National Economics

AUSTRALIAN LOCAL GOVERNMENT ASSOCIATION

# State of the Regions 2011-12

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# STATE OF THE REGIONS
# 2011-12

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# An overview: The mechanisms of current Australian regional development

The latest Australian regional statistics show that, since the middle of the last decade, Australia's 67 regions are no longer converging towards more equality as measured by differences in income, labour utilisation rates etc. Inequality between regions has been growing for the past five years. All the evidence points to the likelihood that this trend will not only continue; it may well accelerate over the next five years and beyond.

For some regions, namely the resource regions and their metropolitan support base such as the Perth regions, the current trends point to a medium-term outlook of sustained expansion in terms of employment, income and population growth. For these regions, production will grow as mining output increase due to the increases in mine capacity put in place over the past five years. This growth will approach double digit levels. Moreover, mining output growth will be sustained by resource investment levels over the next five years. It is expected that growth in mine capacity over the next five years will at least match that over the last five. Although the rate of investment in minerals may decline significantly by 2015 this is likely to be offset by energy investment.

For most other regions the outlook is less optimistic. The popular literature is already referring to the 'two speed' economy while those who remember the history of the North Sea oil boom are referring to the 'Dutch Disease'. Either way, there is already abundant evidence in the latest statistics that the mining boom is having negative effects in much of Australia. These trends are likely to intensify over the next five years at the very least.

As this report makes clear, most, if not all, Australian regions will initially benefit from high levels of mining construction investment and the mining output expansion that flows from the investment. However, as this report also makes clear, the majority of Australian regions are likely within the next five years to reach the point where the positive benefits of the current mining boom are offset by the costs of the mining expansion summed up by the so-called 'crowding out' effect. This effect incorporates the full range of negative influences of the mining construction boom on the general economy, including:

(i) high exchange rates increasing import penetration and reducing non-mining exports;

(ii) high interest rates reducing non-resource investment;

(iii) skill shortages reducing non-resource production; and

(iv) general negative expectations that Australia is not the place to be for non-resource activity.

Perhaps the best indirect indicator of (iv) is the profile of high tech start-ups in Australia.


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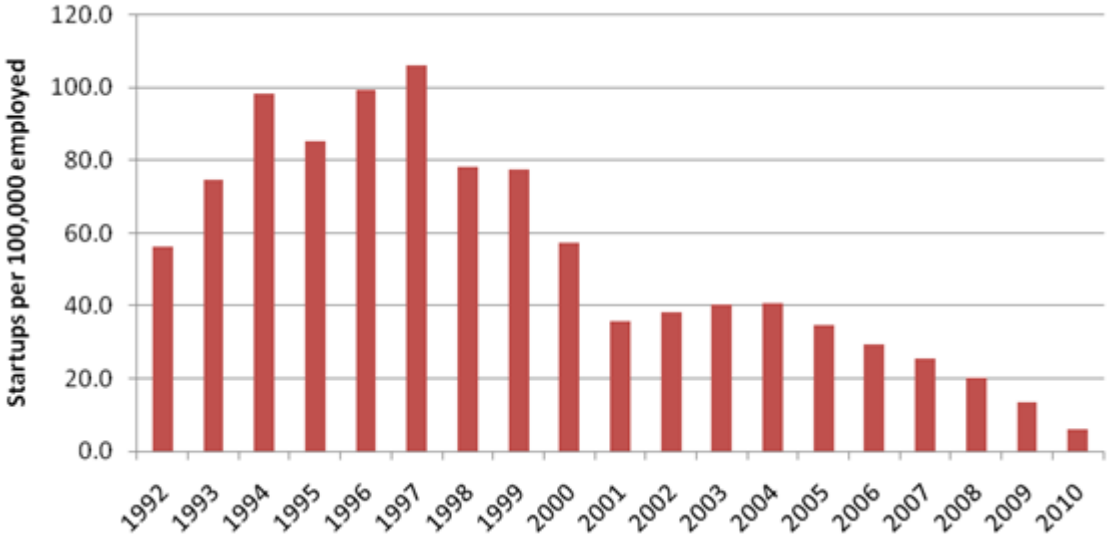
## High tech start-ups




*Source:* Dunn and Bradstreet data base.

How much crowding out will there be?

The forthcoming NIEIR Report for the Australian Steel Institute on the impact of the mining boom, which is complementary to this year's SOR report, concludes that to date Australia's handling of the mining expansion has been significantly less than best practice. Basically, to date Australia has imported much of the labour to support the construction phase of the boom. This is fine so long as the construction phase lasts, but once investment subsides and Australia settles down to benefit from the increased flow of mine output, the overall increase in net national product (that is, excluding depreciation and payments to foreigners) is only just sufficient to maintain overall net product per capita. This is because the crowding out effects are likely to offset between 50 and 100 per cent of the positive benefits of increased mine output. The crowding out or offsets arise due to the negative impacts of mining construction on the rest of the economy. The most serious of these impacts involve reductions in investment in the rest of the economy which permanently reduce the capacity of the non-mining trade-exposed industries.

Using these guidelines, this Report estimates that, excluding the construction effect, after five years resident employment will be adversely affected in 52 of the 67 regions under the full crowding out case, while under the half crowding out case the number is still 43. If the construction effect is included the time to reaching a net negative outcome is delayed but the number of regions that will eventually experience a net negative outcome is not affected. In terms of resident employment, the majority of regions would have been better off if the mining boom since 2006 had not occurred, though it should be noted that this assessment excludes the benefits that may accrue from the expenditure of net additional taxation collected as a result of the expansion.

The mining expansion will aggravate existing problems of income inequality and housing shortages between Australian regions. In relation to housing shortages the core reason for Australia's current housing shortage predicament is the failure of most capital city construction zones (or clusters of LGAs which have vacant land for residential development) to meet Australia's housing needs. As this SOR report and the previous SOR report makes clear, the reasons for this is the failure of the areas accessible from homes in the construction zones to supply the quantity of hours of work and value in terms of $/hour to allow potential home-buyers to earn enough to cover the mortgage payments on new dwelling construction. The current mining boom, by reducing the hours of work and $/hour available in outer metropolitan areas (due to crowding out) will aggravate the current

housing shortage. The mechanisms of crowding out will range from the contraction of manufacturing due to increased import penetration to the failure of high tech enterprises to "start up" and expand.

As this report and the forthcoming NIEIR Report for the ASI make clear, the outcomes of the mining expansion predicted in this report are not inevitable. The general view is that resource crowding out is an unavoidable consequence of pressure on labour resources in a "full employment" environment. This is based on the headline unemployment rate which is currently around 5 per cent and has converged across Australian regions over the last decade.

However, as this and past SOR reports have made clear, the headline unemployment rate is useless for economic evaluation and policy formulation. It bears little resemblance to other indicators of the regional pattern of labour utilisation and under-utilisation, including:

(i) hours of work available per capita of working age population;

(ii) working age social security beneficiaries; and

(iii) not in employment (full time equivalent) working age ratio.

Over the past few years the inequality between Australian regions in these measures has either stayed constant or increased. There is no evidence of convergence as shown by the headline unemployment rate.

The use of the headline unemployment rate for policy evaluation is creating a vicious cycle which threatens to unnecessarily aggravate the negative impact of the current mining boom. As this report makes clear, the evidence of measures other than the headline unemployment rate agrees that many regions which will be negatively impacted on by the mining boom have high rates of unutilised labour. In these regions the tendency will be to place those who lose their employment because of the resource crowding out effect on non-unemployment working age social security (because there are simply no jobs), where they will join with others who have already been classified as outside the labour force. In this case the headline unemployment rate would decline although the not-in-employment working-age ratio will increase. The fall in the headline unemployment rate is then used to justify further increases in interest rates, cuts in government expenditure and increases in migration, which will exacerbate the negative impacts of the mining expansion.

As the NIEIR report for the ASI makes clear, other countries have been far more successful in governing mining expansion. The stand out case is Norway, which experienced (in relation to its size) a much more intensive boom than the boom which Australia is currently experiencing but still managed to produce outcomes (with no reliance on migration) that have larger manufacturing output and higher total gross product per person of working age than Australia as well as a higher employment rate. Further the average Norwegian family of four is indirectly richer by US$600,000 compared to the comparable Australian household, because the Norwegian Sovereign Wealth Fund has considerable assets while the Australian financial sector is heavily in net international debt.

The key to the Norwegian success was to think ahead and to plan and implement resource-management strategies which maximised the benefit of the mining expansion to Norwegians. This included planning to ensure that local non-resource industries benefited from appropriate demand, technology and workforce skills.

The negative consequences of the mining expansion are also contributing to another Australian economic problem, namely low productivity growth. The destruction by the mining expansion of existing manufacturing and high value added services industries is reducing the supply of high wage ($/hour) employment which will reduce national productivity.

This report notes that there will be sufficient installed commercial sector capacity to employ the expected increase in the working age population over the next two to three years. Even better, investments in commercial sector capacity have been fairly evenly distributed across the Australian regions. The threat is that crowding out effects will result in failure to fully utilise this capacity, thus reducing capacity utilisation ratios which in turn will reduce productivity growth. The most important driver of productivity growth where excess capacity exists is simply the growth in demand.

In addition the destruction of employment in Australia's established South East regions, where adequate community and transport infrastructure is already in place, along with the reprovision of the same infrastructure in the expanding regions, will also directly reduce Australia's productivity.

In this context the recent Grattan Institute study "*Investing in Regions: Making a Difference*" can be noted. Though it raises important questions, the study is based on two propositions: that "government spending cannot make economic water flow uphill" in terms of the impact of regional development programs and that what governments need to do is to base government infrastructure fund allocation on the basis of the growth in new residents so that "bolter" regions can be better supported.

This deserves the following response. The Norwegian example and the European and North Asian experience clearly suggest that governments can make "water flow uphill" when it comes to regional development. Indeed China is making water fly uphill. The fact of the matter is that Australia in recent decades has rarely committed the sufficient, sustained quantum of resources to regional development that would be necessary to make a difference. Further it has rarely adopted a whole government/all government approach to maximise efficiency. In other words, most regional development strategies in Australia are designed from the start to fall far short of maximum success. These outcomes are then used by critics to argue that such programs will always be unsuccessful.

Further, the Grattan report does not examine the impact on productivity of reducing the utilisation rates of infrastructure in non-bolter regions.

Finally, the suggestion of basing infrastructure allocation criteria on new residents disregards the moral claims of the residents of regions badly affected by the policies of the past three decades. Many new residents over the past five years have been migrants that have been imported to support the mining boom. What the Grattan Institute report could possibly be interpreted as suggesting is that these residents have first claim on resources while those "indigenous" residents who are trapped in 'stagnating' regions should be judged surplus to requirements. Nothing should be done to address the causes of their entrapment, either by generating employment in their home regions or by easing their migration to expanding regions. Being part of a nation these residents can expect at the very least a governance quality which accepts responsibility to ensure national resources in general and mining resources in particular are used to guarantee equality of opportunity for all Australians.

Further, a number of arguments presented by the Grattan Insttitue can be readily refutted. For example the argument that special regional unemployment assistance in response to major plant closures is ineffective is based on the thoroughly defective headline unemployment rate statistical series. The analysis of the benefits of infrastructure expenditures is unconvincing if only because it depends on short time periods. It also fails to make the fundamental distinction (pointed out in the *State of the Regions* report 2004-05) between standard infrastructure arrays (programs like Roads to Recovery which maintain existing assets but do not give a competitive edge) and strategic infrastructure investments.

The problem for local government in Australia is that attitudes towards regional economic development issues reflect Australia's economic thought and policy that coincides with the interests of nationally focussed organisations. This will only change when a whole of government/all government approach is developed where local government has an important seat at the table, channels in grass root perspectives and counters the limited 50$^{th}$ floor vision of finance.

# Executive summary

In the 1950s it was said that economic policy in the USA could be summarised as 'What's good for General Motors is good for America'. The world's richest country concentrated its energies on automobile production and road-building and in the process generated full employment and an egalitarian distribution of income – and a host of environmental and social problems for future generations to solve.

It is now blindingly obvious that the USA has a new policy mantra: 'What's good for finance is good for America'. How else does one explain the handouts to the banks during the Global Financial Crisis coupled with the way in which they have been allowed to get back to their version of business as usual, unreformed? How else does one explain the rapid return of high salaries and bonuses for their privileged executives while unemployment remains high in the real economy of factories and farms?

It remains that the Global Financial Crisis was an event which should have shattered Americans' confidence in their favourite economic theories. The crisis combined severe underlying imbalances (taxation too low, government borrowing too large, overseas borrowing too large) with finance sector misbehaviour. Sadly, ingrained habits of thought mean that the fundamental problems of the American economy have not been addressed. The desperately-needed tax increases remain unthinkable. Further, the financial sector's contribution to the crisis is increasingly overlooked, hence the anxiety to get the sector back to business as usual. For the persistence of useless economic ideas, the reader may consult John Quiggin's *Zombie Economics.*

As loyal disciples of the American way of thought, Australia's economic policy makers have likewise been anxious to continue business as usual. Past *State of the Regions* reports have pointed with concern to the accumulation of household debt to the financial sector, the accumulation of finance sector debt to overseas lenders and the failure of the finance sector to direct the flow of funds generated by compulsory superannuation contributions into investment in productive Australian assets. To its credit, however, the Australian government did not follow Mr Reagan into the depth of his tax cuts and (less creditably) balanced its budget by cutting public investment. Again, thanks to tighter regulation, the Australian finance sector did not leverage bad assets to the American extent. This is not to claim that Australia's fundamentals were any sounder than the US; just that Australia did not suffer the more outrageous excesses of American finance.

Though the accumulation of household and finance-sector debt had made Australia vulnerable to contagion from international financial crises, the Commonwealth made good use of its balance sheet to stimulate Australia's way through the crisis. The banks were assisted by a deposit guarantee but did not have to be bailed out like those in other parts of the English-speaking world. Not surprisingly, the way in which Australia survived the crisis buoyed confidence, particularly in the finance sector including the Reserve Bank and the Commonwealth Treasury. As in the US, there has been little inclination to question the fundamentals, particularly the reliance on increasing debt to maintain spending and hence to generate jobs.

When the US fell into financial crisis, Australia had already received warnings of impending financial trouble in the form of high household debt, concentrated particularly in the outer suburbs of Sydney. As pointed out in the *State of the Regions* report 2010-11, these problems were partly due to the inability of the residents of the outer suburbs of Sydney to earn enough to pay the costs of housing. This generated two questions:

- Why are housing costs in Western Sydney so high?
- Why are incomes in Western Sydney so low?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High house prices in Western Sydney are traceable to high land costs, related to limited land supplies and traceable eventually to Sydney being hedged in by areas of scenic beauty. The contrast here is Melbourne (with abundant non-scenic land to the north and west), Adelaide (with plenty of non-scenic land to the north) and Perth (with abundant supplies of developable sand-dunes) – not to speak of the ACT, where the foresight of the federation generation left the national capital with a supply of public land available for housing development. To date this supply has contained ACT housing costs and greatly benefited ACT household balance sheets, although as supply tightens problems are emerging.

Household incomes in Western Sydney are low relative to house prices and also relative to incomes in the high-status parts of Sydney but are not low relative to incomes in rural regions. The difference is that low country-town incomes are matched by low house prices. The basic reason for relatively low incomes in Western Sydney is poor accessibility to highly paid jobs. There are two reasons for this: lack of investment in fast transit to the city centre where the jobs are concentrated and (more fundamentally) lack of job generation in the Western suburbs commensurate with the growth of population in these suburbs. The reasons for this imbalance include the following.

- The rise of the knowledge economy, which concentrates in city centres and inner suburbs.
- The rise of the finance sector and related services (such as commercial lawyers) which again concentrate in city centres.
- The decline of manufacturing, which could once be relied on to generate jobs in new outer suburbs.

Faced with over-indebtedness in Western Sydney, the banks pursued business as usual by redirecting their mortgage sales efforts to regions where households were less indebted and house prices were more reasonable – notably Melbourne, SEQ and Perth. The result in Melbourne and SEQ is that the household debt burden is approaching Sydney levels. As households reach debt saturation in region after region the inevitable result will be the subsidence of the long land boom.

If business is to go on as usual, what is to replace the long land boom? The obvious answer is the mining boom.

Given that the American way of thought is so deeply ingrained in Australia, there is a certain irony that the current mining boom is a result of China's independent approach to economic policy. Following the lead of Japan the Chinese government has harnessed both the public and finance sectors to the task of industry development – with the government dominant and staking its non-democratic legitimacy on speedy economic development. Apart from external threats, nothing concentrates the mind of government more urgently than riots of domestic discontent. The knee-jerk reaction is to send in the troops but to its credit the Chinese government is aware of the underlying causes of discontent and in its twelfth five year plan is concentrating on the following:

- re-orienting from an economy based on production of low-wage manufactured exports into an economy serving its own very large population, to increase the standard of living;
- improving housing for said very large population. China has a housing affordability crisis far worse than Australia and increased supply of affordable housing with good job accessibility is the only answer – hence a surge of investment in mass transit as well as in housing; and
- reducing greenhouse gas emissions, not primarily for the global good but to reduce dependence on imported fuels. (This aspect of China's policies is discussed in Chapter 4 of this report.)

A side effect of this program is continued demand for steel, hence for iron ore and metallurgical coal as inputs to the manufacture of steel. There are, again, demands for coal and limestone as inputs to the manufacture of cement and for coal as an input to electricity generation.

The global mining companies were unprepared for the surge in China's demands for iron ore and coal, just as they were unprepared for the surge in global demand for natural gas as a substitute for the diminishing availability of oil – hence the prices of these commodities remained high despite the slump in consumer demand in North America and Europe. The relatively high prices for iron ore, natural gas and coal have generated a mining boom in Australia.

It is far from certain how long the boom will last. Supplies of natural gas have been greatly extended by the extraction of methane from shale and from coal seams. China is working hard to diversify its supplies of iron ore and to limit its demand for coal. However, for the past several years and extending for up to five or six more, Australia has benefited from a mining boom.

To those who think the American way, the mining boom is a godsend. The prospect of booming mineral exports has raised Australia's credit rating and allowed the finance sector to continue with business as usual, at least as regards overseas borrowing. The continued ability of the banks to finance the balance of payments deficit has allowed the Commonwealth to maintain domestic demand and to encourage immigration – ostensibly to meet skill shortages but also to supplement Australia's over-indebted households with new households capable of taking on more debt. Without such households the strategy of maintaining employment through continuing increases in consumer debt would quickly fizzle out.

The mining boom has so far excused Australian policy-makers from any need to reconsider their commitment to the conventional economics. It seems that business as usual can continue. However, as soon as one looks beneath the aggregate figures the mining boom is compromised.

- The strategy of high immigration as a way to underpin household borrowing, which then facilitates bank borrowing overseas to finance the balance of payments deficit, can easily come unstuck – most obviously when the optimism on which it is built is punctured by the reversion of minerals prices to normal levels, based on the cost of supply.
- The boom has been highly selective regionally, and shows no sign of spilling over into non-mining, non-finance regions. Over the past five years the boom has been confined to Western Australia, the two coal-mining regions of Queensland, the coal-mining shires of the Upper Hunter, the finance-dominated regions of Sydney and (perhaps surprisingly) the ACT. The boom has been conspicuously absent in Victoria, Tasmania, South Australia, much of NSW including the outer suburbs of Sydney and much of Queensland including many of the suburbs of Brisbane and some of the non-metropolitan regions such as Qld Far North Torres.
- In previous booms, productivity (output per hour worked) has increased, largely because of high levels of utilisation of the capital stock – boom-time demands cause business to squeeze maximum production out of existing facilities. This effect is absent from the current boom. In much the same way as the boom is confined to the mining regions and those regions which provide them with construction and financial services, the boom has failed to generalise from mining, construction and finance to other Australian industries.
- Worse than this and the major reason why it has failed to generalise regionally, the boom and the financial confidence which it has inspired has raised the exchange rate of the Australian dollar. The increase has been especially strong against the currency of Australia's major competitor in the supply of rural and manufactured goods, the USA. So completely has the Australian policy establishment identified with the American way of thought that they are unable to think of the USA as a competitor which, by its low currency, is destroying the competitiveness of Australian non-mining exporting and import competing industries (in a word, the trade-exposed industries). The industries adversely affected include agriculture, tourism, education and manufacturing. It is significant that these include a high proportion of knowledge-based industries.

- According to the American way of thought, episodes of bracing competition compel trade-exposed industries to increase their productivity and so regain competitiveness; therefore their fate should be left to the finance sector, considered the best judge of future profitability. In Australia the practical experience is that increased productivity is generally achieved by slimming down production and reducing employment even more. As measured, the productivity of a woodchip mill can easily be higher than that of a paper mill.
- Apart from regional and distributional effects, this slimming down may contribute to overall productivity growth, provided the high dollar and the high level of investment in mining are permanent. The problem is that both of these are a passing phase. Sooner or later the construction boom in mining will cease, to be succeeded by a production phase which employs far fewer people. As soon as mining construction falls away the inward flow of funds for mining investment in Australia will subside into an outflow of dividends. The exchange rate is likely to subside in sympathy.
- At this point the non-mining trade-exposed industries will regain their price competitiveness. The question is whether they will have the capacity to take advantage of this. The problem is that capacity cannot be created overnight in the knowledge-based industries or in industries where marketing and reputation are very important (such as tourism). Instead it requires decades of patient investment. The downside of the mining boom is that it is disrupting the flow of investment into the knowledge-based industries. The longer the boom goes on, the worse the disruption and the less the capacity that will emerge after the boom. Evidence of falling capacity continues to be reported, not only from established industrial areas such as Adelaide North, but from tourism-based regions such as Queensland Far North and from regions active in the processing of non-mineral resources, such as SA East.

