western District, Goulburn and Gippsland in Victoria, and Mersey-Lyell in Tasmania.

The employment effects generally mirror the output effects (table 3.7). Incomes per person employed are estimated to increase in almost all areas (table 3.8).

All NCP reforms

Macroeconomic and industry effects

The NCP reforms considered here are cumulatively expected to raise real GDP by about 2.5 per cent, equivalent to almost one year's annual growth (table 3.1). Most of this increase is driven by the electricity and gas, and telecommunications reforms — the contributions of the remaining NCP reforms are modest in comparison. Real GNE, real consumption and real investment are also expected to be higher than otherwise.

Collectively, the reforms would favour international trade because they typically lower domestic production costs enhancing the competitiveness of Australian exporters. This is estimated to increase annual export volumes by 3.4 per cent. The resulting higher levels of national income are estimated to increase annual imports by 2.0 per cent. The substantial increase in export volumes comes at the expense of slightly lower export prices, and results in a small deterioration in the terms of trade.

Given the long-run assumption that aggregate employment remains fixed, the NCP reforms are estimated to feed through into higher pre- and post-tax real wages. Post-tax wages generally rise more than pre-tax wages, since in contrast to IC (1995a), the revenue gains from reform are assumed to be passed back to households via income tax cuts.

The economy-wide results obtained using MONASH-RR are slightly lower than those for corresponding reforms obtained from HILORANI (IC 1995a, pp. 50–1), but are generally comparable. The real GDP gain reported here is slightly higher for

telecommunications, but lower for all of the other reforms. The overall GDP gain of 2.5 per cent is smaller than the 5.5 per cent gain in IC (1995a), primarily because fewer reforms have been modelled.

At the industry level, NCP is estimated to raise the level of output in most mining, manufacturing and service industries. In particular, it would favour many of the industries directly subject to reform — electricity, gas and telecommunications. The export-orientated mining industries — non-ferrous ores, black coal, other mining and services to mining — are also expected to benefit substantially, as are the downstream processing industries, non-ferrous metals and basic iron and steel. Other industries expected to benefit substantially in output terms are the electricity-intensive manufacturing industries (eg pulp and paper and basic chemicals), each transport industry, other finance activities and the residential construction industry.

However, not all industries are estimated to increase output above what would otherwise occur. In particular, the reforms are estimated to have an adverse impact on some agricultural and related manufacturing industries, with milk cattle and pigs, and dairy products being subject to the largest estimated declines, all other things remaining equal.

Industries that gain the most in output terms are shown in the top panel of table 3.2, along with those that are most adversely affected.

Table 3.2   **Key gaining and losing industries from selected NCP reforms**

Measure	Biggest gaining industries		Biggest losing industries	
Output	Gas	(+20.8%)	Dairy	(-24.8%)
	Black coal	(+11.9%)	Milk cattle & pigs	(-14.0%)
	Non-ferrous metals	(+11.2%)	Train manufacturing	(-4.1%)
	Telecommunications	(+7.4%)	Leather	(-1.5%)
	Non-ferrous metal ores	(+6.6%)	Services to agriculture	(-1.1%)
Employment	Black coal	(+15.4%)	Electricity	(-60.9%)
	Non-ferrous metals	(+13.4%)	Telecommunications	(-38.2%)
	Gas	(+9.1%)	Dairy	(-29.4%)
	Non-ferrous metal ores	(+8.0%)	Milk cattle & pigs	(-22.6%)
	Water transport	(+6.2%)	Water	(-8.5%)

Source: MONASH-RR estimates.

Employment effects

The estimated cumulative effects on industry employment generally follow the effects on output (table 3.5). Because the reforms are generally estimated to lead to economy-wide increases in real wages, however, the employment effects in adversely affected industries tend to be bigger than the output effects. Thus,

employment in the pastoral zone is estimated to be 1.4 per cent lower than otherwise, for example, even though its output is estimated to be only 0.7 per cent lower.

There are a few industries in which estimated employment changes are not proportional to estimated output changes — this applies particularly to industries undergoing significant increases in labour productivity. The most obvious examples are electricity and telecommunications, where employment is estimated to decline by roughly 60 and 40 per cent, respectively, despite small increases in output.

State effects

The NCP reforms considered here are estimated to increase output in all States Australia-wide (table 3.6). The strongest increases in output occur in the Northern Territory (3.3 per cent), Western Australia (3.3 per cent), Queensland (2.9 per cent) and New South Wales (2.6 per cent). The ACT benefits less than any other State, owing to the narrowness of its industrial base (1.8 per cent). Victoria benefits only marginally more than the ACT owing to the importance of dairy within the State.

Reflecting the interstate labour mobility assumptions incorporated within the model and the assumption of fixed aggregate employment, the stronger growing regions are estimated to experience the higher employment increases (table 3.7). NCP is estimated to reduce employment from what would otherwise occur in Tasmania (0.7 per cent), the ACT (0.7 per cent), Victoria (0.5 per cent) and South Australia (0.2 per cent). Conversely, Western Australian and the Northern Territory are estimated to have the strongest increases in employment (0.8 and 0.6 per cent, respectively).

NCP reform is estimated to increase regional income per person employed across *all* States, including those estimated to have lower employment than would otherwise occur (table 3.8). Indeed, there is substantially less interstate variation in income per person employed than in output or employment. This highlights the limitations of focusing on employment as the sole barometer of the fortunes of a State (or region).

Regional effects

The modelling results indicate that regional output is likely to increase in 56 of the 57 regions covered within MONASH-RR (table 3.6). The only exception is the Gippsland region of Victoria, which has a narrow industrial base centred on the dairying and electricity industries. Thus, in output terms, NCP reform is good for almost all of Australia, both urban and rural regions.

The State capitals and a number of rural centres, particularly those in New South Wales, have diversified industrial bases and are estimated to experience significant increases in output, relative to what would otherwise occur. However, those regions experiencing the greatest increases are those regions highly reliant on mining — Mackay, Fitzroy and North West in Queensland. Goldfields-Esperance and Peel in Western Australia and also Hunter and Illawarra in New South Wales.

Conversely, those regions estimated to gain the least are the dairy-intensive regions within Victoria and South Australia and Gippsland in Victoria.

The regional effects on employment are estimated to be broadly similar to those on output (table 3.7). In addition, Peel in Western Australia is estimated to experience a strong increase in employment above levels that would otherwise prevail because of its reliance on minerals processing. Three Victorian regions — Gippsland, Western Districts and Goulburn — are estimated to experience the largest declines in employment, relative to what otherwise would occur. As agriculture is estimated to benefit less from NCP reform than other industries, the agricultural regions of the Wheatbelt in Western Australia and the Southern division in Tasmania are estimated to experience a reduction in employment from levels that would otherwise prevail.

However, a very different pattern of regional performance emerges when output per person employed is considered (table 3.8). The most obvious difference is that incomes per person employed are estimated to increase in *every* region, and the increases are generally the greatest where the productivity improvements are the greatest. Thus, Gippsland is estimated to experience the strongest increase in incomes per person employed (7.4 per cent). The movement of employment between regions would tend to reduce regional disparities in income. Other regions estimated to benefit in income per person employed are the Wheatbelt in Western Australia, the Northern division of South Australia, the Southern division of Tasmania and Fitzroy in Queensland (table 3.3). Many of the fast growing mining regions would experience lower increases in income per person employed because of increasing labour intensity and lower prospects for direct productivity improvements.

In short, the modelling highlights that the fortunes of a particular region are closely tied to its industrial base. Those regions with narrow industrial bases are more vulnerable to downturns in activity and employment than more diversified regions. On the other hand, regions with narrow industrial bases have a lot to gain when their industry benefits from reform. The gains in income per person employed are generally highest where the prospects for productivity improvements are high, even though this is often associated with reductions in employment.

Table 3.3	**Key gaining and losing regions from selected NCP reforms**			
Measure	*Regions gaining the most*		*Regions gaining the least*	
Output	Mackay (Qld)	(+5.8%)	Gippsland (Vic)	(-1.1%)
	Goldfields-Esperance (WA)	(+5.5%)	Western District (Vic)	(+0.0%)
	Fitzroy (WA)	(+5.5%)	Goulburn (Vic)	(+0.2%)
	North West (Qld)	(+4.1%)	Murray Lands (SA)	(+1.1%)
	Peel (WA)	(+4.0%)	Loddon (Vic)	(+1.2%)
Employment	Goldfields-Esperance (WA)	(+4.0%)	Gippsland (Vic)	(-8.5%)
	North West (Qld)	(+2.5%)	Western District (Vic)	(-2.9%)
	Mackay (Qld)	(+2.2%)	Goulburn (Vic)	(-2.7%)
	Peel (WA)	(+1.6%)	Wheatbelt (WA)	(-2.5%)
	Fitzroy (Qld)	(+1.5%)	Southern (Tas)	(-2.5%)
Output per capita	Gippsland (Vic)	(+7.4%)	Goldfields-Esperance (WA)	(+1.5%)
	Wheatbelt (WA)	(+4.5%)	North West (Qld)	(+1.6%)
	Northern (SA)	(+4.1%)	Moreton (Qld)	(+1.9%)
	Southern (Tas)	(+4.0%)	Far North (Qld)	(+2.0%)
	Fitzroy (Qld)	(+3.9%)	Barwon (Vic)	(+2.0%)

Source: MONASH-RR estimates.

3.2   Sensitivity analysis

The modelling results presented so far assumed that the labour market gains from NCP reforms fed through into real wage gains rather than increases in aggregate employment. To test the sensitivity of the regional results to this assumption, all of the NCP reforms have also been examined assuming that NCP reforms increased aggregate employment by 1.65 per cent, 2.75 per cent and 3.93 per cent. These increases in employment were based on various assumptions about movements in unemployment, with actual unemployment assumed to move down towards some estimate of the so-called natural rate. As noted in chapter 1, they were equivalent to reductions in the unemployment rate from 9 per cent to 7.5 per cent, from 9 per cent to 6.5 per cent, and from 11 per cent to 7.5 per cent, respectively.

The sensitivity analysis indicates that, if NCP reform increases aggregate employment levels, then the real GDP gains are likely to be higher than those reported earlier in this chapter. With a 3.93 per cent increase in national employment, real GDP is estimated to be 6.7 per cent higher than otherwise — some 4.2 percentage points higher than in the base case. Higher national employment levels would translate into larger increases in regional output and employment (or smaller decreases, if losses were estimated to occur) in every region, relative to the base case.

The number of regions adversely affected declines significantly as aggregate employment increases. Under the sensitivity analysis, no region is estimated to

experience a reduction in output, compared with one in the base case (Gippsland) (table 3.9). The number of regions experiencing employment declines falls progressively from 33 in the base case, to 10 with a 1.65 per cent increase in aggregate employment, to 5 with a 2.75 per cent increase in employment, to just one (Gippsland) with a 3.93 per cent increase in aggregate employment (table 3.10). Even with a 3.93 per cent increase in aggregate employment, NCP reforms are estimated to reduce employment in Gippsland by 4.8 per cent. Because the increases in aggregate employment are spread relatively evenly across regions, the analysis implies that substantially higher national employment growth than has been considered here would be needed to fully offset the adverse employment effects in the Gippsland.

Table 3.4 **Estimated industry output implications of selected NCP reforms**
(per cent)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Pastoral	-0.46	-0.40	0.10	-0.12	-0.22	0.42	-0.67
Wheat Sheep	-0.27	-0.14	0.06	-0.03	-0.12	-0.10	-0.60
High Rainfall	-0.45	-0.32	0.07	-0.11	-0.15	0.02	-0.94
Northern Beef	-0.22	-0.39	0.12	0.02	-0.16	0.89	0.26
Milk Cattle & Pigs	-0.10	-0.38	0.10	0.08	-0.11	-13.57	-13.99
Other Export Farming	-0.95	-0.79	0.08	-0.30	-0.20	1.57	-0.58
Import Competing Farming	-0.32	-0.78	0.14	0.43	-0.12	0.06	-0.59
Poultry	0.01	-0.17	0.11	0.04	-0.11	1.57	1.45
Agricultural Services	-0.62	-0.36	0.03	-0.11	-0.20	0.12	-1.14
Forestry & Forest Products	0.41	-0.24	0.17	0.44	-0.13	0.22	0.87
Fishing & Fish Products	-0.39	-0.47	0.24	0.48	-0.10	0.89	0.66
Iron Ore	3.00	-0.57	0.17	0.76	0.06	0.69	4.13
Non Ferrous Ores	3.93	0.64	0.17	1.37	-0.04	0.53	6.60
Black Coal	2.44	8.97	0.18	0.18	-0.31	0.41	11.88
Oil, Gas & Brown Coal	1.61	-0.36	0.34	0.62	-0.19	0.43	2.45
Other Mining	1.21	-0.15	0.28	0.99	-0.06	0.56	2.84
Mining Services	2.51	0.51	0.23	1.00	-0.05	0.46	4.67
Meat Products	-0.03	-0.27	0.15	0.01	-0.17	2.32	2.00
Dairy Products	0.00	-0.41	0.08	0.18	-0.07	-24.62	-24.85
Fruit Vegetable	0.96	-0.26	0.26	0.67	-0.05	1.87	3.46
Margarine, Oil & Fat Products	1.23	-0.35	0.24	0.55	0.08	1.57	3.32
Flour & Cereal Products	1.32	0.28	0.24	0.57	0.02	0.06	2.49
Bread, Cakes & Biscuits	0.30	0.03	0.05	0.22	0.01	0.36	0.98
Confectionary & Cocoa Products	0.58	-0.21	0.19	0.66	0.07	2.46	3.73
Seafood, Sugar & Other Food	0.41	-0.82	0.31	0.79	-0.05	-0.12	0.53
Soft Drinks & Cordials	0.56	0.06	0.14	0.47	0.06	0.24	1.54
Beer & Malt Products	1.03	0.08	0.25	0.66	0.06	0.31	2.40
Other Alcoholic Beverages	0.65	-0.36	0.30	2.06	0.00	0.78	3.43
Tobacco Products	0.48	0.19	0.09	0.32	0.03	0.18	1.30
Cotton Ginning, Wool Scouring	-0.01	-0.29	0.15	0.10	-0.13	0.38	0.21
Man-made Fibres & Yarns	1.33	-0.30	0.18	0.92	-0.12	0.36	2.36
Cotton Yarns & Fabrics	0.90	-0.29	0.17	0.46	-0.16	0.29	1.37
Worsted & Woollen Yarns	0.84	-0.18	0.19	0.57	-0.12	0.31	1.61
Textile Finishing	0.37	-0.11	0.14	0.50	-0.06	0.19	1.02
Textile Floor Coverings	0.98	-0.08	0.25	1.03	-0.06	0.35	2.46
Other Textile Products	0.70	-0.22	0.20	1.08	-0.04	0.38	2.11
Knitting Mill Products	0.40	-0.10	0.12	0.60	-0.04	0.23	1.21
Clothing	0.17	-0.06	0.11	0.38	-0.05	0.15	0.69
Footwear	-0.09	-0.18	0.14	0.11	-0.15	0.16	-0.02
Sawmill Products	0.69	-0.79	0.32	1.07	-0.22	0.43	1.50

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Table 3.4   (continued)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Veneers & Boards	1.37	-0.14	0.27	0.93	-0.04	0.29	2.69
Fittings, Joinery & Wood Products	0.74	0.12	0.25	1.04	0.03	0.23	2.41
Furniture & Matresses	0.82	0.10	0.22	0.87	0.00	0.28	2.30
Pulp, Paper & Paperboard	2.24	-0.11	0.11	0.77	0.00	0.26	3.27
Bags & Fibreboard Boxes	0.83	-0.27	0.13	0.73	-0.01	0.18	1.59
Paper Products nec	1.02	-0.10	0.09	0.90	0.09	0.20	2.20
Newspapers & Books	0.58	-0.11	0.09	0.92	0.10	0.15	1.73
Commercial Printing	0.75	-0.01	-0.05	0.92	0.09	0.13	1.83
Chemical Fertilisers	0.98	0.20	0.18	0.56	0.01	-0.15	1.78
Other Basic Chemical Products	2.77	-0.26	0.27	0.86	-0.09	0.33	3.88
Paints & Varnishes	0.92	-0.04	0.27	1.06	-0.01	0.34	2.53
Pharmaceutical Products	0.51	-0.25	0.25	1.30	0.04	0.51	2.36
Soaps & Detergents	0.55	-0.07	0.16	1.17	0.04	0.32	2.17
Cosmetics & Toiletries	0.51	-0.09	0.18	0.90	0.23	0.21	1.93
Other Chemical Products	1.14	0.23	0.18	0.96	0.03	0.40	2.95
Petroleum & Coal Products	1.47	-0.26	0.27	1.03	0.10	0.26	2.85
Glass & Glass Products	1.36	-0.13	0.23	0.91	-0.02	-0.47	1.88
Clay Products & Refractories	1.70	0.05	0.29	1.04	-0.02	0.28	3.34
Cement	0.86	0.13	0.29	0.99	0.02	0.27	2.56
Readymix Concrete	0.32	0.14	0.29	1.05	0.04	0.26	2.10
Concrete Products	0.26	0.08	0.28	1.01	0.02	0.26	1.92
Non-Metallic Mineral Products	1.55	0.10	0.29	1.00	0.04	0.33	3.31
Basic Iron & Steel	4.19	-0.71	0.31	0.86	-0.21	0.46	4.90
Non Ferrous Metal Products	9.99	-0.16	0.20	0.78	-0.23	0.66	11.25
Structural Metal Products	-1.93	0.01	0.24	0.99	-0.01	0.27	-0.43
Sheet Metal Products	1.68	-0.79	0.30	1.30	-0.15	0.54	2.89
Other Metal Products	0.32	-0.24	0.21	0.96	-0.08	0.30	1.45
Motor Vehicles & Parts	0.78	-0.14	0.25	1.02	-0.08	0.23	2.06
Ships & Boats	0.86	-0.24	0.21	0.46	-0.25	0.43	1.47
Railway Rolling Stock	1.69	-6.57	0.17	0.50	-0.12	0.21	-4.12
Aircraft	0.74	-0.51	0.17	0.99	0.04	0.47	1.89
Scientific Equipment	0.51	-0.49	0.23	1.71	0.01	0.52	2.48
Electronic Equipment	0.19	-0.39	0.22	1.35	0.08	0.48	1.93
Household Appliances	0.90	-0.04	0.28	1.23	0.03	0.31	2.70
Other Electical Equipment	1.01	-0.10	0.23	1.22	-0.02	0.34	2.68
Agricultural Machinery	0.31	-0.80	0.27	1.47	-0.25	-0.06	0.93
Construction Machinery	0.15	-0.43	0.30	1.28	-0.14	0.43	1.59
Other Manufacturing Machinery	-0.35	-0.22	0.24	1.25	-0.07	0.39	1.23
Leather & Leather Products	-1.73	-1.30	0.32	-0.52	-0.79	2.50	-1.52
Rubber Products	1.23	0.20	0.20	0.87	-0.03	0.26	2.74

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Table 3.4   (continued)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Plastic & Related Products	1.05	-0.17	0.20	0.94	-0.07	-0.08	1.87
Signs & Advertising Displays	0.71	-0.15	0.14	0.86	0.01	0.15	1.71
Other Manufacturing	-0.24	-0.65	0.20	0.80	-0.28	0.57	0.39
Electricity	2.52	0.05	-0.05	0.59	0.04	0.07	3.21
Gas	19.68	0.04	0.16	0.77	-0.02	0.17	20.80
Water, Sewage & Drainage	1.12	0.16	0.16	0.71	0.20	0.18	2.52
Residential Building	1.15	0.25	0.36	1.33	0.08	0.29	3.46
Other Building & Construction	-0.47	0.05	0.23	0.80	0.01	0.22	0.84
Wholesale Trade	0.82	-0.17	0.19	0.89	0.00	-0.02	1.71
Retail Trade	0.70	0.20	0.18	0.66	0.05	0.15	1.95
Mechanical Repairs	0.71	0.08	0.18	0.71	0.03	0.10	1.82
Other Repairs	0.98	0.27	0.18	0.86	0.01	0.18	2.49
Road Transport	0.79	0.61	0.12	0.71	-0.03	0.03	2.23
Rail & Other Transport	2.21	-1.32	0.15	0.37	-0.13	0.17	1.45
Water Transport	3.02	1.15	0.16	0.62	-0.09	0.82	5.69
Air Transport	0.88	0.01	0.21	0.87	0.09	0.53	2.60
Transport Services	1.28	0.26	0.16	0.75	0.01	0.16	2.61
Communication	1.08	0.18	0.10	5.69	0.13	0.17	7.35
Banking	1.09	0.16	0.13	0.90	0.05	0.14	2.46
Non-Bank Finance	1.03	-0.10	0.19	0.90	0.05	0.19	2.26
Investment Services	0.85	0.02	-0.17	0.83	0.04	0.22	1.80
Insurance Services	0.37	0.12	0.40	1.61	0.41	-0.37	2.55
Other Financial Services	1.01	-0.02	0.12	1.43	0.79	0.13	3.47
Ownership of Dwellings	1.36	0.33	0.29	0.57	-0.07	0.29	2.77
Public Administration	0.18	-0.01	0.04	0.18	0.01	0.02	0.42
Defence	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Health	0.63	0.16	0.16	0.43	-0.06	0.12	1.44
Education	-0.42	-0.09	0.09	0.04	-0.20	0.06	-0.52
Welfare & Religious Services	0.34	0.06	0.08	0.46	-0.02	0.08	1.00
Entertainment & Leisure	1.20	0.23	0.23	1.12	0.27	0.28	3.33
Restaurants, Hotels & Clubs	0.93	0.10	0.21	0.71	0.15	0.54	2.64
Personal Services	1.03	0.22	0.26	0.70	0.07	0.24	2.53
Other	-0.01	-0.10	0.01	0.02	0.00	0.01	-0.07

Source: MONASH-RR estimates.