To summarise this argument, a mining boom has two obvious positive effects, the construction boom and the subsequent increase in mine production. However, it has a negative effect on capacity in the non-mining trade-exposed industries.

A characteristic of the American way of thought is that the future is should be left to the decisions of individual businesses and especially to the decisions of the finance sector. The apparent success of this insouciant approach since its adoption as the basis of Australian policy in the mid-1980s (and overlooking the 1990 recession) underpins the current treatment the mining boom as an opportunity to prolong the economic policies adopted in the mid 1980s and especially so in the period from 1995 onwards. Because of this, nothing has been done to maintain capacity in the non-mining trade-exposed industries threatened by the mining boom. The effect is already visible in regional performance: boom in the mining regions, the breath of recession in regions which concentrate on the non-mining trade-exposed industries. This threat is palpable in the statistics reported in Chapter 1 for Victoria, especially Melbourne, not to speak of SA, Tasmania, more than half of NSW and more than half of Queensland.

The positive effects of the mining boom tend to come early because of the employment generated by the investment in new mines and their supporting transport systems and ports; the negative effects come later because it takes time to destroy capacity in agriculture, education, tourism and manufacturing. Most regions gain from the mining boom initially – if not from the boom as such, they gain from the maintenance of demand which the boom makes possible. The regions which gain new mines benefit indefinitely, or at least until the region is mined out. However, for the majority of regions there will comes a time (if not already) when net benefit switches over into net loss. The timing depends on how successfully the non-mining trade-exposed industries fight to maintain their capacity. If they react to the boom by reducing capacity in line with their reduction in short-term profitability, the break-even will come remarkably quickly, in some regions within a couple of years. If they resist the evil day can be postponed – perhaps indefinitely.

Resistance can be bolstered by government and in Chapter 2 we suggest possible policies. The most effective of these would be to wean the finance sector off its commitment to mortgages guaranteed by house prices and household incomes in favour of forward-thinking participation in regional development, with priority to the conservation of job opportunities through the present emergency. If jobs and skills are conserved they can become the foundation for capacity expansion as soon as the exchange rate falls and the competitiveness of the non-mining trade-exposed industries revives. The particular opportunity offered by these industries, once relieved of the burden of the mining boom, is that they are capable of generating well-paid jobs outside the core metropolitan areas, in regions where it is possible to provide affordable housing. These regions include the outer suburbs of the metropolitan cities, the independent cities, the lifestyle regions and the rural regions – basically all the regions which are currently being adversely affected by the boom, but also including some (such as NSW Outer Hunter and WA Peel South West) which have been favourably affected by the boom.

In this *State of the Regions* report the mining boom is discussed exhaustively in Chapter 2, beginning with the long and romantic history which predisposes many Australians to defer to the interests of the mining industry. The chapter describes the current boom in macroeconomic terms and predicts its regional effects. Given that the boom has been under way for several years now, these effects are already discernable in the rates of growth of employment, productivity and income in the different regions, a point emphasised in the review of regional trends in Chapter 1.

In Chapter 3 the report returns to the subject of telecommunications, last covered at length in the *State of the Regions* report for 2005-06. The Chapter begins with a discussion of history, asking whether the present upheaval in telecommunications can be compared with its predecessors including the introduction of the telegraph, the telephone and radio. It is noticeable that those previous technological changes were complementary to investments in faster transport, whereas the current burst of innovation in telecommunications has no transport counterpart – indeed, as reported in Chapter 4, transport speeds and costs are still threatened by the need to curtail greenhouse gas emissions. Instead, the changes are complementary to – indeed integrated with – advances in data management symbolised by the growth in the power of computers and (more important) by developments in the use of computers.

The past few years have been marked by a battle of telecommunications technologies, basically various wireless technologies versus optic fibre. The battle still simmers but in NIEIR's view it is now reasonably established that only fibre has the capacity to carry the data loads imposed by the computers which will soon be state of the art in business, including small business and home-based business. Wireless is limited in several ways, fundamentally by the availability of spectrum but also by the distances over which reliable transmission can take place. In countries with advanced telecommunications systems it will therefore remain ancillary to the fibre network, essentially restricted to those applications where mobility is a pre-requisite.

The following conclusions are reached.

- Whatever its benefits to consumers, fast broad-band is justified as an investment in business infrastructure.
- As compared to struggling on with the existing system (fibre connections to CBD businesses and between exchanges; copper-based ADSL in most exchanges and voice mobile available in most populated areas) a telecommunications system based on fibre to the premise offers scope for major productivity increases.
- The scope depends on fibre connections and a major priority must be to find ways to extend these connections cost-effectively in rural and remote regions.
- Of themselves, the productivity increases will make it possible to do the same work with fewer workers, mainly in business services. A further threat is that the outsourced workers will be located out-of-region, even overseas. The threat is balanced by a corresponding opportunity:

providers of business services in regions with good telecommunications will find their potential market much increased. The income generation consequences of fast broad-band are positive, but the employment consequences less certain.

There is likely to be a considerable delay between the installation of high-capacity telecommunications and full take-up of the increased opportunities. However, there is no technical half-way house between the existing system and a fibre-connected system. This means that the lowest-cost course of action is to make the investment now, even though it will take some time before it is fully utilised and commercially profitable. Better this than to spend money trying to upgrade the existing system and then have to spend again to reach the fully-fibre goal. This means government finance, though it could alternatively be achieved by the redirection of finance sector flows into long-term investment via a mixture of tax incentives and regulatory requirements – governments like those of Japan or China, which are not subject to the American way of thought, would have no compunction about this.

Further, as with the existing Telstra copper connections, local fibre connections will remain a natural monopoly. This distinguishes them from long-distance telecommunications and the various value-added services provided using the telecommunications network, and even from the semi-monopoly inherent in mobile telephony (where spectrum limitations coupled with economies of scale in systems of towers limit the number of firms which can economically provide the service). The natural monopoly characteristics of local fibre connections recommend government ownership or its equivalent in strongly-regulated private ownership.

In view of these characteristics, the Commonwealth is on the right track with what Paul Budde calls the 'national telecommunications settlement'. The principles are right; now for the implementation. Many design aspects are not yet fixed and there is every reason for local government to take an intense interest. After all, current proposals are that many rural businesses will not be converted to fibre but will be left dependant on relatively low-capacity radio links.

A second area for local government interest will be 'fibre readiness' – that is, preparing the businesses of their area (particularly small home-based businesses) for the opportunities of fibre-based telecommunications and bracing them for the threats. Fibre-based telecommunications will eventually become (in terms of the concepts put forward in the *State of the Regions* report 2004-05) part of the standard infrastructure array, but in the meantime they, along with their utilisation, will become strategic investments, not only regionally but for Australia as a whole as it makes its way in the knowledge-based world which will succeed the mining boom.

In Chapter 4 we update greenhouse gas emission abatement. There is not much to report on the domestic scene – for several years now there has been little decisive action. However, international carbon politics are changing and if it does not keep abreast of the changes Australia risks finding itself internationally isolated.

Finally, Chapter 5 updates the analysis of housing affordability from the 2010-11*State of the Regions* report. In a word, little has changed except that the mining boom is further postponing a solution to the problems of housing increasing metropolitan populations.

## Data notes

The data estimates for this report are benchmarked to the Australian National Accounts December quarter 2010. The labour market estimates are benchmarked to the March quarter 2011 ABS employment and unemployment estimates. Therefore, the remaining quarters for 2011 fiscal year are NIEIR estimates.


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# Key map


1 - Darwin

11 - Wide Bay Burnett
12 - SEQ Sunshine Coast
13 - SEQ Moreton Bay
14 - SEQ Brisbane City
15 - SEQ Logan Redland
16 - SEQ Gold Coast
17 - SEQ West Moreton

21 - NSW Newcastle
22 - Sydney Outer West
23 - Sydney Outer North
24 - Sydney Northern Beaches
25 - Sydney Paramatta Bankstown
26 - Sydney Old West
27 - Sydney Central
28 - Sydney Eastern Beaches
29 - Sydney Outer South West

31 - Melbourne Northern Outer
32 - Melbourne Northern Inner
33 - Melbourne Eastern Inner
34 - Melbourne City
35 - Melbourne Southern Inner

41 - SA North
42 - Adelaide North
43 - Adelaide South
44 - SA Fleurieu
45 - SA East

51 - Perth Outer North
52 - Perth Central
53 - Perth Outer South
54 - WA Peel South West


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# 1. Recent trends

The real meat of each *State of the Regions* report resides in the appendix of regional indicators. In this chapter we comment briefly on a selection of these indicators. Values for each region will be found in Appendix 3.

In keeping with the theme of this report, attention is paid to the effects of the mining boom which began in 2005. These effects are now discernable in the data for most regions. When reference is made to 'mining regions' the primary meaning is regions currently booming due to the construction of mines and associated transport works. The four regions most affected are WA Pilbara Kimberley, WA Gascoyne Goldfields, Qld Mackay and Qld Fitzroy Central West. The boom is also affecting individual LGAs in a number of other regions, such as NSW Outer Hunter, where the boom is primarily affecting the inland portion of the region and not the lifestyle shires on the coast.

## 1.1 Population

This *State of the Regions* report includes two discussions of trends in population. The present chapter covers recent trends and the current position, while the discussion in Chapter 2 Section 2.6 is more speculative and concentrates on the effect of the continuing mining boom.

Currently natural increase and net migration are contributing about equally to Australia's population growth rate of 1.5 per cent a year. Natural increase is reasonably steady at 0.8 per cent a year but migration is more volatile. A surge of migration in 2008 pushed the national population growth rate up to 2.1 per cent and employers have been calling for another surge to ease their difficulties in labour recruitment. Immigration is not, however, popular with environmentalists nor with workers who perceive it as a threat to their own employment chances and power to bargain over wages and conditions. The Commonwealth has recently attempted to square the circle by resorting to 'guest worker' visas (technically 457 visas), designed to meet temporary labour shortages. It can be debated whether immigrants arriving on these visas will add to the permanent population, but European experience is that many of them are likely to extend their stay.

The surge in the rate of population growth between the years 2001-06 and 2006-11 meant that the national average population growth rate averaged 1.9 per cent a year for the five years. The increase in the growth rate was strongest in three groups of regions.

- As expected, the rate of population growth rose in the WA mining regions – Pilbara Kimberley, Gascoyne Goldfields and also Peel South West. Though the rate of population growth rose in the WA mining regions, it actually dropped in Qld Mackay. Population growth in mining regions depends on the timing of construction.
- The rate of population growth also rose in parts of Sydney, particularly Parramatta Bankstown and Old West. This increase was a bounce-back from very low rates of population growth in the early 2000s.
- In SEQ the rate of population growth rose in West Moreton but fell in the Gold Coast and Sunshine Coast. This reflected both Queensland Government policy to transfer growth from the coast to the inland hinterland of Brisbane and the availability of greenfields sites with relatively good job accessibility.
- In Melbourne population growth shifted towards the outer northern and western suburbs, again reflecting the availability of greenfields sites with relatively good job accessibility, particularly if supported by appropriate transport investments.


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### 1.1.1 Population growth 2006-11

These changes somewhat modified the previous pattern of population growth, but did not extinguish the pattern established in the recovery from the 1991 recession. Among the metropolitan areas:

- Perth grew most rapidly, particularly in the outer suburbs. The growth of metropolitan Perth spilled into WA Peel South West, which also has its own resource developments and grew very rapidly at 3.8 per cent a year;
- in SEQ, population growth in the Gold Coast and Sunshine Coast regions grew by an average of 2.9 per cent a year, a high figure though reduced from the previous five years. Instead the star performers in SEQ were Moreton Bay (3.4 per cent) and West Moreton (3.8 per cent), in both cases reflecting the availability of greenfields residential land with reasonable access to jobs;
- in Darwin the population growth rate accelerated to 2.6 per cent a year on the basis of movements in defence personnel as well as resource investments;
- in Melbourne growth continued on the outer edge of the metropolitan area, particularly in the West (3.6 per cent), Outer North (3.2 per cent) and Outer South (2.8 per cent). By contrast, population growth in the Outer East slowed to 0.8 per cent, reflecting both natural and administrative barriers to outward extension;
- though population growth in Sydney revived, growth rates were generally below the three metropolitan areas so far mentioned. Among the regions, the fastest growth was in Parramatta Bankstown (2.1 per cent), which combines reasonable access to jobs with (albeit expensive) residential redevelopment opportunities. As pointed out in the *State of the Regions Report 2010-11* the outer suburbs of Sydney offer a poor bargain when job accessibility is balanced against house prices and their population growth rates have suffered as a result; and
- Adelaide and Hobart both attracted their share of the surge in national population growth, but remained below the national average growth rate. The population of the ACT grew a little less rapidly than the national average rate.

Among the non-metropolitan regions, the most rapid population growth was, not surprisingly, in two mining regions: WA Pilbara Kimberley (2.7 per cent) and Qld Mackay (2.5 per cent). However, growth was also rapid in two Queensland lifestyle regions, Qld Wide Bay Burnett and Qld Far North Torres (both 2.5-2.6 per cent).

Mining provided no guarantee of rapid population growth: WA Gascoyne Goldfields and NSW Outer Hunter both experienced less than the Australian average rate of population growth despite substantial mining dev elopements. Similarly lifestyle provided no guarantee: growth in the NSW lifestyle regions was subdued, perhaps as a result of subdued growth in the state capital.

As already related, the rate of population growth from 2006 to 2011 fell below 1 per cent a year in Outer East Melbourne. Other regions with growth rates less than 1 per cent a year comprised all of the NSW inland plains (Murray Far West, Riverina, Central West and Orana), partly as a result of drought. The rate of population growth was also low (though positive) in SA East, SA Far North and West, Tasmania North and Tasmania North West.

### 1.1.2 Population growth 2011-12

Turning to the current year, the national population growth rate is expected to fall to 1.5 per cent. Despite this general fall, population growth is expected to accelerate in a few regions, notably WA Pilbara Kimberley. In the majority of regions, however, the population growth rate is expected to fall compared to 2006-2011, particularly in lifestyle regions and in rural regions recovering from drought

and adversely affected by the high dollar exchange rate. Among the metropolitan areas, the most significant change of pattern is expected in SEQ, where population growth is expected to continue its shift from the coast to the inland fringe to the south west of Brisbane in Logan Redland and West Moreton.

The population projections for 2012 are based on dwellings already under construction, and have a high chance of fulfilment. Several regions stand out as above the projected national population growth rate of 1.5 per cent for the year.

- WA Pilbara Kimberley (4.4 per cent), reflecting its mining boom.
- SEQ West Moreton (4.3 per cent), reflecting the diversion of SEQ population growth into the region.
- Melbourne West and Outer North (both 3.2 per cent), reflecting the diversion of Melbourne's growth away from the east to the west and north.
- WA Peel South West (3.1 per cent), a combination of inflow from Perth, local and lifestyle developments.

As before, mining provides no guarantee of population growth, with WA Gascoyne Goldfields, SA Far North and West and NSW Outer Hunter all projected to return growth rates well below national average. A continuation of subdued growth is also projected for much of NSW, both the inland and the coast, with one region (Murray Far West) projected to lose population.

## 1.2 Productivity and investment

According to past experience of the trade cycle, the USA should now be recovering from the recession brought about by the Global Financial Crisis. In some ways it is – following its massive bailouts, the finance sector is bubbling along much as before. However, deep recession persists in the US labour market. Similarly Europe is far from buoyant.

Australia did not experience quite such a recession as the US, but one would still expect that demand growth stemming from the mining boom would be lifting productivity through higher utilisation of capacity in the economy generally. Unfortunately, as explained in detail in Chapter 2, this is not happening – rather the reverse. The boom in mining construction has dampened the demand for many other Australian goods and services, largely through the high exchange rate. More fundamentally, there has been no move to correct the dependence of demand for goods and services on growing household debt. As more and more households reach debt saturation the great consumer and land boom which started in 1995 or so continues to subside – and the mining boom provides no substitute.

Stagnant or declining demand in the non-mining trade-exposed industries and in the consumer-related industries has reduced capacity utilisation, resulting in aggregate in low or zero growth in the value of output per employee – in other words, stagnant productivity. The government, the finance sector and the media may believe that recovery from the Global Financial Crisis is under way, but that is a merely a pious hope so long as fundamental imbalances persist.

### 1.2.1 Business productivity

The business productivity measure used in this report covers the value of production ('value added') by the residents of each LGA, excluding their contribution to corporate gross profits and taxes paid by corporations. Profits of small business are included. Corporate profits are excluded for two reasons:

- it is not possible to allocate them to regions without access to detailed accounts; and

- they are not paid directly to households, but instead pass into a pool from which dividends and interest are paid. Some of the payments go overseas, and the rest reach households all over the country, often very indirectly via financial intermediaries such as superannuation funds. From a regional income-generation point of view, the value of corporate profits generated locally is irrelevant unless the corporation is tightly locally-owned.

The exclusion of corporate gross profits means that, compared to the national accounts, the value of output is understated for all industries – least for government services (where there are no profits) and for industries with low capitalisation and a preponderance of small business, and most for corporate capital-intensive businesses. Since the mining industry is both corporate-owned and capital-intensive, its value of output is much diminished in our regional accounts.

The other definition to be kept in mind is that the estimates of business productivity are prepared on a residential basis, not by the location of workplaces. This makes little difference in the non-metropolitan regions but in the metropolitan regions the productivity is often that of commuters. The estimate that people living in the Sydney Eastern Beaches had the highest productivity in the country does not mean that businesses located in that region generated the highest productivity. The high estimate is more likely to be due to the high proportion of Eastern Beaches residents who commute to knowledge-sector businesses located in the Sydney Central region.

The mining boom which is the theme of this report began in 2005 and is continuing, though we report its progress only to 2011. The period also includes:

- the debt-financed consumption boom, as analysed in previous *State of the Regions* reports, which is still continuing though faltering due to the debt-saturation of many households;
- the Global Financial Crisis and Australia's stimulus response; and
- a major drought in the south-eastern states.

Against this background, business productivity increased in all regions apart from a few rural regions struck by drought. The potential causes of the increase were increased real wage rates and increased non-corporate business profits. The mining boom shows up as rapid increases in business productivity in two regions: WA Pilbara Kimberley and Qld Fitzroy Central West. However, the value of output per employed person did not increase so rapidly in all mining regions – in NSW Outer Hunter the increase was modest, and in Qld Mackay and WA Gascoyne Goldfields the mining boom increased employment more than it increased real wages per employee.

A second positive effect of the mining boom was the rapid increase in business productivity in Perth. Many highly-paid and highly-productive mining industry employees and support personnel are based in Perth, including many fly-in fly-out workers.

Among the cities, the second-highest increase in business productivity occurred in the ACT. Mining may have contributed to this increase through the influx of lobbyists and through the contribution of government support services for the industry. More generally, the ACT benefited from its lack of trade-exposed industries and hence its isolation from the effects of the high exchange rate.

Business productivity in SEQ and Adelaide grew at around the national average rate. These two cities benefit from mining developments in their states but also suffer from the difficulties of trade-exposed industry.

With its concentration in finance, Sydney is to some degree sheltered from the difficulties of the non-mining trade-exposed industries, but the net effect has not been favourable and business productivity in Sydney rose at less than the national average rate. However, the most unfavourable effects of the mining boom were reserved for Melbourne, which, with its concentration on trade-exposed non-mining industry, experienced very little growth in business productivity. This should be a cause for

considerable concern. It is argued in Chapter 2 of this report that the decline of the non-mining trade-exposed industries which has accompanied the mining boom is likely to be permanent, which means that they will not be available to provide income and employment when the mining boom ends.

The rural regions are trade-exposed but the effect of the high exchange rate was counterbalanced in most cases by high world commodity prices. Apart from the effects of drought, these regions in general experienced growth in business productivity at national average rates or better. Special mention should be made of the three Tasmanian regions, especially North and North West, which managed to catch up with similarly structured regions on the mainland.

### 1.2.2 Non-farm business productivity

The regional pattern moves more sharply into focus if we exclude farming, with its long history of productivity fluctuations due to good and bad seasons and fluctuating commodity prices. Wages earned and small-business profits made in mining are still included, though corporate gross profits remain excluded. By this measure the mining boom accounts for much of the regional pattern of non-farm productivity growth. All WA regions experienced productivity growth more rapid than any non-WA region – the WA region with the slowest non-farm productivity growth, Wheatbelt Great Southern, was in front of the most rapidly growing Eastern States region, the ACT.

Non-farm productivity growth was also fairly rapid in the major Queensland coal-mining regions (Qld Mackay and Qld Fitzroy Central West) and, by provision of services to mining, in SEQ. Growth in Adelaide was faster than in Sydney, while there was scarcely any non-farm productivity growth in Melbourne or indeed in any Victorian region. This lack of growth can be related to the squeezing of both wages and small-business profits in the trade-exposed non-mining industries.

By contrast with Victoria, Tasmania managed a rate of non-farm productivity growth above national average, though this was largely due to catch-up.

The result of these trends is that Australia now has three islands of high non-farm labour productivity.

- WA Pilbara Kimberley, dominated by mining.
- The ACT, a knowledge economy which is almost completely sheltered from overseas competition and hence immune to the effects of the high exchange rate.
- The Eastern parts of Sydney, whose knowledge-economy industries emphasise finance, an industry which again is substantially sheltered from overseas competition.

The regions of low non-farm labour productivity include the following.

- The lifestyle regions on the NSW and Queensland coasts – the continuation of a trend noted in previous *State of the Regions* reports.
- Non-mining trade-exposed regions generally, including most of Victoria, Tasmania and SA.

The mining boom is primarily a WA boom, with lesser participation of Queensland, and threatens recession in SE Australia.

### 1.2.3 High tech start-ups

Previous *State of the Regions* report included data on patent applications, regarded as indicators of the state of the knowledge economy. These data are not available this year, so in partial compensation NIEIR has re-instated the series on high-tech start-ups, derived from Dun and Bradstreet data. The measure comprises the number of new businesses recorded in industry codes regarded as 'high-tech', in relation to total employment in each region.

Historically, the high-tech start-up rate peaked in the late 1990s, as might be expected of a period when there was rising confidence in innovation and in trade-exposed industry. The series record the passing of this moment of confidence. More seriously, the decline in new-tech start-ups seems to have continued to the present, with the rate now running at about 10 per cent of the levels attained at the peak of confidence in new technologies. This probably over-estimates the decline, since Dun and Bradstreet do not always notice new businesses in their year of formation, nor do they always initially classify them as high-tech. However, there are good reasons to believe that the decline is real and considerable, including the following.

- High-tech industries tend to be trade-exposed, and as we have seen prospects are poor in these industries so long as the Australian dollar remains over-valued and many of the overseas markets for high-tech goods and services are in recession.
- The finance sector continues its preference for consumer finance via mortgage loans rather than financing risky business.

Something can perhaps be learnt from the geographic pattern of decline. As a general rule, the decline was relatively less in the mining regions and states. It was greater in the relatively depressed regions of SE Australia. As a result of these trends, the high-tech start up rate is now most rapid in the Outer Perth regions and is also remarkably high in Qld Mackay.

Despite the recession in the south east, the high-tech start-up rate remains high in the high-status suburbs of Sydney and the outer northern, eastern and southern suburbs of Melbourne, followed y the suburbs of Brisbane. It is notable that the high-tech start-up rate is not particularly high in the central metropolitan regions, despite the high rank of these regions in the knowledge economy. Accommodation costs in these regions are not very friendly towards start-up businesses, which in any case tend to get lost among the high total employment of the city centres.

### 1.2.4 Investment and employment growth

The SOR database includes estimates of floor space completions by type. Using the latest approvals data, estimates of the increase in employment from immediate past, current and short term future investment can be made. The 'employment generating capacity' panel for each region in Appendix 3 provides estimates of the employment generation that is likely to flow from the stock of commercial investments (offices, factories, hospitals, etc.) that will be available by 2012.

The data strongly suggest that the emergence of a two-speed economy cannot be blamed on either the quantum or the regional allocation of commercial investment. For the majority of regions the increase in commercial installed capacity by 2012 will be capable of generating more employment positions than the increase in the working age population. For most of the remaining regions the ratio of potential employment increase to working age population increase is not too far below unity.

A summary by zones is as follows.

| Zones | Ratio of potential employment from commercial capacity expansion to increase in working age population (2010-2012) | Per cent of total potential employment increase from commercial investment (%) | Per cent of working age population (%) |
|---|---|---|---|
| Knowledge Intensive | 2.1 | 45.3 | 27.6 |
| Dispersed Metro | 0.8 | 25.8 | 37.8 |
| Lifestyle | 1.1 | 4.6 | 7.3 |
| Rural | 1.4 | 14.8 | 17.7 |
| Independent City | 1.6 | 4.3 | 4.8 |
| Resource Based | 1.8 | 5.1 | 4.7 |
| Australia | 1.4 | 100.0 | 100.0 |

From the table the only zone where potential employment from commercial investments increases less than the working age population is the Dispersed Metro zone. However, a significant source of employment from this zone is the Knowledge Intensive zone which includes central areas of the capital cities. However, it will be argued in Chapter 5 that there are problems in accessing this employment from the urban fringes where house construction is relatively low cost.

Despite this problem, Australia as a whole has been installing a quantum of capacity sufficient to employ the growing population.

## 1.3 Employment and unemployment

The Appendix to this report includes two tables of data on employment by industry and on hours worked and income earned, both by region of residence and region of work. These tables provide abundant data on industry structure by region. In this chapter, however, we concentrate on labour as an under-utilised resource.

### 1.3.1 Definitions of unemployment

In the 1950s and 1960s the Commonwealth of Australia was committed to full employment, by which it meant that every person wanting a job at the going wages and conditions could find one within a matter of weeks. Unemployment persisted and was regularly and carefully measured to determine the number of people with jobs and the number actively searching to work. The workforce was defined as the total of these two. In 1962 the unemployment rate so defined briefly exceeded 2 per cent and the Menzies government came within a seat of losing office. In retrospect the 1950s and 1960s were a golden age, though not perhaps for everybody. It has frequently been pointed out that full employment in those years meant 40 hours a week for men with women expected to stay out of the workforce or paid at low rates if they had the temerity to enter it.

The end of full employment was accompanied by a great deal of dissension about the measurement of unemployment. The ABS soldiered on with its established definition but governments did not like the high numbers thus produced and persuaded the Bureau to tighten its definition gradually. On the other hand, the government's opponents argued that the Bureau definition (in the *State of the Regions* reports called the 'headline' rate) omitted important components of unemployment – the 'hidden unemployment' of people who were not looking for work because it was hard to find and they could depend on other family members to cover their basic needs and the papered-over unemployment of


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people who the Commonwealth transferred from unemployment benefits to types of social security assistance which did not require job search and were accordingly out of the labour force.

In this chapter we work backwards from broad definitions of unemployment to the narrowest definition – the 'headline' unemployment rate.

### 1.3.2 Hours of work available per week per resident of workforce age

One approach is to give up on the idea of 'unemployment', with its connotations of unsatisfactory income and job search, and consider simply the availability of work in relation to the population of workforce age, here defined as 15-64. This is not a completely satisfactory definition, in that some hours of paid work are performed by persons aged 65 and over and a few by children aged 14 and under. Further, it can only be interpreted in relation to a norm concerning desired hours of work. This will be less than full-time hours for all persons of workforce age due to people desiring non-work hours for purposes including child care, study and leisure, and also to the unavailability of people who are too sick or disabled to work.

By this measure, the trend over the course of the mining boom has on the whole been favourable. Between 2005 and 2011, 80 per cent of regions experienced increases in hours of work per resident of workforce age. The more detailed pattern is, however, complex.

The most rapid increase, in NT Darwin, can be related to the mining boom though the defence build-up in Northern Australia was also important. Defence yields high hours of work per adult because it provides full-time employment for defence personnel and frequently for their spouses. Even so, the estimate is so high that we wait to see whether it gets revised.

Other mining boom regions experiencing significant increases in hours worked per resident of working age were the Perth metropolitan area and NSW Outer Hunter. Qld Townsville North West and NT Lingiari also experienced increases, though like Darwin these are regions where defence makes a large contribution to the economic base.

Surprisingly, hours of work per resident did not increase in two of the prime mining boom regions, WA Pilbara Kimberley and Qld Fitzroy Central West. One may hazard a guess that high wages attracted more new residents than could be employed, and/or that more workers brought partners who did not wish to be employed.

Two other regions provide important evidence on the effects of the mining boom. There has been a serious decrease in hours of work available in Queensland Far North Torres and to a lesser extent in SEQ Sunshine Coast due to the collapse of the tourist industry as a result of the high Australian dollar combined with recession in the tourist source countries. The collapse of tourism also helps to account for the lack of job generation in WA Pilbara Kimberley. In other regions adversely affected by the high dollar the reduction in available incomes manifested itself more in limited earnings growth rather than in declining hours of work.

Some of the changes in hours worked by residents resulted from internal migration. Thus the growth of population in SEQ West Moreton was accompanied by a reduction in hours worked, if only because of the limited availability of local work for women with little time for commuting. In an opposite effect, hours worked by residents of Melbourne Inner North increased as the region gentrified.

The national pattern of hours worked has a major high point in NT Darwin and an adjacent low point in NT Lingiari – the former due to resource development and defence, the latter due to the large under-employed Aboriginal population. Outside the NT, high working hours are available to the

residents of Perth, eastern Sydney, Qld Mackay and Qld Townsville North West. There is a mixture here of mining, defence and long hours in the finance and other knowledge-based offices of Sydney.

At the other extreme and continuing a long tradition, hours of work are low in the coastal lifestyle regions and in some of the rural regions.

### 1.3.3 Social security take-up by persons of workforce age

The Australian social security system provides to persons deemed unable to support themselves adequately. Accordingly, social security take-up by persons of workforce age provides an indirect indicator of the availability of paid work. Social security take-up by persons of workforce age is unlikely to fall to zero because of the needs of sick and disabled people and their carers but it can fall quite low – down to 4 per cent in Sydney Outer North and Sydney Northern Beaches. However, these low rates are partly due to high housing costs in these regions, which mean that social security recipients cannot afford to live there unless, exceptionally, they own their own houses.

Some of the reductions in social security take-up from 2005 to 2011 can be linked to the mining boom. Take-up fell in the Perth metropolitan area (by around 25 per cent), in WA Pilbara Kimberley (similarly) and in Qld Mackay by nearly 40 per cent. There were also substantial decreases in take-up (around 20 per cent) in Qld Fitzroy Central West and NSW Newcastle. The major decreases which occurred in NT Darwin and NT Lingiari can also be partly related to the boom.

Among regions adversely affected by the boom, there was a significant increase in social security uptake in Qld Far North Torres. Other regions with major increases in uptake were SA North and SA East, followed by Vic Hume, Vic Grampians and Vic Loddon Mallee, all regions with non-mining trade-exposed agricultural and manufacturing industries coupled with drought effects. However, social security uptake declined in Melbourne itself, related to the way in which the mining boom reduced wage rates rather than reducing employment. Similarly the NSW inland regions failed to translate their moderate decreases in hours worked into increases in social security take-up.

After these changes, social security uptake by persons of workforce age is low in the regions of high socio-economic status in Sydney and Melbourne and in the ACT. It is high in NT Lingiari, SA Far North and West and NSW Orana (with their poor employment opportunities for Aboriginal people) and in the lifestyle regions of the NSW coast, in Qld Wide Bay Burnett and now also in Qld Far North Torres (which is affected not only by the tourism downturn but by lack of employment opportunities for the residents of remote areas). Uptake is also high in Tasmania and Adelaide North, regions which have not completely recovered from the economic reforms of the 1980s.

### 1.3.4 NIEIR unemployment

We turn now to a narrower definition of unemployment, familiar from past *State of the Regions* reports. This is NIEIR unemployment, which is calculated by adjusting the headline unemployment rate for excess take-up of disability pension. It has long been observed that increases in the headline unemployment rate tend to be followed by transfer of many of the long-term unemployed to disability pension. From the point of view of the individual pensioner this recognises the hopelessness of looking for work when there isn't any coupled with the debilitating effects of being unable to find work, while from the point of view of governments it massages the headline unemployment rate downwards.

Trends in the NIEIR unemployment rate are similar to trends in the workforce-age social security uptake rate with the striking exceptions of NT Lingiari, WA Pilbara Kimberley and Qld Far North Torres, in which the NIEIR unemployment rate increased much more rapidly than social security take-

up. In all three regions the Commonwealth seems to have been transferring the Aboriginal population onto disability pension.

The resulting pattern of NIEIR unemployment rates is familiar. The rate is high in two groups of regions: the remote regions headed by NT Lingiari and the lifestyle regions headed by NSW South Coast and including the NSW Mid North Coast. Only one of the regions hard-hit by the 1980s reforms remains on the high unemployment list, Tasmania North West.

As always, the NIEIR unemployment rate is low among residents of the high-status and inner suburbs of Sydney and Melbourne and in the ACT. It has also fallen to the exceptionally low level of 3 per cent in NT Darwin.

### 1.3.5 Headline unemployment

As already noted, the headline unemployment rate is a rather narrowly-based measure. At the regional level, two changes stand out over the period 2005 to 2011.

- The rate in NT Lingiari has halved – good news, perhaps, but more likely a stroke of the pen redefining how the residents of remote Aboriginal communities are supported. The rate also fell noticeably in Darwin.
- The rate in Qld Far North Torres has doubled, confirming the bad news we have already noted from the more general indicators.

Mining cannot be guaranteed to reduce the headline unemployment rate – if it could, the rate would not have risen in WA Pilbara Kimberley.

Away from the tropics, the headline rate fell in Perth and in other WA regions apart from Pilbara Kimberley, in most of Melbourne and in the other Victorian regions except Hume, in coastal NSW but not in Sydney, not in NSW Riverina and not in NSW Murray Far West, in Tasmania South and North and in non-metropolitan Queensland apart from Far North Torres.

The headline rate rose in most of SEQ, balanced by a considerable reduction in West Moreton – the new home-buyers of that region doubtless include few who are unemployed. The headline rate also rose across Sydney, particularly Parramatta Bankstown.

There is little in these patterns that relates strongly to the mining boom, which can be related to the narrowness of the headline unemployment rate as a measure.

The resulting pattern is at least partly familiar. The worst region for headline unemployment is now Qld Far North Torres, a relative newcomer to this particular malady, but the other regions with high headline unemployment are familiar: NSW South Coast, NSW Mid North Coast, SEQ Sunshine Coast and Qld Wide Bay Burnett among lifestyle regions, Sydney Parramatta Bankstown, Sydney Old West, Tasmania North West and Vic Grampians among regions not fully recovered from the reforms of the 1980s, and one new recruit: SEQ Logan Redland, also a region which has also suffered from the decline of manufacturing.

### 1.3.6 Conclusion

The dark shadow of the economic reforms of the 1980s continues to afflict not only the former manufacturing regions but many regions which initially benefited from the reforms – the rural regions where the high exchange rate resulting from the mining boom is squeezing the profits out of the pastoral and agricultural industries and also out of manufacturing based on local raw materials and out of international tourism.

However, the mining boom has had its benefits, particularly for the finance sector and more generally for the knowledge-economy based in the metropolitan centres. Most notably, it has brought something akin to full employment to a small number of regions, of which the outstanding example is NT Darwin. Here the headline unemployment rate has fallen below two per cent – not quite equivalent to the rates which were normal in the 1950s and 1960s due to changes of definition, but well below any unemployment rate reported at regional level for over three decades. This prompts two groups of questions.

- Given the prominence of skill mismatches as explanations of recent high unemployment rates, how was the low unemployment rate achieved? Has Darwin somehow managed to generate a job mix appropriate to the skills of its population? To what extent has Darwin depended on migration from interstate and overseas to fill skilled positions?
- What does the low level of unemployment in Darwin have to say to those economists who believe that a relatively high unemployment rate is required to discipline labour and prevent inflation? Have the Commonwealth authorities – Treasury and Reserve Bank – been deliberately maintaining a higher unemployment rate than necessary, in the mistaken belief that this is 'natural' or 'normal'?

## 1.4 The components of household income

### 1.4.1 Wages

According to our definition, business value added splits into two components – wages (including salaries, employer superannuation contributions and all other payments to employees) and the 'mixed income' of working proprietors and their families. As already mentioned, a third component – corporate gross profits – is excluded from the regional estimates of valued added.

In nearly all regions, wages is the dominant component in the split, reaching 92 per cent in the ACT and in Sydney Outer South West. Only in two rural regions, WA Wheatbelt Great Southern and SA East, does the split approach 50-50, though mixed incomes are prominent (generally around 25 per cent) in the other rural regions. These proportions have been reasonably stable, apart from pronounced increases in the wage share in WA Gascoyne Goldfields and WA Wheatbelt Great Southern. In these two regions the mining boom has reduced the relative importance of small-business production.

When assessing productivity we related business value added to employment. Rather than relate wages to employment (and so calculate average earnings) we regard them as a source of household income and accordingly relate them to regional population. This measure, wages per capita, will increase when real wage rates increase and/or when the hours worked by the regional population increase. A boom will tend to increase wages per capita both ways; through increases in wage rates (including the effect of changes in job mix towards higher-paid jobs) and through increases in hours worked.

Over the past six years, real wages (in 2008-09 dollars) per capita increased rapidly in all WA regions. The increases ranged from 27 per cent in WA Peel South West to 41 per cent in Perth Central. Most of these increases related directly or indirectly to mining (including oil and gas) – there were mining and mineral-processing developments in all non-metropolitan WA regions while the metropolitan area provided administrative, technical and financial services to mining. The lowest WA increase of 27 per cent exceeded the highest elsewhere (25 per cent in Darwin).

Coal-related increases in real wages per capita took place in Qld Mackay and Qld Fitzroy Central West (both 23 per cent for the six years). The third major coal region – NSW Outer Hunter and NSW Newcastle – recorded a rather lower increase of 16 per cent, diluted by the relatively poor performance of the lifestyle and trade-exposed industries of these regions.

The relatively low mining-related increases of 21 per cent in Qld Townsville North West, SA Far North and West and NT Lingiari reflected a less favourable mix of minerals. The increase of 25 per cent in NT Darwin reflected, in part, the importance of this city in the provision of services to mining in its hinterland and to offshore oil and gas production. They were also affected by its importance as a defence base.

The final full-sized region receiving an increase in real wages per capita of more than 20 per cent (we discount the City of Melbourne) was the ACT. As already noted, the ACT provides administrative and political services to mining, but the more important factor is that very little of its employment is trade-exposed, which shelters it from employment losses due to the high exchange rate.

Though the mining boom has been confined to the regions already mentioned, all regions received increases in real wages per capita over the six years from 2005 to 2011. However, the increases were seriously constrained in regions where the growth in business productivity was negligible or modest. The following regions fell behind.

- Just about all of Melbourne and Geelong (though real wages per capita increased in Inner Northern Melbourne due to gentrification).
- All of Sydney, especially regions housing employees in trade-exposed industries.
- The drought- affected rural regions in NSW, Victoria and SA.
- Lifestyle regions (including Qld Far North Torres), due to their exposure to tourism, which has been adversely affected by the double whammy of recession in tourist source countries and the high Australian dollar. The major exception is Qld Wide Bay Burnett, which seems to have cornered benefits from the boom. It should also be noted that NSW Northern Rivers has continued its diversification away from lifestyle services towards the knowledge economy.

These changes have impacted on the previous distribution of real wages per capita to produce regions where wages account for high household incomes.

- The ACT is unchallenged as the region with the highest wages per capita ($\$_{2008\text{-}09}$ 44,000 per capita).
- The four Sydney regions with highly-paid knowledge-economy populations have just maintained their second position.
- NT Darwin and WA Pilbara Kimberley come next with wages per capita of $ 36,000 and over. No other region exceeds $30,000 per capita.

At the other end of the distribution:

- the lowest levels of wages per capita are found, as previously, in NT Lingiari (whose large non-earning and low-wage Aboriginal population has benefited little from the mining boom) plus five lifestyle regions: NSW Mid North Coast, NSW Northern Rivers, NSW South Coast, Qld Wide Bay Burnett and SEQ Sunshine Coast; and
- average real wages per capita are a little higher in the rural regions, though they are still only about 40 per cent of the average in the ACT.

### 1.4.2 Business (mixed) incomes

As already pointed out, business mixed incomes claim a smaller share of business value added than wages except in very rural regions. The most significant changes over the past six years have been increases in Sydney, particularly Sydney Old West, Sydney Northern Beaches and Sydney Eastern Beaches, also in SEQ Brisbane City and Adelaide, presumably due to increases in consultancy and other professional businesses. Melbourne seems to have missed this trend, perhaps because the trend has been masked by the falling incomes of small-business manufacturers.

By contrast with its strong growth in wages per capita, WA has experienced but subdued growth in business incomes – small business does not seem to have benefited from the mining boom. However, non-farm small businesses have increased their incomes in Qld Townsville North West and Qld Fitzroy Central West, perhaps by providing services to mining which are beyond the capacity of their equivalents to the west.

### 1.4.3 Property incomes

Property incomes include rents received from real estate, interest, dividends and (nowadays most important) income from superannuation, including the income which the ABS imputes to households as their superannuation assets earn dividends, interest and capital gains or losses.

Because of the close tie between superannuation and wages, changes in property incomes over the past six years have been closely related to increases in wages, with particularly high increases in Perth Central, Qld Mackay and the ACT. However, the largest increases (admittedly from a low base) have been in Tasmania North and Tasmania North West, and can best be related to an increase in the savings rate as these regions have caught up with the rest of the country. One cannot help but comment that the high savings rates in Tasmania and the ACT are relatively affordable housing.

If wealth is judged by property income per capita, the ACT and Sydney Eastern Beaches now tie for the honour of Australia's richest regions. Sydney Northern Beaches, Sydney Central and Melbourne Inner South also make the grade with property incomes per capita of $\$_{2008\text{-}09}$ 10,000 or more. Perth Central and Brisbane City are coming up, but have yet to make the list. The richest non-metropolitan region remains Victoria South West with average property income of $6,200.