Table 3.5 **Estimated industry employment implications of selected NCP reforms**
(per cent)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Pastoral	-0.91	-0.64	0.13	-0.20	-0.30	0.56	-1.36
Wheat Sheep	-0.77	-0.31	0.10	-0.09	-0.20	-0.26	-1.52
High Rainfall	-0.89	-0.56	0.10	-0.19	-0.24	-0.01	-1.80
Northern Beef	-0.59	-0.68	0.18	0.01	-0.25	1.45	0.11
Milk Cattle & Pigs	-0.30	-0.63	0.14	0.11	-0.17	-21.70	-22.55
Other Exporting Farming	-1.41	-1.10	0.11	-0.43	-0.26	-3.65	-6.75
Import Competing Farming	-0.48	-1.01	0.18	0.55	-0.15	0.05	-0.87
Poultry	-0.41	-0.28	0.09	-0.05	-0.14	1.84	1.05
Agricultural Services	-0.96	-0.46	0.02	-0.17	-0.22	0.07	-1.72
Forestry & Forest Products	0.32	-0.29	0.18	0.48	-0.13	0.20	0.75
Fishing & Fish Products	-0.80	-0.62	0.27	0.50	-0.11	0.98	0.22
Iron Ore	3.81	-1.01	0.22	1.06	0.12	0.85	5.04
Non Ferrous Metal Ores	4.75	0.77	0.18	1.76	-0.05	0.60	8.01
Black Coal	2.79	12.24	0.20	0.17	-0.41	0.43	15.42
Oil, Gas & Brown Coal	1.18	-0.57	0.32	0.49	-0.29	0.47	1.61
Other Mining	1.00	-0.33	0.34	1.24	-0.07	0.63	2.80
Mining Services	2.54	0.52	0.24	1.04	-0.06	0.47	4.75
Meat Products	-0.21	-0.33	0.15	-0.02	-0.19	2.51	1.91
Dairy Products	-0.30	-0.53	0.07	0.14	-0.09	-28.73	-29.45
Fruit & Vegetable Products	0.91	-0.30	0.27	0.70	-0.05	1.98	3.51
Margarine, Oil & Fat Products	1.07	-0.48	0.25	0.56	0.09	1.78	3.28
Flour & Cereal Products	1.12	0.25	0.24	0.55	0.01	0.02	2.18
Bread, Cakes & Biscuits	0.15	0.00	0.04	0.21	0.01	0.35	0.77
Confectionary & Cocoa Products	0.37	-0.30	0.19	0.71	0.08	2.79	3.83
Seafood, Sugar & Other Food	0.19	-0.99	0.34	0.85	-0.06	-0.19	0.13
Soft Drinks & Cordials	0.27	0.00	0.13	0.44	0.05	0.22	1.11
Beer & Malt Products	0.78	0.03	0.25	0.66	0.06	0.31	2.08
Other Alcoholic Beverages	0.39	-0.47	0.31	2.26	-0.01	0.84	3.33
Tobacco Products	0.33	0.18	0.09	0.31	0.04	0.16	1.10
Cotton Ginning, Wool Scouring	-0.26	-0.36	0.15	0.05	-0.15	0.38	-0.19
Man-made Fibres & Yarns	1.27	-0.37	0.18	0.97	-0.14	0.35	2.27
Cotton Yarns & Fabrics	0.80	-0.35	0.17	0.46	-0.18	0.28	1.19
Worsted & Woollen Yarns	0.80	-0.20	0.19	0.59	-0.12	0.31	1.55
Textile Finishing	0.30	-0.13	0.14	0.50	-0.06	0.18	0.93
Textile Floor Coverings	0.87	-0.13	0.26	1.10	-0.07	0.35	2.38
Other Textile Products	0.51	-0.30	0.20	1.14	-0.06	0.39	1.89
Knitting Mill Products	0.34	-0.12	0.12	0.62	-0.04	0.22	1.14
Clothing	0.08	-0.08	0.10	0.38	-0.05	0.13	0.57
Footwear	-0.18	-0.20	0.13	0.10	-0.16	0.15	-0.16
Sawmill Products	0.51	-0.93	0.34	1.14	-0.25	0.44	1.24

Table 3.5   (continued)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Veneers & Boards	1.33	-0.18	0.28	0.97	-0.05	0.29	2.64
Fittings, Joinery & Wood Products	0.67	0.11	0.26	1.09	0.03	0.22	2.38
Furniture & Matresses	0.76	0.09	0.22	0.91	0.00	0.27	2.26
Pulp, Paper & Paperboard	2.24	-0.23	0.10	0.81	-0.01	0.23	3.14
Bags & Fibreboard Boxes	0.58	-0.41	0.13	0.80	-0.01	0.14	1.22
Paper Products nec	0.80	-0.20	0.07	1.00	0.11	0.16	1.94
Newspapers & Books	0.40	-0.16	0.08	0.93	0.10	0.13	1.48
Commercial Printing	0.58	-0.05	-0.08	0.92	0.09	0.11	1.57
Chemical Fertilisers	0.97	0.20	0.19	0.57	0.01	-0.16	1.77
Other Basic Chemical Products	2.93	-0.39	0.29	0.95	-0.11	0.32	3.98
Paints & Varnishes	0.84	-0.08	0.28	1.15	0.00	0.33	2.52
Pharmaceutical Products	0.36	-0.31	0.26	1.40	0.05	0.52	2.29
Soaps & Detergents	0.30	-0.16	0.17	1.37	0.06	0.31	2.05
Cosmetics & Toiletries	0.38	-0.14	0.19	0.98	0.27	0.19	1.88
Other Chemical Products	1.05	0.22	0.19	1.05	0.04	0.41	2.95
Petroleum & Coal Products	1.52	-0.37	0.32	1.23	0.14	0.22	3.05
Glass & Glass Products	1.31	-0.21	0.26	1.03	-0.02	-0.64	1.72
Clay Products & Refractories	1.72	0.01	0.33	1.18	-0.02	0.26	3.48
Cement	0.62	0.08	0.33	1.14	0.03	0.23	2.43
Readymix Concrete	0.12	0.12	0.33	1.18	0.06	0.23	2.04
Concrete Products	0.08	0.05	0.31	1.14	0.04	0.24	1.85
Non-Metallic Mineral Products	1.54	0.06	0.34	1.18	0.06	0.31	3.48
Basic Iron & Steel	4.40	-0.77	0.33	0.92	-0.22	0.46	5.11
Non Ferrous Metal Products	12.05	-0.25	0.24	0.94	-0.27	0.71	13.43
Structural Metal Products	-2.19	-0.01	0.25	1.04	-0.01	0.26	-0.65
Sheet Metal Products	1.69	-0.89	0.31	1.39	-0.16	0.56	2.90
Other Metal Products	0.24	-0.28	0.21	1.00	-0.09	0.29	1.38
Motor Vehicles & Parts	0.74	-0.17	0.26	1.10	-0.08	0.22	2.07
Ships & Boats	0.82	-0.29	0.22	0.49	-0.26	0.43	1.41
Railway Rolling Stock	1.72	-7.04	0.18	0.54	-0.12	0.20	-4.52
Aircraft	0.71	-0.55	0.18	1.03	0.04	0.47	1.88
Scientific Equipment	0.40	-0.57	0.24	1.84	0.01	0.54	2.47
Electronic Equipment	0.07	-0.45	0.23	1.42	0.08	0.49	1.84
Household Appliances	0.87	-0.06	0.29	1.29	0.03	0.30	2.73
Other Electical Equipment	0.99	-0.12	0.24	1.28	-0.02	0.34	2.72
Agricultural Machinery	0.27	-0.84	0.27	1.52	-0.26	-0.08	0.89
Construction Machinery	0.13	-0.45	0.30	1.31	-0.15	0.44	1.58
Other Manufacturing Machinery	-0.43	-0.24	0.24	1.30	-0.07	0.39	1.18
Leather & Leather Products	-1.98	-1.41	0.33	-0.59	-0.84	2.64	-1.85
Rubber Products	1.19	0.19	0.21	0.94	-0.02	0.25	2.76

Table 3.5   (continued)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
Plastic & Related Products	0.97	-0.22	0.21	0.99	-0.08	-0.13	1.75
Signs & Advertising Displays	0.65	-0.18	0.14	0.89	0.01	0.13	1.65
Other Manufacturing	-0.38	-0.71	0.20	0.84	-0.30	0.58	0.23
Electricity	-61.46	-0.10	-0.15	0.87	0.11	-0.14	-60.87
Gas	7.81	-0.11	0.21	1.12	0.00	0.03	9.05
Water, Sewage & Drainage	0.92	0.08	0.19	1.05	-10.77	0.06	-8.47
Residential Building	1.04	0.24	0.37	1.36	0.07	0.29	3.38
Other Building & Construction	-0.55	0.04	0.23	0.82	0.01	0.21	0.77
Wholesale Trade	0.66	-0.24	0.19	0.92	-0.01	-0.06	1.46
Retail Trade	0.63	0.19	0.18	0.68	0.06	0.14	1.89
Mechanical Repairs	0.66	0.07	0.18	0.74	0.04	0.09	1.77
Other Repairs	0.93	0.27	0.18	0.90	0.01	0.17	2.46
Road Transport	0.67	0.66	-0.30	0.79	-0.03	-0.04	1.75
Rail & Other Transport	2.30	-10.67	0.15	0.40	-0.13	0.15	-7.81
Water Transport	3.27	1.30	0.17	0.68	-0.10	0.90	6.22
Air Transport	0.60	-0.09	0.22	0.99	0.11	0.58	2.41
Transport Services	1.20	0.25	0.17	0.83	0.02	0.13	2.59
Communication	0.88	0.13	0.08	-39.59	0.15	0.13	-38.21
Banking	0.83	0.11	0.10	0.94	0.04	0.10	2.13
Non-Bank Finance	0.60	-0.22	0.15	0.88	0.02	0.17	1.60
Investment Services	0.50	-0.06	-0.25	0.82	0.03	0.22	1.25
Insurance Services	0.33	0.11	0.40	1.63	0.42	-0.38	2.51
Other Financial Services	0.95	-0.06	0.12	1.56	0.89	0.11	3.57
Ownership of Dwellings	0.92	0.35	0.36	0.80	-0.11	0.28	2.60
Public Administration	0.12	-0.03	-3.01	0.19	0.02	0.00	-2.71
Defence	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00
Health	0.60	0.16	0.17	0.43	-0.06	0.12	1.41
Education	-0.49	-0.11	0.09	0.04	-0.20	0.05	-0.62
Welfare & Religious Services	0.31	0.06	0.08	0.47	-0.02	0.08	0.96
Entertainment & Leisure	1.11	0.21	0.24	1.20	0.30	0.28	3.34
Restaurants, Hotels & Clubs	0.82	0.07	0.22	0.77	0.18	0.57	2.62
Personal Services	0.87	0.20	0.25	0.69	0.06	0.24	2.31
Other	-0.01	-0.10	0.01	0.02	0.00	0.01	-0.07

Source: MONASH-RR estimates.

Table 3.6   **Estimated regional output implications of selected NCP reforms** (per cent)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
New South Wales	**0.96**	**0.35**	**0.24**	**0.81**	**0.05**	**0.24**	**2.64**
Sydney	0.96	0.15	0.23	0.92	0.12	0.25	2.62
Hunter	1.16	1.55	0.25	0.76	-0.05	0.28	3.95
Illawarra	1.60	0.82	0.26	0.79	-0.04	0.30	3.73
Richmond-Tweed	0.92	0.14	0.26	0.69	0.02	0.12	2.15
Mid-North Coast	0.70	0.14	0.26	0.71	0.02	0.02	1.86
Northern	0.59	0.21	0.22	0.53	-0.04	0.24	1.75
North Western	0.84	0.37	0.23	0.51	-0.05	0.25	2.16
Central West	0.58	0.58	0.23	0.59	-0.04	0.27	2.21
South Eastern	0.56	0.16	0.24	0.65	0.02	0.16	1.78
Murrumbidgee	0.64	0.13	0.22	0.54	-0.05	0.25	1.74
Murray	0.81	0.11	0.24	0.59	-0.05	-0.02	1.69
Far West	1.67	0.33	0.28	0.62	-0.04	0.45	3.32
Victoria	**1.05**	**-0.01**	**0.24**	**0.77**	**0.05**	**-0.20**	**1.89**
Melbourne	1.18	-0.02	0.23	0.88	0.11	0.05	2.43
Barwon	1.33	0.01	0.27	0.74	-0.02	-0.13	2.20
Western District	1.27	0.01	0.25	0.51	-0.03	-1.97	0.04
Central Highlands	1.21	0.05	0.26	0.63	-0.03	0.16	2.28
Wimmera	1.25	0.10	0.26	0.48	-0.05	0.17	2.21
Mallee	1.03	-0.02	0.26	0.53	-0.08	-0.03	1.70
Loddon	1.00	0.04	0.24	0.60	-0.03	-0.62	1.23
Goulburn	0.91	0.00	0.23	0.55	-0.05	-1.47	0.18
Ovens-Murray	1.03	0.03	0.25	0.59	0.00	-0.19	1.71
East Gippsland	1.43	-0.03	0.28	0.56	-0.06	-0.16	2.02
Gippsland	-0.84	-0.08	0.21	0.61	-0.03	-0.93	-1.06
Queensland	**1.07**	**0.48**	**0.23**	**0.85**	**0.04**	**0.19**	**2.86**
Brisbane	0.90	0.16	0.22	0.94	0.10	0.21	2.53
Moreton	0.93	0.25	0.24	1.00	0.13	0.13	2.67
Wide Bay-Burnett	0.45	0.20	0.23	0.75	-0.04	-0.01	1.59
Darling Downs	0.63	0.08	0.21	0.65	-0.03	-0.26	1.27
South West	0.93	0.11	0.23	0.52	-0.08	0.48	2.18
Fitzroy	2.18	2.11	0.23	0.68	-0.11	0.38	5.46
Central West	1.00	0.17	0.24	0.54	-0.06	0.46	2.35
Mackay	1.52	3.17	0.24	0.61	-0.11	0.33	5.76
Northern	1.41	0.46	0.22	0.77	-0.02	0.33	3.16
Far North	1.17	0.12	0.23	0.84	0.02	0.13	2.52
North West	2.12	0.40	0.24	0.88	-0.05	0.49	4.09
South Australia	**0.99**	**0.00**	**0.23**	**0.89**	**0.01**	**0.16**	**2.29**
Adelaide	0.97	-0.02	0.23	0.99	0.06	0.26	2.50
Outer Adelaide	0.79	-0.03	0.24	0.83	-0.04	-0.23	1.56
Yorke and Lower North	0.71	0.02	0.21	0.60	-0.08	-0.01	1.45
Murray Lands	0.67	-0.10	0.23	0.67	-0.12	-0.25	1.09
South East	0.88	-0.05	0.24	0.74	-0.08	-0.32	1.40
Eyre	0.75	0.04	0.22	0.59	-0.10	0.21	1.71
Northern	1.96	0.25	0.24	0.71	-0.11	0.36	3.39
Western Australia	**1.65**	**0.10**	**0.24**	**0.96**	**0.03**	**0.34**	**3.32**
Perth	1.44	0.03	0.23	1.01	0.08	0.34	3.13
Peel	2.30	0.11	0.27	0.94	-0.03	0.35	3.95
South West	2.05	0.62	0.24	0.94	-0.05	0.07	3.86
Great Southern	1.00	0.07	0.23	0.68	-0.07	0.25	2.18
Wheatbelt	0.86	0.13	0.20	0.68	-0.10	0.25	2.01
Goldfields-Esperance	3.23	0.46	0.22	1.15	-0.04	0.50	5.52
Mid West	2.00	0.22	0.24	0.94	-0.05	0.43	3.78
Gascoyne	1.68	0.20	0.27	0.79	-0.06	0.44	3.32
Pilbara	2.26	-0.22	0.28	0.78	-0.08	0.50	3.53
Kimberley	1.47	0.15	0.26	0.82	-0.06	0.49	3.12
Tasmania	**1.10**	**0.06**	**0.18**	**0.89**	**0.03**	**-0.09**	**2.17**
Greater Hobart	0.93	0.05	0.15	0.92	0.08	0.16	2.29
Southern	0.43	0.01	0.16	0.75	-0.05	0.19	1.50
Northern	1.56	0.08	0.20	0.90	0.02	-0.04	2.73
Mersey-Lyell	1.10	0.06	0.20	0.88	-0.01	-0.70	1.53
Northern Territory	**1.71**	**0.13**	**0.16**	**0.83**	**0.05**	**0.44**	**3.33**
Australian Capital Territory	**0.75**	**0.11**	**-0.01**	**0.62**	**0.09**	**0.24**	**1.80**

Source: MONASH-RR estimates.

Table 3.7   **Estimated regional employment implications of selected NCP reforms**
(per cent)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
New South Wales	**-0.17**	**0.19**	**0.04**	**-0.07**	**0.01**	**0.13**	**0.14**
Sydney	0.04	-0.03	0.05	-0.07	0.07	0.18	0.24
Hunter	-0.44	1.63	0.08	0.18	-0.10	0.17	1.52
Illawarra	0.42	0.84	0.08	0.09	-0.09	0.17	1.51
Richmond-Tweed	-0.23	-0.04	0.03	-0.19	0.01	-0.12	-0.53
Mid-North Coast	-0.73	-0.15	0.04	-0.23	-0.01	-0.22	-1.30
Northern	-0.87	0.00	0.00	-0.28	-0.07	0.09	-1.12
North Western	-0.43	0.22	0.00	-0.27	-0.09	0.08	-0.49
Central West	-1.39	0.41	0.00	-0.13	-0.08	0.14	-1.04
South Eastern	-1.33	-0.11	-0.11	-0.26	0.00	-0.04	-1.84
Murrumbidgee	-0.97	-0.23	0.02	-0.21	-0.16	0.07	-1.49
Murray	-0.69	-0.13	0.01	0.05	-0.16	-0.45	-1.37
Far West	0.76	-0.11	0.02	0.02	-0.21	0.34	0.81
Victoria	**0.16**	**-0.19**	**0.03**	**-0.21**	**0.00**	**-0.32**	**-0.53**
Melbourne	0.53	-0.18	0.04	-0.22	0.06	0.01	0.24
Barwon	0.74	-0.20	0.06	-0.07	-0.11	-0.25	0.16
Western District	0.50	-0.16	-0.01	-0.26	-0.07	-2.94	-2.94
Central Highlands	0.38	-0.27	0.03	-0.37	-0.12	0.04	-0.30
Wimmera	0.19	-0.23	-0.02	-0.31	-0.19	0.01	-0.55
Mallee	0.07	-0.25	0.01	-0.22	-0.34	-0.48	-1.21
Loddon	0.18	-0.20	0.02	-0.29	-0.14	-0.88	-1.31
Goulburn	0.02	-0.21	0.02	-0.28	-0.16	-2.04	-2.65
Ovens-Murray	-0.03	-0.15	-0.02	-0.05	-0.03	-0.48	-0.75
East Gippsland	-0.12	-0.14	-0.01	-0.22	-0.14	-0.72	-1.35
Gippsland	-6.40	-0.20	-0.04	-0.09	-0.10	-1.68	-8.50
Queensland	**-0.05**	**0.03**	**0.00**	**0.16**	**0.02**	**0.08**	**0.23**
Brisbane	-0.10	-0.07	-0.03	0.09	0.06	0.16	0.11
Moreton	0.06	0.12	0.09	0.37	0.11	0.01	0.75
Wide Bay-Burnett	-1.25	-0.23	0.02	0.16	-0.07	-0.36	-1.73
Darling Downs	-0.52	-0.27	0.02	0.05	-0.05	-0.48	-1.26
South West	-0.51	-0.55	-0.04	-0.34	-0.18	0.48	-1.14
Fitzroy	0.40	0.63	0.05	0.26	-0.11	0.30	1.52
Central West	-0.80	-0.49	-0.08	-0.18	-0.17	0.50	-1.21
Mackay	0.24	1.70	0.08	0.20	-0.08	0.11	2.24
Northern	0.26	-0.22	-0.04	0.12	-0.04	0.17	0.26
Far North	0.41	-0.08	-0.04	0.27	0.00	-0.06	0.50
North West	1.46	-0.07	-0.02	0.71	-0.12	0.50	2.46
South Australia	**-0.15**	**-0.20**	**0.02**	**0.27**	**-0.07**	**-0.02**	**-0.16**
Adelaide	-0.05	-0.14	0.00	0.30	-0.02	0.17	0.26
Outer Adelaide	-0.35	-0.18	0.05	0.28	-0.13	-0.75	-1.09
Yorke and Lower North	-0.79	-0.17	0.03	-0.09	-0.16	-0.60	-1.79
Murray Lands	-0.57	-0.38	0.03	0.15	-0.38	-1.14	-2.30
South East	-0.27	-0.26	0.06	0.29	-0.18	-0.92	-1.27
Eyre	-0.73	-0.23	0.03	-0.07	-0.32	-0.02	-1.33
Northern	-0.32	-0.74	0.10	0.24	-0.20	0.22	-0.70
Western Australia	**0.42**	**-0.08**	**0.04**	**0.25**	**-0.04**	**0.19**	**0.78**
Perth	0.50	-0.09	0.02	0.20	0.01	0.24	0.88
Peel	1.07	-0.09	0.11	0.49	-0.04	0.09	1.63
South West	-0.09	0.30	0.09	0.42	-0.14	-0.54	0.03
Great Southern	-0.29	-0.14	0.02	-0.15	-0.17	0.01	-0.73
Wheatbelt	-1.82	-0.31	-0.02	-0.06	-0.34	0.01	-2.53
Goldfields-Esperance	2.53	0.22	0.10	0.84	-0.08	0.40	4.03
Mid West	0.81	0.00	0.07	0.39	-0.12	0.28	1.44
Gascoyne	0.05	-0.09	0.02	0.18	-0.18	0.23	0.22
Pilbara	-0.06	-0.50	0.13	0.45	-0.10	0.42	0.33
Kimberley	0.18	-0.02	0.00	0.43	-0.20	0.45	0.84
Tasmania	**-0.51**	**-0.05**	**-0.18**	**0.22**	**-0.02**	**-0.20**	**-0.74**
Greater Hobart	-0.89	0.00	-0.36	0.08	0.01	0.10	-1.06
Southern	-2.17	-0.17	-0.16	0.16	-0.10	-0.01	-2.46
Northern	0.34	-0.04	-0.02	0.31	-0.02	-0.17	0.40
Mersey-Lyell	-0.30	-0.10	-0.07	0.38	-0.04	-0.86	-0.98
Northern Territory	**0.32**	**0.07**	**-0.23**	**0.04**	**0.07**	**0.29**	**0.56**
Australian Capital Territory	**0.11**	**0.03**	**-0.81**	**-0.17**	**0.06**	**0.11**	**-0.66**

Source: MONASH-RR estimates.

Table 3.8   **Estimated implications of selected NCP reforms for regional income per person employed** (per cent)

	Electricity and gas	Rail	Road	Telecom	Water	SMAs	All NCP reforms
New South Wales	**1.13**	**0.16**	**0.20**	**0.87**	**0.04**	**0.11**	**2.50**
Sydney	0.91	0.18	0.18	1.00	0.05	0.07	2.39
Hunter	1.60	-0.08	0.17	0.58	0.06	0.11	2.44
Illawarra	1.18	-0.01	0.19	0.70	0.04	0.12	2.22
Richmond-Tweed	1.14	0.18	0.23	0.87	0.00	0.25	2.68
Mid-North Coast	1.43	0.29	0.22	0.94	0.02	0.25	3.15
Northern	1.46	0.21	0.22	0.81	0.03	0.15	2.87
North Western	1.27	0.16	0.23	0.79	0.04	0.17	2.65
Central West	1.97	0.17	0.24	0.71	0.04	0.13	3.25
South Eastern	1.88	0.27	0.35	0.90	0.01	0.21	3.62
Murrumbidgee	1.62	0.36	0.21	0.75	0.10	0.18	3.22
Murray	1.51	0.23	0.23	0.54	0.12	0.43	3.05
Far West	0.91	0.45	0.26	0.60	0.17	0.11	2.50
Victoria	**0.89**	**0.18**	**0.21**	**0.98**	**0.05**	**0.12**	**2.43**
Melbourne	0.65	0.16	0.19	1.10	0.04	0.04	2.18
Barwon	0.59	0.22	0.21	0.81	0.10	0.11	2.04
Western District	0.77	0.17	0.26	0.77	0.03	0.97	2.98
Central Highlands	0.83	0.32	0.23	0.99	0.09	0.12	2.58
Wimmera	1.06	0.33	0.28	0.79	0.14	0.16	2.76
Mallee	0.96	0.23	0.25	0.75	0.27	0.45	2.91
Loddon	0.82	0.24	0.23	0.89	0.11	0.26	2.54
Goulburn	0.89	0.21	0.21	0.83	0.11	0.57	2.83
Ovens-Murray	1.06	0.18	0.27	0.64	0.02	0.29	2.45
East Gippsland	1.55	0.11	0.29	0.78	0.08	0.56	3.37
Gippsland	5.56	0.12	0.24	0.71	0.07	0.75	7.44
Queensland	**1.12**	**0.46**	**0.22**	**0.69**	**0.02**	**0.12**	**2.62**
Brisbane	1.01	0.23	0.24	0.85	0.04	0.05	2.42
Moreton	0.87	0.12	0.16	0.63	0.02	0.12	1.92
Wide Bay-Burnett	1.70	0.43	0.21	0.59	0.03	0.35	3.32
Darling Downs	1.15	0.34	0.19	0.60	0.02	0.22	2.52
South West	1.44	0.66	0.27	0.85	0.10	-0.01	3.31
Fitzroy	1.78	1.48	0.18	0.41	0.00	0.08	3.94
Central West	1.80	0.65	0.32	0.72	0.11	-0.05	3.56
Mackay	1.29	1.47	0.15	0.42	-0.02	0.22	3.53
Northern	1.15	0.67	0.26	0.64	0.02	0.16	2.91
Far North	0.76	0.20	0.27	0.57	0.02	0.19	2.02
North West	0.67	0.47	0.26	0.17	0.07	-0.01	1.62
South Australia	**1.14**	**0.20**	**0.22**	**0.63**	**0.08**	**0.18**	**2.45**
Adelaide	1.01	0.12	0.23	0.69	0.08	0.10	2.24
Outer Adelaide	1.14	0.15	0.19	0.55	0.09	0.53	2.65
Yorke and Lower North	1.50	0.19	0.18	0.69	0.08	0.59	3.24
Murray Lands	1.24	0.28	0.19	0.52	0.26	0.89	3.39
South East	1.14	0.21	0.18	0.45	0.10	0.60	2.68
Eyre	1.48	0.28	0.18	0.66	0.22	0.23	3.05
Northern	2.28	0.98	0.14	0.47	0.08	0.14	4.09
Western Australia	**1.23**	**0.18**	**0.20**	**0.72**	**0.07**	**0.15**	**2.54**
Perth	0.94	0.13	0.21	0.81	0.07	0.10	2.25
Peel	1.23	0.20	0.16	0.46	0.01	0.26	2.32
South West	2.14	0.32	0.15	0.52	0.09	0.61	3.83
Great Southern	1.30	0.22	0.21	0.83	0.11	0.25	2.91
Wheatbelt	2.67	0.44	0.21	0.73	0.23	0.24	4.54
Goldfields-Esperance	0.70	0.24	0.12	0.31	0.03	0.09	1.50
Mid West	1.19	0.22	0.17	0.55	0.07	0.15	2.34
Gascoyne	1.63	0.29	0.24	0.61	0.12	0.21	3.10
Pilbara	2.32	0.28	0.16	0.33	0.02	0.08	3.19
Kimberley	1.29	0.16	0.26	0.39	0.13	0.04	2.28
Tasmania	**1.61**	**0.11**	**0.36**	**0.67**	**0.05**	**0.11**	**2.91**
Greater Hobart	1.82	0.05	0.51	0.84	0.07	0.06	3.35
Southern	2.61	0.18	0.32	0.59	0.06	0.21	3.96
Northern	1.22	0.12	0.22	0.60	0.04	0.13	2.33
Mersey-Lyell	1.40	0.16	0.26	0.49	0.04	0.15	2.51
Northern Territory	**1.39**	**0.06**	**0.39**	**0.80**	**-0.02**	**0.15**	**2.77**
Australian Capital Territory	**0.63**	**0.09**	**0.80**	**0.78**	**0.02**	**0.12**	**2.45**

Source: MONASH-RR estimates.

Table 3.9   **Sensitivity of estimated output effects of selected NCP reforms by region to alternative assumptions about aggregate employment**

	Base case (0%)	Low (1.65%)	Medium (2.75%)	High (3.93%)
New South Wales	**2.64**	**4.43**	**5.63**	**6.91**
Sydney	2.62	4.40	5.58	6.86
Hunter	3.95	5.78	7.01	8.32
Illawarra	3.73	5.66	6.95	8.33
Richmond-Tweed	2.15	4.03	5.28	6.63
Mid-North Coast	1.86	3.72	4.97	6.30
Northern	1.75	3.39	4.49	5.66
North Western	2.16	3.89	5.04	6.27
Central West	2.21	3.95	5.11	6.35
South Eastern	1.78	3.51	4.66	5.90
Murrumbidgee	1.74	3.38	4.48	5.66
Murray	1.69	3.49	4.69	5.98
Far West	3.32	5.56	7.05	8.65
Victoria	**1.89**	**3.67**	**4.85**	**6.12**
Melbourne	2.43	4.20	5.38	6.65
Barwon	2.20	4.00	5.20	6.49
Western District	0.04	1.76	2.91	4.15
Central Highlands	2.28	4.10	5.32	6.62
Wimmera	2.21	4.10	5.36	6.70
Mallee	1.70	3.55	4.78	6.11
Loddon	1.23	2.93	4.06	5.28
Goulburn	0.18	1.77	2.83	3.97
Ovens-Murray	1.71	3.43	4.58	5.81
East Gippsland	2.02	4.08	5.45	6.92
Gippsland	-1.06	0.70	1.87	3.13
Queensland	**2.86**	**4.62**	**5.79**	**7.05**
Brisbane	2.53	4.25	5.40	6.63
Moreton	2.67	4.49	5.71	7.01
Wide Bay-Burnett	1.59	3.33	4.49	5.73
Darling Downs	1.27	2.82	3.85	4.96
South West	2.18	4.07	5.33	6.69
Fitzroy	5.46	7.33	8.58	9.92
Central West	2.35	4.40	5.77	7.23
Mackay	5.76	7.74	9.06	10.48
Northern	3.16	4.84	5.97	7.17
Far North	2.52	4.27	5.43	6.68
North West	4.09	6.07	7.39	8.81
South Australia	**2.29**	**4.03**	**5.19**	**6.44**
Adelaide	2.50	4.23	5.39	6.63
Outer Adelaide	1.56	3.33	4.50	5.77
Yorke and Lower North	1.45	3.11	4.22	5.40
Murray Lands	1.09	2.78	3.90	5.11
South East	1.40	3.19	4.38	5.65
Eyre	1.71	3.43	4.57	5.79
Northern	3.39	5.24	6.48	7.80
Western Australia	**3.32**	**5.18**	**6.43**	**7.76**
Perth	3.13	4.94	6.14	7.44
Peel	3.95	6.02	7.41	8.89
South West	3.86	5.79	7.07	8.44
Great Southern	2.18	3.91	5.07	6.31
Wheatbelt	2.01	3.58	4.63	5.76
Goldfields-Esperance	5.52	7.48	8.79	10.19
Mid West	3.78	5.70	6.97	8.35
Gascoyne	3.32	5.43	6.84	8.36
Pilbara	3.53	5.85	7.40	9.06
Kimberley	3.12	5.09	6.40	7.81
Tasmania	**2.17**	**3.87**	**5.00**	**6.21**
Greater Hobart	2.29	3.93	5.02	6.18
Southern	1.50	3.26	4.43	5.69
Northern	2.73	4.49	5.67	6.93
Mersey-Lyell	1.53	3.23	4.36	5.58
Northern Territory	**3.33**	**4.97**	**6.07**	**7.24**
Australian Capital Territory	**1.80**	**2.85**	**3.55**	**4.30**

Source: MONASH–RR estimates.

Table 3.10   **Sensitivity of estimated employment effects of selected NCP reforms by region to alternative assumptions about aggregate employment**

	Base case (0%)	Low (1.65%)	Medium (2.75%)	High (3.93%)
New South Wales	**0.14**	**1.83**	**2.96**	**4.18**
Sydney	0.24	1.97	3.13	4.38
Hunter	1.52	3.28	4.45	5.71
Illawarra	1.51	3.30	4.50	5.78
Richmond-Tweed	-0.53	1.08	2.15	3.31
Mid-North Coast	-1.30	0.35	1.45	2.63
Northern	-1.12	0.35	1.32	2.37
North Western	-0.49	0.99	1.97	3.03
Central West	-1.04	0.49	1.51	2.61
South Eastern	-1.84	-0.37	0.60	1.65
Murrumbidgee	-1.49	-0.11	0.81	1.79
Murray	-1.37	0.16	1.18	2.27
Far West	0.81	2.43	3.50	4.66
Victoria	**-0.53**	**1.16**	**2.29**	**3.51**
Melbourne	0.24	2.01	3.18	4.44
Barwon	0.16	1.86	2.98	4.19
Western District	-2.94	-1.44	-0.44	0.63
Central Highlands	-0.30	1.33	2.41	3.58
Wimmera	-0.55	0.94	1.92	2.99
Mallee	-1.21	0.37	1.43	2.57
Loddon	-1.31	0.24	1.27	2.37
Goulburn	-2.65	-1.20	-0.23	0.81
Ovens-Murray	-0.75	0.71	1.69	2.73
East Gippsland	-1.35	0.23	1.29	2.42
Gippsland	-8.50	-6.95	-5.92	-4.81
Queensland	**0.23**	**1.88**	**2.97**	**4.15**
Brisbane	0.11	1.76	2.86	4.04
Moreton	0.75	2.50	3.67	4.92
Wide Bay-Burnett	-1.73	-0.14	0.92	2.06
Darling Downs	-1.26	0.19	1.15	2.18
South West	-1.14	0.37	1.38	2.46
Fitzroy	1.52	3.26	4.41	5.65
Central West	-1.21	0.22	1.17	2.20
Mackay	2.24	4.02	5.21	6.48
Northern	0.26	1.75	2.75	3.82
Far North	0.50	2.09	3.15	4.29
North West	2.46	4.13	5.25	6.44
South Australia	**-0.16**	**1.47**	**2.56**	**3.72**
Adelaide	0.26	1.91	3.01	4.19
Outer Adelaide	-1.09	0.52	1.58	2.73
Yorke and Lower North	-1.79	-0.34	0.62	1.66
Murray Lands	-2.30	-0.79	0.22	1.29
South East	-1.27	0.28	1.32	2.43
Eyre	-1.33	0.10	1.06	2.09
Northern	-0.70	0.97	2.08	3.27
Western Australia	**0.78**	**2.46**	**3.58**	**4.78**
Perth	0.88	2.57	3.70	4.90
Peel	1.63	3.42	4.61	5.88
South West	0.03	1.78	2.94	4.18
Great Southern	-0.73	0.66	1.59	2.58
Wheatbelt	-2.53	-1.17	-0.26	0.71
Goldfields-Esperance	4.03	5.84	7.05	8.35
Mid West	1.44	3.09	4.19	5.37
Gascoyne	0.22	1.77	2.80	3.91
Pilbara	0.33	2.29	3.59	4.99
Kimberley	0.84	2.38	3.41	4.51
Tasmania	**-0.74**	**0.77**	**1.77**	**2.85**
Greater Hobart	-1.06	0.36	1.31	2.33
Southern	-2.46	-1.00	-0.02	1.02
Northern	0.40	2.01	3.09	4.25
Mersey-Lyell	-0.98	0.56	1.59	2.69
Northern Territory	**0.56**	**1.97**	**2.91**	**3.92**
Australian Capital Territory	**-0.66**	**0.15**	**0.69**	**1.27**

Source: MONASH–RR estimates.

4 Analysis of broad economic forces affecting rural and regional Australia

4.1 Introduction

A distinguishing feature of economic activity in much of rural and regional Australia is a dependence on resource-based activities. These activities include agriculture, forestry, fishing, and mining. They also include other land-using activities such as nature conservation reserves (National Parks, National Estate and World Heritage listings) and Aboriginal lands, transport and communications easements and service activities, and tourism developments. Each of these activities is supported by community and business service activities which may be located adjacent to the primary activity, or may be located separately in a regional or other centre.

The natural determinant of the location of resource-based activities is the availability of suitable land and other natural resources. For market activities such as agriculture and mining, investment and production decisions are based normally on the expected net returns from competing land uses. For non-market activities (eg wilderness areas), public location decisions are based normally on assessments of the environmental and social value of such land uses relative to other uses (including primary industry activities like agriculture and mining). Location decisions concerning ancillary and service activities are based on the variety of services expected and relative cost of providing such services in one location as opposed to another.

There are many factors that affect rural and regional Australia. National Competition Policy (NCP) is only one of these. This chapter puts NCP into an historical context by looking at the broader forces affecting rural and regional Australia from the mid-1980s to the mid-1990s.

This chapter examines the effects of the following national economic forces on rural and regional development:

- changes in general economic conditions — population, employment, general productivity and border assistance;

- changing terms of trade for agricultural and mining commodities;

- increases in net investment in mining activities;

- improvements in productivity in the agricultural and minerals industries;

- increases in international visitor expenditure; and

- increases in the level of real government consumption expenditure.

The chapter first examines available evidence about these factors and then uses this information to examine the economy-wide and regional effects of each factor.

4.2 Changes in general economic conditions

General theories of economic growth identify population and productivity growth as being the basic factors behind growth in real production. Over the period 1985-86 to 1995-96, the Australian population and national employment numbers grew annually by around 1.3 per cent and 1.7 per cent, respectively. These measures of growth have been included in the current analysis to capture the general effects of trend growth.

The second basic component of growth comes from improvements in productivity. In any one year, productivity of labour and capital inputs can be improved through technological change and better organisation of production. When this occurs, output growth cannot be fully explained by growth in labour and capital inputs — any difference provides a measure of multifactor productivity growth.[1] Over the 10-year period investigated, growth in multifactor productivity contributed about half the growth in the 'market sector' (table 4.1).

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[1] A distinction is made in this paper between multifactor productivity (MFP) and total factor productivity (TFP). MFP refers to the productivity of the primary factors of production — labour and capital — in generating value added output (referred to in a regional context as gross national, state or regional product in this study). It differs from TFP — a measure which recognises intermediate transactions in materials and services, along with labour and capital as production inputs, and uses gross output as a measure of output. Estimates of TFP are available for agricultural and mining industries (see below), but not available for other market or non-market sector activities.

Table 4.1 **Average annual contribution of labour, capital and multifactor productivity to market sector output growth by industry, 1985-86 to 1995-96** (per cent)

Industry	Labour	Capital	MFP	Output
Agriculture, forestry, fishing	-0.29	-0.11	1.92	1.51
Mining	-0.09	2.84	0.69	3.45
Manufacturing (total)[a]	**-0.65**	**0.68**	**2.10**	**2.13**
Food beverages and tobacco	0.10	0.99	0.93	2.02
Textiles, clothing, footwear and leather	-2.16	0.38	0.32	-1.46
Printing, publishing and recorded media	1.29	2.61	-1.45	2.45
Petroleum, coal, chemicals etc	-0.18	0.51	2.03	2.35
Basic metal products	-0.87	-0.20	2.94	1.87
Structural and sheet metal products	0.68	-0.14	1.30	1.84
Transport equipment	-1.56	0.99	1.22	0.65
Other manufacturing	0.41	1.45	0.59	2.45
Electricity, gas and water	-1.64	0.59	3.87	2.81
Construction	2.06	0.30	-0.60	1.77
Wholesale trade	1.04	0.23	2.10	3.37
Retail trade	1.61	0.58	0.00	2.19
Accommodation, cafes and restaurants	3.34	1.82	-1.18	3.99
Transport,storage and communication	0.72	1.58	3.49	5.79
Cultural and recreational services	2.29	2.21	-1.60	2.90
Market sector	**0.59**	**0.85**	**1.51**	**2.95**

a The estimates for the manufacturing subdivisions are based on data for the 10-year period 1984-85 to 1994-95.

Source: Based on Gretton and Fisher (1997).

Estimated multifactor productivity growth generally makes a positive contribution to industry output growth. However, for some industries, such as retail trade, the contribution appears to be very low or negative over extended periods. The dominance of labour and capital input growth as sources of expansion indicates that demands have been focused on services requiring higher levels of input (eg more elaborate shopping environments or higher staffing levels for some services) rather than obtaining standard services with successively lower levels of input.

Other than broadacre agriculture and mining activities (for which more detailed estimates are reported below), the productivity estimates for market sector activities have been adopted in the current analysis. The market sector accounts for about two-thirds of national output and employment. Data limitations have made it impractical to analyse productivity growth for the remaining industries (collectively referred to as the 'non-market' sector) (see Gretton and Fisher 1997). Industries in the non-market sector include public administration and defence, education and health services. Their productivity contribution to growth has been assumed to be zero in the current analysis.

In addition to these general economic influences, changes in border assistance have been included to capture the flow-on effects of lower assistance to the industrial structure of the national economy and national activity levels over the period. Annualised changes in border assistance to manufacturing industry from 1986-87 to 1993-94 are adopted to capture key assistance changes. The effects of the May (1988) Economic Statement and phased reductions from the implementation of the textile, clothing and footwear and passenger motor vehicle industry plans are included in the border assistance changes analysed (IC 1998). The four-year tariff reduction program initiated in the May Economic Statement involved lowering tariff rates higher than 15 per cent to 15 per cent, and lowering rates between 10 and 15 per cent to 10 per cent. The phasing arrangements for TCF and PMV involve lowering tariff levels for clothing and most textiles to 25 and 15 per cent, respectively, over the period 1989 to 2000, and lowering PMV tariffs from 35 to 15 per cent over the period 1992 to 2000.

4.3   Changes in terms of trade

Primary industries generally produce standard commodities that are traded widely on world markets. Individual producers therefore have little or no control over the prices they receive for their output. They also have little control over the prices they pay for their inputs. However, producers have some control over their costs of production through the selection of production technologies and the implementation of productivity improvements. This section discusses changes in farmers' and miners' terms of trade, and the next discusses productivity and growth.

One of the fundamental factors governing the economic environment in which farmers and miners operate is the prices they receive for their outputs relative to the price that they pay for their inputs — that is, the industry terms of trade. For Australian rural industries, the terms of trade have declined over the past 40 years at an average annual rate of 2 per cent around a series of year-to-year changes (figure 4.1). Farmers' expectations about prices and management of risk would be need to take into account this volatility as well as the possibility that the past declining trend in Australian dollar terms will continue.

Figure 4.1   **Farmers' terms of trade,[a] 1955-56 to 1996-97**
(Australian dollars, index 1987-88 = 100)
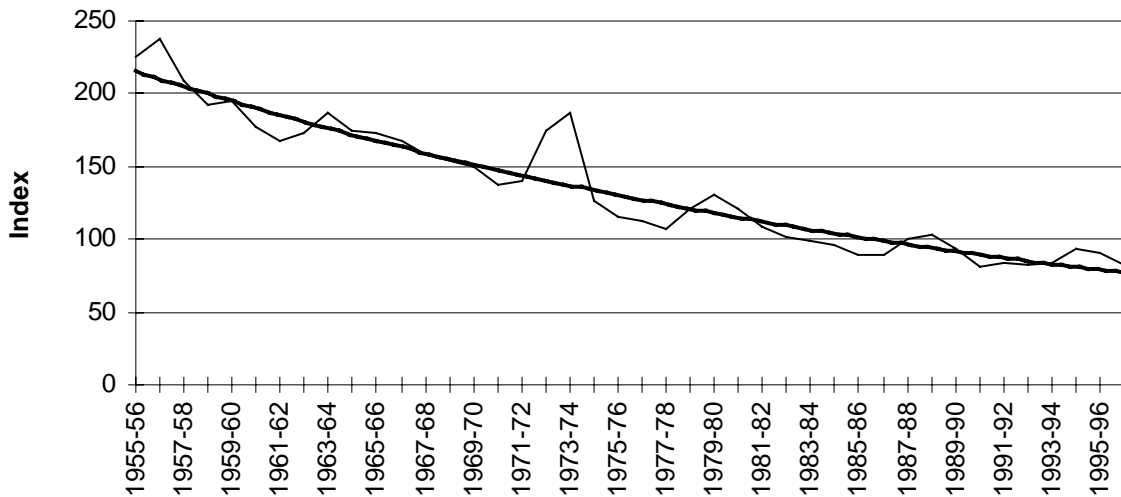
a Ratio of an index of prices received by farmers to an index of prices paid by farmers.
Source: ABARE 1997.

Figure 4.2   **Mining industries' terms of trade,[a] 1968-69 to 1994-95**
(Australian dollars, index 1989-90 = 100)
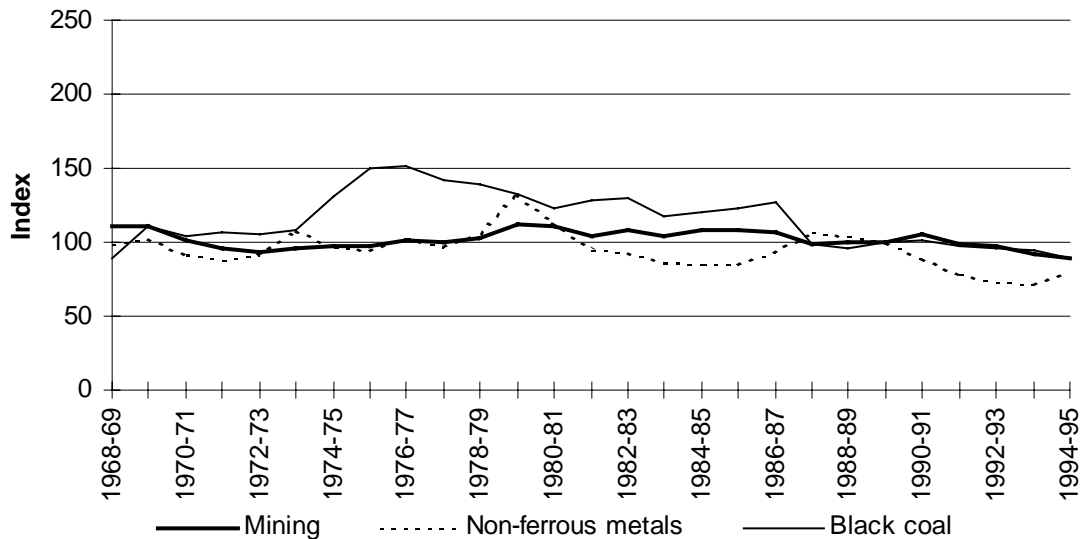
a Ratio of an index of prices received by miners in Australian dollars to an index of prices paid for material and service inputs by miners.
Source: PC estimates.