By this measure, the three poorest regions are NT Lingiari, Qld Darling Downs South West and Qld Wide Bay Burnett – two rural/pastoral regions (though Qld Darling Downs South West is beginning to experience a coal boom) and a lifestyle region.

### 1.4.4 Interest paid

Though property income provides a measure of riches, the measure is compromised in that it deals with but part of the household balance sheet – the paper assets part (including rented properties). As has been pointed out in the *State of the Regions* reports for many years, the accumulating superannuation assets of Australian households are balanced by accumulating debt. Interest payments by households have increased over the past six years at about the same rate as property income. The rate of increase has tapered off in a number of debt-saturated regions (notably Sydney Outer South West, Sydney Outer West, NSW Illawarra and NSW Central Coast) but has roared ahead in regions targeted by the banks as having mortgage-servicing capability, notably WA Pilbara Kimberley, Melbourne Inner East, Brisbane City, Perth Central, WA Gascoyne Goldfields and WA Wheatbelt Great Southern – note the mixture of inner suburbs (to keep away from the over-indebted mortgage belt) and regions with resource development prospects.

### 1.4 5 Net property income

The changes in property income received and interest paid can be offset to provide an indicator of the change in net financial wealth of each region. From 2005 to 2011 net financial wealth, as thus measured, increased significantly in the following regions.

- The ACT, with by far the largest increase.
- Sydney regions, especially Eastern Beaches, Northern Beaches and Central.
- Melbourne City and Inner South.
- All Tasmanian regions.

By contrast, the increase in interest payments overwhelmed the increase in property incomes in the following regions.

- WA apart from Perth Central, with the biggest decline in net property income occurring in WA Pilbara Kimberley.
- All Queensland regions.

The finance sector has moved quickly to exploit the mining boom.

These changes have modified the established pattern of net property incomes. By this measure, the ACT has become Australia's richest region – a change from the pattern of a decade ago, when it had the highest wages but relatively small property incomes. The ACT is closely followed by Sydney Eastern Beaches, then after a considerable gap come Sydney Northern Beaches, Melbourne Inner South, Melbourne City and Sydney Central. Sydney Outer North has fallen behind the coastal Sydney regions, but remains slightly ahead of Melbourne Inner East, Adelaide South, Perth Central and SEQ Brisbane. Other regions with positive net financial wealth by this measure include all of Tasmania and Victoria South West.

Several regions report negative financial flows, notably WA Pilbara Kimberley, SEQ Logan Redland and SEQ Moreton Bay, and less seriously some of the other mining boom regions. However, the outer Sydney regions have climbed back from the pits of debt and now have rough equality of interest payments and property income – though not equality of cash flows, since much of the property income is tied up in superannuation.

### 1.4.6 Debt service ratios

A broader way of viewing the cost of debt is to relate debt servicing (both interest and repayments of principal) to income less tax. This measure has been tracked through successive *State of the Regions* reports.

During the period 2006-11 the Australia-wide debt service ratio continued to increase as the Commonwealth and the banks continued their policy of supporting home purchase and household consumption by encouraging households to take on debt. However, the debt salesmen shifted their scenes of operation compared to the previous five years. The household debt service ratio increased rapidly in three groups of regions.

- Melbourne generally, and particularly the Inner East, where a major increase in debt was sold to a previously conservative population. The resulting increase in the debt service ratio was helped along by the lack of growth in real income.

- Parts of SEQ, particularly the new outer suburbs of Moreton Bay and West Moreton, in which confidence was maintained in future income growth but not realised in the short term.
- WA Pilbara Kimberley, alone among the mining boom regions.

The ratio fell, or grew but slowly, in another three groups of regions.

- Perth, where mining boom increases in income ran ahead of house prices.
- A ring of regions around the fringe of Sydney as both residents and the banks reacted to the high debt service ratios generated in the housing boom of 1995-2008. Significantly, the high status parts of Sydney did not experience an equivalent loss of confidence.
- Most of the non-mining trade-exposed rural regions, especially those where confidence in future incomes withered during the drought.

As a result of these changes, Sydney now no longer boasts the highest debt service ratios in the country. The dubious honour now belongs to suburban SEQ, followed by Perth (despite recent reductions in the ratio). Third place on the list is taken by Melbourne, followed by Adelaide and finally a somewhat chastened Sydney.

Apart from lifestyle regions, the debt service ratio is generally lower in the non-metropolitan regions than in the country as a whole, with particularly low ratios in regions where confidence in the future is low – the non-mining trade-exposed regions whether or not threatened by climate change. Two more urban regions have notably low debt service ratios: Darwin and the ACT. Both have been favoured by the mining boom, and in both housing is reasonably affordable in relation to incomes.

### 1.4.7 Cash benefits

The Australian social security system is designed to distribute income to people who would otherwise have little or no income. The major component is the age pension, which is means-tested but not severely so. Various other components are designed to assist with child-rearing, high rental costs, disability and unemployment.

In 2011 the regions receiving the highest incomes per capita from cash benefits are a group of inland rural and remote areas which have lately suffered from drought – NSW Riverina, NSW Murray Far West, NSW Central West, NSW Orana and SA Far North and West, closely followed by SA East and more distantly by other rural regions. In these regions cash benefits reach $\$_{2008\text{-}09}$ 10,000 per capita and more.

The regions receiving least in cash benefits were NT Darwin and Sydney Outer North ($ 3300 a year), closely and perhaps surprisingly followed by NT Lingiari – this latter because benefits to Aboriginal people come largely from a different part of the Commonwealth budget. The other metropolitan regions, including the ACT, all qualified for average cash benefits of around $4-5000 a year.

These patterns reflected several changes in the pattern of benefits paid out before the mining boom. As would be expected for means-tested assistance, payments declined in Perth and WA Pilbara Kimberley, though not in WA Gascoyne Goldfields or WA Wheatbelt Great Southern. Benefits also declined in all Queensland regions (particularly Mackay), Adelaide and all Tasmanian regions. The payout rate was fairly constant in Sydney and Melbourne and declined in coastal NSW. These declines were, however, offset by spectacular increases in payments in drought-affected inland NSW, Victoria and SA.

As a result of the drought-related payments, the share of benefits in household income is now highest in NSW Riverina and NSW Central West (26 per cent of income), closely followed by SA Far North and West, NSW Murray Far West, NSW Orana and NSW Mid North Coast. Only the last of these is a traditional lifestyle-retirement region with high social security dependence.

### 1.4.8 Net income tax and cash benefits

Income tax differs from indirect taxes in that it is a claim on people's incomes rather than a levy on their expenditures. It can be offset against social security payments to give a measure of net cash flow between households and the Commonwealth

Comparing 2011 with 2005, the residents of 22 regions are now paying less tax per capita with the rest paying more. The tax reductions have tended to benefit Tasmanian, Queensland and WA regions and the ACT.

Combining the changes to cash benefits and income tax, net payments per capita to the Commonwealth have increased significantly only in the three wealthier Sydney regions, Melbourne City and Qld Mackay. Net payments from the Commonwealth to households have increased markedly in the drought-affected rural regions, and less markedly in most other regions.

Balancing income tax against cash benefits, all metropolitan regions save the ACT and SEQ Sunshine Coast make net contributions to the Commonwealth budget while nearly all non-metropolitan regions receive net payments from the budget – the main exceptions being the mining boom regions of Qld Mackay, Qld Fitzroy Central West and WA Pilbara Kimberley.

### 1.4.9 Disposable income

Putting all these factors together we calculate household disposable income per capita – that is, income from all sources less interest and income tax. Confirming the themes of the above discussion, the most rapid increases were in the mining-boom regions of WA, notably Perth as a whole followed by WA Pilbara Kimberley. The mining boom was not so intense in Queensland but still produced rapid income growth in Qld Mackay and Qld Fitzroy Central West.

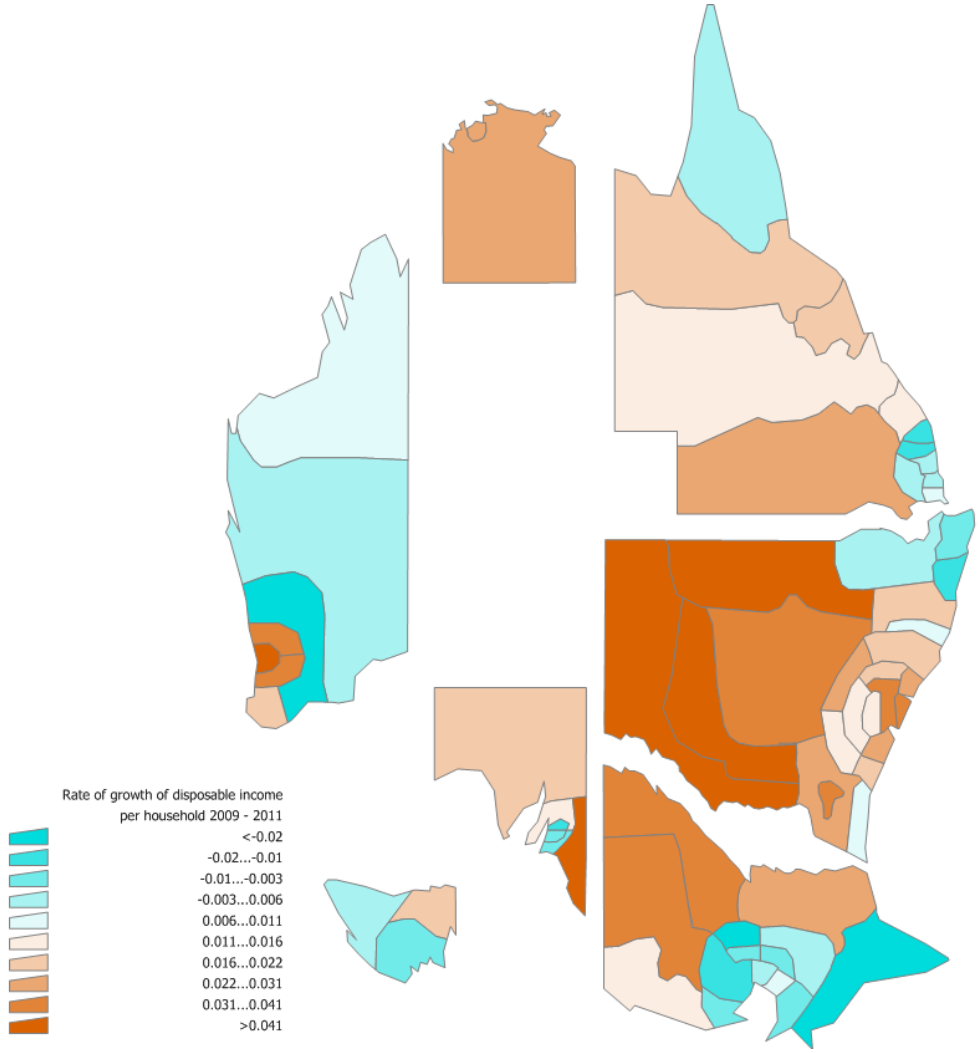
Rapid growth in disposable income was not confined to mining regions. We have already noted the ACT as a star performer, and also NT Darwin. Disposable income also grew rapidly in a number of rural regions, including regions which received large increases in cash benefits – the star performers were Tasmania North and NSW Riverina. However, not all rural regions were so buoyant and WA Wheatbelt Great Southern and NSW Northern Inland received some of the lowest increases in per capita disposable income in the country.

As has been emphasised, the downside of the mining boom has been most severe in Melbourne, but Sydney, Adelaide, SEQ and the tourist-oriented lifestyle regions have all suffered from loss of international competitiveness due to the high exchange rate, not to speak of recession slumps in demand in many international markets. Disposable income per capita has grown in all regions, but some, such as Melbourne Outer North, report rates of increase as low as 7 per cent for the six years. Melbourne Inner East is something of a special case. Here the low rate of growth of disposable income reflects the combination of the problems of non-mining trade exposure coupled with an epidemic of debt.

The resulting national pattern of disposable incomes places the ACT as indubitably the region with the highest average disposable income ($\$_{2008\text{-}09}$ 65,000 a year), followed by Sydney Eastern Beaches. (This calculation does not allow for the difference in housing costs between the two regions, which places the ACT even more securely ahead.) Four other regions report disposable incomes over $50,000 a head – Sydney Northern Beaches, Sydney Central, NT Darwin and Perth Central.

NT Lingiari and some of the lifestyle regions (Qld Wide Bay Burnett, NSW Mid North Coast, SEQ Sunshine Coast, NSW Northern Rivers and NSW South Coast) retain their established position as regions with disposable incomes per capita around 40 per cent of the ACT level. In most non-metropolitan regions other than those directly affected by the mining boom disposable income per capita is around half the ACT level, as it also is in the manufacturing-oriented suburbs of SEQ, Sydney, Melbourne and Adelaide.

**Figure 1.1: Rate of average household disposable income growth (2009 to 2011)**





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## 1.5 Housing

The *State of the Regions report 2010-11* included a detailed analysis of trends in housing. Briefly, during the 1970s housing was readily affordable, in relation to incomes, in virtually all regions in Australia, and construction outpaced population growth, allowing a reduction in the average number of people living in each dwelling. During the 1980s house purchase became less affordable due to high nominal mortgage interest rates but the rate of construction continued to keep pace with population growth. However, from the mid-1990s on house prices rose more rapidly than incomes, reflecting two broad factors:

- underlying population growth, translated into demand for housing by the ready availability of mortgages at nominal interest rates considerably lower than those which obtained during the 1980s; and
- restricted supply of greenfield development sites with good access to the employment opportunities in the metropolitan regions.

When burgeoning demand meets restricted supply the result is increases in prices, or in this case a housing affordability crisis.

### 1.5.1 Dwellings

A theme of this *State of the Regions* report is the effects of the current mining boom. As regards housing, the boom affects both demand and supply.

- The demand side effect is simply that of increased population growth, particularly in the regions directly benefited by the boom.
- The supply side effect is more complex, but on balance worsens the problem of supplying affordable housing.

We noted in the 2010 report that the decline of manufacturing provides an important reason for the difficulty of supplying new, affordable housing. The reason is that manufacturing tends to seek outer suburban and provincial locations and hence to raise job accessibility from locations where residential land is relatively low-priced. Manufacturing is not the only industry to prefer outer suburban land – warehousing and logistics is another – but its decline has made it harder to generate jobs in locations where greenfield residential land is readily available. By contrast, businesses operating in the knowledge economy (including finance as well as business services, design and the like) tend to seek CBD and inner suburban locations. As these industries have grown, job opportunities in the centres of the metropolitan areas have increased. The result has been a demand for dwellings with good access to these centralised job opportunities.

There are two main ways to meet the demand:

- redevelopment. In all Australian cities inner urban land formerly devoted to transport and manufacturing has been redeveloped for medium and high density housing, supplemented by the redevelopment of low-density residential sites. In addition to the expense of demolition, redesign and boutique construction in frequently contaminated areas, redevelopment is necessarily a fairly slow process; and
- transport investments to improve the accessibility of inner urban workplaces to outer suburban residents. The investments have to be in public transport, generally rail, because of its efficiency in the use of land – high-density urban centres do not have room for extensive car

parks (even if multi-storeyed) nor for multi-lane freeways. Unfortunately Australian investment in urban transport has emphasised roads, leaving rail transport relatively neglected in most cities.

One might hope that a mining boom would create numerous jobs in remote areas and thus reduce the concentration of jobs in metropolitan centres. Unfortunately this has not been true of the present boom, for several reasons.

- Though mining directly creates construction and operational jobs in remote areas, it also creates numerous administrative and technical support jobs which are completely integrated into the knowledge economy and hence essentially city-centre in nature.
- As discussed in Section 1.2 and further explained in Chapter 2, the high exchange rate which has accompanied the mining boom has put pressure on a wide variety of traded-exposed industries, notably manufacturing, agriculture, tourism and education. Though education is part of the knowledge economy, it is not strongly CBD-oriented, and the other industries under pressure generate jobs on the urban fringes and in the non-metropolitan regions. An indirect result of the mining boom is poor job generation in these industries and made it difficult to decentralise employment.
- As also explained in Chapter 2, the general business confidence and high exchange rate which have accompanied the mining boom have helped to maintain activity in the financial sector, in which employment is highly centralised.

As related in Chapter 2, mining was once a fairly labour-intensive industry which generated employment in far-flung locations. However, recent changes in the industry have had two results.

- Largely through indirect macroeconomic effects, a mining boom generates demands for skilled and specialised labour, met by immigration, thus increasing the demand for housing through population growth.
- Both directly and through its indirect effects on trade-exposed industry, a mining boom increases the difficulty and expense of providing affordable housing with good job access. This is because it adds very little to employment in areas with low dwelling construction costs.

By itself, therefore, we can expect a mining boom to reduce housing affordability. However, the period from 2005 to 2011 included more than a mining boom: it included the consumer credit boom which led up to the Global Financial Crisis and the subsequent Commonwealth stimulus. The housing affordability crisis antedates the mining boom – it was set off in the mid-1990s by a combination of high mortgage lending and the recentralisation of employment in the metropolitan areas. Recentralisation is continuing, but the boom in mortgage lending is tapering off for lack of credit-worthy borrowers.

### 1.5.2 The capacity to pay for housing

The determinants of house prices have been discussed at length in the *State of the Regions* reports for 2010-11 (generally) and 2006-07 (concerning underlying land costs). A primary determinant of house prices was found to be the accessibility of employment, or more precisely access to earnings opportunities from employment. This determinant is primary in the sense that it applies in the long run. Over periods of decades the housing market settles on prices justified by the earnings opportunities available from each house site with supplementary influence from the accessibility of local services and the quality of the urban landscape. This last is usually strongly correlated with local socio-economic status.

While these fundamental determinants apply in the long run, short-run changes in house prices can diverge sharply from the long run trend due to financial factors such as the availability of finance and the activities of speculators and due also to leads and lags in the processes of land development, redevelopment and dwelling construction.

Trends in the fundamental determinant, access to earned income with which to pay for housing, were outlined in Sections 1.3 and 1.4. Though this determinant is affected by changes in the location of employment and by transport investments which affect accessibility, these influences change slowly and over periods of five or six years access to earned income is affected chiefly by trends in regional employment and earnings. In this respect, over the period 2005-11 Australia divides into three groups of regions.

- Western Australia, particularly Perth, with high increases in the ability to pay for housing. In Perth increases in accessible earnings were of the order of 15-20 per cent for the six years.
- Victoria, and particularly Melbourne, with low increases in real accessible earnings, of the order of 1 per cent for the six years.
- The rest of the country, with moderate increases in accessible earnings of the order of 5-7 per cent a year. These moderate increases applied in Sydney and the rest of NSW, Queensland, the NT, Tasmania and SA. The ACT was an outlier at 10 per cent, which poised it between the general run of Eastern States growth rates and the WA rates.

On this basis, one would expect depressed house price growth in Victoria and rapid growth in WA. The actual pattern was very different.

### 1.5.3 House prices

At national level, over the period 2005-2011 house prices increased at more or less the same rate as household disposable income. On cursory inspection it can be claimed that this represented two offsetting forces: the tailing-off of the credit-based boom in house prices and the cutting-in of a new mining-based boom. Though both these factors could be observed, the geographic patterns reflect additional influences.

The only mining-boom region where house prices grew faster than household disposable income was WA Pilbara Kimberley. In other mining-boom regions average house prices either grew more slowly than disposable income (notably WA Gascoyne Goldfields and Qld Fitzroy Central West) or actually fell (Qld Mackay and the three Perth metropolitan regions). The decline of house prices in Perth during a period of rising ability to pay for housing is a substantial achievement, and reflects the following.

- A ready supply of greenfield sites at reasonable prices. Much of the country that surrounds Perth, including areas near to the coast, comprises sand dunes which are not in strong demand for hobby farms.
- Judicious investment in mass transit as well as roads.
- Some unwinding of speculative positions taken during the land boom of 1995-2008.

Outside WA, the region with the most rapid growth in the ability to pay for housing was the ACT. Here there was an increase in house prices but it fell well below the increase in disposable incomes. The ratio of house prices to disposable income in the ACT is now similar to Perth and reflects the benefits of the active land development and management policy of the ACT government. This has been a major reason why ACT residents have been able to save and become asset owners rather than mortgage debtors.

At the opposite extreme we have the paradox of virtually constant ability to pay for housing coupled with major house price increases in Melbourne. Despite the increases, average house prices in Melbourne in 2011 remained less than in Sydney and Perth, though generally above prices in Brisbane and Adelaide. Taking this into account, we may comment that the availability of greenfield sites at reasonable prices and job accessibility (or at least potential accessibility, as judged by distance from the CBD) turned developers' attention from Sydney to Melbourne, particularly Outer West and Outer North Melbourne. A second attractive factor was that, despite rising house prices and stagnant incomes, the typical mortgage burden was below Sydney – though rising to equality by 2011. The increase in house prices in Melbourne therefore had a large element of catch-up with Sydney and now that catch-up has been achieved the market may be expected to weaken.