For the mining industry as a whole, the terms of trade have been relatively flat in Australian dollar terms since the early 1970s (figure 4.2). Nevertheless, there has

been a downward movement in real prices since the early 1980s and substantial variability in real price changes between activities. For example, after rising to a peak in the mid-1970s, the terms of trade for black coal declined to around the sector average by the late 1980s. Around peaks in the late-1970s and 1980s, the average real price for non-ferrous metals has tended to decline. Miners' expectations about future prices would need to take into account the year to year variation in real prices and medium-term cyclical elements around an apparent declining trend for some minerals in Australian dollar terms.

Because of the export orientation of rural, mining and related processing industries, the price of exports — that is the price of Australian products on world markets in Australian dollar terms — is the focus of further analysis of the effects of changing terms of trade on rural and regional Australia. Over the medium to longer term, the time scale of the current analysis, it would be expected that changes in export prices would translate into equivalent domestic price changes.

If the export prices of agricultural and mineral products were the only prices to change, only information about such price changes would need to be taken into account. However, other prices have also changed, raising or lowering the cost of inputs to rural and mining industries. The 'real' price effect of export price changes adopted in this analysis is therefore equal to the nominal price change of exports less an indicator of the price of inputs.[2]

Between the mid-1980s and the mid-1990s, the real price of export oriented agricultural, mining and related processed commodities is estimated to have declined in nearly all cases (table 4.2). The largest real price decline was for wool (2.7 per cent a year) while, at the other end of the spectrum, the real prices of wheat other cereal products rose fractionally. Over the period, there appears to have been greater variability in average price changes for rural commodities than for mineral commodities.

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[2] That is $p^e = np^e - p$ where p^e is the annual average percentage change in the real export price of a commodity, np^e is the change in the nominal export price and p is the change in a general indicator of domestic price changes. In the current study, the implicit price deflator for GDP is selected as the general price indicator.

Table 4.2   **Real export price changes for broadacre agriculture, mining and related processed 'export' commodities,[a] mid-1980s to mid-1990s** (per cent per year)

Export commodity	Nominal prices	Real prices[b]
Broadacre agricultural commodities		
Wool	1.14	-2.71
Wheat	4.39	0.54
Barley	1.63	-2.22
Other cereal grains[c]	4.09	0.24
Mining commodities		
Ferrous metal ores	-0.73	-4.58
Non-ferrous metal ores	1.27	-2.59
Black coal	-0.29	-4.14
Oil and natural gas	0.97	-2.88
Processed broadacre agricultural and mining commodities		
Meat and meat products	2.20	-1.65
Floor and cereal foods (including rice)	3.16	-0.69
Wool scouring and top making	1.05	-2.80
Other basic metals[d]	0.05	-3.81

a Commodities for which export demand is more than 20 per cent of local production. The estimates for: non-ferrous metals and coal come from ABS export price data; wool, wheat, iron ore, flour and cereal foods (including rice), and other food products (including processed sugar) come from ABARE unit price data; and the other items from a MONASH model validation exercise. ABS and ABARE data relate to the period 1985-86 to 1995-96, MONASH data to the period 1986-87 to 1993-94. **b** Estimated by deducting the change in the national accounts implicit price deflator from the nominal export price change. **c** Includes sorghum, oilseeds and legumes. **d** Includes primary and secondary recovery of copper, silver, lead, zinc, aluminium and nickel.

Sources: MONASH model historical validation exercise; Econdata; ABARE (*Australian Commodity Statistics* 1998b).

Without innovation to lower the unit cost of output or the expectation of increasing prices, other things being equal, the trend in relative export prices would have provided a poor incentive for many resource owners and processors to maintain or expand output. On the other hand, there would be incentives to divert land to other uses including non-agricultural and non-mining activities. Within the agricultural sector, there would be an incentive to divert resources away from wool growing in favour of grain production, particularly the production of wheat, and sorghum, oilseeds and legumes in the model's 'other cereal grains' group.

The effects of these real export price changes on national and regional output and employment are considered below.

4.4 Productivity growth

Productivity growth is a fundamental way for industry to reduce the unit costs of production. Productivity growth comes from technological change (new ways of using land and other natural resources and more generally producing goods and services). It also comes from the better organisation of production (better ways of using available resources given available technology, including land management and mineral extraction and processing).

Available measures indicate that agricultural sector output growth is coming primarily from productivity improvements (figure 4.3). Since the time of European settlement, there has been a progressive increase in the intensity of land use and the substitution of sophisticated industry-based technologies for naturally occurring lower yielding processes (see Hamblin and Kyneur 1993 for an analysis of the growth in wheat yields). There also has been a progressive increase in the area committed to crops and sown pastures and a decline in the total area of land committed to agriculture over the 1970s and 1980s (Gretton and Salma 1996). Within this framework, the main limits to sectoral growth in the longer term are the availability of new technologies and land management practices, and the ability of farmers to apply these technologies and practices.

Traditionally, a requirement for mineral industry growth has been access to large amounts of land for exploration and relatively small areas for mining. This growth pattern has favoured new investment as a primary means of expanding output (figure 4.3). With traditional reliance on capital accumulation as the main source of growth, productivity has provided a relatively small net contribution to sectoral growth over the last two decades.

Nevertheless, within the two decades there appear to have been two growth episodes. The period 1974-75 to the mid-1980s was characterised by rapid growth in capital inputs, with the peak growth period being in 1981-82. As output growth did not keep pace with input growth during the period, productivity of in situ capital and labour declined.

Figure 4.3   **Contributions to average annual output growth of primary industries, 1974-75 to 1995-96** (per cent)

1974-75 to 1995-96

Agriculture, forestry, fishing and hunting

Mining

1974-75 to 1985-86

Agriculture, forestry, fishing and hunting

Mining

1985-86 to 1995-96

Agriculture, forestry, fishing and hunting
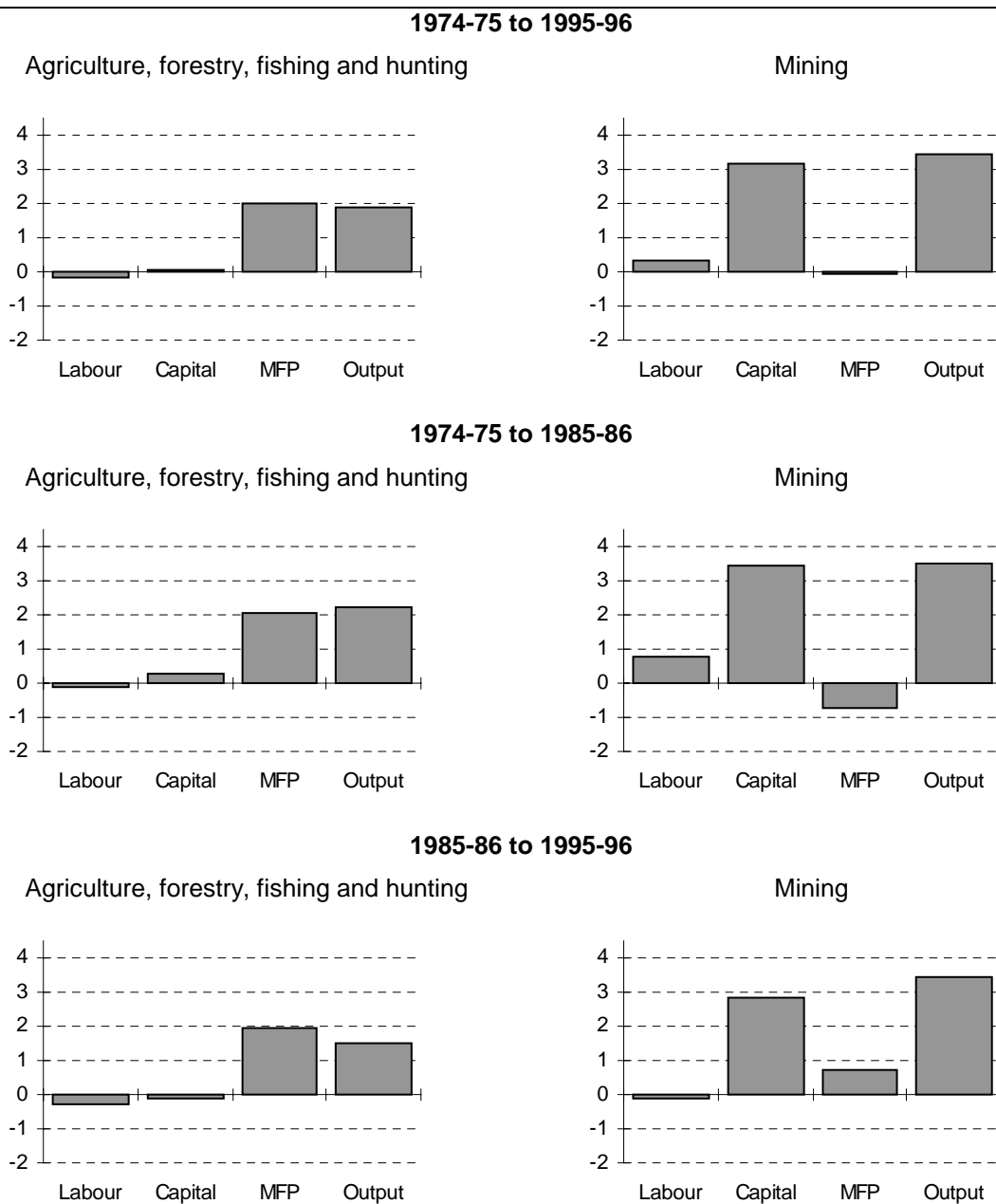
Mining

Source: Based on Gretton and Fisher (1997).

From the mid-1980s to the mid-1990s, capital accumulation was again the main contributor to mining sector growth. However, there is evidence of a sector-wide adjustment to absorb the previous rapid growth of inputs. This adjustment took the form of a slowing of the rate of capital and labour input growth, and higher output

growth. Other factors may have also been at work. First, land available for minerals (and agricultural industries) was subject to increasing restrictions on access and uncertainties concerning future access (IC 1996; East, Lambert and Veitch 1997). Uncertainty over the rules of access may have limited the scope for finding new high-grade deposits, focusing more attention on productivity improvements at existing mining sites to expand output. Second, reforms in labour market regulation beginning in the second half of the 1980s (IC 1998) have promoted change in workplace relations and facilitated improved work practices. Such reforms would support productivity-enhancing changes at the industry level. Nevertheless, because mineralisation at single deposits is finite, new projects and the associated capital expenditure and employment of labour are likely to continue to provide the main source of mining sector growth.

Overall, available evidence indicates that longer-term output growth in the agricultural sector depends mainly on productivity improvements while mining growth depends mainly on new capital (although the latter could also embody new technology).

Industry decomposition of rural industry productivity growth

Broadacre farms collectively contribute around half of the total value of agricultural production and are the main suppliers of raw materials for export oriented agricultural product processing industries. Information about productivity growth for broadacre agricultural industries is available from a detailed study of total factor productivity on Australian broadacre agriculture (Knopke, Strappazzon and Mullen 1995). In addition, information about the productivity growth in the dairy industry is available from a related ABARE study.

Productivity growth has been the main source of output growth in each Australian broadacre agricultural zone over the period 1977-78 to 1996-97 (table 4.3). In addition, individual activities with above average output growth also tend to have above average productivity growth. For example, the industry 'wheat and other crops' had the highest average annual output and productivity growth (of around 7 and 4 per cent a year, respectively), whereas sheep grazing had the lowest annual growth in both output and productivity (0.9 per cent and 0.3 per cent). Within the animal husbandry group, specialist beef producers had the highest productivity and output growth.

An important finding of the study into broadacre agricultural industry productivity is that productivity in crop activities has been growing ahead of productivity in livestock industries. Knopke, Strappazzon, and Mullen (KSM) attribute this difference to substantial changes in cropping technology and production methods

during the study period, and the fact that livestock activities remain relatively more labour-intensive activities in the broadacre sector.

KSM also suggest that the higher growth rate in cropping may be overstated due to farmers delaying input expenditures because of financial pressures associated with periodically depressed grain prices. While this consideration could be important in the short run (eg with the sudden drop in average wheat prices in 1990-91), it is less likely to be so over the longer term, when farmers have the opportunity to adjust their purchasing decisions to take account of trends in both prices and productivity.

At the State level, there is no immediately obvious link between productivity and output growth. This could be due to a number of factors including:

- a different underlying mix in activities between States and technical or other limits on the ability of producers to switch between activities (particularly towards more productive and faster growing activities); and

- different weather patterns.

Table 4.3   **Australian broadacre agriculture total factor productivity growth, 1977-78 to 1996-97** (annual average rate of change, per cent)

	1977-78 to 1996-97		1985-86 to 1995-96	
	Output	*TFP*	*Output*	*TFP*
Australian broadacre agricultural zones				
Pastoral zone	3.26	2.89	3.66	3.43
Wheat-sheep zone	4.91	3.67	4.19	3.06
High rainfall zones	1.16	1.23	-1.20	-0.73
Australian broadacre agricultural activities				
Wheat and other crops	7.02	4.41	4.88	2.56
Mixed crops and livestock	3.23	2.62	2.86	1.91
Sheep	0.90	0.31	-0.92	-0.38
Beef	1.71	1.65	0.00	2.03
Sheep-beef	0.03	1.37	0.33	-1.18
Australian broadacre agriculture by state				
New South Wales	3.31	2.82	2.27	1.67
Victoria	3.26	2.99	3.06	2.86
Queensland	3.66	2.78	0.72	1.46
South Australia	4.57	4.07	3.13	2.47
Western Australia	5.11	3.30	5.21	3.07
Tasmania	2.56	2.53	0.19	0.60
Northern Territory	3.89	1.89	2.09	6.13
Australia	**3.77**	**2.93**	**2.73**	**2.22**

Source: Knopke, Strappazzon, and Mullen (1995); supplementary data provided by ABARE.

The longer-term trends also abstract from the substantial year-to-year fluctuations in output and productivity due to variable seasonal conditions, and also mask some substantial differences in regional growth patterns (figure 4.4). For example, productivity and output growth in 1994-95 was reduced sharply in New South Wales, Victoria, South Australia and Western Australia by severe drought. On the other hand, a different pattern is evident for Queensland. Broadacre agriculture in this State showed virtually no growth from 1983-84 to 1995-96, followed by a sudden increase in output from 1995-96 to 1996-97.

For the dairy industry, increases in inputs have been the major source of growth (table 4.4). Nevertheless, individual State experiences differ substantially. For example, from the mid-1980s to mid-1990s, productivity contributed around one-quarter of growth in New South Wales, whereas it made only a fractional contribution in Victoria, although both States had similar rates of output growth. Over the same period, South Australia had the fastest output and productivity growth while the Queensland dairy industry had the slowest output, but about average productivity growth.

Industry decomposition of mining industry capital capacity and productivity growth

Information about fixed capital capacity and total factor productivity for nine mining industries for the period 1985-86 to 1994-95 has been prepared by the Commission for this inquiry.

In a resource driven sector such as mining, new investment and fixed capital accumulation are the primary means of providing access to new high quality resources and applying new processes to existing ore bodies. Between the mid-1980s and mid-1990s, mining sector capital growth is mainly attributable to investment in the oil and gas (including the development of North West Shelf reserves), gold mining (the move to open pit mining) and to a lesser extent, the mineral sands industries (table 4.5). However, for most other mining industries, increases in capital capacity were negligible and for bauxite mining, it is estimated that the depreciation of fixed capital exceeded new investment to yield a decline in capital capacity.

Figure 4.4   **Output and productivity growth in Australian broadacre agriculture by State, 1977-78 to 1996-97** (index 1977-78=100)

New South Wales

Victoria

Queensland

South Australia

Western Australia

Tasmania

——— Output   - - - - - Total factor productivity
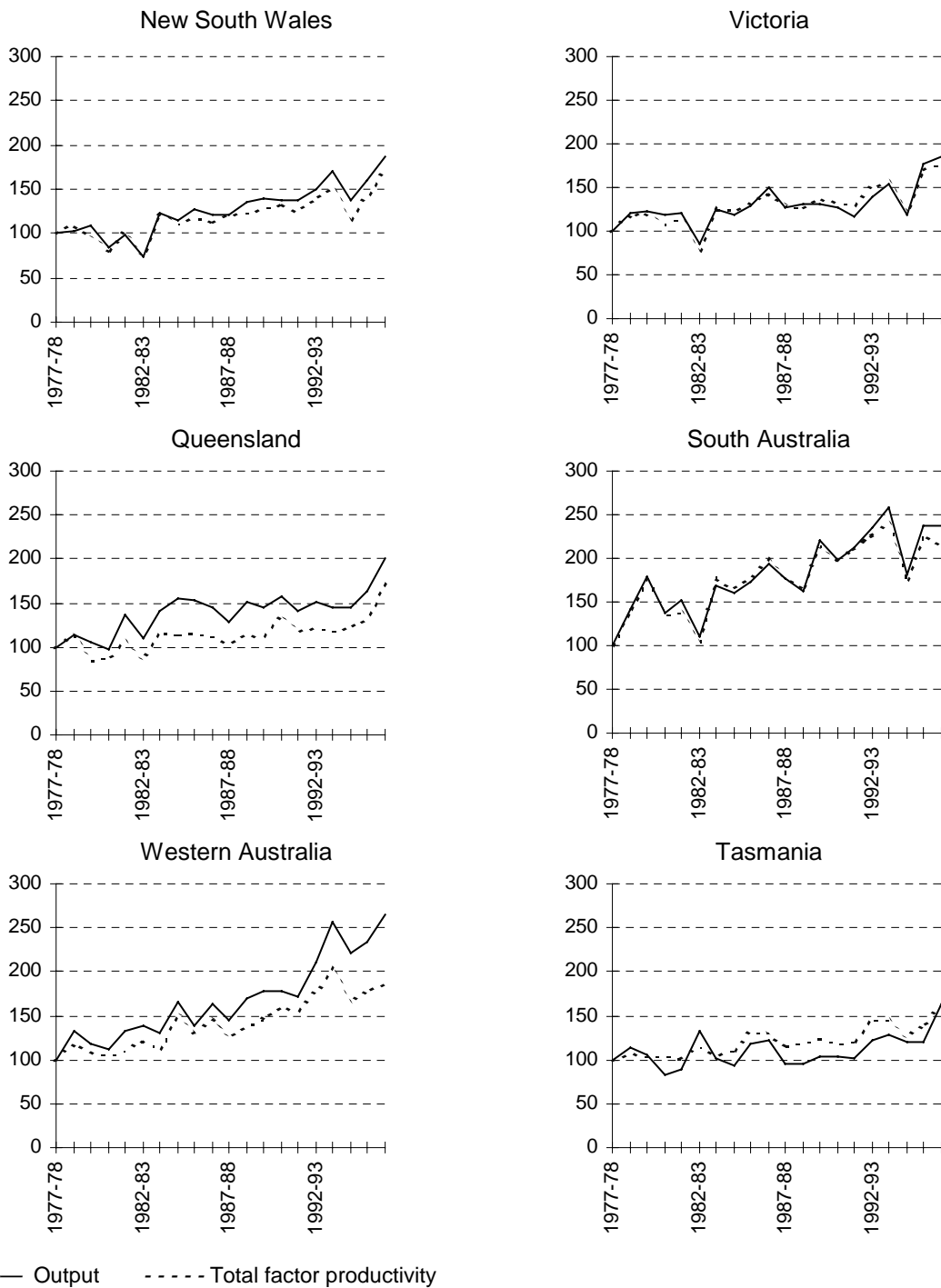
Source: Knopke, Strappazzon, and Mullen (1995); supplementary data provided by ABARE.

Table 4.4   **Australian dairy industry total factor productivity growth, 1977-78 to 1996-97** (per cent per year)

	1978-79 to 1996-97		1985-86 to 1995-96	
	Output	*TFP*	*Output*	*TFP*
New South Wales	3.97	1.43	4.80	1.34
Victoria	3.59	0.40	4.81	0.41
Queensland	2.66	0.51	2.85	0.93
South Australia	2.81	0.15	6.29	2.06
Western Australia	1.87	0.73	5.24	1.07
Tasmania	3.53	2.17	4.82	0.54
Australia	**3.50**	**0.78**	**4.86**	**1.13**

Source: Supplementary data provided by ABARE.

Table 4.5   **Australian mining industry growth in capital capacity, 1985-86 to 1994-95** (per cent per year)

Industry	*Fixed capital capacity*
Black coal mining	0.49
Oil and gas extraction	6.15
Iron ore mining	1.40
Bauxite mining	-0.87
Copper ore mining	0.09
Gold ore mining	14.19
Mineral sand mining	6.64
Silver-lead-zinc mining	1.02
Metal ore mining nec	0.31
Total non-ferrous metal mining	4.87
Total	**3.73**

Source: PC estimates.

In the longer run, new capital must be justified by demand for industrial output and productivity improvements which lower the unit costs of production. Declining real export prices for mineral industry outputs indicate that the balance of demand and supplies available on world markets has provided little incentive for new mining investment. The role of productivity in lowering unit costs of production has varied between activities.

In the gold mining industry, growth in output, supported by a major investment program as the industry moved from underground to open-pit mining and the economic processing of low grade ore, has exceeded growth in capital, labour and intermediate inputs, with improvements in productivity making up the difference (table 4.6). On the other hand, growth in inputs to oil and gas extraction and mineral sands mining has exceeded the growth in output, so that productivity has declined over the period examined. Nevertheless, this does not necessarily indicate that productivity of commissioned operations in the industry has been declining. Rather it may indicate that the long lead times inherent in large mining developments, such as the North West Shelf, mean that additional output arising from new investment in the ten-year period examined will be realised in later periods.

For other mining industries, productivity improvements provided the major source of output growth. For some of these industries, including iron ore, bauxite and silver-lead-zinc mining, productivity improvements have compensated for reductions in inputs or other factors per unit of output.

Table 4.6   **Australian mining industry total factor productivity growth, 1985-86 to 1994-95** (per cent per year)

Industry	Output	Interm-ediate inputs	Labour inputs	Fixed capital	TFP
Black coal mining	2.82	-0.19	-0.83	0.15	3.69
Oil and gas extraction	1.30	0.05	-0.05	5.40	-4.10
Iron ore mining	3.55	-1.47	-0.43	0.91	4.54
Bauxite mining	4.29	2.28	-0.18	-0.57	2.75
Copper ore mining	5.36	2.56	-0.34	0.73	2.40
Gold ore mining	16.18	7.08	0.67	5.82	2.62
Mineral sand mining	4.04	2.86	0.25	4.09	-3.16
Silver-lead-zinc mining	1.20	-1.08	-1.49	0.63	3.14
Metal ore mining nec	2.22	-0.08	-1.18	-0.19	3.66
Total non-ferrous metal min.	8.06	3.22	-0.21	2.80	2.26
Total	**4.07**	**0.73**	**-0.41**	**2.37**	**1.37**

Source: PC estimates.

4.5   Growth in inbound international travel expenditure

International tourism to Australia has grown rapidly in recent years and now accounts for nearly 13 per cent of Australia's export earnings (BTR 1998). From the mid-1980s to the mid-1990s, international tourism spending grew at around 10 per cent a year, which was ahead of annual growth in total exports and national output (at 7.5 per cent and 3 per cent, respectively).

The four most important items in international visitor spending are air transport, restaurants, hotels and clubs, education, and retail trade (table 4.7). Together these items comprise around two-thirds of total international visitor expenditure. The items of education and retail trade warrant some further explanation. Education reflects Australia's role as a destination for foreign students whose spending is included in the international travel aggregate. Retail trade refers to retail margin services provided on goods and services purchased by visitors, including items of food, souvenirs, clothing and appliances. As production of goods sold may be dispersed among many regions, it is the retail margin that is often the main focus in assessing the direct impact of tourist expenditure on activity levels in tourist-destination regions.

According to a recent study by Tulpule (1999), spending identified with particular tourist destinations comprises about 56 per cent of total spending by inbound international tourists (table 4.8). The remaining spending (ie not allocatable to individual tourist localities) includes airfares for travel to and from Australia, long distance travel within Australia by aeroplane, train or coach, package tours and capital items (eg motor vehicles).

Table 4.7   **International visitor expenditure by commodity, 1995-96**

	$m	%
Air transport	3 482	27
Restaurants, hotels and clubs	2 525	20
Education, libraries	1 292	10
Retail trade	1 095	9
Primary and manufacturing industries	1 339	11
Other service industries	2 937	23
Total	**12 670**	**100**

Source: O'Dea (1997).

Table 4.8   **International visitor expenditure in capital cities and regional Australia, 1997**

	Capital city		Regional areas		State total	
	Value	Share of state total	Value	Share of state total	Value	Share of national total
	$m	%	$m	%	$m	%
New South Wales	2 485	89	296	11	2 781	21
Victoria	1 155	93	93	7	1 248	9
Queensland	421	19	1 755	81	2 177	16
South Australia	202	85	36	15	238	2
Western Australia	621	91	64	9	685	5
Tasmania	52	54	44	46	96	1
Northern Territory	46	24	142	76	188	1
ACT	121	100	0	0	121	1
Total allocated spending	**5 103**	**68**	**2 431**	**32**	**7 534**	**56**
Other expenditures						
Capital items					349	3
Air fares					208	2
Package tours					5 317	40
Total					**13 407**	**100**

Source: Tulpule (1999).

The relative concentration of tourism spending in New South Wales is partly due to Sydney airport accounting for around 45 per cent of total passenger arrivals. While there is a concentration of allocatable tourist spending in New South Wales, the Northern Territory is the most international travel-intensive locality, as measured by the share of allocatable expenditure in gross state product (nearly 4 per cent). The level of tourism intensity in Queensland and New South Wales is somewhat below this, at around 2.8 per cent and 1.6 per cent, respectively.

Within States, international tourist activity is regionally dispersed, with more than 32 per cent of such spending undertaken in non-capital city locations across Australia (table 4.8). Indeed, the majority of regional spending occurred in non-metropolitan areas in Queensland and the Northern Territory. For Queensland, regional spending is divided between a number of major tourist destination regions, which are almost exclusively on the coast (table 4.9).

Table 4.9	International visitor expenditure in Queensland by region, 1997		
		Value	*Share of national total*
		$m	%
Brisbane		421	19.4
Gold coast		887	40.8
Sunshine coast		56	2.6
Gympie/Maryborough		16	0.8
Darling Downs		13	0.6
Bundaberg		5	0.2
Fitzroy		22	1.0
Mackay		5	0.2
Whitsundays		87	4.0
Northern		35	1.6
Far North		603	27.7
Great Barrier Reef North		16	0.7
Great Barrier Reef South		8	0.4
Outback		2	0.1
Total allocated spending		**2 177**	**100.0**

Source: Tulpule (1999).

4.6 Changes in spending on government services

Public administration and defence services have been the fastest growing components of general government final consumption expenditure from the mid-1980s to the mid-1990s (table 4.10).

The direct effects of changes in government spending on rural and regional Australia depend on the share of government spending in any one region and the growth in government activity (such as public administration and defence) at the regional level. Overall, the distribution of employment in government service provision across regions coincides closely with the distribution of the population as a whole and national employment (table 4.11). This distribution reflects the role of government and community service industries in the provision of services that are consumed largely at the point of provision. The concentration of Commonwealth Government services in the ACT is reflected in the fractionally larger share of the ACT in total government employment (2 per cent) than in national employment or the Australian population (1.9 per cent and 1.6 per cent, respectively).

Although the relative importance of government activity levels in any one region generally corresponds to regional activity and population levels, over the period changes in government activity levels differed substantially between regions (figure 4.5). The highest growth in employment in government and community service provision occurred in the Kimberley statistical division of Western Australia

(8.2 per cent a year). The main component of this growth is attributed to increases in employment in education services. In addition, the region also had above average growth in public administration and health services. The largest employment decline occurred in the Gascoyne region of Western Australia (nearly 7 per cent a year). This decline came mainly from the scaling down of public administration and defence services due to the withdrawal of personnel from a naval communications centre in the region. Employment in health and community services also declined while employment in education services increased in Gascoyne. There was a substantial growth in government service employment in 'other' localities (5.7 per cent a year) (including offshore territories such as Christmas Island and Cocos (Keeling) Islands, although population declined in these areas.

Table 4.10   **Changing composition of government consumption expenditure,[a] 1985-86 to 1995-96**

	Expenditure shares		Average annual growth: 1985-86 to 1995-96
	mid-1980s [b]	mid-1990s [b]	
	%	%	% p.a.
Public administration	20	29	6.9
Defence	13	12	2.6
Health	17	16	2.3
Education	25	23	2.1
Community services	11	9	0.4
Other goods and services	14	12	1.7
Total	**100**	**100**	**2.2**

[a] Average annual growth in real government consumption expenditure is based on data from the Australian national accounts. Expenditure on individual goods and services is based on information on the composition of government spending in the mid-1980s and mid-1990s obtained from Australian input-output tables. [b] Mid-1980s and mid-1990s refers to 1983-84 and 1993-94, respectively.

Sources: ABS (*Australian National Accounts*, *National Income, Expenditure and Product Accounts,* Cat. no. 5206.0, and *Input-Output Tables,* Cat. no. 5209.0); Econdata.

Table 4.11 Employment in government administration, defence, education and health by statistical division, 1986 to 1996

	Population	Employ-ment	Government and community service industries					
			Employ-ment	Gov't admin. & defence	Health & community services	Education	Total	Deviation from average growth
	% share	% share	% share	% p.a.	% p.a.	% p.a.	% p.a.	% points
Sydney	21.2	22.1	21.1	-1.9	2.4	2.6	1.5	-0.4
Hunter	3.1	2.8	2.9	0.8	2.2	3.5	2.4	0.5
Illawarra	2.0	1.8	1.9	0.3	2.7	4.3	2.8	0.9
Richmond-Tweed	1.1	0.8	1.0	-0.9	4.4	5.7	4.0	2.1
Mid-North Coast	1.4	1.1	1.3	0.1	4.0	5.5	3.9	2.0
Northern	1.1	1.0	1.0	-0.1	0.6	3.2	1.4	-0.5
North Western	0.7	0.6	0.6	-0.9	2.1	3.1	1.8	-0.1
Central West	1.0	0.9	0.9	0.3	1.8	2.4	1.7	-0.2
South Eastern	1.0	1.0	1.1	0.6	2.6	4.1	2.4	0.5
Murrumbidgee	0.9	0.8	0.8	-2.2	1.7	2.8	0.8	-1.1
Murray	0.6	0.6	0.6	-0.4	2.0	2.8	1.7	-0.2
Far West	0.2	0.1	0.1	-3.4	-0.2	1.9	0.2	-1.7
Melbourne	18.0	18.8	17.8	-3.0	0.8	2.5	0.7	-1.2
Barwon	1.3	1.2	1.2	-1.0	0.7	3.6	1.6	-0.3
Western District	0.6	0.6	0.5	-2.8	0.0	1.0	-0.1	-2.0
Central Highlands	0.7	0.7	0.7	-1.8	0.7	1.6	0.8	-1.1
Wimmera	0.3	0.3	0.3	-3.5	-0.6	1.0	-0.4	-2.3
Mallee	0.5	0.5	0.5	-1.8	-0.2	1.0	0.0	-1.9
Loddon	0.8	0.8	0.8	-4.1	1.6	1.3	0.3	-1.6
Goulburn	1.0	1.0	1.0	-4.4	0.6	3.4	0.2	-1.7
Ovens-Murray	0.5	0.5	0.5	-1.2	1.5	2.9	1.0	-0.9
East Gippsland	0.5	0.4	0.4	-3.2	1.4	3.3	0.7	-1.2
Gippsland	0.9	0.8	0.8	-1.9	1.1	2.2	0.9	-1.0
Brisbane	8.0	8.2	8.5	0.4	4.1	4.5	3.3	1.3
Moreton	3.0	2.7	3.3	2.5	7.6	9.2	7.1	5.2
Wide Bay-Burnett	1.2	1.0	1.2	2.0	4.5	5.1	4.2	2.3
Darling Downs	1.1	1.1	1.1	0.2	4.6	4.3	3.4	1.5
South West	0.2	0.2	0.2	1.4	3.8	4.4	3.2	1.3
Fitzroy	1.0	1.0	1.0	2.7	4.1	4.1	3.8	1.9
Central West	0.1	0.1	0.1	2.2	2.4	3.3	2.6	0.7
Mackay	0.7	0.7	0.7	-1.1	3.6	5.1	3.2	1.3
Northern	1.1	1.1	1.1	1.2	2.8	4.4	2.7	0.8
Far North	1.2	1.1	1.2	7.0	4.3	6.3	5.9	4.0
North West	0.2	0.2	0.2	6.7	0.9	2.4	3.6	1.7
Adelaide	6.1	6.0	5.9	-0.8	1.0	1.5	0.9	-1.0
Outer Adelaide	0.5	0.5	0.5	0.8	2.4	4.9	3.2	1.3
Yorke and Lower North	0.3	0.2	0.2	-0.9	-0.2	1.4	0.4	-1.6
Murray Lands	0.4	0.4	0.4	0.0	-1.0	2.8	0.8	-1.1
South East	0.4	0.4	0.3	-0.3	-0.3	1.1	0.3	-1.6
Eyre	0.2	0.2	0.2	-1.1	0.2	5.3	2.0	0.1
Northern	0.5	0.5	0.5	-2.7	-1.0	2.4	0.2	-1.8
Perth	6.6	6.9	7.0	0.9	3.4	2.9	2.6	0.7
Peel	0.3	0.2	0.3	6.1	7.8	7.1	7.2	5.3
South West	0.6	0.6	0.6	2.1	5.0	3.5	3.8	1.9
Lower Great Southern	0.3	0.3	0.3	0.4	4.1	0.7	2.0	0.1
Wheatbelt	0.4	0.4	0.4	0.1	4.9	1.5	2.4	0.5
Goldfields-Esperance	0.3	0.3	0.3	0.9	6.0	4.3	4.3	2.4
Mid West	0.3	0.3	0.3	1.9	3.2	2.4	2.6	0.7
Gascoyne	0.1	0.1	0.1	-10.3	-5.3	2.3	-5.0	-6.9
Pilbara	0.3	0.3	0.3	2.6	3.4	2.5	2.8	0.9
Kimberley	0.2	0.2	0.2	4.5	4.5	11.0	8.2	6.3
Greater Hobart	1.1	1.1	1.1	3.5	0.8	1.4	1.8	-0.1
Southern	0.2	0.2	0.2	4.8	1.1	3.8	3.1	1.2
Northern	0.8	0.7	0.7	1.1	0.9	2.7	1.8	-0.1
Mersey-Lyell	0.6	0.6	0.6	1.0	-0.3	1.5	0.8	-1.2
Northern Territory	1.0	1.0	1.1	3.6	1.7	6.6	4.0	2.1
Aust. Capital Territory	1.6	1.9	2.0	0.3	0.2	4.0	0.9	-1.0
Other localities	0.1	0.1	0.1	6.7	-1.2	-3.8	5.7	3.8
Total	**100.0**	**100.0**	**100.0**	**-0.5**	**2.2**	**3.2**	**1.9**	**na**

Source: ABS (*Population Census*, Cat. no. 1502.0)

Overall, there appears to be little evidence from aggregate information that there has been a general pattern towards the centralisation of government services that would break the nexus between population and employment in government services — at least at the statistical division level. Growth in employment in government service activities has tended to be highest in regions with the fastest population growth (figure 4.5). However, average or above average growth of employment in government services has not always meant comparable population growth. Indeed for regions with slower growing or declining populations, employment in government services tended to remain stable or increase — raising the level of employment in government services per capita in the region. Only in three statistical divisions — Wimmera and Western District in Victoria and Gascoyne in Western Australia — did employment in government and community services and population both decline.

The effect of growth in government spending by commodity item is analysed below to assess the combined effects of changes in the level and composition of government spending on national and regional output and employment. Additional spending is assumed to be funded by income tax increases, which adjust to ensure that the fiscal balance is unchanged.

Figure 4.5   **Growth in government and community service employment and population by statistical division ranked by population growth** (per cent per year)
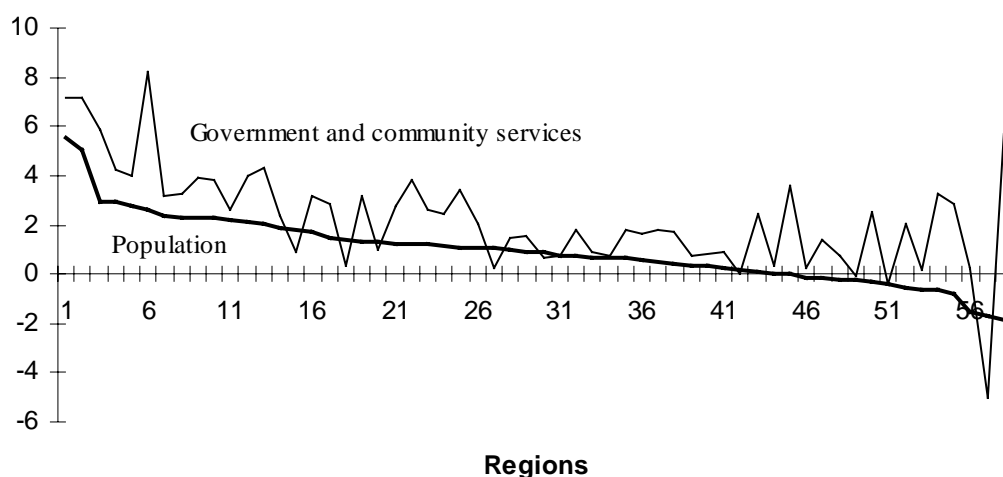
Source: ABS (*Population Census,* Cat. no. 1502.0).

4.7 Longer-run effects of selected broad economic forces

The longer-run effects of these national economic forces have been examined under the same economic environment (ie closure, see appendix A) as was used to look at NCP reforms:

- selected changes in general economic conditions;

- changing terms of trade for selected agricultural and mining commodities;

- improvements in productivity in broadacre agriculture, dairy and mining activities;

- increases in capital capacity in mining activities;[3]

- increases in inbound international visitor spending; and

- changes in the level and composition of government spending.

Macroeconomic effects

These selected national forces are estimated to have contributed more than 75 per cent of the actual GDP growth of 3.0 per cent a year experienced from the mid-1980s to the mid-1990s (table 14.12). As would be expected, changes in general economic conditions are estimated to have made a substantial positive contribution to national growth (around 2.8 percentage points per year) and to growth in each industry sector.

The various other factors considered have had both positive and negative effects on national and sectoral growth. The main negative effects on national and industry output arise from terms of trade declines. On the other hand, the main positive effects on growth arise from productivity improvements in agriculture, and productivity and capital growth in mining industries. Depending on the stimulus, productivity improvements and sectoral capital growth may increase or decrease either agricultural or mining sector output.

International travel and government spending are estimated to have reduced output growth in agricultural and mining activities. Overall, higher government spending, though not tourist spending, is estimated to have lowered national output growth. However, as the main function of government is to provide goods and services not

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[3] An exogenous increase in mining capital is modelled as lowering the expected returns to capital in mining relative to other activities, other things being equal. With lower returns, the supply of capital for future investment would also be lower than otherwise.

provided by business enterprises or households at a socially optimum level or composition, the estimated reduction in national and industry output growth need not reflect the ultimate effects of government service provision. The provision of government services could provide a net improvement in overall productivity, social output and community wellbeing in ways not captured in the current study.[4]

Table 4.12   **Estimated macroeconomic implications of selected broad economic forces affecting rural and regional Australia, mid-1980s to mid-1990s** (per cent per year)

		Agriculture		Mining						
	General econ. condit's	Terms of trade	Prod-uctivity	Terms of trade	Capital growth	Prod-uctivity	Interntl travel	Gov't expend.	Sub-total: selected forces	Other	Actual
Real GDP	2.77	-0.16	0.12	-1.18	0.26	0.56	0.06	-0.22	2.22	0.74	2.96
Real consumption	3.21	-0.32	0.16	-1.95	0.36	0.71	0.10	-0.70	1.59	1.41	3.00
Real investment	3.21	-0.32	0.16	-1.95	0.36	0.71	0.10	-0.70	1.59	0.79	2.38
Real gov't expenditure	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.19	2.19	0.00	2.20
Export volumes	4.53	0.66	-0.10	1.34	0.04	0.16	-0.07	-0.99	5.56	1.95	7.52
Import volumes	3.50	0.15	-0.02	-0.72	0.19	0.21	0.04	-0.61	2.73	3.67	6.40
Terms of trade	-0.44	-0.45	0.04	-1.88	-0.01	0.00	0.08	0.08	-2.58	2.64	0.06
Industry sector (gross product)											
Agriculture	1.16	-1.79	1.33	2.01	-0.25	-0.75	-0.13	-0.41	1.18	0.33	1.51
Mining	3.69	0.41	-0.19	-10.91	2.77	6.91	-0.13	-0.70	1.85	1.59	3.45
Manufacturing	3.35	0.08	-0.01	0.44	-0.10	-0.43	-0.12	-0.58	2.63	-0.50	2.13
Services	2.64	-0.17	0.07	-1.11	0.22	0.40	0.11	-0.05	2.11	1.41	3.51

Sources: MONASH-RR estimates; ABS (*Australian National Accounts*, *National Income, Expenditure and Product Accounts*, Cat. no. 5204.0).

Regional effects

How regions have adjusted to national economic forces depends on many factors, including national changes, regional economic diversity and the availability of other opportunities for economic resources located in regions. In order to assess the importance of these national forces to rural and regional Australia, estimated output and employment effects have been generated for the 57 statistical divisions in the model.

At the statistical division level, output is estimated to have grown in all regions, except for Fitzroy in Queensland and Peel in Western Australia, as a result of these national economic forces (table 4.13). For the Fitzroy division, the estimated negative effect on output of mining terms of trade declines (particularly for black

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[4] Growth in government expenditure in the long run may have a different effect on output trends from short-run, cyclical, increases in government spending in periods of high unemployment. For a general discussion of government expenditure and economic growth in the longer term, see Barro and Sala-i-Martin (1995, pp. 152–8).

coal) are estimated to have dominated the (net) positive effects of mining productivity improvements and other factors. It is the only region to have a significant estimated output decline. In all other regions, the estimated cumulative positive effects of change outweighed the cumulation of any negative effects.

The decline in export prices for rural products was estimated to lower output in most regions (table 4.13) and to lead to the relocation of labour away from many rural and regional areas towards capital city and adjacent statistical divisions (eg Sydney, Hunter and Illawara in New South Wales and Melbourne and Barwon in Victoria) (table 4.14). Similarly, the decline in export prices for mining commodities was estimated to lead to employment declines in the main mining areas such as Hunter in New South Wales and most Western Australian divisions.

Agricultural and mining productivity improvements were estimated to raise output growth in most divisions. Higher output was estimated to lead to higher employment in some regions such as the Wheatbelt in Western Australia. However, rural industry productivity improvements were not always estimated to raise both output and employment growth. When the estimated regional output effects were less than the estimated efficiency effects, regional employment is estimated to have declined. For example, for the Mallee division in Victoria and Northern in Queensland, productivity improvements were estimated to raise output but lower divisional employment.

Changes in international travel and government spending were estimated to have only fractionally positive or negative effects on regional employment. Regions that were estimated to have benefited from increased travel spending included Sydney, Far North Queensland and the Northern Territory — localities where there is a relative concentration of travel related activities (eg restaurants, hotels and accommodation establishments). An increase in government spending growth was estimated to have had a strong positive effect on employment growth in the ACT but negligible effects elsewhere.

For regional employment (though not output), the model's estimated impact of national economic forces can be compared with actual average employment growth over the 1986 to 1996 period. The estimated direction of regional employment changes matches the actual direction in 75 per cent of divisions.