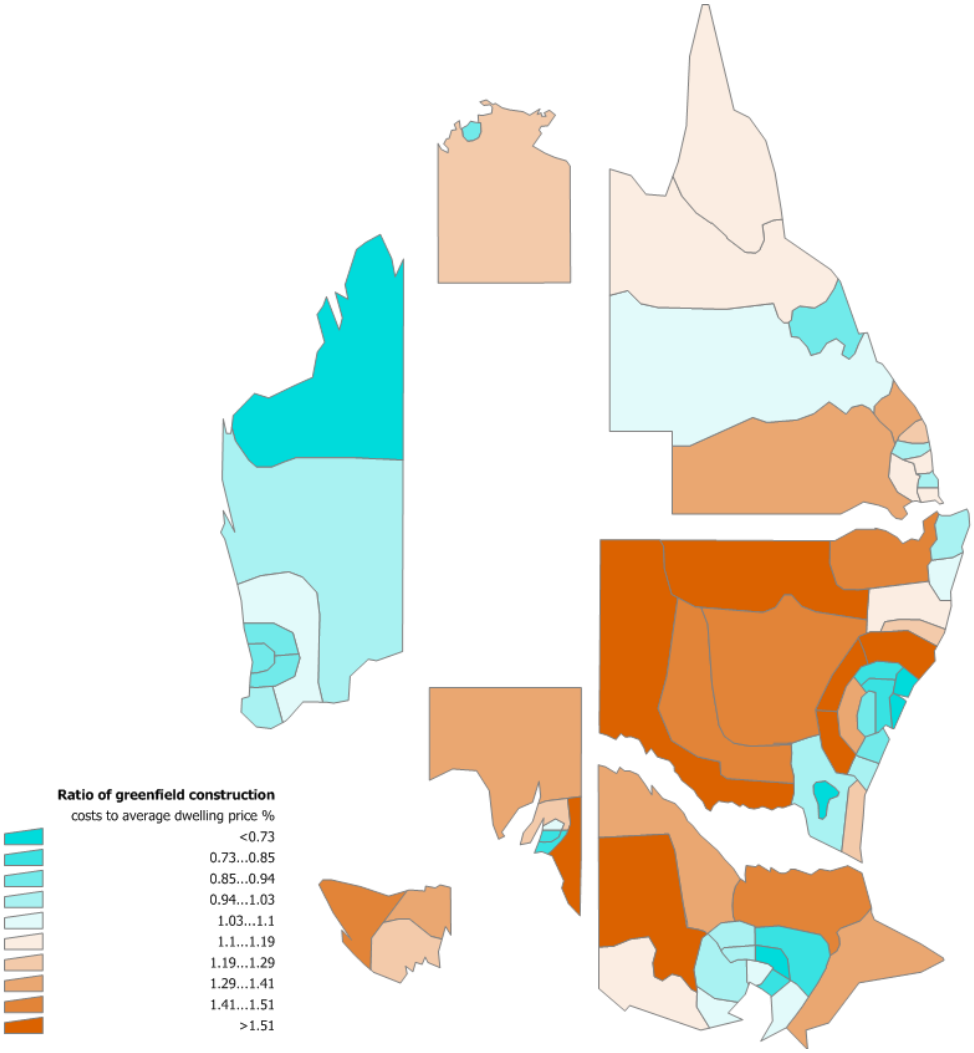
In Sydney the ability to pay for housing increased at more or less national average rates, maintaining Sydney's position as the metropolitan area with the highest capacity to pay for housing, at least in the regions east of Olympic Park – ability to pay in the Outer South West and Outer West was not dissimilar from Outer Northern Melbourne. By contrast with Melbourne, average house prices declined in most Sydney regions, though not enough to deprive Sydney Eastern Beaches of the highest average dwelling prices in the country. Prices on the western fringe of Sydney indeed fell to below the northern and western fringe in Melbourne. The decline in Sydney house prices went some way towards removing the speculative excess prices generated during the 1995-2008 credit boom.

Two other regions recovering from previous speculative excess in house prices were SEQ Gold Coast and SEQ Sunshine Coast. In both cases prices fell back towards the levels justified by regional earnings. In the rest of SEQ both the ability to pay for housing and house prices grew at national average rates.

The story in Adelaide was a subdued version of Melbourne: ability to pay up at more or less the national average rate, average house prices up rather more rapidly but to a level less than the two big cities and comparable with SEQ, so that house prices grew more rapidly than household disposable income.

In non-metropolitan regions outside WA and Victoria the ability to pay for housing grew at around the national average rate. Though house prices rose, the rate of growth was particularly low in the drought-affected regions of inland NSW. The drought appears to have dampened expectations much more than it reduced actual incomes. As a result, NSW Orana and SE East now have the lowest average house prices in the country, closely followed by other inland regions in Victoria, NSW and SA.

## Figure 1.2: Ratio of greenfield construction costs to average dwelling price (per cent)





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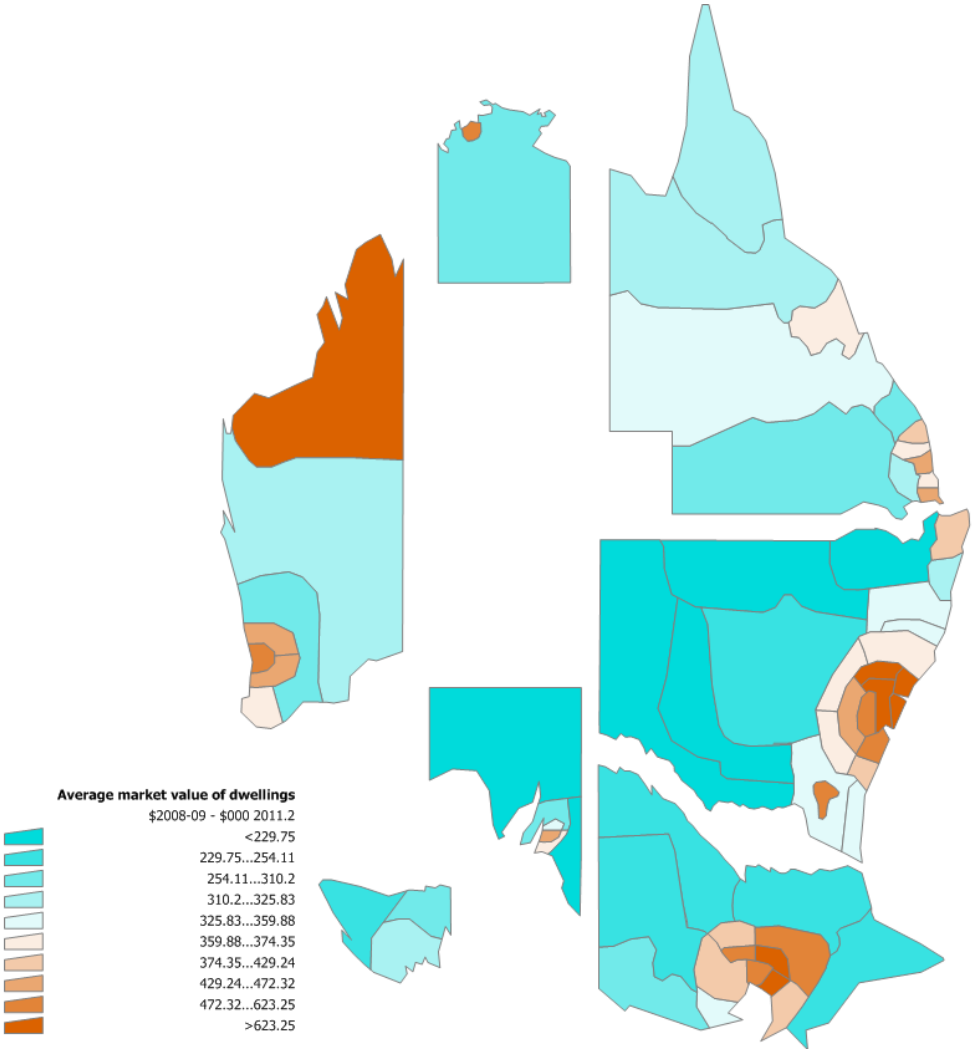
## Figure 1.3: Average market value of dwellings ($2008-09 – $'000 2011.2)





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## Figure 1.4: Change in average dwelling prices (2011.2 over 1991.3 in 2008-09 prices – %)

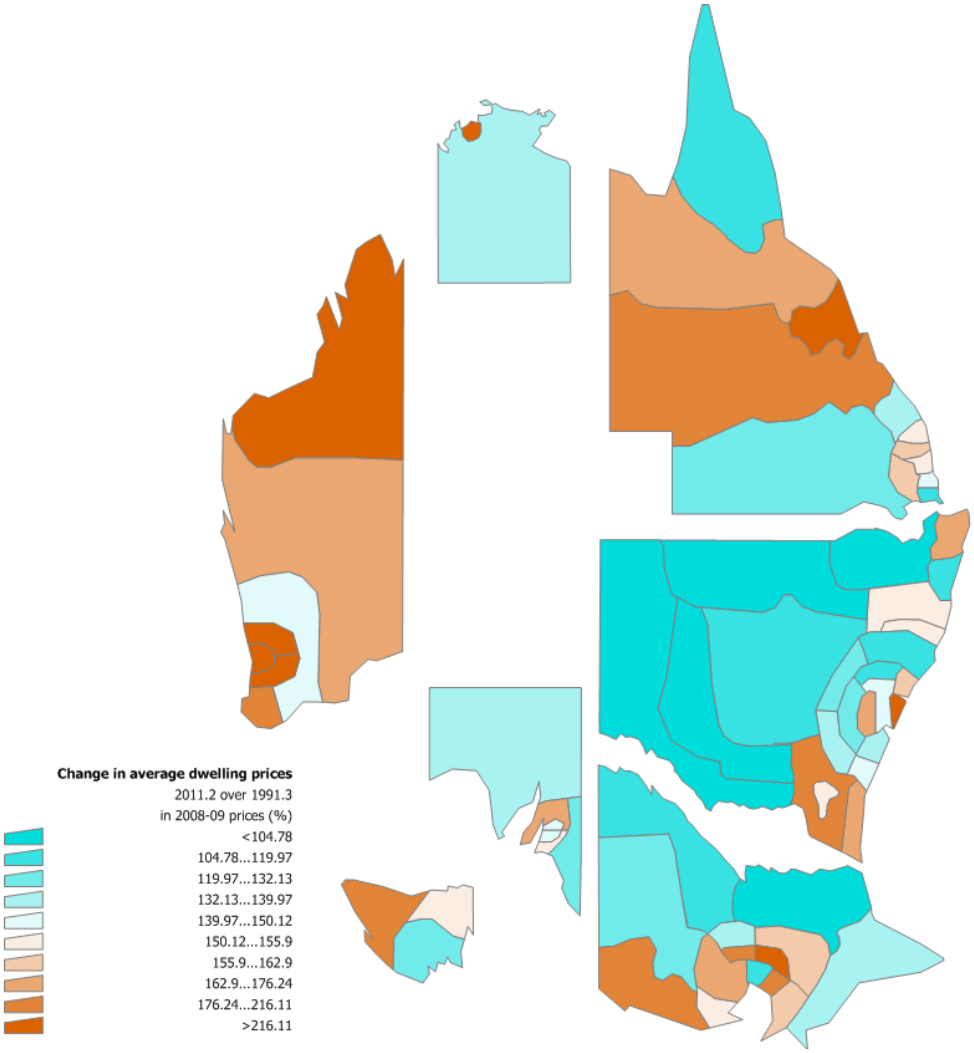



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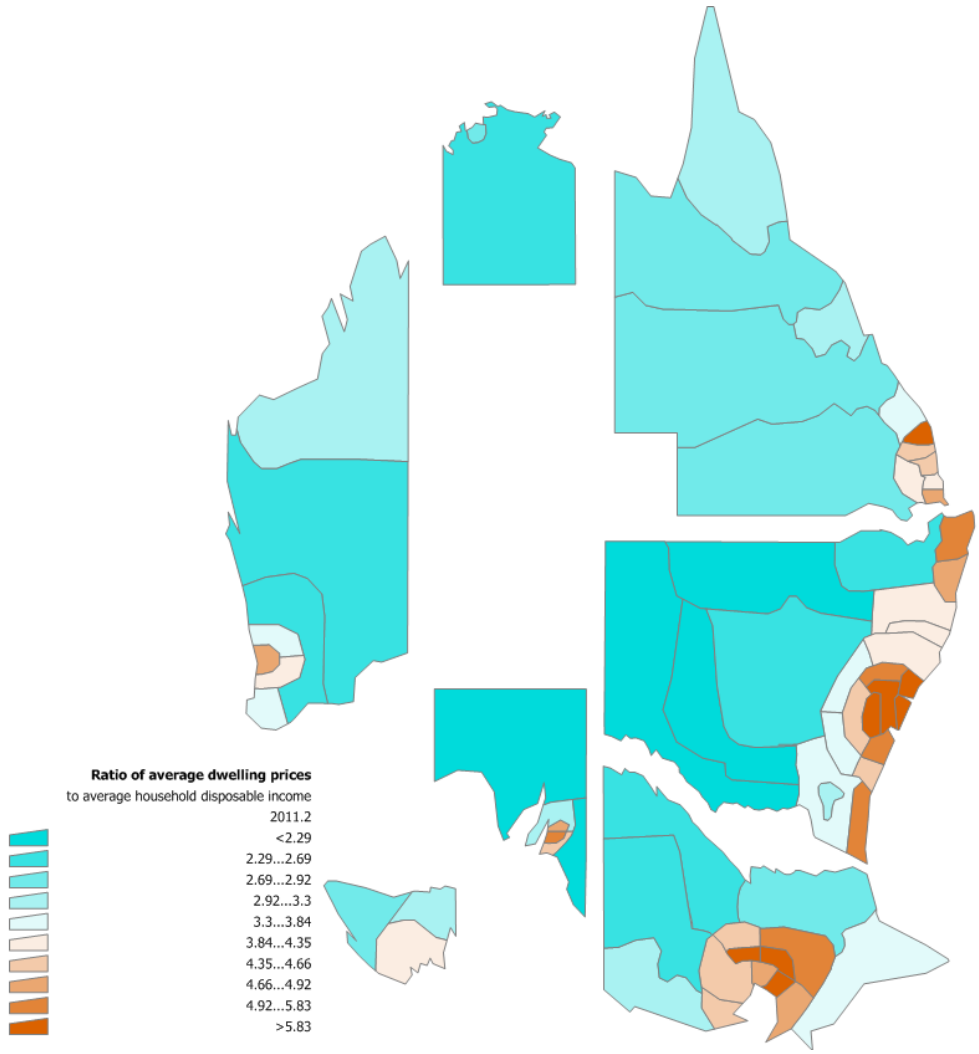
**Figure 1.5: Average dwelling prices to household disposable income (2011.2)**




### 1.5.4 Mortgage burdens

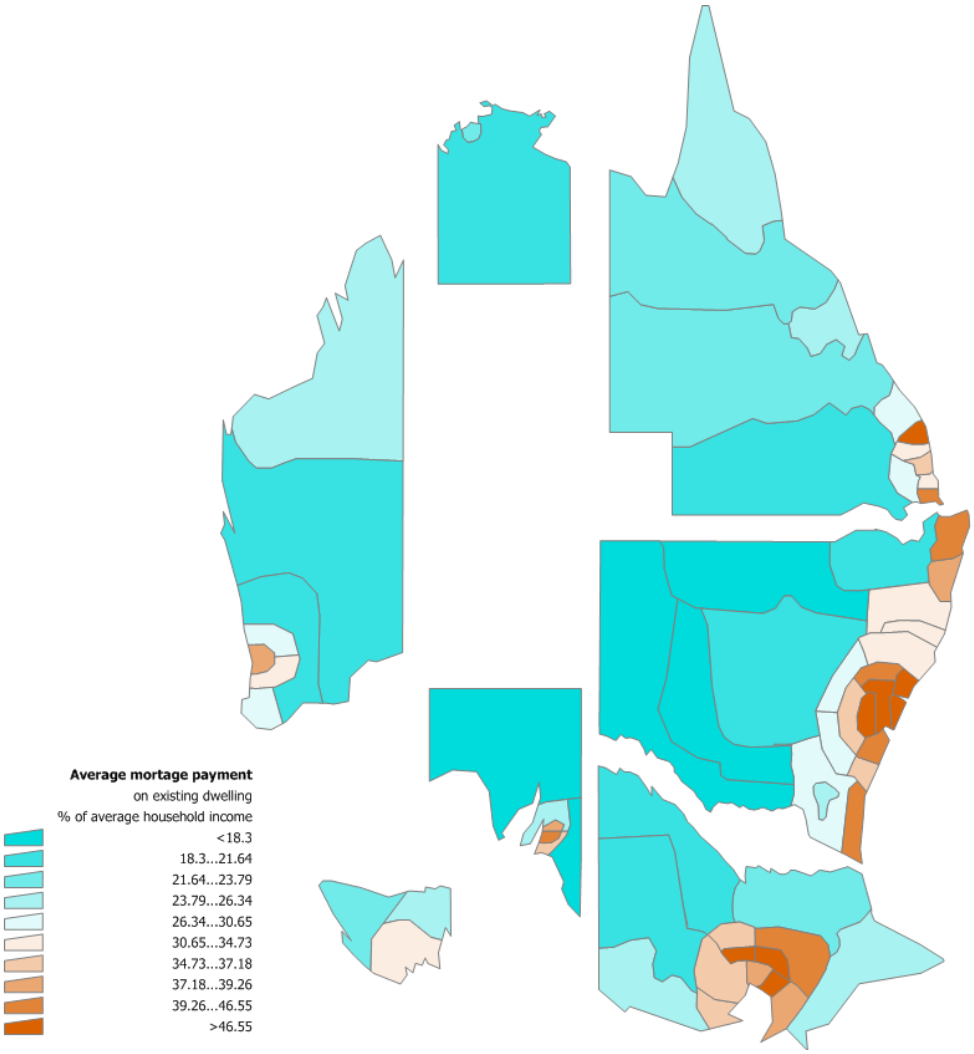
An important indicator of the affordability of housing is the mortgage burden in relation to household incomes. At national scale this declined a little between 2006 and 2011, indicating emergence from the credit-boom conditions of 1995-2008. The decline was particularly noticeable in Perth but did not extend to Adelaide and Melbourne, both of which experienced increases in the average mortgage burden – in all three cases reflecting trends in house price relative to incomes.

These changes have maintained the general rule that mortgage burdens are more severe in metropolitan areas than they are in non-metropolitan regions with their ready supply of low-cost residential land. In relation to household disposable income, mortgages were high in Sydney east of Olympic Park, Melbourne Inner East and South, Adelaide South and SEQ Sunshine Coast. The burdens were not so high in Sydney Outer West and Outer South West, where declining mortgages provided a little relief from rising transport costs.

This said, in Sydney Outer South West and Sydney Outer West mortgage burdens are still very high in relation to the ability to pay for housing as indicated by incomes accessible within reasonable time-distance. They are also high in SEQ Gold Coast and SEQ Sunshine Coast.

Nationally, the lowest average burdens are in WA Wheatbelt Great Southern and WA Gascoyne Goldfields, where incomes have benefited from the mining boom without too much effect, as yet, on house prices. By this measure housing is also quite affordable in the other WA regions except Perth Central. Housing is also highly affordable in the ACT, which combines the good fortune of rapid increases in income with house price increases moderated by an activist government approach to land supply. This activism was made possible by the foresight of the Commonwealth parliament which nationalised the land of the ACT nearly a century ago, thus ensuring a ready supply of land for residential development at rural land cost without any margins due to hobby farm developments or speculative holdings. Unfortunately this supply of raw land is almost exhausted so one may question the ability of the ACT government to maintain control over land supply with land banking possibly becoming an important issue.

**Figure 1.6: Average mortgage payment on existing dwelling (% of average household income)**





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### 1.5.5 Vacancy rates

When the dwelling construction rate falls behind the population growth rate, either the house vacancy rate must fall or the number of people in the average household must rise.

On a regional basis, high house vacancy rates are found in two circumstances:

- Lifestyle regions tend to have high vacancy rates due to holiday houses – whether second houses or houses maintained for intermittent rental to holidaymakers; and
- regions with declining populations tend to have high vacancy rates due to houses no longer required but not yet demolished.

Among the lifestyle regions, NSW South Coast recorded the highest house vacancy rate in 2011 (67 per cent) followed by SA Fleurieu (75 per cent). High vacancy rates in Great Lakes shire were largely responsible for a high overall vacancy rate in NSW Outer Hunter – this swamped the mining-related low vacancy rates in Muswellbrook and Singleton shires. However, not all lifestyle regions reported high vacancy rates; for example, in Qld Wide Bay Burnett the vacancy rate was around national average, reflecting its role as a retirement residential region rather than a weekend retreat region.

Several other regions which reported high vacancy rates did so as a combination of retreat accommodation and high vacancy rates in declining country towns. These included Vic Gippsland, Vic South West and WA Wheatbelt Great Southern.

At the other end of the scale, low vacancy rates were the norm in the metropolitan areas.

### 1.5.6 Household size

In the *State of the Regions* Report 2010-11 NIEIR observed that a major response to housing shortages is an increase in the number of people per occupied dwelling. The mechanisms include increases in group housing and failure of young adults to leave the parental nest. The simplest estimate of household size is calculated by dividing regional population by the number of occupied permanent private dwellings. By this measure, average dwelling occupancy was 3.1 people in 2011, an increase from 2.9 persons per occupied private dwelling in 2005. Possible reasons for the increase include the following.

- An increase in the proportion of the population accommodated in non-private dwellings, which are mainly dwellings which are not self-contained such as hotels, hostels and army barracks. These people enter into the numerator of the measure but not into the denominator and can raise the average even when relatively few establishments are involved.
- Much the same effect occurs if the proportion of the population sleeping rough rises.
- A voluntary reversal of the previous trend towards increased numbers of single-person households. An example would be the immigration of refugees from places like Somalia where large families are the norm.
- An involuntary reversal of the previous trend towards increased numbers of single-person households due to problems of housing affordability.

The reversal of the trend towards smaller households coincides with the trend to worsening affordability, so there is a strong probability that the last of these possibilities is dominant. However, other factors affect the geographic pattern. Average household size tends to be large in the following kinds of regions.

- Regions dominated by young families – hence outer suburbs generally.
- Regions with high Aboriginal populations, due not only to large families but to inadequate provision of houses.
- Regions with high institutional populations, hence city centres (with many hotels), military regions (with barracks) and booming mining regions (with catered accommodation in construction camps).

These factors account for part of the national pattern of house occupancy: higher in outer suburbs than in well-established suburbs, generally high in Northern Australia (particularly NT Lingiari), and low in regions of ageing population.

The influence of housing affordability becomes more apparent when we shift to the pattern of changes in average household size. Over the five years from 2005 to 2011 the national average number of people per dwelling increased by 0.16 persons. The increase was more than double this in four regions.

- The City of Melbourne, due to increased hotel and student hostel accommodation.
- The two NT regions, due to increased military and catered construction camp accommodation as well as general affordability pressures in Darwin.
- WA Pilbara Kimberley, due to increased catered construction and mining camp accommodation as well as general affordability pressures.

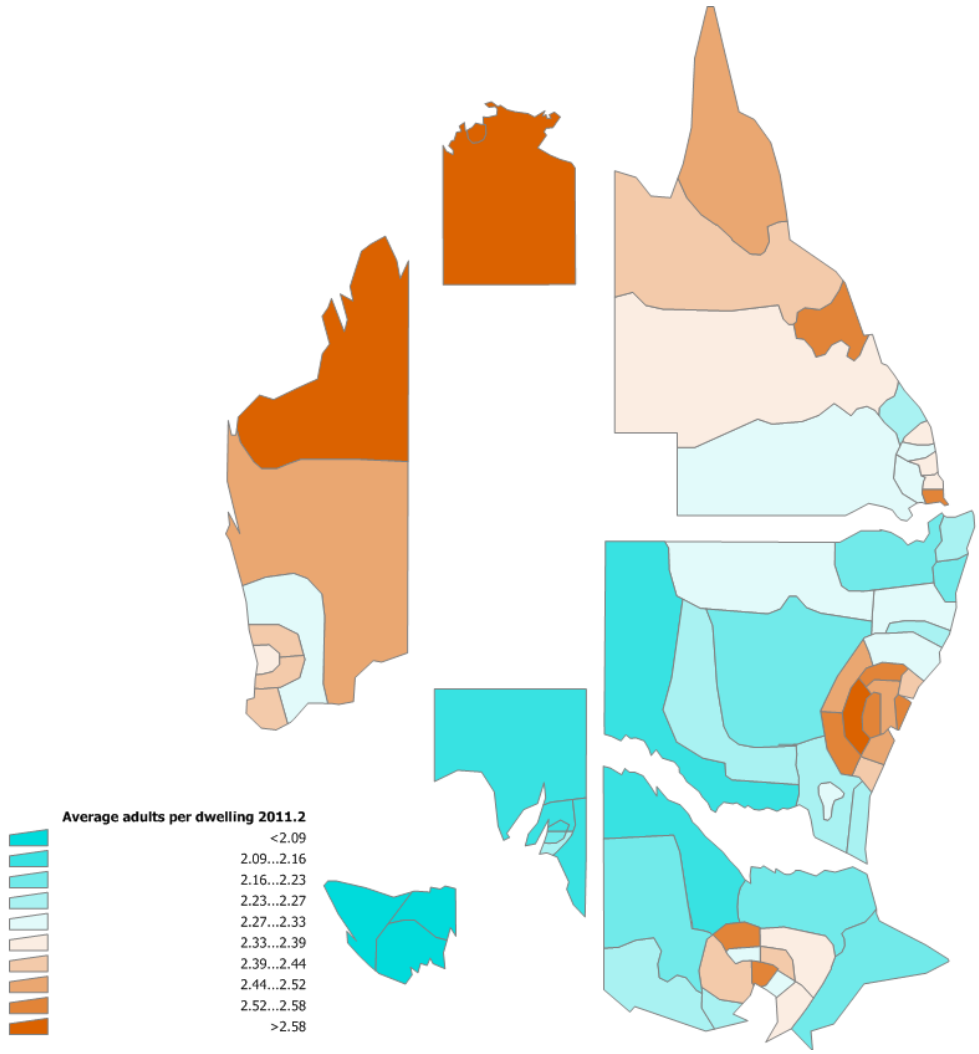
The other mining boom regions recorded more or less average national increases in average household size, indicating that construction (even if it was only dongas) was not far short of keeping pace with demand.

The other regions in which average household size grew more rapidly than national average were the following.

- All Sydney regions, and particularly Central, Eastern Beaches and Parramatta Bankstown. There is no explanation for these increases apart from difficulties with housing affordability.
- All Perth regions, not quite so strongly as Sydney but still significantly. However in this case some of the increase might be due to a younger, family-oriented population.
- SEQ Gold Coast and SEQ Sunshine Coast, reflecting a rise in average household size from below-average to average as the proportion of families increased and the proportion of retirees fell.

At the other end of the scale, Tasmania North and Tasmania North West maintained the previous trend to smaller households. By this measure housing was reasonably affordable in Tasmania South, non-metropolitan SA, NSW Murray Far West and NSW Northern Inland.

**Figure 1.7: Adult population per dwelling (2011.2)**




## 1.5.7 The housing shortage

By comparing average dwelling occupancy with the rate achieved in regions with little evidence of housing shortage, NIEIR has prepared estimates of the housing shortage, in the sense of the shortage of housing which can reasonably be provided by the private sector. The estimates do not attempt to cover the need for welfare housing, such as the housing requirements of homeless people or those requiring special accommodation such as aged care. The housing shortage is expressed as a proportion of occupied private dwellings, and represents the addition to the dwelling stock required to bring dwelling occupancy rates back to normal in each region. There is no implication that it is practicable to do this.

The estimates are as expected. There is a national housing shortage concentrated in a limited number of regions and absent from many others. The shortage is concentrated in Sydney followed by Melbourne, with lower levels of shortage in SEQ (especially the Gold Coast), Perth and Adelaide. The effectiveness of the Queensland policy of adding to the western suburbs of Brisbane is shown by the low level of shortage in SEQ West Moreton – which has the effect of reducing the shortage elsewhere in SEQ. Unlike Sydney and Melbourne, where the shortage reflects the lack of greenfields residential sites with high job accessibility, the shortage in Perth is due to lags in construction to keep

up with population growth and will be much easier to rectify than the shortage in the two very big cities.

Among the mining areas, there is a noticeable shortage in two regions – WA Pilbara Kimberley and Qld Mackay, both likely to be due to construction lags. There is a general but milder shortage in the other regions north of Capricorn. By contrast, there is no shortage of private-sector housing (as distinct from welfare housing) in Tasmania, non-metropolitan Victoria, non-metropolitan SA (apart, perhaps, from SA Fleurieu), non-metropolitan NSW (apart from NSW Illawarra), one region in WA, Wheatbelt Great Southern, and two non-metropolitan regions in Queensland, Qld Wide Bay Burnett and Qld Darling Downs South West.

### 1.5.8 Conclusion

In so far as it has redirected population and income growth towards areas with abundant land for housing development, the mining boom has had a favourable effect on housing affordability – fortunately mine construction and operation pay enough to compensate for high remote-area construction costs. More important, the boom has directed population and income growth away from Sydney and Melbourne and towards Perth and to a lesser extent SEQ and the ACT – all of which, in their various ways, have strategies for the provision of affordable housing based on greenfields developments.

The mining boom has, however, had two adverse effects. By worsening the economic prospects of the non-mining trade-exposed industries, it has worsened the capacity to pay for housing in outer suburbs generally, and particularly in outer Sydney, Melbourne and Adelaide while at the same time promoting the centralisation of employment. Even worse, by dimming the economic prospects of the average rural region (including its prospects of value-adding to rural produce) the mining boom is creating a swathe of affordable housing in places where job opportunities are declining.

## Figure 1.8: Housing shortage (per cent)

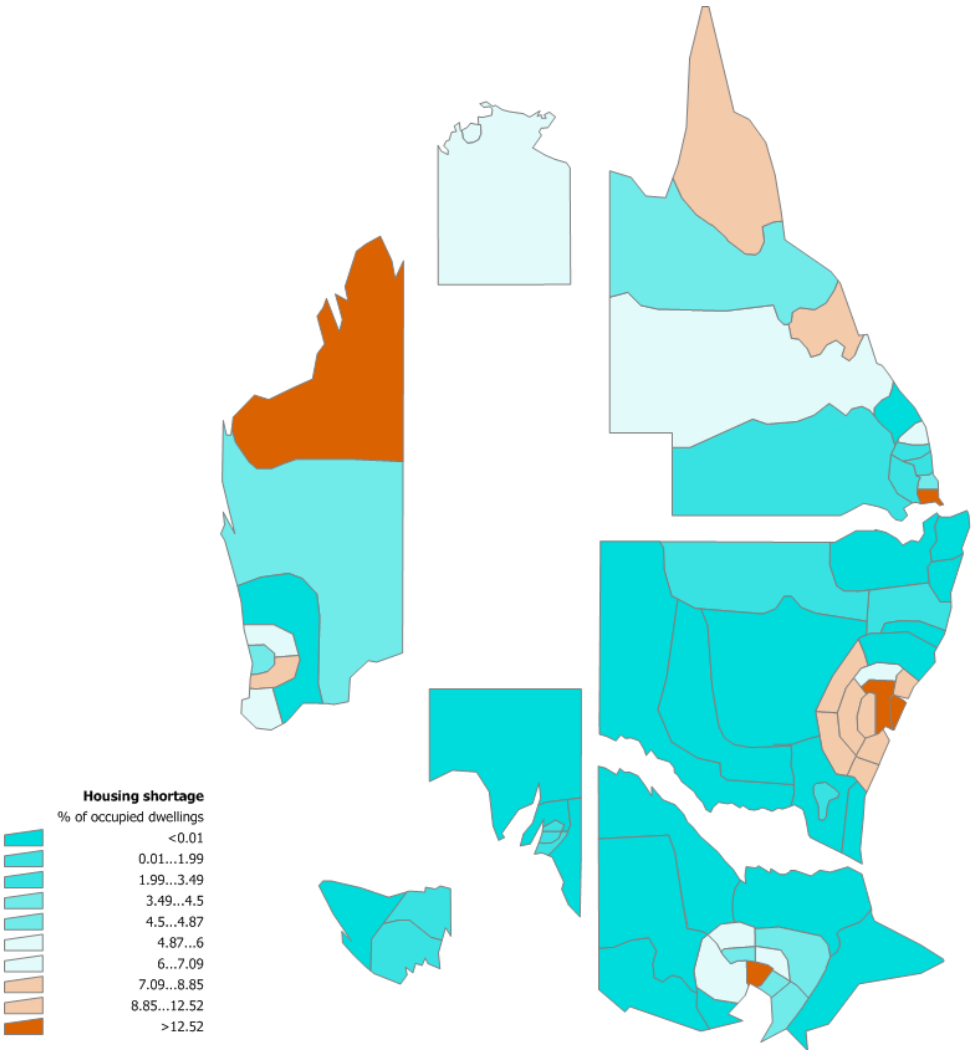




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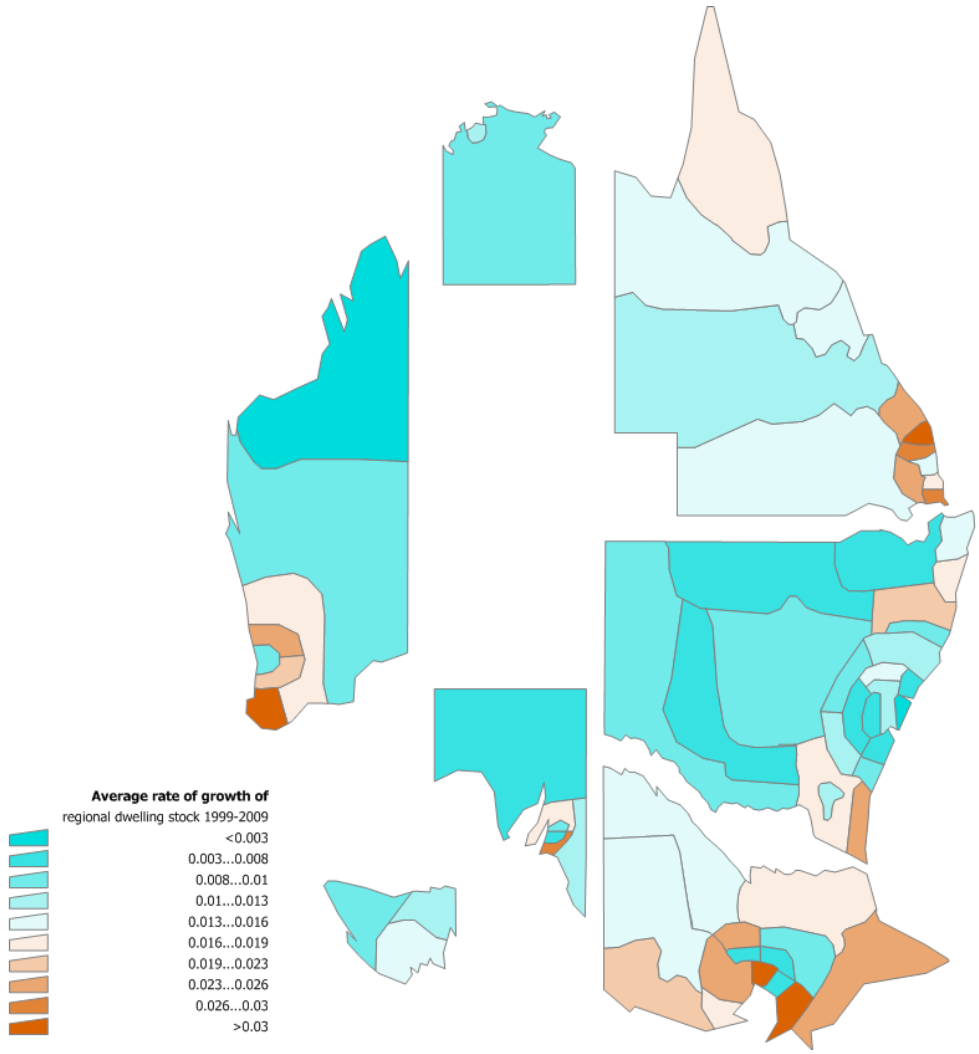
**Figure 1.9: Average rate of growth of regional dwelling stock (1999 to 2009)**




## 1.6 Measures of regional divergence

Over the past decade and a half Australia has experienced two overlapping booms – a credit-based land boom based on household debt and a mining boom the benefits of which have been partially generalised by further accumulation of household debt. Though the mechanisms of boom are different, the two overlap. We therefore define two overlapping periods – 1998 to 2008 for the land boom and 2005 to 2011 for the mining boom.

The data considered in this the foregoing sections can be used to address an important question: what have these booms done for interregional equality? For each measure, we calculate the aggregate Australian annual rate of growth followed by annual growth in two measures of regional inequality. The first measure (overall divergence) is calculated by adding regional divergences from the national average, regardless of sign; the second (maximum) is simply the difference between the highest regional value and the lowest, regardless of what is happening in any other region.

In interpreting these estimates, it should be remembered that they refer to differences of regional averages, not to differences between individuals.

The underlying data is provided, at national level, in Table 1.1, while indicator values for each region are provided in Tables 1.2 to 1.8. In these latter tables the estimates for 1998 stand for the beginning of the combined land/mining boom, while the estimates for 2011chart the progress of the boom to date.

### 1.6.1 Gross regional product per capita

This measure is a close relative of business productivity discussed in Section 1.2. It grew by 3.1 per cent a year under the land boom but at about half that rate under the mining boom.

Inequality between regions increased by both measures and in both periods. The rate of increase in inequality was faster during the land boom.

### 1.6.2 Household disposable income per capita

This measure was also discussed in 1.4.9. By contrast with gross regional product per capita it grew by around 2.6 per cent a year under the land boom and a little more rapidly under the mining boom.

Inequality between regions increased by both measures and in both periods. The maximum measure increased more than the overall divergence indicator. According to the overall divergence indicator, the mining boom generated inter-regional inequality more rapidly than the land boom.

### 1.6.3 Headline unemployment

As discussed in Section 1.3.5, the definition of headline unemployment was massaged so that the rate declined during both booms – more rapidly during the land boom than during the mining boom.

Concurrent with the decline in headline unemployment, the overall divergence of headline unemployment rates also declined – more so during the land boom than during the mining boom. Indeed, according to the maximum indicator the spread of headline unemployment rates increased during the mining boom. In general, these trends are contrary to the trends in the other indicators of regional inequality, which casts doubt on the continuing validity of the headline unemployment rate as an indicator of unutilised labour resources.

### 1.6.4 NIEIR unemployment

The national NIEIR unemployment rate was very close to constant during the land boom but increased during the mining boom (see also Section 1.3.4).

Regional divergence of NIEIR unemployment rates grew slightly under the land boom (regional divergence) or possibly declined (maximum). However, both measures agree that inter-regional inequality increased under the mining boom.

**Table 1.1 Divergence indicator summary**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Equality indicator** | | | | | | | | | | | | | | |
| Gross local regional product per capita ($CVM per capita) | 17.1 | 18.0 | 19.7 | 19.5 | 17.3 | 17.7 | 18.9 | 19.2 | 19.2 | 20.5 | 21.4 | 21.1 | 21.0 | 20.9 |
| Real household disposable income ($CVM per capita) | 13.2 | 14.0 | 14.4 | 14.1 | 13.5 | 13.4 | 13.6 | 13.6 | 13.3 | 14.4 | 14.6 | 14.0 | 14.5 | 15.4 |
| Headline unemployment rate (%) | 2.1 | 1.9 | 1.8 | 1.6 | 1.6 | 1.4 | 1.3 | 1.2 | 1.3 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 |
| NIEIR unemployment rate (%) | 2.3 | 2.4 | 2.4 | 2.4 | 2.2 | 2.1 | 2.1 | 2.1 | 2.2 | 2.3 | 2.4 | 2.3 | 2.3 | 2.4 |
| Social Security take-up rate (%) | 2.7 | 2.8 | 2.9 | 3.0 | 3.2 | 3.3 | 3.2 | 3.2 | 3.1 | 3.2 | 3.2 | 3.2 | 3.2 | 3.6 |
| Not in employment full time equivalent rate (%) | 4.5 | 5.1 | 5.1 | 4.7 | 4.3 | 4.2 | 4.2 | 4.4 | 4.4 | 4.8 | 5.0 | 5.1 | 4.8 | 5.1 |
| Hours per week per working age population (%) | 1.7 | 1.9 | 1.9 | 1.8 | 1.6 | 1.6 | 1.6 | 1.7 | 1.7 | 1.8 | 1.9 | 1.9 | 1.8 | 1.9 |
| **Difference from Maximum to Minimum** | | | | | | | | | | | | | | |
| Gross local regional product per capita ($CVM per capita) | 29300 | 32563 | 37899 | 39052 | 34667 | 34644 | 39300 | 46134 | 46839 | 51334 | 54027 | 52648 | 52906 | 52470 |
| Real household disposable income ($CVM per capita) | 20793 | 22080 | 24796 | 25123 | 22363 | 23591 | 26611 | 29894 | 30126 | 34053 | 34312 | 34677 | 37185 | 38284 |
| Headline unemployment rate (%) | 12.0 | 11.3 | 12.0 | 9.3 | 9.5 | 9.3 | 8.6 | 7.2 | 7.0 | 6.7 | 5.5 | 5.7 | 8.0 | 9.0 |
| NIEIR unemployment rate (%) | 14.1 | 14.7 | 15.4 | 16.0 | 15.4 | 14.4 | 13.6 | 12.3 | 13.3 | 11.0 | 12.7 | 12.5 | 13.7 | 14.5 |
| Social Security take-up rate (%) | 17.8 | 18.3 | 18.7 | 18.9 | 21.8 | 22.1 | 22.5 | 22.3 | 17.4 | 16.9 | 16.8 | 16.8 | 16.2 | 18.4 |
| Not in employment full time equivalent rate (%) | 27.4 | 29.3 | 32.2 | 37.6 | 29.9 | 32.1 | 42.4 | 43.6 | 43.3 | 43.8 | 48.7 | 47.6 | 48.5 | 51.5 |
| Hours per week per working age population (%) | 10.4 | 11.1 | 12.3 | 14.3 | 11.4 | 12.2 | 16.1 | 16.6 | 16.4 | 16.6 | 18.5 | 18.1 | 18.4 | 19.6 |
| **National indicator value** | | | | | | | | | | | | | | |
| Gross local regional product per capita ($CVM per capita) | 30638 | 31385 | 32610 | 32695 | 33171 | 33937 | 35565 | 37138 | 38701 | 40301 | 41498 | 40953 | 40994 | 40719 |
| Real household disposable income ($CVM per capita) | 27241 | 27562 | 28576 | 29230 | 29680 | 29736 | 30828 | 31742 | 32672 | 34671 | 35045 | 36988 | 36813 | 37789 |
| Headline unemployment rate (%) | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.2 | 1.2 | 1.1 | 1.1 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 |
| NIEIR unemployment rate (%) | 2.1 | 2.2 | 2.2 | 2.2 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Social Security take-up rate (%) | 2.7 | 2.8 | 2.9 | 3.0 | 3.1 | 3.1 | 3.0 | 2.9 | 3.0 | 3.0 | 2.9 | 2.9 | 2.9 | 3.2 |
| Not in employment full time equivalent rate (%) | 3.8 | 4.3 | 4.3 | 4.1 | 3.6 | 3.6 | 3.5 | 3.7 | 3.8 | 4.1 | 4.3 | 4.3 | 4.1 | 4.5 |
| Hours per week per working age population (%) | 1.4 | 1.6 | 1.6 | 1.5 | 1.4 | 1.4 | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.7 | 1.6 | 1.7 |