Table 4.13 **Estimated regional output implications of selected broad economic forces affecting rural and regional Australia, mid-1980s to mid-1990s** (per cent per year)

| | General economic conditions | Agriculture | | Mining | | | Inter-national travel | Govern-ment spending | Sub total: selected forces | Other | Actual |
		Terms of trade	Prod-uctivity	Terms of trade	Capital growth	Prod-uctivity					
New South Wales	**2.81**	**-0.17**	**0.13**	**-0.65**	**0.11**	**0.48**	**0.08**	**-0.28**	**2.50**	**-0.08**	**2.42**
Sydney	2.74	0.01	0.02	-0.07	0.05	0.10	0.07	-0.23	2.70		
Hunter	3.07	-0.08	0.02	-2.73	0.13	2.10	0.02	-0.32	2.21		
Illawarra	3.39	0.06	-0.01	-1.22	0.12	1.17	0.04	-0.39	3.16		
Richmond-Tweed	2.92	-0.54	0.14	-0.90	0.22	0.37	0.14	-0.40	1.96		
Mid-North Coast	2.90	-0.42	0.14	-0.80	0.20	0.35	0.13	-0.41	2.10		
Northern	2.44	-0.73	0.64	-0.52	0.13	0.32	0.10	-0.33	2.06		
North Western	2.63	-0.82	0.77	-1.18	0.24	0.71	0.09	-0.41	2.03		
Central West	2.62	-0.50	0.42	-1.29	0.18	0.89	0.09	-0.32	2.10		
South Eastern	2.71	-0.43	0.30	-0.95	0.22	0.41	0.12	-0.20	2.17		
Murrumbidgee	2.50	-0.84	0.57	-0.61	0.18	0.25	0.09	-0.26	1.88		
Murray	2.77	-0.73	0.53	-0.72	0.20	0.29	0.10	-0.43	2.01		
Far West	3.54	-0.67	0.29	-3.39	0.84	1.88	0.16	-0.66	2.00		
Victoria	**2.70**	**-0.12**	**0.09**	**-0.19**	**0.17**	**0.03**	**0.06**	**-0.19**	**2.55**	**-0.57**	**1.98**
Melbourne	2.68	0.06	0.00	0.32	0.05	-0.13	0.05	-0.15	2.88		
Barwon	2.90	-0.14	0.08	-1.17	0.20	0.16	0.09	-0.28	1.84		
Western District	2.68	-0.39	0.39	-1.18	0.17	0.12	0.09	-0.28	1.60		
Central Highlands	2.79	-0.33	0.14	-0.42	0.19	0.16	0.09	-0.29	2.35		
Wimmera	2.86	-0.73	0.38	-1.19	0.32	0.47	0.12	-0.38	1.86		
Mallee	2.77	-1.02	0.15	-0.45	0.18	0.15	0.10	-0.37	1.51		
Loddon	2.56	-0.47	0.32	-0.25	0.14	0.10	0.10	-0.20	2.31		
Goulburn	2.40	-0.44	0.39	-0.04	0.10	0.02	0.07	-0.16	2.34		
Ovens-Murray	2.67	-0.36	0.20	-0.39	0.17	0.15	0.09	-0.06	2.46		
East Gippsland	3.18	-0.22	0.11	-3.15	1.43	1.07	0.08	-0.38	2.12		
Gippsland	2.65	-0.19	0.13	-1.59	0.81	0.50	0.05	-0.24	2.11		
Queensland	**2.77**	**-0.12**	**0.14**	**-1.80**	**0.21**	**0.87**	**0.07**	**-0.28**	**1.85**	**2.78**	**4.62**
Brisbane	2.64	0.01	0.05	-0.82	0.14	0.29	0.07	-0.16	2.22		
Moreton	2.82	-0.17	0.10	-1.06	0.17	0.40	0.11	-0.47	1.90		
Wide Bay-Burnett	2.65	-0.08	0.12	-0.78	0.13	0.46	0.04	-0.36	2.19		
Darling Downs	2.30	-0.65	0.67	-0.38	0.12	0.12	0.05	-0.29	1.94		
South West	2.87	-1.39	0.78	-1.59	0.44	0.54	0.09	-0.52	1.22		
Fitzroy	3.41	-0.20	0.13	-7.47	0.25	3.18	0.01	-0.41	-1.10		
Central West	3.18	-1.18	0.66	-2.10	0.42	0.74	0.16	-0.62	1.27		
Mackay	3.08	0.18	0.04	-4.95	0.16	4.63	0.03	-0.49	2.68		
Northern	2.82	0.01	0.07	-3.06	0.28	0.98	0.06	-0.17	0.99		
Far North	2.76	0.04	0.09	-1.21	0.32	0.62	0.12	-0.26	2.47		
North West	3.29	-0.42	0.30	-4.93	1.29	3.05	0.07	-0.48	2.16		
South Australia	**2.68**	**-0.43**	**0.18**	**-0.50**	**0.24**	**0.13**	**0.04**	**-0.19**	**2.16**	**-0.36**	**1.80**
Adelaide	2.62	-0.22	0.02	-0.16	0.20	0.03	0.04	-0.08	2.46		
Outer Adelaide	2.68	-0.85	0.24	-0.37	0.23	0.10	0.05	-0.35	1.74		
Yorke and Lower North	2.53	-0.87	1.06	-0.67	0.25	0.23	0.07	-0.37	2.24		
Murray Lands	2.52	-1.60	0.35	-0.05	0.15	-0.01	0.03	-0.42	0.96		
South East	2.73	-0.85	0.36	-0.23	0.15	0.05	0.04	-0.46	1.78		
Eyre	2.63	-0.60	1.07	-0.82	0.27	0.29	0.09	-0.38	2.54		
Northern	3.37	-0.39	0.38	-3.67	0.63	1.09	-0.01	-0.42	1.01		
Western Australia	**3.08**	**-0.10**	**0.07**	**-4.07**	**0.99**	**1.84**	**0.02**	**-0.44**	**1.39**	**3.73**	**5.11**
Perth	2.93	-0.05	0.00	-3.00	0.67	1.06	0.02	-0.37	1.27		
Peel	3.73	-0.27	0.07	-5.39	0.97	1.42	0.06	-0.67	-0.08		
South West	3.44	-0.19	0.03	-5.85	0.96	2.36	-0.01	-0.54	0.21		
Great Southern	2.73	-0.57	0.66	-1.68	0.38	0.53	0.09	-0.52	1.62		
Wheatbelt	2.47	-0.54	0.91	-2.55	0.71	1.29	0.03	-0.38	1.94		
Goldfields-Esperance	3.34	0.09	0.03	-7.70	2.43	5.81	-0.06	-0.58	3.37		
Mid West	3.17	-0.24	0.24	-4.41	1.47	2.91	0.02	-0.55	2.61		
Gascoyne	3.48	-0.53	0.30	-3.94	0.96	1.76	0.15	-0.64	1.54		
Pilbara	3.92	0.20	-0.10	-11.04	3.10	6.01	-0.05	-0.78	1.25		
Kimberley	3.31	-0.48	0.19	-2.81	0.71	1.17	0.14	-0.48	1.75		
Tasmania	**2.82**	**-0.06**	**0.08**	**-1.96**	**0.19**	**0.32**	**0.05**	**-0.01**	**1.43**	**-0.08**	**1.35**
Greater Hobart	2.71	0.08	0.02	-1.89	0.14	0.17	0.06	0.30	1.59		
Southern	2.90	-0.42	0.14	-1.41	0.19	0.22	0.07	-0.13	1.57		
Northern	3.03	-0.10	0.09	-2.61	0.13	0.20	0.04	-0.26	0.51		
Mersey-Lyell	2.75	-0.11	0.13	-1.52	0.34	0.80	0.03	-0.22	2.19		
Northern Territory	**2.87**	**-0.27**	**0.20**	**-3.92**	**0.87**	**1.31**	**0.09**	**0.05**	**1.20**	**3.48**	**4.67**
Aust. Capital Territory	**1.71**	**-0.11**	**0.06**	**-0.66**	**0.15**	**0.23**	**0.12**	**1.76**	**3.26**	**1.10**	**4.36**

Sources: MONASH-RR estimates; ABS (Australian National Accounts, State Accounts, Cat. no. 5220.0).

Table 4.14 Estimated regional employment implications of selected broad economic forces affecting rural and regional Australia, mid-1980s to mid-1990s (per cent per year)

| | General economic conditions | Agriculture | | Mining | | | Inter-national travel | Govern-ment spending | Sub total: selected forces | Other | Actual |
		Terms of trade	Prod-uctivity	Terms of trade	Capital growth	Prod-uctivity					
New South Wales	**1.79**	**-0.01**	**0.00**	**0.22**	**-0.08**	**0.06**	**0.00**	**-0.09**	**1.91**	**-0.52**	**1.39**
Sydney	1.82	0.14	-0.03	0.56	-0.07	-0.14	0.02	-0.10	2.19	-0.76	1.43
Hunter	2.01	0.16	-0.07	-2.29	-0.07	1.41	-0.06	-0.16	0.92	0.53	1.46
Illawarra	2.17	0.30	-0.10	-0.61	-0.09	0.68	-0.03	-0.18	2.15	-0.47	1.67
Richmond-Tweed	1.83	-0.31	0.04	0.70	-0.07	-0.22	0.05	-0.09	1.93	1.67	3.60
Mid-North Coast	1.81	-0.20	0.03	0.60	-0.06	-0.15	0.04	-0.16	1.92	0.68	2.60
Northern	1.33	-0.90	0.27	0.94	-0.15	-0.25	0.00	-0.06	1.18	-1.17	0.01
North Western	1.46	-0.98	0.38	0.51	-0.11	0.01	-0.04	-0.11	1.12	-0.39	0.73
Central West	1.42	-0.59	0.16	-0.03	-0.11	0.32	-0.02	-0.03	1.13	-0.36	0.77
South Eastern	1.55	-0.28	0.10	0.48	-0.05	-0.11	0.03	0.17	1.90	0.06	1.96
Murrumbidgee	1.20	-0.97	0.24	1.03	-0.12	-0.33	-0.01	0.10	1.14	-0.29	0.85
Murray	1.48	-0.59	0.23	1.27	-0.15	-0.43	-0.01	-0.10	1.68	-1.10	0.58
Far West	1.77	-0.82	0.19	-1.32	0.45	0.78	-0.07	-0.09	0.89	-2.49	-1.60
Victoria	**1.70**	**0.08**	**-0.02**	**0.88**	**-0.08**	**-0.35**	**0.00**	**-0.06**	**2.15**	**-1.50**	**0.65**
Melbourne	1.79	0.19	-0.06	0.99	-0.09	-0.35	0.00	-0.09	2.38	-1.46	0.91
Barwon	1.84	0.02	-0.03	-0.24	-0.03	-0.24	0.02	-0.14	1.20	-0.11	1.09
Western District	1.54	-0.19	0.12	-0.06	-0.13	-0.46	-0.01	0.01	0.83	-1.14	-0.32
Central Highlands	1.67	-0.02	0.00	0.93	-0.07	-0.30	0.01	-0.05	2.19	-1.20	0.99
Wimmera	1.43	-0.60	0.17	0.63	-0.02	-0.18	0.00	0.04	1.46	-1.93	-0.47
Mallee	1.44	-0.67	-0.03	1.32	-0.14	-0.48	0.00	-0.05	1.39	-1.16	0.23
Loddon	1.49	-0.24	0.13	0.97	-0.09	-0.33	0.03	0.01	1.97	-0.59	1.38
Goulburn	1.37	-0.21	0.14	1.29	-0.14	-0.45	-0.01	0.03	2.03	-0.93	1.09
Ovens-Murray	1.55	-0.09	0.03	1.17	-0.12	-0.39	-0.01	0.27	2.42	-0.79	1.63
East Gippsland	1.71	0.01	-0.01	0.04	0.31	-0.16	0.01	0.14	2.04	-1.88	0.16
Gippsland	1.10	0.03	-0.02	0.73	0.04	-0.37	-0.02	0.02	1.51	-2.06	-0.55
Queensland	**1.76**	**0.00**	**0.02**	**-0.58**	**0.01**	**0.14**	**0.01**	**-0.04**	**1.31**	**1.85**	**3.15**
Brisbane	1.68	0.14	0.00	-0.01	0.00	-0.02	0.02	0.05	1.87	1.17	3.03
Moreton	2.14	-0.04	0.02	-0.16	0.01	0.07	0.06	-0.31	1.79	4.32	6.11
Wide Bay-Burnett	1.57	0.03	-0.03	0.67	-0.11	-0.18	-0.04	-0.11	1.80	0.94	2.74
Darling Downs	1.34	-0.78	0.31	0.95	-0.11	-0.35	-0.03	-0.05	1.28	0.14	1.42
South West	1.31	-2.24	0.44	1.15	-0.02	-0.49	-0.10	-0.15	-0.10	-0.11	-0.20
Fitzroy	2.13	-0.14	-0.02	-6.40	0.06	1.07	-0.07	-0.18	-3.55	5.13	1.58
Central West	1.22	-2.10	0.47	1.74	-0.23	-0.61	-0.08	-0.16	0.25	-0.71	-0.47
Mackay	1.94	0.37	-0.06	-2.30	-0.09	1.61	-0.04	-0.26	1.18	1.51	2.69
Northern	1.63	0.15	-0.03	-1.96	0.07	0.24	-0.02	0.16	0.24	1.62	1.86
Far North	1.73	0.18	-0.03	-0.08	0.07	0.10	0.05	0.02	2.04	2.74	4.78
North West	2.08	-0.14	-0.05	-4.72	0.94	1.96	-0.14	-0.11	-0.20	1.14	0.94
South Australia	**1.61**	**-0.18**	**0.02**	**0.76**	**-0.05**	**-0.31**	**-0.01**	**0.02**	**1.85**	**-1.16**	**0.68**
Adelaide	1.66	-0.07	-0.03	0.73	-0.03	-0.28	0.00	0.09	2.07	-1.54	0.53
Outer Adelaide	1.56	-0.46	0.05	1.20	-0.11	-0.46	-0.04	-0.12	1.62	0.58	2.20
Yorke and Lower North	1.30	-0.55	0.42	1.51	-0.16	-0.57	-0.05	-0.05	1.85	-2.61	-0.76
Murray Lands	1.21	-0.72	0.05	1.79	-0.21	-0.66	-0.08	-0.19	1.19	-0.88	0.31
South East	1.41	-0.77	0.20	1.75	-0.21	-0.65	-0.08	-0.25	1.39	-1.24	0.15
Eyre	1.18	-0.43	0.50	1.32	-0.14	-0.48	-0.02	-0.03	1.89	-2.78	-0.89
Northern	1.71	-0.20	0.10	-1.36	0.14	0.08	-0.09	-0.17	0.21	-1.38	-1.17
Western Australia	**1.96**	**-0.02**	**0.00**	**-1.96**	**0.40**	**0.58**	**-0.03**	**-0.18**	**0.76**	**1.44**	**2.19**
Perth	1.96	0.03	-0.04	-1.52	0.32	0.40	0.00	-0.13	1.02	1.61	2.63
Peel	2.43	-0.04	-0.03	-3.17	0.46	0.41	-0.05	-0.42	-0.40	6.49	6.09
South West	2.09	-0.10	-0.06	-3.21	0.38	0.71	-0.09	-0.32	-0.61	3.82	3.21
Great Southern	1.31	-0.70	0.47	0.85	-0.08	-0.36	-0.05	-0.26	1.19	0.34	1.53
Wheatbelt	0.96	-0.64	0.60	0.05	0.13	0.01	-0.09	-0.15	0.87	-0.32	0.55
Goldfields-Esperance	2.39	0.35	-0.08	-6.24	1.53	2.68	-0.17	-0.40	0.05	3.24	3.29
Mid West	2.00	-0.17	0.12	-2.17	0.74	1.02	-0.08	-0.29	1.18	0.66	1.84
Gascoyne	1.71	-0.31	0.18	-0.93	0.38	0.44	-0.02	-0.13	1.32	-3.56	-2.24
Pilbara	2.62	0.46	-0.18	-9.02	1.27	3.13	-0.11	-0.44	-2.27	1.65	-0.62
Kimberley	1.84	-0.50	0.05	-0.31	0.28	0.15	0.02	-0.02	1.51	2.15	3.66
Tasmania	**1.61**	**0.03**	**-0.02**	**-0.69**	**-0.04**	**-0.11**	**-0.01**	**0.36**	**1.15**	**-0.42**	**0.72**
Greater Hobart	1.57	0.19	-0.03	-0.73	-0.02	-0.16	0.02	0.78	1.61	-0.91	0.70
Southern	1.32	-0.40	-0.03	0.65	-0.15	-0.44	-0.05	0.23	1.13	-0.01	1.13
Northern	1.79	-0.01	-0.01	-1.15	-0.07	-0.17	-0.02	0.00	0.37	0.29	0.66
Mersey-Lyell	1.58	-0.01	0.00	-0.48	0.02	0.18	-0.04	0.07	1.31	-1.79	-0.48
Northern Territory	**1.72**	**0.03**	**-0.03**	**-1.68**	**0.44**	**0.52**	**0.06**	**0.58**	**1.65**	**0.35**	**2.00**
Aust. Capital Territory	**0.88**	**0.08**	**-0.01**	**0.26**	**-0.02**	**-0.09**	**0.06**	**2.29**	**3.44**	**-2.16**	**1.28**

Sources: MONASH-RR estimates; ABS (*Population Census*, Cat. no. 1502.0).

For the remaining 25 per cent of regions, the disaggregated modelling approach has not captured the direction of change in regional employment. Region-specific factors provide one important reason for the actual and estimated changes differing.

On the one hand, there are region-specific factors that have lowered actual growth relative to estimated growth, such as:

- the removal or scaling down of defence facilities and other region-specific activities — for example, in the Gascoyne division of Western Australia and in Mersey-Lyell in Tasmania; and

- labour-saving reform in the electricity-generating industry, particularly evident in Gippsland, Victoria.

When all national and region-specific factors are taken into account, actual employment grew in 45 and declined in 12 divisions from the mid-1980s to the mid-1990s. Divisions with increased employment were spread between metropolitan, coastal and rural and regional Australia. However, divisions with declining employment were concentrated in some of the more remote rural and regional areas (figure 4.6).

On the other hand, there have been important region-specific factors that have raised employment growth relative to estimated growth in some regions, such as:

- mine developments in regions such as Goldfields-Esperance in Western Australia and the North West division in Queensland;

- development of rural centres such as the Emerald irrigation area in the Fitzroy division; and

- urban/service/industry centre developments in the Peel division of Western Australia, and Mackay, Northern and Far North in Queensland.

After taking account of these positive region factors, there were 4 divisions in which employment increased from the mid-1980s to the mid-1990s, although the disaggregation of national projection estimated a decline. These were Fitzroy and North West in Queensland, and Peel and South West in Western Australia.

Figure 4.6   **Regions experiencing actual employment declines, 1986 to 1996**

With employment declines

Other
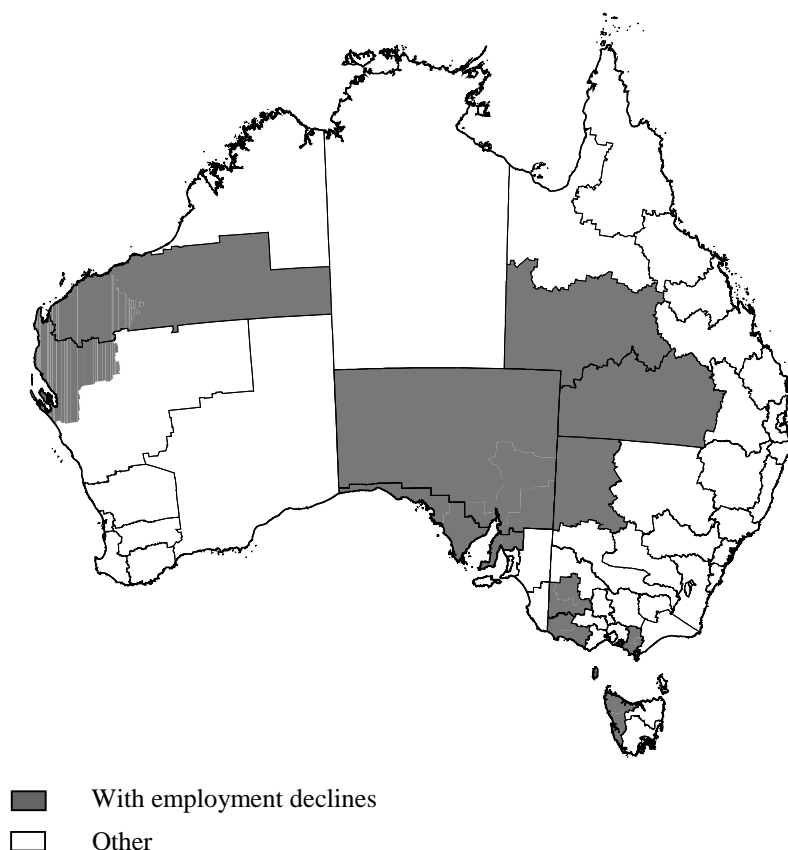
List of statistical divisions with actual employment declines

New South Wales	**South Australia**
Far West	Yorke and Lower North
Victoria	Eyre
Western District	Northern
Wimmera	**Western Australia**
Gippsland	Gascoyne
Queensland	Pilbara
South West	**Tasmania**
Central West	Mersey-Lyell

Source: ABS (*Population Census*, Cat. no. 1502.0).

Implications of output and employment changes for regional income per worker

Estimates of changes in output and employment can be used to provide estimates of changes in regional output per person employed. These estimates indicate that regions experiencing employment declines are among those with the highest growth in average regional output per person employed (figure 4.7). On the other hand,

growth in regional output per person employed tends to be lowest in regions with the largest increases in employment. The latter effect reflects the expansion of relatively labour-intensive activities in regions attracting the largest number of new employees. Overall, with the relocation of labour, average income generated per person employed would be higher than otherwise in all regions, other things remaining equal.

While indicative of changes in income generated per person employed, these estimates do not indicate how income would be appropriated. As such, the estimates do not necessarily indicate the change in income for each individual in regional communities.

Figure 4.7   **Estimated effects of selected broad economic forces on growth of gross regional product per person employed**
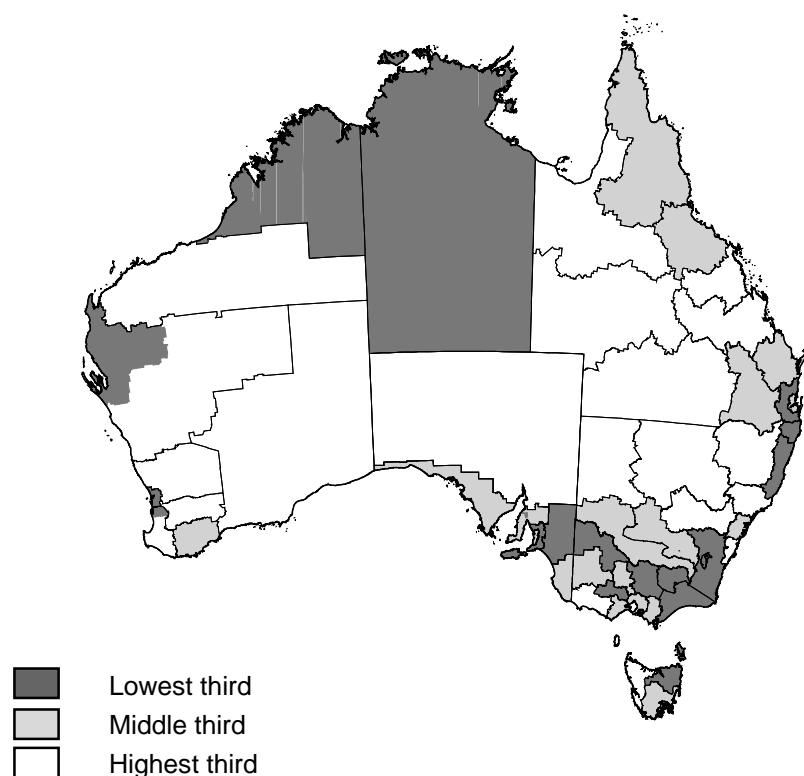
Source: MONASH-RR estimates.

4.8 Relationship between historical experience and the effects of NCP reform

The NCP reforms examined in this report are reforms of major infrastructure — electricity and gas, rail, road, telecommunications, and water — and reviews of Commonwealth and State statutory marketing arrangements. The effects of national changes have been disaggregated to the regional level to put the estimated regional effects of NCP into context. However, since there has been limited progress on the implementation of NCP, the estimated effects of NCP reform would not be generally evident in actual employment changes.