*Notes:* **Equality indicator** is derived as the average of the sum of absolute difference of each region from national average.
The **Difference from maximum to minimum** is an indicator or the spread of the regional values for each indicator value.

| Table 1.2 | Gross local regional product – difference from Australian average (per cent) | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | 53.3 | 61.0 |
| 2 | Sydney Eastern Beaches | 58.4 | 90.1 |
| 3 | Sydney Northern Beaches | 58.4 | 64.9 |
| 4 | Sydney Old West | -1.9 | 1.1 |
| 5 | Sydney Outer North | 57.5 | 43.1 |
| 6 | Sydney Outer South West | -4.4 | -14.4 |
| 7 | Sydney Outer West | -8.3 | -6.9 |
| 8 | Sydney Parramatta Bankstown | -12.8 | -21.5 |
| 9 | Sydney South | 23.5 | 15.1 |
| 10 | NSW Central Coast | -11.8 | -15.7 |
| 11 | NSW Central West | -16.0 | -21.7 |
| 12 | NSW Illawarra | -4.2 | -9.9 |
| 13 | NSW Mid North Coast | -37.2 | -38.4 |
| 14 | NSW Murray Far West | -16.0 | -19.0 |
| 15 | NSW Newcastle | -9.8 | -11.6 |
| 16 | NSW Northern Inland | -11.4 | -24.3 |
| 17 | NSW Northern Rivers | -34.3 | -32.8 |
| 18 | NSW Orana | -16.0 | -20.2 |
| 19 | NSW Outer Hunter | -11.5 | -18.7 |
| 20 | NSW Riverina | -7.9 | -16.6 |
| 21 | NSW South Coast | -32.2 | -32.4 |
| 22 | NSW Southern Inland | -10.9 | -5.5 |
| 23 | Melbourne City | 35.7 | 26.2 |
| 24 | Melbourne Eastern Inner | 23.8 | 24.3 |
| 25 | Melbourne Eastern Outer | 3.8 | -1.3 |
| 26 | Melbourne Northern Inner | -3.7 | 6.9 |
| 27 | Melbourne Northern Outer | -7.6 | -18.1 |
| 28 | Melbourne Southern Inner | 20.2 | 28.9 |
| 29 | Melbourne Southern Outer | -4.4 | -13.5 |
| 30 | Melbourne Western | -8.3 | -9.5 |
| 31 | VIC Geelong | -14.1 | -16.3 |
| 32 | VIC Gippsland | -18.4 | -18.5 |
| 33 | VIC Grampians | -16.1 | -20.3 |
| 34 | VIC Hume | -11.9 | -18.7 |
| 35 | VIC Loddon Mallee | -13.8 | -20.8 |
| 36 | VIC South West | -5.4 | -9.0 |
| 37 | SEQ Brisbane City | 9.7 | 16.6 |
| 38 | SEQ Gold Coast | -13.5 | -14.9 |
| 39 | SEQ West Moreton | -23.2 | -27.0 |
| 40 | SEQ Logan Redland | -16.5 | -15.4 |
| 41 | SEQ Moreton Bay | -19.8 | -17.9 |
| 42 | SEQ Sunshine Coast | -23.4 | -25.9 |
| 43 | QLD Darling Downs South West | -8.7 | -22.2 |
| 44 | QLD Far North Torres | -7.7 | -20.0 |
| 45 | QLD Fitzroy Central West | -7.3 | -10.2 |
| 46 | QLD Mackay | 4.3 | 10.3 |
| 47 | QLD Townsville North West | 0.1 | 0.5 |
| 48 | QLD Wide Bay Burnett | -33.8 | -37.1 |
| 49 | Adelaide South | 4.2 | 1.8 |
| 50 | Adelaide North | -17.1 | -21.9 |
| 51 | SA East | 11.4 | -10.4 |
| 52 | SA Far North and West | 0.1 | -10.4 |
| 53 | SA Fleurieu | -1.0 | -11.0 |
| 54 | SA North | -7.5 | -19.3 |
| 55 | Perth Central | 5.2 | 37.3 |
| 56 | Perth Outer North | -5.8 | 12.6 |
| 57 | Perth Outer South | -6.5 | 7.9 |
| 58 | WA Gascoyne Goldfields | 22.7 | 2.8 |
| 59 | WA Peel South West | -5.7 | -8.7 |
| 60 | WA Pilbara Kimberley | 18.0 | 14.0 |
| 61 | WA Wheatbelt Great Southern | 34.7 | 6.5 |
| 62 | TAS Hobart South | -21.4 | -18.3 |
| 63 | TAS North | -23.7 | -22.9 |
| 64 | TAS North West | -20.5 | -17.3 |
| 65 | NT Darwin | 15.9 | 34.9 |
| 66 | NT Lingiari | -25.8 | -38.7 |
| 67 | ACT | 44.0 | 70.2 |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| Table 1.3 Real household disposable income per capita – difference from Australian average (per cent) | | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | 38.6 | 42.3 |
| 2 | Sydney Eastern Beaches | 49.6 | 63.6 |
| 3 | Sydney Northern Beaches | 47.8 | 42.7 |
| 4 | Sydney Old West | -1.3 | -2.6 |
| 5 | Sydney Outer North | 47.8 | 25.4 |
| 6 | Sydney Outer South West | -5.4 | -13.5 |
| 7 | Sydney Outer West | -9.0 | -8.6 |
| 8 | Sydney Parramatta Bankstown | -9.0 | -19.6 |
| 9 | Sydney South | 17.3 | 8.2 |
| 10 | NSW Central Coast | -8.7 | -12.4 |
| 11 | NSW Central West | -5.9 | -1.6 |
| 12 | NSW Illawarra | -1.6 | -8.4 |
| 13 | NSW Mid North Coast | -23.7 | -28.3 |
| 14 | NSW Murray Far West | -0.3 | 8.5 |
| 15 | NSW Newcastle | -2.7 | -6.8 |
| 16 | NSW Northern Inland | 4.2 | -9.7 |
| 17 | NSW Northern Rivers | -20.1 | -25.1 |
| 18 | NSW Orana | -3.5 | 5.3 |
| 19 | NSW Outer Hunter | -5.8 | -13.3 |
| 20 | NSW Riverina | 4.1 | 13.5 |
| 21 | NSW South Coast | -22.1 | -25.9 |
| 22 | NSW Southern Inland | -4.5 | -2.6 |
| 23 | Melbourne City | 25.3 | 16.9 |
| 24 | Melbourne Eastern Inner | 22.1 | 10.0 |
| 25 | Melbourne Eastern Outer | 2.0 | -5.7 |
| 26 | Melbourne Northern Inner | -2.2 | -0.4 |
| 27 | Melbourne Northern Outer | -8.0 | -19.2 |
| 28 | Melbourne Southern Inner | 17.0 | 18.2 |
| 29 | Melbourne Southern Outer | -6.5 | -14.3 |
| 30 | Melbourne Western | -7.3 | -11.4 |
| 31 | VIC Geelong | -8.2 | -13.5 |
| 32 | VIC Gippsland | -16.8 | -16.5 |
| 33 | VIC Grampians | -13.7 | -1.5 |
| 34 | VIC Hume | -10.9 | -5.0 |
| 35 | VIC Loddon Mallee | -13.6 | -1.6 |
| 36 | VIC South West | -7.5 | 4.5 |
| 37 | SEQ Brisbane City | 5.8 | 9.4 |
| 38 | SEQ Gold Coast | -13.9 | -15.0 |
| 39 | SEQ West Moreton | -20.4 | -22.0 |
| 40 | SEQ Logan Redland | -14.2 | -18.1 |
| 41 | SEQ Moreton Bay | -18.9 | -19.6 |
| 42 | SEQ Sunshine Coast | -18.3 | -24.8 |
| 43 | QLD Darling Downs South West | -6.7 | -7.7 |
| 44 | QLD Far North Torres | -6.1 | -12.5 |
| 45 | QLD Fitzroy Central West | -5.5 | -1.5 |
| 46 | QLD Mackay | 4.4 | 9.4 |
| 47 | QLD Townsville North West | 1.5 | 1.5 |
| 48 | QLD Wide Bay Burnett | -26.7 | -28.0 |
| 49 | Adelaide South | 6.2 | -0.9 |
| 50 | Adelaide North | -11.4 | -20.0 |
| 51 | SA East | 2.8 | 17.6 |
| 52 | SA Far North and West | -2.9 | 2.9 |
| 53 | SA Fleurieu | -5.2 | -10.2 |
| 54 | SA North | -11.2 | -7.2 |
| 55 | Perth Central | 2.9 | 32.7 |
| 56 | Perth Outer North | -7.7 | 8.0 |
| 57 | Perth Outer South | -7.8 | 4.9 |
| 58 | WA Gascoyne Goldfields | 12.7 | 13.2 |
| 59 | WA Peel South West | -10.6 | -8.0 |
| 60 | WA Pilbara Kimberley | 5.2 | 22.0 |
| 61 | WA Wheatbelt Great Southern | 25.5 | 18.6 |
| 62 | TAS Hobart South | -22.5 | -8.8 |
| 63 | TAS North | -22.2 | -6.3 |
| 64 | TAS North West | -18.4 | -6.0 |
| 65 | NT Darwin | 12.7 | 44.1 |
| 66 | NT Lingiari | -25.1 | -30.0 |
| 67 | ACT | 34.4 | 71.4 |


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| Table 1.4 | Headline unemployment rate – difference from Australian average (percentage point) | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | -4.0 | -1.4 |
| 2 | Sydney Eastern Beaches | -3.9 | -2.3 |
| 3 | Sydney Northern Beaches | -5.3 | -1.5 |
| 4 | Sydney Old West | -1.7 | 1.3 |
| 5 | Sydney Outer North | -5.6 | -1.7 |
| 6 | Sydney Outer South West | 1.1 | 0.5 |
| 7 | Sydney Outer West | -0.9 | 0.9 |
| 8 | Sydney Parramatta Bankstown | 1.8 | 2.8 |
| 9 | Sydney South | -4.4 | -0.4 |
| 10 | NSW Central Coast | 1.0 | 0.9 |
| 11 | NSW Central West | -2.3 | -0.4 |
| 12 | NSW Illawarra | 3.5 | 1.6 |
| 13 | NSW Mid North Coast | 5.3 | 1.3 |
| 14 | NSW Murray Far West | 1.3 | 0.8 |
| 15 | NSW Newcastle | 3.2 | -0.4 |
| 16 | NSW Northern Inland | -0.6 | 0.7 |
| 17 | NSW Northern Rivers | 6.2 | 0.8 |
| 18 | NSW Orana | -0.6 | 0.7 |
| 19 | NSW Outer Hunter | -0.1 | -1.1 |
| 20 | NSW Riverina | -0.5 | -0.4 |
| 21 | NSW South Coast | 6.4 | 2.2 |
| 22 | NSW Southern Inland | -1.5 | -1.6 |
| 23 | Melbourne City | -0.8 | -1.2 |
| 24 | Melbourne Eastern Inner | -1.4 | -0.5 |
| 25 | Melbourne Eastern Outer | -1.6 | -1.0 |
| 26 | Melbourne Northern Inner | 1.7 | -0.3 |
| 27 | Melbourne Northern Outer | -0.6 | 1.0 |
| 28 | Melbourne Southern Inner | -0.4 | -0.4 |
| 29 | Melbourne Southern Outer | -0.8 | -0.2 |
| 30 | Melbourne Western | 1.5 | 0.9 |
| 31 | VIC Geelong | 3.0 | 0.5 |
| 32 | VIC Gippsland | 2.3 | -0.4 |
| 33 | VIC Grampians | 2.8 | 1.3 |
| 34 | VIC Hume | -0.6 | 0.6 |
| 35 | VIC Loddon Mallee | 0.8 | 0.7 |
| 36 | VIC South West | -0.1 | -0.8 |
| 37 | SEQ Brisbane City | -1.1 | -0.6 |
| 38 | SEQ Gold Coast | 2.0 | 0.9 |
| 39 | SEQ West Moreton | 1.7 | -0.6 |
| 40 | SEQ Logan Redland | 2.2 | 1.9 |
| 41 | SEQ Moreton Bay | 2.1 | -0.3 |
| 42 | SEQ Sunshine Coast | 4.5 | 1.4 |
| 43 | QLD Darling Downs South West | -1.0 | -1.5 |
| 44 | QLD Far North Torres | -2.1 | 5.4 |
| 45 | QLD Fitzroy Central West | 0.8 | 0.3 |
| 46 | QLD Mackay | 0.0 | -0.9 |
| 47 | QLD Townsville North West | -0.1 | -0.6 |
| 48 | QLD Wide Bay Burnett | 3.7 | 1.7 |
| 49 | Adelaide South | -0.4 | -0.2 |
| 50 | Adelaide North | 3.3 | 1.9 |
| 51 | SA East | 1.4 | 1.0 |
| 52 | SA Far North and West | 2.6 | -0.2 |
| 53 | SA Fleurieu | 0.8 | -1.1 |
| 54 | SA North | 2.0 | -1.0 |
| 55 | Perth Central | -0.2 | -0.8 |
| 56 | Perth Outer North | -2.0 | -1.1 |
| 57 | Perth Outer South | -1.2 | -0.3 |
| 58 | WA Gascoyne Goldfields | -1.7 | -0.4 |
| 59 | WA Peel South West | -0.8 | -0.6 |
| 60 | WA Pilbara Kimberley | -2.6 | 0.4 |
| 61 | WA Wheatbelt Great Southern | -3.1 | -1.3 |
| 62 | TAS Hobart South | 1.7 | -0.2 |
| 63 | TAS North | 3.4 | 0.3 |
| 64 | TAS North West | 3.4 | 2.2 |
| 65 | NT Darwin | -3.8 | -3.6 |
| 66 | NT Lingiari | -2.7 | -0.4 |
| 67 | ACT | -0.9 | -1.9 |


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| Table 1.5 NIEIR unemployment rate – difference from Australian average (percentage point) | | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | -3.5 | -3.8 |
| 2 | Sydney Eastern Beaches | -2.4 | -4.4 |
| 3 | Sydney Northern Beaches | -5.6 | -3.5 |
| 4 | Sydney Old West | 0.0 | -0.7 |
| 5 | Sydney Outer North | -5.5 | -3.4 |
| 6 | Sydney Outer South West | -0.4 | 0.3 |
| 7 | Sydney Outer West | -1.2 | 0.5 |
| 8 | Sydney Parramatta Bankstown | 0.3 | 1.9 |
| 9 | Sydney South | -4.7 | -2.0 |
| 10 | NSW Central Coast | 0.9 | 1.5 |
| 11 | NSW Central West | -1.5 | 2.7 |
| 12 | NSW Illawarra | 3.8 | 2.3 |
| 13 | NSW Mid North Coast | 5.8 | 5.2 |
| 14 | NSW Murray Far West | 1.1 | 3.5 |
| 15 | NSW Newcastle | 2.6 | 0.9 |
| 16 | NSW Northern Inland | 0.6 | 4.2 |
| 17 | NSW Northern Rivers | 6.6 | 4.6 |
| 18 | NSW Orana | 0.4 | 3.2 |
| 19 | NSW Outer Hunter | -1.2 | 0.8 |
| 20 | NSW Riverina | -1.1 | 0.7 |
| 21 | NSW South Coast | 5.3 | 5.4 |
| 22 | NSW Southern Inland | -1.7 | -1.0 |
| 23 | Melbourne City | -1.7 | -3.5 |
| 24 | Melbourne Eastern Inner | -2.5 | -1.7 |
| 25 | Melbourne Eastern Outer | -2.0 | -1.0 |
| 26 | Melbourne Northern Inner | 1.3 | -1.7 |
| 27 | Melbourne Northern Outer | -0.8 | 1.2 |
| 28 | Melbourne Southern Inner | -0.8 | -1.3 |
| 29 | Melbourne Southern Outer | -1.5 | 0.2 |
| 30 | Melbourne Western | 2.1 | -0.2 |
| 31 | VIC Geelong | 1.9 | 1.3 |
| 32 | VIC Gippsland | 2.8 | 3.3 |
| 33 | VIC Grampians | 2.2 | 3.8 |
| 34 | VIC Hume | -0.7 | 2.7 |
| 35 | VIC Loddon Mallee | 0.5 | 3.0 |
| 36 | VIC South West | 0.8 | 0.7 |
| 37 | SEQ Brisbane City | -0.5 | -2.3 |
| 38 | SEQ Gold Coast | 3.3 | 0.0 |
| 39 | SEQ West Moreton | 2.1 | 0.9 |
| 40 | SEQ Logan Redland | 2.7 | 2.1 |
| 41 | SEQ Moreton Bay | 0.7 | -0.6 |
| 42 | SEQ Sunshine Coast | 7.1 | 1.6 |
| 43 | QLD Darling Downs South West | -1.6 | 0.0 |
| 44 | QLD Far North Torres | -0.8 | 6.1 |
| 45 | QLD Fitzroy Central West | 0.8 | 0.3 |
| 46 | QLD Mackay | -0.2 | -2.5 |
| 47 | QLD Townsville North West | -0.7 | -1.1 |
| 48 | QLD Wide Bay Burnett | 8.5 | 6.6 |
| 49 | Adelaide South | -1.0 | 0.0 |
| 50 | Adelaide North | 2.5 | 3.2 |
| 51 | SA East | -1.5 | 3.8 |
| 52 | SA Far North and West | 6.3 | 3.0 |
| 53 | SA Fleurieu | -2.3 | -0.6 |
| 54 | SA North | 1.2 | 2.7 |
| 55 | Perth Central | 0.0 | -3.2 |
| 56 | Perth Outer North | -2.4 | -2.6 |
| 57 | Perth Outer South | -1.3 | -2.1 |
| 58 | WA Gascoyne Goldfields | -2.2 | -0.2 |
| 59 | WA Peel South West | -1.3 | -1.6 |
| 60 | WA Pilbara Kimberley | -3.0 | 2.0 |
| 61 | WA Wheatbelt Great Southern | -2.6 | 0.5 |
| 62 | TAS Hobart South | 5.3 | 2.8 |
| 63 | TAS North | 3.9 | 2.6 |
| 64 | TAS North West | 4.9 | 5.7 |
| 65 | NT Darwin | -3.0 | -4.4 |
| 66 | NT Lingiari | 0.4 | 10.0 |
| 67 | ACT | 0.1 | -2.9 |