An exception to this general rule is reform of the gas and electricity industries, which commenced in the 1980s and whose NCP effects are estimated to have begun in the early 1990s. Electricity reform has a substantial labour-saving component, so that regional employment could already be lower than otherwise as a result. For example, NCP electricity reform is estimated to reduce employment in Gippsland (the location of the LaTrobe Valley electricity-generating complex) by more than 6 per cent (chapter 3). In practice, employment in Gippsland declined for region-specific reasons (included in the 'other' column in table 4.14) by around 20 per cent from the mid-1980s to the mid-1990s (ie at an annual average rate of about 2 per cent, table 4.14). One of the reasons for this decline could be the progressive implementation of NCP electricity reforms, although other non-NCP factors could also be at work.

However, this partial picture of employment changes does not represent the full picture. In Gippsland, taking both national and region-specific factors into account, actual employment declined by around 5 per cent over the ten years, with important offsetting positive forces being the effects of general economic growth, and the resource relocation effects of agriculture and mining terms of trade declines (table 4.14). By contrast, for the Hunter region in New South Wales, employment grew from the mid-1980s to the mid-1990s, despite the implementation of electricity reforms alone being estimated to have a fractionally negative net effect on regional employment (table 3.7).

As noted, in most regions, the actual employment changes experienced over the mid-1980s to the mid-1990s would not reflect much influence from NCP reforms, because much of the implementation of NCP has yet to occur. But as the employment implications of NCP reforms do flow through, they could either exacerbate or offset past trends (assuming those trends continue into the future).

Nine out of the 12 regions that have experienced a net employment decline from the mid-1980s to the mid-1990s are estimated to have (eventually) employment lower

than otherwise as a result of NCP reforms (table 4.15). All are rural and regional, rather than metropolitan regions.

The other three out of the 12 regions that have experienced employment declines in the recent past are estimated to have employment higher than otherwise as a result of NCP reforms. These regions specialise in mining activities.

Table 4.15 **Comparison of regional employment changes from mid-1980s to mid-1990s with the estimated effects of selected NCP reforms on regional employment**

Regions experiencing employment declines and estimated NCP induced declines		*Regions experiencing employment declines and estimated NCP increases*	
Victoria	**South Australia**	**New South Wales**	
Western District	Yorke and Lower North	Far West	
Wimmera	Eyre	**Western Australia**	
Gippsland	Northern	Gascoyne	
Queensland	**Tasmania**	Pilbara	
South West	Mersey Lyell		
Central West			

Regions experiencing employment increases and estimated NCP induced declines		*Regions experiencing employment increases and estimated NCP induced increases*	
New South Wales	**South Australia**	**New South Wales**	**South Australia**
Richmond-Tweed	Outer Adelaide	Sydney	Adelaide
Mid-North Coast	Murray Lands	Hunter	**Western Australia**
Northern	South East	Illawara	Perth
North Western	**Western Australia**	**Victoria**	Peel
Central West	Great Southern	Melbourne	South West
South Eastern	Wheatbelt	Barwon	Goldfields-Esperance
Murrumbidgee	**Tasmania**	**Queensland**	Mid West
Murray	Greater Hobart	Brisbane	Kimberley
Victoria	Southern	Moreton	**Tasmania**
Central Highlands	**Australian Capital Territory**	Fitzroy	Northern
Mallee		Mackay	**Northern Territory**
Loddon		Northern	
Goulburn		Far North	
Ovens-Murray		North West	
East Gippsland			
Queensland			
Wide Bay-Burnett			
Darling Downs			

Sources: PC estimates; ABS (*Population Census*, Cat. no. 1502.0).

However, the estimated beneficial impact of NCP on employment in these regions needs to be treated with caution, as the model does not account of the move towards fly-in, fly-out modes of operation. It also does not take account of new mine developments or mine closures which, in the normal course of events, would not be affected by NCP reforms.

The majority of regions (ie 45 of the 57) experienced employment growth from the mid-1980s to the mid-1990s. Of these, it is estimated that 21 would also gain in employment terms under NCP. This group includes five of the six State capitals, the Northern Territory and the metropolitan regions of Hunter, Illawara and Barwon.

On the other hand, 24 regions with employment growth in the recent past have future estimated employment lower than otherwise as a result of NCP reforms. Most of these are rural and regional, although Greater Hobart and the Australian Capital Territory also are included.

Table 4.15 compares the direction of past employment trends with the direction of the estimated effects of NCP reforms. However, it does not capture the relative magnitudes.

Table 4.16 presents information on magnitudes for each region, categorised according to whether regional employment has grown or declined from the mid-1980s to the mid-1990s, and whether for each group, NCP is estimated to raise or lower regional employment from levels that would be otherwise attained.

For most regions, the employment effect of NCP is equivalent to less than one year's actual employment change. For these regions, NCP reforms are likely to have a relatively small role to play in regional employment growth.

There are 14 regions in which employment is declining or slow growing and in which NCP reforms are likely to either:

- add to past employment declines (eg Western District in Victoria); or
- require more than five years' growth (based on historical movements) to offset the negative effects of NCP (eg Northern in New South Wales).

These regions are located in rural and regional Australia, and were shown in figure 1.4 of chapter 1.

Table 4.16 **Actual regional employment growth and estimated employment changes due to selected NCP reforms, and annual equivalent of NCP employment changes**

	Actual	NCP reform	With actual empl. declines		With actual empl. increases	
			NCP decline	NCP increase	NCP decline	NCP increase
	% per year	%	yrs	yrs	yrs	yrs
New South Wales	**1.39**	**0.14**				**0.1**
Sydney	1.43	0.24				0.2
Hunter	1.46	1.52				1.0
Illawarra	1.67	1.51				0.9
Richmond-Tweed	3.60	-0.53			0.1	
Mid-North Coast	2.60	-1.30			0.5	
Northern	0.01	-1.12			106.5	
North Western	0.73	-0.49			0.7	
Central West	0.77	-1.04			1.4	
South Eastern	1.96	-1.84			0.9	
Murrumbidgee	0.85	-1.49			1.8	
Murray	0.58	-1.37			2.3	
Far West	-1.60	0.81		0.5		
Victoria	**0.65**	**-0.53**			0.8	
Melbourne	0.91	0.24				0.3
Barwon	1.09	0.16				0.1
Western District	-0.32	-2.94	9.3			
Central Highlands	0.99	-0.30			0.3	
Wimmera	-0.47	-0.55	1.2			
Mallee	0.23	-1.21			5.2	
Loddon	1.38	-1.31			1.0	
Goulburn	1.09	-2.65			2.4	
Ovens-Murray	1.63	-0.75			0.5	
East Gippsland	0.16	-1.35			8.2	
Gippsland	-0.55	-8.50	15.4			
Queensland	**3.15**	**0.23**				0.1
Brisbane	3.03	0.11				0.0
Moreton	6.11	0.75				0.1
Wide Bay-Burnett	2.74	-1.73			0.6	
Darling Downs	1.42	-1.26			0.9	
South West	-0.20	-1.14	5.6			
Fitzroy	1.58	1.52				1.0
Central West	-0.47	-1.21	2.6			
Mackay	2.69	2.24				0.8
Northern	1.86	0.26				0.1
Far North	4.78	0.50				0.1
North West	0.94	2.46				2.6
South Australia	**0.68**	**-0.16**			0.2	
Adelaide	0.53	0.26				0.5
Outer Adelaide	2.20	-1.09			0.5	
Yorke and Lower North	-0.76	-1.79	2.3			
Murray Lands	0.31	-2.30			7.4	
South East	0.15	-1.27			8.6	
Eyre	-0.89	-1.33	1.5			
Northern	-1.17	-0.70	0.6			
Western Australia	**2.19**	**0.78**				0.4
Perth	2.63	0.88				0.3
Peel	6.09	1.63				0.3
South West	3.21	0.03				0.0
Great Southern	1.53	-0.73			0.5	
Wheatbelt	0.55	-2.53			4.6	
Goldfields-Esperance	3.29	4.03				1.2
Mid West	1.84	1.44				0.8
Gascoyne	-2.24	0.22		0.1		
Pilbara	-0.62	0.33		0.5		
Kimberley	3.66	0.84				0.2
Tasmania	**0.72**	**-0.74**			1.0	
Greater Hobart	0.70	-1.06			1.5	
Southern	1.13	-2.46			2.2	
Northern	0.66	0.40				0.6
Mersey-Lyell	-0.48	-0.98	2.1			
Northern Territory	**2.00**	**0.56**				0.3
Aust. Capital Territory	**1.28**	**-0.66**			0.5	

Sources: MONASH-RR estimates; ABS (*Population Census*, Cat. no. 1502.0).

A   The MONASH-RR model

A.1   Introduction

MONASH is a multipurpose extension of the ORANI model (Dixon, Parmenter, Sutton and Vincent 1982). The MONASH-RR model is a special version of the MONASH model that includes intermodal substitution in transport and a regional disaggregation of results. Documentation of the MONASH model is evolving with its development. Some of the main references describing features of the model are listed in box A.1.

This appendix describes the structure and key elements of the workings of the MONASH-RR model.

A.2   The model

The MONASH model and its derivatives are composed of three elements — a database, theory and parameters — which are embodied in the model's system of equations. These equations describe how industries and consumers are assumed to respond to changes in the economic and policy variables being studied. There is also a model closure, which describes the economic environment in which it is assumed that these decisions are made.

Database

The core of the MONASH model is its database showing how each sector in the economy is linked to other sectors.

Box A.1 **Documentation on the MONASH model**

No single reference on the MONASH model currently exists. The following papers give detailed information on how the model is structured and used for policy analysis, forecasting, historical analysis and regional analysis. Full documentation is currently being prepared and its release is forthcoming.

Overview of the MONASH model

Adams, P., Dixon, P., McDonald, D., Meagher, G. and Parmenter, B. 1994, 'Forecasts for the Australian economy using the MONASH model', *International Journal of Forecasting*, no. 10, pp. 557–71.

Parmenter, B. 1995, 'Forecasting and policy analysis with the MONASH model', Paper prepared for the International Symposium on Economic Modelling, Bologna, Italy, 19–21 July.

Behavioural theory in detail (excluding capital and labour adjustment)

Dixon, P., Parmenter, B., Sutton, J. and Vincent, D. 1982, *ORANI: a Multisectoral Model of the Australian Economy*, North-Holland, Amsterdam.

Capital accumulation theory

Dixon, P. and Malakellis, M. 1996, 'Investment Behaviour in the MONASH Model of the Australian Economy', in Vlacic, L.J., Nguyen, T. and Cecez-Kecemanovic, D. (eds), *Modelling and Control of National and Regional Economies 1995*, Pergamon, Oxford.

Historical analysis

Dixon, P. and McDonald, D. 1993, *An Explanation of Structural Changes in the Australian Economy: 1986-87 to 1990-91*, Background Paper no. 29, Economic Planning and Advisory Commission, Canberra, June.

Forecasting

CoPS (Centre of Policy Studies) 1996, *Guide to Growth,* CoPS, Monash University, Melbourne.

Dixon, P., Parmenter, B. and Rimmer, M. 1998, *Forecasting and Policy Analysis with a Dynamic CGE model of Australia*, CoPS, Monash University.

Policy analysis

Industry Commission 1997b, *The Textiles, Clothing and Footwear Industries*, Industry Commission, Report no. 59, AGPS, Canberra.

Regional analysis

Adams, P. and Dixon, P. 1995, 'Prospects for Australian Industries, States and Regions: 1993-94 to 2001-02', *Australian Bulletin of Labour*, vol. 21, no. 2, pp. 87–108.

The database is based on input-output tables prepared by the Australian Bureau of Statistics (ABS). These tables show commodity flows for more than 100 commodities and industries (ABS 1999). In essence, input-output tables show:

- the flow of industry outputs to other industries (termed 'intermediate demands'), 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) and commodity taxes and subsidies.

The MONASH-RR model uses the standard MONASH model classifications of 113 industries and 115 commodities. The main modifications to the ABS input-output classification are as follows.[1]

- The individual product-industries (eg sheep, cereal grains and meat cattle) shown in the input-output tables are replaced by industries representing Australian agricultural zones, which each produce several commodities reflecting regional differences in production technologies, climatic and biological factors. Four agricultural zonal industries are identified in the MONASH model (see box A.2).

- The industry 'other farming' is disaggregated into two sub-industries to take account of different usage patterns associated with commodities produced by each sub-industry.

- The composite input-output item 'coal, oil and gas' is disaggregated into two commodities — 'oil and gas (including brown coal)' and 'black coal'.

The agricultural and mining industry and commodity classifications adopted in the current study are presented in table A.1.

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[1] The standard MONASH model classifications are based on those of the 1989-90 edition of the ABS input-output tables (although the data itself has been updated to 1993-94). The industry and commodity classifications in this edition are based on the Australian Standard Industrial Classification (ASIC). Subsequently, the ABS introduced the Australian and New Zealand Standard Industrial Classification (ABS 1993). The ANZSIC was adopted in the input-output tables for the reference year 1993-94 (ABS 1997).

Box A.2   **Australian agricultural zones**

The *pastoral zone* includes most of northern tropical areas and the arid and semi-arid regions of Australia. Agricultural land use in this zone is characterised by extensive grazing of native pastures. Some cropping is undertaken, but it is impractical on most farms because of inadequate rainfall.

The *wheat-sheep zone* has a climate and topography that generally allows regular cropping of grains in addition to the grazing of sheep and beef cattle on a more intensive basis than in the pastoral zone. Rainfall is generally adequate for producing a variety of pasture species, usually as part of a crop-grazing rotation. Farms, on average, are much smaller in area than in the pastoral zone.

The *high rainfall zone* forms the greater part of the coastal belt and adjacent tablelands of the three eastern mainland States, small areas in south east South Australia, south western Western Australia and all of Tasmania. Higher rainfall, steeper topography, more adequate surface water and greater humidity make the high rainfall zone less suitable than the wheat-sheep zone for cropping of grains but more suitable for grazing and producing other crops.

The *northern beef* industry comprises all properties located in the Kimberley region in Western Australia, the Northern Territory and the Peninsular Gulf and Coastal Central regions of Queensland. The principal agricultural industry in this region is beef cattle, with input and output characteristics significantly different from beef cattle grazing in other agricultural zones. Most of the product from this industry is exported as lower quality manufacturing beef. Except in some fringe areas of the Queensland Coastal region, climate and biological factors are such that traditionally there has been virtually no alternatives to beef cattle.
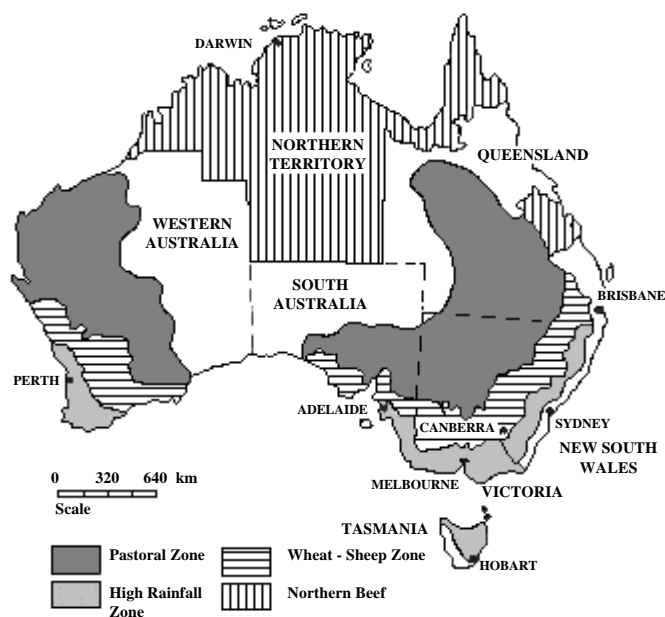
Sources: Higgs (1986); ABARE (1998a).

The MONASH database provides a detailed description of the structure of production and demands in the Australian economy. It accounts for taxes and subsidies on all transactions. It also includes margins, which represent the costs associated with transferring a product from the firm or the wharf (in the case of imports) to consumers and other users. Examples of margins are wholesale and retail trade, transport, storage and insurance costs. Taxes and margins represent the difference between the cost of providing a good or service (at the firm level) and the price paid by the user. Tariffs are treated as a commodity tax on imports.

Table A.1   **The MONASH-RR agriculture and mining industry and commodity classifications**

MONASH-RR industry	MONASH-RR commodity
Agriculture, forestry and fishing	
I1 Pastoral zone	C1 Wool
I2 Wheat-sheep zone	C2 Sheep (for meat)
I3 High rainfall zone	C3 Wheat
I4 Northern beef zone	C4 Barley
I5 Dairy cattle farming and pig farming	C5 Other cereal grains (including rice, maize, millet, oats and sorghum)
I6 Other agriculture - including sugar cane, fruit and nuts	C6 Meat cattle
I7 Other agriculture - including vegetables, cotton, oil seeds and tobacco.	C7 Milk cattle and pig products
I8 Poultry farming	C8 Other agricultural products - including sugar cane, fruit and nuts
I9 Services to agriculture	C9 Other agricultural products - including vegetables, cotton, oil seeds and tobacco.
I10 Forestry and logging	C10 Poultry
I11 Fishing	C11 Agricultural services
	C12 Forestry and forest products
	C13 Fishing and fish products
Mining	
I12 Iron ore mining	C14 Iron ore
I13 Non-ferrous metal ore mining	C15 Non-ferrous metal ores
I14 Black coal mining	C16 Black coal
I15 Oil, and gas extraction; brown coal mining	C17 Oil and gas; and brown coal
I16 Other mining	C18 Other minerals
I17 Services to mining	C19 Services to mining

Sources: ABS (*Input-Output Tables*, Cat. no. 5209.0, 1989-90 Edition); Higgs (1986).

Theory and parameters

The MONASH model uses economic theory to specify the behaviour of producers, consumers, foreigners and investors. It also has a government sector whose revenue and expenditure behaviour are modelled separately. The theoretical structure of the

model enables estimates to be made of the social accounting aggregates of gross domestic production, gross national expenditure, imports and exports and for these aggregates to be disaggregated by industry and category of demand. Aggregate and industry employment estimates are also made.

Important elements of the standard theoretical structure of MONASH are as follows.

- Producers and consumers respond to changes in the international competitiveness of the Australian industries. 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 industries. The demand for Australian exports is modelled as responding to changes in the export price of Australian products (other than for public administration and defence services, which are assumed to be exogenously fixed).

- 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 those factors in production.

- Final consumers change their consumption of particular commodities as their aggregate spending changes, and as they substitute between different commodities in response to relative price changes of items in the household basket.

- For multi-product agriculture industries (such as the wheat-sheep zone), producers vary the composition of their output in response to relative changes in the price of each component of their output.

- Producers may reduce the resource cost, and thereby the price, of their outputs by productivity improvements. Any productivity improvements may improve the efficiency of the use of all inputs (ie total factor productivity) or selected inputs (such as labour and fixed capital) (ie multifactor productivity).

In general, the theory and parameter values that are standard to the MONASH model have been applied in the MONASH-RR adaptation. Nevertheless, some enhancements and modifications to standard theory and parameter values have been made for the purposes of the inquiry into the impact of competition policy in rural and regional Australia.

Intermodal substitution in transport

Industries that purchase intermediate inputs are required to pay freight, insurance and other costs needed to transport those inputs from the point of production (eg a farm, mine or factory) or importation. They are also required to pay any commodity taxes applicable to those inputs. The intermediate input costs that guide industry choices of intermediate inputs are the costs inclusive of transport margins, distribution margins and commodity taxes.

The MONASH-RR model extends the standard MONASH model by assuming that industries have a degree of choice over the modes used to transport their intermediate input requirements. MONASH-RR allows for this intermodal substitution between road freight transport, rail transport (including mining rail, private iron ore rail, non-bulk rail and grain freight rail) and water transport. This extension was applied previously in the HILORANI model (IC 1995a). The elasticities adopted assume a relatively high level of substitutability between road and rail transport and a relatively low level of substitutability between the other modes. Depending on the commodities concerned, the intermodal substitution elasticities were generally set at 2 between the road-rail pair, 0.5 between road-water, and 0.5 between rail-water.

Import substitution and export demand elasticities

The MONASH model data base contains two sets of elasticities governing the responsiveness of imports and exports to changes in competitiveness in Australia relative to other countries. One set governs the substitution between domestic products and imports (ie import substitution elasticities), while the other governs foreign demand for Australian exports (ie export demand elasticities).

In the current study, the standard set of import substitution elasticities have been applied. These range between 0.5 and 5.2. The treatment of exports differs from that usually applied in MONASH model simulations. The usual treatment involves a distinction between traditional and non-traditional exports. Traditional exports include commodities for which more than 20 per cent of local output is exported (mainly agricultural, mining and refined primary-industry products). Non-traditional exports include most other items (including most manufactures and services). In the standard treatment, each non-traditional export responds by a common percentage, determined by the *average* percentage change in the price of all non-traditional exports, and a single export demand elasticity for the group of -4.

In the current application, all exports are treated in the same fashion as traditional exports, that is, export demand for each industry's output is determined separately

on the basis of its own export price and its own assumed responsiveness of demand to export price changes. It is assumed that for each non-traditional export commodity, local producers have little or no influence on price levels of their commodities in world markets. This is achieved by setting the export demand elasticity to -20 for each item.

This 'endogenous' exports treatment allows individual activities to be modelled as responding directly to changes in their own competitiveness. The application of the higher export demand elasticity avoids some of the overspecialisation in agriculture and mining activities that can otherwise occur. The new treatment also allows more appropriate regional responses to changes affecting particular exports.

The only exception to this endogenous exports treatment is in the SMAs scenario, where in some cases the exports of commodities affected by reforms are treated as exogenous and held constant. The reasons were discussed in chapter 2.

The longer-term environment (or model closure)

The basic assumptions defining the economic environment are as follows.

- Real pre-tax wages adjust (with wage relativities fixed), while aggregate employment is exogenous. In most scenarios, aggregate employment is fixed. The exceptions are where the model is used to track historical employment growth over time, and in the sensitivity analysis of NCP reforms, where aggregate employment is allowed to be higher than otherwise as a result of NCP reforms.

- Each industry adjusts its capital stocks in order to equilibrate its expected and actual post-tax rates of return on capital. The expected rate of return is determined by the growth in an industry's capital stocks relative to average capital growth (ie the supply of capital is assumed to be upward sloping).

- Real household consumption moves in line with after-tax disposable income, while the balance of trade to GDP ratio is allowed to vary.

- Real government spending is held fixed. Budget neutrality is maintained by allowing income tax rates to vary.

This closure is a standard one used to model tariff changes and other microeconomic reforms (eg IC 1997b). When evaluating the effects of tariff and other tax changes, it is important that the evaluation be done in a budget-neutral context. Otherwise the evaluation of the efficiency implications of the tariff and other tax changes is confounded by changes in fiscal stance.

The closure differs from that often used in a forecasting context. There, it is often the case that the trade balance, rather than the government budget balance, is held fixed and household consumption adjusts to meet the trade balance target, rather than responding to household disposable income.

Holding the government budget fixed does limit the trade balance movement to a large extent, although the 'twin deficits' relationship is not perfect because investment also adjusts. The difference between the two closures is not large. This was confirmed by running the national economic forces scenarios of chapter 4 under the alternative closure with trade balance fixed. Both the macroeconomic and the regional results were close to those reported here.

A.3 Regional disaggregation of results

State and regional economies may have a greater (or lesser) dependence on particular industries than the economy as a whole. Thus, economic developments which affect an industry at the national level can flow through to have an above (or below) average impact on a State or region depending on the relative importance of the activity to an individual region.

In MONASH-RR, the six States and two Territories are identified separately. The six States are further disaggregated into 55 statistical divisions. These divisions are shown in table A.2, with a link to the related ABS statistical division classification, and a listing of the main townships in each division.

In MONASH, regional estimates are made using a '*tops down*' approach described in Adams and Dixon (1995), based on the ORANI regional equation system in Dixon et al. (1982). The current system is termed the MONASH Regional Equation System (MRES). In mapping national results to regions, a distinction is made between *national* activities, *State* activities and *local* activities (table A.3). National industries are assumed to be those that produce a commodity that is highly tradeable on inter-regional markets (eg automobiles, clothing and other non-perishable and easily transported commodities). Because of the tradeable nature of their output, the fortunes of national industries are assumed to depend mainly on factors outside the region in which they are located. Conversely, State and local industries are assumed to be those that produce a commodity that is not heavily traded in inter-regional or overseas markets (eg most services and perishable commodities). The fortunes of State industries are assumed to depend mainly on factors specific to the *State* in which they are located. The fortunes of local industries are assumed to depend mainly on factors specific to the *statistical division* in which they are located.

Table A.2 MONASH Regional Equation System (MRES) regions in the MONASH-RR model

	MRES Region	ABS SD	Main centre	Other selected urban centres
D1	Sydney	105	Sydney	Campbelltown, Gosford, Katoomba, Parramatta, Sutherland
D2	Hunter	110	Newcastle	Cessnock, Maitland, Muswellbrook, Port Stephens, Singleton
D3	Illawarra	115	Wollongong	Kiama, Mittagong, Moss Vale, Shellharbour, Shoalhaven
D4	Richmond-Tweed	120	Lismore	Ballina, Byron Bay, Casino, Tweed Heads
D5	Mid-North Coast	125	Coffs Harbour	Grafton, Kempsey, Port Macquarie, Taree
D6	Northern	130	Tamworth	Armidale, Glen Innes, Gunnedah, Inverell, Moree, Tenterfield
D7	North Western	135	Dubbo	Bourke, Cobar, Coonabarabran, Gilgandra, Mudgee, Walgett
D8	Central West	140	Orange	Bathurst, Blayney, Cowra, Forbes, Lithgow, Oberon, Parkes
D9	South Eastern	145	Queanbeyan	Bega, Bombala, Cooma, Crookwell, Goulburn, Yass, Young
D10	Murrumbidgee	150	Wagga Wagga	Cootamundra, Griffith, Gundagai, Hay, Narrandera, Tumut
D11	Murray	155	Albury	Balranald, Deniliquin, Holbrook, Tumbarumba, Wentworth
D12	Far West	160	Broken Hill	Tibooburra, Wilcannia
D13	Melbourne	205	Melbourne	Altona, Dandenong, Lilydale, Mornington Peninsula, Sunbury
D14	Barwon	210	Geelong	Apollo Bay, Colac, Lorne, Queenscliffe
D15	Western District	215	Warrnambool	Camperdown, Hamilton, Portland
D16	Central Highlands	220	Ballarat	Ararat, Bacchus Marsh, Daylesford
D17	Wimmera	225	Horsham	Dimboola, St Arnaud, Stawell
D18	Mallee	230	Swan Hill	Kerang, Mildura, Ouyen
D19	Loddon	235	Bendigo	Castlemaine, Maryborough
D20	Goulburn	240	Shepparton	Benalla, Echuca, Kyabram, Rochester
D21	Ovens-Murray	245	Wodonga	Beechworth, Bright, Mount Beauty, Rutherglen, Wangaratta
D22	East Gippsland	250	Sale	Bairnsdale, Omeo, Orbost
D23	Gippsland	255	Traralgon	Moe, Morwell, Wonthaggi
D24	Brisbane	305	Brisbane	Beenleigh, Logan, Mount Gravatt, Redcliffe
D25	Moreton	310	Coolangatta	Burleigh Heads, Caloundra, Ipswich, Noosa, Surfers Paradise
D26	Wide Bay-Burnett	315	Maryborough	Bundaberg, Gympie, Hervey Bay, Mundubbera
D27	Darling Downs	320	Toowoomba	Dalby, Goondiwindi, Stanthorpe, Warwick
D28	South West	325	Charleville	Quilpie, Roma, St George
D29	Fitzroy	330	Rockhampton	Emerald, Gladstone
D30	Central West	335	Longreach	Barcaldine, Blackall, Winton
D31	Mackay	340	Mackay	Clermont, Proserpine
D32	Northern	345	Townsville	Ayr, Bowen, Charters Towers, Ingham
D33	Far North	350	Cairns	Atherton, Cooktown, Innisfail, Mareeba, Mosman, Weipa
D34	North West	355	Mount Isa	Cloncurry, Hughenden, Normanton
D35	Adelaide	405	Adelaide	Glenelg, Henley, Hindmarsh, Marion, Salisbury
D36	Outer Adelaide	410	Mount Barker	Barossa Valley, Kangaroo Island, Onkaparinga
D37	Yorke and Lower North	415	Yorketown	Bute, Riverton, Wallaroo
D38	Murray Lands	420	Renmark	Murray Bridge, Pinnaroo
D39	South East	425	Mount Gambier	Bordertown, Kingston, Naracoorte
D40	Eyre	430	Port Lincoln	Ceduna
D41	Northern	435	Whyalla	Cooper Peedy, Port Augusta, Port Pirie, Woomera
D42	Perth	505	Perth	Armadale, Fremantle, Joondalup, Stirling, Wanneroo
D43	Peel	510(p)	Rockingham	Kwinana, Mandurah
D44	South West	510(p)	Bunbury	Busselton, Collie, Manjimup, Margaret River, Pemberton
D45	Great Southern	515	Albany	Denmark, Katanning
D46	Wheatbelt	520, 525	Northam	Merridin, Moora, Narrogin
D47	Goldfields-Esperance	530	Kalgoorlie	Boulder, Coolgardie, Esperance
D48	Mid West	535(p)	Geraldton	Meekatharra, Mount Magnet
D49	Gascoyne	535(p)	Carnarvon	Exmouth
D50	Pilbara	540	Port Hedland	Karratha, Newman, Tom Price
D51	Kimberley	545	Broome	Derby, Kununurra, Wyndham
D52	Greater Hobart	605	Hobart	Clarence, Glenorchy, Sorell
D53	Southern	610	Geeveston	Bicheno, Huonville, Triabunna
D54	Northern	615	Launceston	Deloraine, Georgetown, St Helens
D55	Mersey-Lyell	620	Burnie	Devonport, Queenstown, Smithton, Ulverstone, Zeehan
	Northern Territory	7	Darwin	Alice Springs, Katherine, Nhulunbuy, Tennant Creek
	Australian Capital Territory	8	Canberra	

a The MRES statistical division Goldfields-Esperance is referred to as South Eastern in the ASGC.

Sources: Adams and Dixon (1995); ABS (*Australian Standard Geographic Classification (ASGC)*, Cat. no. 1216.0).

Table A.3 Classification of MONASH-RR model commodities into national, state and regional

No.	Activity	Status	No.	Activity	Status
C1	Wool	National	C60	Clay products; refractories	National
C2	Sheep	National	C61	Cement	National
C3	Wheat	National	C62	Readymix concrete	Regional
C4	Barley	National	C63	Concrete products	National
C5	Other grains	National	C64	Non-metallic mineral products	National
C6	Meat cattle	National	C65	Basic iron and steel	National
C7	Milk cattle and pigs	National	C66	Other basic metals	National
C8	Other agriculture (incl. Vegetables, cotton)	National	C67	Structural metal products	National
C9	Other agriculture (incl. sugar, fruit, nuts)	National	C68	Sheet metal products	National
C10	Poultry	National	C69	Other metal products	National
C11	Agricultural services	State	C70	Motor vehicles and parts	National
C12	Forestry and forest products	National	C71	Ships and boats	National
C13	Fishing and fish products	National	C72	Railway rolling stock	National
C14	Iron ore	National	C73	Aircraft	National
C15	Non-ferrous metal ores	National	C74	Scientific equipment	National
C16	Black coal	National	C75	Electronic equipment	National
C17	Oil and gas, and brown coal	National	C76	Household appliances	National
C18	Other mining	National	C77	Other electrical equipment	National
C19	Services to mining	National	C78	Agricultural machinery	National
C20	Meat	National	C79	Construction machinery	National
C21	Milk products	National	C80	Other machinery and equipment	National
C22	Fruit and vegetable products	National	C81	Leather and leather products	National
C23	Margarine, oil and fats	National	C82	Rubber products	National
C24	Flour and cereal products	National	C83	Plastic and related products	National
C25	Bread, cakes and biscuits	State	C84	Signs and advertising displays	National
C26	Confectionary and cocoa products	National	C85	Other manufacturing	National
C27	Other food products	National	C86	Electricity	Regional
C28	Soft drinks and cordials	State	C87	Gas	National
C29	Beer and malt products	State	C88	Water, sewage and drainage	Regional
C30	Other alcoholic beverages	National	C89	Resident building	Regional
C31	Tobacco products	National	C90	Other building and construction	Regional
C32	Cotton ginning, wool scouring etc.	National	C91	Wholesale trade	State
C33	Man-made fibres and yarns	National	C92	Retail trade	Regional
C34	Cotton yarns and fabrics	National	C93	Mechanical repairs	Regional
C35	Worsted and woollen yarns	National	C94	Other repairs	Regional
C36	Textile finishing	National	C95	Road transport	National
C37	Textile floor coverings	National	C96	Rail and other transport	National
C38	Other textile products	National	C97	Water transport	National
C39	Knitting mill products	National	C98	Air transport	National
C40	Clothing	National	C99	Services to transport	National

(Continued on next page)

Table A.3   continued

No.	Activity	Status	No.	Activity	Status
C41	Footwear	National	C100	Communication	Regional
C42	Sawmill products	National	C101	Banking	Regional
C43	Veneers and boards	National	C102	Non-bank finance	Regional
C44	Joinery and wood products	National	C103	Investment and services	Regional
C45	Furniture and mattresses	National	C104	Insurance and services	National
C46	Pulp, paper and paper board products	National	C105	Other business services	Regional
C47	Bags, fibreboard boxes	National	C106	Ownership of dwellings	Regional
C48	Paper products nec	National	C107	Public administration	National
C49	Newspapers, books	National	C108	Defence	National
C50	Commercial printing	National	C109	Health	Regional
C51	Chemical fertilisers	National	C110	Education	Regional
C52	Other basic chemical products	National	C111	Welfare and religious services	Regional
C53	Paints and varnishes	National	C112	Entertainment and leisure	Regional
C54	Pharmaceutical goods	National	C113	Restaurants, hotels and clubs	State
C55	Soaps and detergents	National	C114	Personal services	Regional
C56	Cosmetics and toiletries	National	C115	Non-competing imports	National
C57	Other chemical goods	National			
C58	Petroleum and coal products	National			
C59	Glass and glass products	National			

Source: MONASH-RR data base.

Given the distinction between national and local industries, the standard way national results in MONASH are mapped to the States involves a two step procedure. First, the economy-wide estimates for national industries are allocated to the regions on the basis of regional employment shares. For example, if employment in a national industry increases by 10 per cent at the economy-wide level, then it is assumed that in each State employment in that industry also increases by 10 per cent. Second, estimates for the local industries are obtained by computing the induced effects on the State economies implied by the estimates for the national industries. For example, if a national industry located in Victoria is estimated to expand by 10 per cent, it will directly stimulate the local industries which supply inputs to the national industry. In this example, local industries will also be stimulated indirectly via input-output linkages (that is, the local industries that supply inputs to the national industries will stimulate the demand for inputs from other local industries) and via local income effects (that is, the increase in activity in the State will stimulate regional consumption). Results at the State level are further subdivided into MONASH statistical divisions based on the activity mix of each statistical division. To ensure internal consistency of model results, final projections are determined after a balancing of regional and national projections.

The key determinant of regional results generated using this standard method is the structure of regional output and employment by industry.

In the course of the inquiry, two suggestions were made for the revised modelling of regional impacts using the tops down approach. First, it was suggested that it may be more appropriate to treat electricity as a State rather than a regional activity. The electricity industry, as defined in the ABS input-output tables and the MONASH model, comprises electricity generation and distribution activities. In employment terms, more than half of the industry's activity is associated with the distribution component — a component that is likely to be heavily influenced by regional considerations. Because differences in regional activity levels are modelled explicitly in MONASH-RR, it was possible to test whether the different treatments affected regional results. The sensitivity tests showed that the alternative treatments produce no difference in results at national and State levels and only negligible differences at the regional level. On balance, the regional treatment adopted in the draft report has been retained.

Second, the model authors suggested that projected employment changes by industry be disaggregated to the regional level using output estimates rather than employment estimates. This treatment was investigated and found not to affect the broad conclusions from the model analysis. In addition, the revised employment estimates for the selected broad economic forces were compared with the draft report projections and actual changes to see whether the revised treatment provided improvements in accuracy. It was found that the average accuracy of the estimates declined with the implementation of the revised treatment. On balance, the draft report treatment has been retained.

B   Referees' comments

This appendix summarises external referees' comments on the Commission's modelling of the regional impacts of NCP reforms. Copies of the referees' written reports are available from the Commission on request.

The referees were each chosen for their experience in modelling regional impacts and/or NCP reforms. They were:

- Dr John Madden, Director of the Centre for Regional Policy Analysis at the University of Tasmania;

- Professor Ken Clements, head of the Economic Research Centre at the University of Western Australia; and

- Dr John Fallon and Craig Sugden, from Economic Insights Pty Ltd, a Brisbane consulting firm.

Each was asked to participate in a workshop on the modelling and to provide a written report. The workshop was held on Canberra on 10 March 1999, attended by the referees and interested inquiry participants. At the workshop, a work-in-progress version of the analysis in this report was presented, and the referees gave their comments, some of which have been incorporated in the current report.

Dr John Madden

Dr Madden broke the Commission's modelling down into six tasks, and commented on whether the tasks were sufficient to meet the objectives of the study, and on how well the Commission had carried them out.

The first task was to examine each of the main NCP reforms likely to have large effects on rural and regional Australia, identifying their direct effects on industry variables, particularly productivity. Dr Madden thought the choice of reforms looked appropriate. He thought it reasonable that the Commission had not attempted to split those reforms that have occurred to date from those yet to be implemented. He noted that there was a question of whether there might be some remaining distortions or other factors (such as geographic or demographic features) that might prevent NCP reforms from fully closing the identified productivity gaps.

Dr Madden thought that, given the large size of the project covered by the report, it was quite understandable that the Commission had stuck quite closely to the set of NCP shocks that were analysed previously by the IC (1995a) in its modelling of NCP. However, he gave some suggestions for strengthening the answers to some criticisms that were made of that report. His suggestions have been adopted in this supplement. He concluded:

> However, it is worth noting that the estimates presented by the IC/PC still represent the most comprehensive treatment of the direct effects of NCP. It should be borne in mind that, while an effort to improve the NCP direct-effects estimates would significantly improve the PC report, it remains to be seen whether such an improvement would make any real difference to its bottom line ... while overestimates of productivity improvements might overstate the gains from NCP, they are less likely to underestimate the regional employment dislocation.

The second task was to simulate the impact of these direct NCP effects via a version of the CGE model, MONASH, to obtain a set of national results. Here Dr Madden requested more detail about the model closure in the main report, something which has been provided in this supplement. He preferred the fixed aggregate employment assumption to that of IC (1995a), where there had been a positive response of participation, and that of Quiggin (1997), where there was essentially a negative participation response.

He noted a difference in closure between the simulation of national economic forces and the simulation of the NCP reforms. In this supplement, the treatment has been standardised, though as Dr Madden noted in his comments, this is not a matter of large consequence.

The third task was to decompose the national results to the State and regional level, using a 'tops down' regional extension. The major question is the use of a 'tops down' model. Dr Madden noted that 'to a large extent, the Commission, may have had little choice'. He suggested using a 'bottoms up/tops down' hybrid extension of FEDERAL to check the Commission's results for the Pilbara. However, since then the Commission's modelling of the Pilbara has been refined by more carefully targeting the commodities subject to NCP reform.

He noted that the benefits from 'bottoms up' modelling may not be large except where the direct effects of reforms differ substantially across regions. Finally, Dr Madden noted that the 'tops down' approach can be improved in some instances by 'shocking' the regional share parameters driving the regional disaggregation. He suggested that this may be appropriate to deal with any interstate shifts in telecommunications employment. However, the evidence in the draft report is that telecommunications employment declines have been relatively even.

The fourth task was to identify six non-NCP economic forces that have affected the economy substantially over the decade to the mid-1990s. Dr Madden noted that, given the use of the MONASH model, it was a pity that forecasts for the period involving the introduction of key NCP reforms could not have been used to generate the baseline comparison. He noted, however, that 'this would have greatly expanded an already formidable task'. As noted in chapter 1, MONASH has not yet been used in a *regional* validation exercise, a task beyond the time and resources of the current exercise. Dr Madden noted that the direct effects of national economic forces were well described and analysed.

The fifth task was to model these six national economic forces and to compare the regional employment results with actual average annual changes in regional employment. Dr Madden thought the selection of factors was reasonable. He questioned how the shocks were calculated to achieve the right productivity results. This appears to refer to the ex ante/ex post distinction discussed in chapter 2. However, in the modelling of national economic forces, the productivity changes are applied equally to all primary factors, so that the 'effective' relative price changes that drive the ex ante/ex post distinction do not arise.

The sixth task was to compare the regional effects of NCP reforms and national economic forces. Dr Madden described the comparison as good, and made some structural suggestions to improve readability.

Overall, Dr Madden concluded by noting that the Commission's modelling represented the first time a comprehensive analysis of NCP reforms had been undertaken at the regional level. The report evidenced a very professional study which clearly put the regional impact of NCP reforms in the context of overall regional economic forces. He noted that, with more resources, many improvements could be made, but such improvements may turn out to have an impact on detail rather than on major conclusions. To cover adjustment problems properly, a much bigger exercise would be necessary (as noted in chapter 1).

Professor Ken Clements

Professor Clements found the study very interesting and well executed, and thought it would become an influential piece of research.

He thought the analysis would benefit from some discussion of why regions are important, and what the sources of regional adjustment problems were. Some of this now appears in this supplement. He also thought the paper would benefit from some historical material on the long-term movement of people from rural areas to the cities. This material appears in the draft report.

Professor Clements had several comments on the modelling framework. He asked for some sensitivity analysis around the issue of holding aggregate employment fixed. This appears in the supplement.

He queried why the regional output results were so different from the employment results, when both were projected down from the national level using employment patterns from the Census. The answer is that the differences reflect changes in productivity, many of which are industry-specific. This supplement contains a more detailed description of how the *regional* output and employment projections for NCP reforms follow from the *industry* output and employment projections.

He noted the importance of new industries to some regions, and asked how they were dealt with in the modelling framework. As noted in chapter 1, new industries are not dealt with, except insofar as they have been the cause of some of the expansions in mining investment modelled as one of the national economic forces.

Finally, he wondered whether NCP reforms and national economic forces were comparable, given that the former were the result of policy decisions and the latter were not. However, in an environment in which people have been experiencing national economic forces and perhaps attributing some of the effects to NCP reforms, it is useful to compare the directions and magnitudes of the effects. As Professor Clements noted, however, observing that the effects of NCP reforms are small relative to national economic forces does not constitute evidence that the move is not worthwhile.

Professor Clements asked whether Western Australia was different. Although the modelling showed that some significant NCP reforms would benefit energy-intensive mining and minerals processing activities and hence Western Australia, there are features of the Western Australian economy that may make it not well suited to a 'tops down' treatment. As noted in Chapter 2, it will not be connected to the electricity grid. However, two other points mentioned by Professor Clements — the use of contract mining, and the use of Perth-based financial engineering services in the mining sector — would both be handled appropriately within the input-output framework. Such firms would be treated as selling services to the mining sector, and would expand as the mining sector expanded.

Professor Clements made some presentational and expositional suggestions, which have been addressed in this supplement.

Dr John Fallon and Craig Sugden

Craig Sugden made the presentation at the workshop. He made comments on the calculation of the shocks, the sensitivity of the model results, distributional effects and adjustment costs.

He noted that the Commission's modelling of NCP reforms was based largely on IC (1995a) and more recent benchmarking studies. Such studies can be good indicators of the potential impact of reform, but clearly have their limitations. For example, he noted that many competition reforms deal with markets with a relatively high potential for the abuse of market power, which might prevent the benefits of reform from flowing through to consumers. Nevertheless, the aim of NCP reforms is to promote competition.

He also noted that the Commission's long-term estimates of potential benefits could be 'reality-tested' by comparing them with information about the gains to date. The draft report contains such information about actual reforms. More often than not, the comparison suggests that the estimates of the long-term potential benefits are conservative.

He questioned the attribution of all electricity reforms since 1991 as being NCP reforms. Yet as noted in the draft report, this is generally accepted as the scope of the CoAG-related electricity reform that was written into the Implementation Agreement.

Mr Sugden also noted that competition policy can create substantial administration and negotiating costs, although these have not been modelled.

He noted that the estimated static gains do not factor in some of the dynamic gains from competition.

He queried the assumed saving in construction costs in the electricity industry, noting that, although such stations were cheaper to build, they were more expensive to operate because of the higher price of gas. However, as noted in chapter 2, the assumed switch to gas was based on detailed, State-specific MENSA modelling. This recognised that while there might be little incentive to switch to gas in Queensland or in South Australia, where it did not constitute a cheap fuel alternative, there would be considerable scope in Victoria. The details are given in IC (1995a).

He had some specific comments on the modelling of dairy SMA reforms. However, in light of more general discussion at the workshop, the entire treatment of dairy reform has been revised in this supplement. In addition, he noted that the gains from

dairy reform are likely to be very region-specific, and not well captured in a 'tops down' approach. This continues to be the case.

On sensitivity analysis, he noted that the results of regional modelling can vary greatly, depending on what is assumed about regional factor mobility. This is well demonstrated in the Commission's own modelling of the effects of various regional defence projects in IC (1994). However, such sensitivity analysis requires a 'bottoms up' model. The 'tops down' approach used here simply assumes that workers are geographically mobile. To the extent that this is not so, both the benefits of NCP reforms, and the extent of employment dislocation, would be significantly smaller than modelled here.

As far as distributional effects are concerned, he argued for a fuller treatment of income effects as well as employment effects. This has been provided in this supplement.

He noted that the Commission's long-run snapshot picture of the effects of NCP reforms did not give an explicit picture about adjustment costs. However, as noted in chapter 1, the projected changes in employment give some idea of the potential dislocation, especially when compared with actual trends in employment over the past decade. The requirements for a proper treatment of adjustment costs were outlined in chapter 1.

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