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| Table 1.6 | Social Security take-up – difference from Australian average (percentage point) | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | -2.7 | -5.6 |
| 2 | Sydney Eastern Beaches | -4.3 | -6.2 |
| 3 | Sydney Northern Beaches | -7.0 | -7.3 |
| 4 | Sydney Old West | 0.8 | -1.6 |
| 5 | Sydney Outer North | -8.8 | -7.7 |
| 6 | Sydney Outer South West | 0.2 | 1.2 |
| 7 | Sydney Outer West | -0.6 | 0.6 |
| 8 | Sydney Parramatta Bankstown | 1.3 | 1.9 |
| 9 | Sydney South | -5.4 | -4.6 |
| 10 | NSW Central Coast | 3.7 | 4.6 |
| 11 | NSW Central West | -0.3 | 3.7 |
| 12 | NSW Illawarra | 1.8 | 2.4 |
| 13 | NSW Mid North Coast | 8.7 | 9.8 |
| 14 | NSW Murray Far West | 1.6 | 3.6 |
| 15 | NSW Newcastle | 4.0 | 3.5 |
| 16 | NSW Northern Inland | 1.1 | 5.4 |
| 17 | NSW Northern Rivers | 9.0 | 8.7 |
| 18 | NSW Orana | 3.5 | 6.2 |
| 19 | NSW Outer Hunter | -1.2 | 3.6 |
| 20 | NSW Riverina | -1.1 | 0.7 |
| 21 | NSW South Coast | 6.1 | 7.7 |
| 22 | NSW Southern Inland | -1.5 | -1.1 |
| 23 | Melbourne City | 1.4 | -6.2 |
| 24 | Melbourne Eastern Inner | -4.9 | -5.7 |
| 25 | Melbourne Eastern Outer | -4.8 | -3.4 |
| 26 | Melbourne Northern Inner | 3.3 | -0.8 |
| 27 | Melbourne Northern Outer | -0.9 | 0.3 |
| 28 | Melbourne Southern Inner | -1.3 | -3.1 |
| 29 | Melbourne Southern Outer | -1.5 | -0.2 |
| 30 | Melbourne Western | 1.6 | 0.4 |
| 31 | VIC Geelong | 1.6 | 2.0 |
| 32 | VIC Gippsland | 2.0 | 4.2 |
| 33 | VIC Grampians | 1.9 | 3.5 |
| 34 | VIC Hume | 1.0 | 2.7 |
| 35 | VIC Loddon Mallee | 2.3 | 3.9 |
| 36 | VIC South West | 0.5 | 0.7 |
| 37 | SEQ Brisbane City | -2.0 | -3.5 |
| 38 | SEQ Gold Coast | 3.4 | -0.1 |
| 39 | SEQ West Moreton | 3.0 | 4.2 |
| 40 | SEQ Logan Redland | 2.3 | 1.6 |
| 41 | SEQ Moreton Bay | 1.0 | 1.0 |
| 42 | SEQ Sunshine Coast | 6.4 | 1.0 |
| 43 | QLD Darling Downs South West | -0.4 | 1.5 |
| 44 | QLD Far North Torres | 2.7 | 4.5 |
| 45 | QLD Fitzroy Central West | 1.0 | -0.1 |
| 46 | QLD Mackay | 1.6 | -3.1 |
| 47 | QLD Townsville North West | -0.8 | 0.5 |
| 48 | QLD Wide Bay Burnett | 7.3 | 9.4 |
| 49 | Adelaide South | -1.9 | -0.3 |
| 50 | Adelaide North | 2.2 | 5.0 |
| 51 | SA East | -1.0 | 4.8 |
| 52 | SA Far North and West | 3.5 | 6.8 |
| 53 | SA Fleurieu | -2.9 | -0.7 |
| 54 | SA North | -0.3 | 4.6 |
| 55 | Perth Central | -1.2 | -3.9 |
| 56 | Perth Outer North | -2.7 | -3.8 |
| 57 | Perth Outer South | -1.8 | -2.5 |
| 58 | WA Gascoyne Goldfields | -1.4 | 0.9 |
| 59 | WA Peel South West | -0.6 | -0.7 |
| 60 | WA Pilbara Kimberley | -1.8 | 1.8 |
| 61 | WA Wheatbelt Great Southern | -3.4 | 1.4 |
| 62 | TAS Hobart South | 7.4 | 4.6 |
| 63 | TAS North | 3.3 | 5.4 |
| 64 | TAS North West | 3.9 | 7.5 |
| 65 | NT Darwin | 0.8 | -1.7 |
| 66 | NT Lingiari | 3.8 | 10.6 |
| 67 | ACT | -3.0 | -5.2 |


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| Table 1.7 | Not in employment full time equivalent rate – difference from Australian average (percentage point) | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | -4.2 | -6.7 |
| 2 | Sydney Eastern Beaches | -4.1 | -5.6 |
| 3 | Sydney Northern Beaches | -9.4 | -8.7 |
| 4 | Sydney Old West | 1.9 | 1.9 |
| 5 | Sydney Outer North | -9.0 | -4.5 |
| 6 | Sydney Outer South West | -3.4 | 0.6 |
| 7 | Sydney Outer West | -0.8 | -3.0 |
| 8 | Sydney Parramatta Bankstown | 2.2 | 7.1 |
| 9 | Sydney South | -7.0 | -4.9 |
| 10 | NSW Central Coast | 1.6 | 2.1 |
| 11 | NSW Central West | 2.5 | 4.4 |
| 12 | NSW Illawarra | 4.1 | 5.2 |
| 13 | NSW Mid North Coast | 14.2 | 15.7 |
| 14 | NSW Murray Far West | 2.7 | 3.7 |
| 15 | NSW Newcastle | 4.4 | 2.8 |
| 16 | NSW Northern Inland | 4.5 | 5.5 |
| 17 | NSW Northern Rivers | 12.8 | 13.1 |
| 18 | NSW Orana | 3.9 | 2.6 |
| 19 | NSW Outer Hunter | 5.1 | 3.2 |
| 20 | NSW Riverina | -0.5 | 2.2 |
| 21 | NSW South Coast | 13.8 | 13.6 |
| 22 | NSW Southern Inland | -0.1 | -0.4 |
| 23 | Melbourne City | 9.2 | 10.2 |
| 24 | Melbourne Eastern Inner | -3.7 | -1.2 |
| 25 | Melbourne Eastern Outer | -4.0 | -3.1 |
| 26 | Melbourne Northern Inner | 0.8 | -2.0 |
| 27 | Melbourne Northern Outer | -1.3 | 2.6 |
| 28 | Melbourne Southern Inner | -2.4 | -2.8 |
| 29 | Melbourne Southern Outer | -2.8 | 0.6 |
| 30 | Melbourne Western | -0.3 | -0.4 |
| 31 | VIC Geelong | 2.8 | 3.6 |
| 32 | VIC Gippsland | 8.0 | 4.0 |
| 33 | VIC Grampians | 4.5 | 4.3 |
| 34 | VIC Hume | 0.2 | 2.5 |
| 35 | VIC Loddon Mallee | 4.2 | 5.1 |
| 36 | VIC South West | 3.3 | 1.2 |
| 37 | SEQ Brisbane City | -3.3 | -5.1 |
| 38 | SEQ Gold Coast | 2.0 | 2.8 |
| 39 | SEQ West Moreton | 1.0 | 4.2 |
| 40 | SEQ Logan Redland | -2.8 | -5.7 |
| 41 | SEQ Moreton Bay | 0.5 | -2.5 |
| 42 | SEQ Sunshine Coast | 7.1 | 8.3 |
| 43 | QLD Darling Downs South West | -1.3 | 3.2 |
| 44 | QLD Far North Torres | -5.5 | 4.3 |
| 45 | QLD Fitzroy Central West | -2.0 | 2.2 |
| 46 | QLD Mackay | -7.1 | -8.2 |
| 47 | QLD Townsville North West | -5.7 | -9.3 |
| 48 | QLD Wide Bay Burnett | 10.2 | 8.7 |
| 49 | Adelaide South | 0.2 | -1.2 |
| 50 | Adelaide North | 3.6 | 2.5 |
| 51 | SA East | 0.8 | 3.8 |
| 52 | SA Far North and West | 5.5 | 5.1 |
| 53 | SA Fleurieu | 4.4 | 2.1 |
| 54 | SA North | 7.0 | 5.5 |
| 55 | Perth Central | 0.1 | -4.8 |
| 56 | Perth Outer North | -5.2 | -8.2 |
| 57 | Perth Outer South | -3.1 | -4.9 |
| 58 | WA Gascoyne Goldfields | -3.8 | -3.2 |
| 59 | WA Peel South West | 0.2 | 2.0 |
| 60 | WA Pilbara Kimberley | -8.4 | -2.3 |
| 61 | WA Wheatbelt Great Southern | 3.5 | 2.8 |
| 62 | TAS Hobart South | 7.2 | 6.9 |
| 63 | TAS North | 7.8 | 6.2 |
| 64 | TAS North West | 7.1 | 2.8 |
| 65 | NT Darwin | -13.3 | -27.9 |
| 66 | NT Lingiari | 12.2 | 23.6 |
| 67 | ACT | 0.9 | -1.4 |

| Table 1.8 | Hours per week per working age population – difference from Australian average (percentage point) | | |
|---|---|---|---|
| **SOR ID** | **SOR Name** | **1998** | **2011** |
| 1 | Sydney Central | 1.6 | 2.5 |
| 2 | Sydney Eastern Beaches | 1.6 | 2.1 |
| 3 | Sydney Northern Beaches | 3.6 | 3.3 |
| 4 | Sydney Old West | -0.7 | -0.7 |
| 5 | Sydney Outer North | 3.4 | 1.7 |
| 6 | Sydney Outer South West | 1.3 | -0.2 |
| 7 | Sydney Outer West | 0.3 | 1.1 |
| 8 | Sydney Parramatta Bankstown | -0.8 | -2.7 |
| 9 | Sydney South | 2.6 | 1.9 |
| 10 | NSW Central Coast | -0.6 | -0.8 |
| 11 | NSW Central West | -0.9 | -1.7 |
| 12 | NSW Illawarra | -1.5 | -2.0 |
| 13 | NSW Mid North Coast | -5.4 | -6.0 |
| 14 | NSW Murray Far West | -1.0 | -1.4 |
| 15 | NSW Newcastle | -1.7 | -1.1 |
| 16 | NSW Northern Inland | -1.7 | -2.1 |
| 17 | NSW Northern Rivers | -4.9 | -5.0 |
| 18 | NSW Orana | -1.5 | -1.0 |
| 19 | NSW Outer Hunter | -1.9 | -1.2 |
| 20 | NSW Riverina | 0.2 | -0.8 |
| 21 | NSW South Coast | -5.2 | -5.2 |
| 22 | NSW Southern Inland | 0.0 | 0.1 |
| 23 | Melbourne City | -3.5 | -3.9 |
| 24 | Melbourne Eastern Inner | 1.4 | 0.5 |
| 25 | Melbourne Eastern Outer | 1.5 | 1.2 |
| 26 | Melbourne Northern Inner | -0.3 | 0.8 |
| 27 | Melbourne Northern Outer | 0.5 | -1.0 |
| 28 | Melbourne Southern Inner | 0.9 | 1.1 |
| 29 | Melbourne Southern Outer | 1.1 | -0.2 |
| 30 | Melbourne Western | 0.1 | 0.1 |
| 31 | VIC Geelong | -1.1 | -1.4 |
| 32 | VIC Gippsland | -3.0 | -1.5 |
| 33 | VIC Grampians | -1.7 | -1.6 |
| 34 | VIC Hume | -0.1 | -1.0 |
| 35 | VIC Loddon Mallee | -1.6 | -1.9 |
| 36 | VIC South West | -1.3 | -0.5 |
| 37 | SEQ Brisbane City | 1.3 | 2.0 |
| 38 | SEQ Gold Coast | -0.8 | -1.0 |
| 39 | SEQ West Moreton | -0.4 | -1.6 |
| 40 | SEQ Logan Redland | 1.1 | 2.2 |
| 41 | SEQ Moreton Bay | -0.2 | 0.9 |
| 42 | SEQ Sunshine Coast | -2.7 | -3.1 |
| 43 | QLD Darling Downs South West | 0.5 | -1.2 |
| 44 | QLD Far North Torres | 2.1 | -1.6 |
| 45 | QLD Fitzroy Central West | 0.7 | -0.8 |
| 46 | QLD Mackay | 2.7 | 3.1 |
| 47 | QLD Townsville North West | 2.2 | 3.5 |
| 48 | QLD Wide Bay Burnett | -3.9 | -3.3 |
| 49 | Adelaide South | -0.1 | 0.5 |
| 50 | Adelaide North | -1.4 | -0.9 |
| 51 | SA East | -0.3 | -1.4 |
| 52 | SA Far North and West | -2.1 | -1.9 |
| 53 | SA Fleurieu | -1.7 | -0.8 |
| 54 | SA North | -2.7 | -2.1 |
| 55 | Perth Central | 0.0 | 1.8 |
| 56 | Perth Outer North | 2.0 | 3.1 |
| 57 | Perth Outer South | 1.2 | 1.9 |
| 58 | WA Gascoyne Goldfields | 1.5 | 1.2 |
| 59 | WA Peel South West | -0.1 | -0.8 |
| 60 | WA Pilbara Kimberley | 3.2 | 0.9 |
| 61 | WA Wheatbelt Great Southern | -1.3 | -1.1 |
| 62 | TAS Hobart South | -2.7 | -2.6 |
| 63 | TAS North | -3.0 | -2.4 |
| 64 | TAS North West | -2.7 | -1.1 |
| 65 | NT Darwin | 5.0 | 10.6 |
| 66 | NT Lingiari | -4.6 | -8.9 |
| 67 | ACT | -0.3 | 0.5 |


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### 1.6.5 Social security take-up by persons of workforce age

The proportion of persons of workforce age dependent on social security benefits increased slowly under the land boom and more rapidly under the mining boom (see also Section 1.3.3).

According to the regional divergence indicator, inequality between regions increased during both booms. However, according to the maximum indicator the difference between extremes declined.

### 1.6.6 Persons of working age not employed (full time equivalent basis) and hours of work performed per person of working age

These two measures yield very similar results. At national level job availability increased during both booms – more rapidly during the mining boom than the land boom (see also Section 1.3.2).

Inequality between regions increased during both booms and under both measures. Using the regional divergence measure, inequality between regions increased more rapidly under the mining boom.

### 1.6.7 Summary

A simple examination of indicators of regional divergence during the land boom and mining boom substantiate the view that inter-regional inequality is increasing in Australia. The only indicator which does not describe this increase is the headline unemployment rate, but as NIEIR have commented in virtually every *State of the Regions* report the headline unemployment rate has been subject to subtle changes of relevance which have reduced its utility as an indicator of the state of the labour market.

# 2. The mining boom

As measured by GDP growth, the Australian economy appears to be in great shape, particularly compared with the tottering economies of Europe and North America, dogged as they still are by the fundamental imbalances which precipitated the Global Financial Crisis. By contrast, Australia seems to have escaped damage, originally because the Commonwealth government delivered a large, well-timed stimulus package and now because the mining industry has continued to boom. The mining boom seems like yet another stroke of good luck for the Lucky Country. It seems churlish to question Lady Luck, and this would be a major reason for the lack of public examination of the costs of the mining boom. However, Lady Luck is not always as bountiful as she makes out, and in this chapter we consider the regional effects of the mining boom and find them not completely favourable.

A second reason why the bounty of the mining boom has not been questioned is the way the industry is perceived, arising from its role in Australian history.

## 2.1 Mining in the Australian imagination

Mining has a hold on the Australian imagination, linked to the national history of boom and bust. With several mining booms over the past five decades, the present generation is in danger of romanticising mining in the same way that Australians forty years ago celebrated the then-subsiding 1950s wool boom with their romantic view of the bush. Urban Australians, oblivious to the fact that most mine production is now from quarries or from pipes sucking gas from under the sea bed, return in their imaginations to the great old days. Individualists remember the gold rushes and the adventurers who staked their small and occasionally bonanza claims; collectivists remember the great days of union power in places like Broken Hill and the Hunter coalfields. The most recent memory is that of stock-exchange mining booms – the days, as recently as the 1980s, when 'blue sky' mining stocks fed speculation on roaring stock exchanges, continuing a tradition established when the Victorian goldfields shifted from individual claims to capital-hungry deep lead and reef mining.

Four states include mining booms among their foundational events: South Australia has Burra (1845), Victoria has its gold rush (1851), the Northern Territory has Pine Creek (1872) and Western Australia has the Eastern Goldfields (belated, in 1893). Though mining rushes were less than foundational in the other three states, all states have historic sites where grey nomads can soak in the atmosphere of mines past – places like Chillagoe in Queensland, Broken Hill in NSW and Queenstown in Tasmania.

The history books, historical sites and museums which feed the romance of mining unwittingly contribute to unrealistic perceptions of the industry as it stands today. Consider the major elements in the mining romance of the past.

- Much of the romance is built on the lonely figure of the individual prospector, wandering through the bush with his geological hammer. By contrast, mineral and petroleum exploration is now highly capital-intensive, involving aerial surveys and a great deal of scientific equipment. Much of the work comprises office analysis of data bases and, with the internet available, this can be conducted in city offices a world away from the potential mine site.
- The early gold rushes were not only prospected individually; they were exploited by individuals and by small teams of mates. This phase ended early, as soon as stamper batteries were required to crush ore and poppet legs to stand over mine shafts. Mining went through a phase of small-scale capitalism – the golden era of Australia's mining exchanges – but has now stabilised as the province of very large mining corporations. This represents the triumph of economies of scale, not only at the level of the individual mine (large mineral deposits, even of low grade, are generally more profitable than small, high-grade deposits) but at the level of the firm, where

laboratories and analytical centres can serve a portfolio of working mines and exploration prospects.

- Mining was once predominantly underground. Brave men worked in dangerous conditions. The mines were usually in isolated locations and were company-owned. Dangerous work in isolated locations to the benefit of distant shareholders fostered powerful unions. The isolation is still there, but in many places is softened by drive-in, drive-out and even more by fly-in, fly-out. The danger is still there but has been much reduced by the rise of quarrying in place of underground mining and within the underground sector by changes to stoping techniques and by robot operations. The result is the substitution of capital for labour and the payment of high wages to the remaining workers – wages which are primarily compensation for the skill of working carefully with valuable machinery. Mining is no longer a stronghold of unionism.
- In addition to the risks of personal injury, mining once carried high financial risks – hence the prominence of 'blue sky' mining shares. However, financial risks at mine level have been controlled by the application of science to exploration and to the delineation of ore bodies while financial risks at the firm level have been controlled by the acquisition of portfolios of mines and prospective mines. The three or four multinational mining majors now have investments spread over the whole gamut of minerals (to reduce price risk), mines in various stages of development (to create a development pipeline) and spread over numerous countries (to reduce political risk).The mining boom of the 1980s will probably prove to be the last in which there was substantial participation of 'small miners' – companies on which a financial speculator could pin substantial hopes.

Amalgamations to form large multi-mineral multi-national mining companies have stabilised the industry and increased its profitability, not only by economies of scale but by reductions in competition and by the exercise of the muscle which very large corporations can apply to their dealings with governments. (One need only mention the successful campaign against the proposed increase in resource rents in 2010 and the campaign against carbon pricing.) However, the quasi-monopoly status of the big mining corporations is far from secure. Though global quasi-monopolies based on economies of scale can only be challenged by corporations with considerable financial clout, the big mining corporations have an Achilles heel – they sell to manufacturers and to electric power generators, industries which also benefit from economies of scale. If these customer industries form the opinion that they are paying too much for their raw materials, they have the financial capacity to promote competing supply. Indeed, the rise of the big multinational mining companies in the 2000s was facilitated by the decline of manufacturing in the USA, Europe and Japan, which meant that traditional manufacturers were not in a position to challenge the mining industry, while at the same time the rising manufacturers of China were not yet ready. The evidence is that the manufacturers and power generators of China are now in a position to mount a challenge, and intend to do so.

Though the present-day capital-intensive mining industry dominated by a few multinational corporations is a far cry from the industry of the gold rush days, public attitudes to the industry have yet to catch up. Legislation governing access to property for mining is still weighted against the rights of surface owners, as it has been since the days when the diggers were many and poor and the squatters were few and rich. The media credit the industry with massive contributions to exports and gross domestic product without any allowance for the major outflow of funds and income which results from high overseas ownership. State governments are very reluctant to demand meaningful royalties; instead they rush to sell their Crown minerals cheaply. The Commonwealth is likewise wary of taxing the tiger.

Local government, in its turn, has very limited power to tax miners – the rate base is determined by state law and valuations. However, particularly with state cooperation, councils can sometimes use planning and environmental permissions as a means to get miners to pay for the damage they cause to roads and other municipal facilities and to pay for infrastructure for mine workers. The message of this report to councils hosting mines is that they should never believe industry blarney about the massive contribution mining makes to local and national economies. Mining is profitable, and there is

no reason why it should be subsidised. As for councils located away from the scene of operations, a few benefit but mining booms can easily damage the economy of whole regions.

Given the widespread romantic view of mining and the general gratitude for its contribution to Australia's apparent escape from Financial Crisis, it is not surprising that there has been very little public mention of the downside of the current mining boom. In this report we attempt to produce a balanced analysis, one which credits the benefits but also calculates the costs.

## 2.2 Mining booms, 21st century style

In the heroic days of mining, booms were largely driven by discoveries. No longer. With the application of science and big capital to mineral exploration, the mining corporations have portfolios of prospects which they bring into production as required to protect their market share. Despite their quasi-monopoly status, the mining corporations are sufficiently subject to competition, or at least potential competition, to respond to highly profitable prices by expanding production. The first step is to work existing mines to capacity; the second is to accelerate investment in new mines.

Because each mineral resource is finite, mining corporations maintain portfolios of possible mines, usually at the proven resource stage – that is, mineral deposits which are ready for mining but which are held pending the major capital investment required to bring the deposit into production. In order to conserve capital, once the decision to proceed to production has been made it is usual to construct the mine rapidly so that capital is not tied up in half-completed works. Even with rushed construction it takes time to bring a deposit into production. The development of any sort of petroleum resource inevitably takes years due to the process of proving the field, drilling wells, laying pipes and building processing facilities, delays which are magnified if the field is offshore. Despite the relative simplicity of the technology, it can also take years to develop a large-scale quarry for iron ore, coal, gold or any other mineral. In the cases of coal and iron ore, which are exported with minimal processing, the main source of delay is the time it takes to build heavy-haul transport facilities and ports; in the case of gold, the delay is more in the construction of a heavy-haul transport system within the mine property and the allied construction of a high-volume processing plant. Base metals occupy an intermediate position in that they require both treatment plants near the mine and heavy-haul transport for the resulting concentrates.

Ideally investment would proceed steadily at a rate sufficient to replace worked-out mines and cater to the normal rate of growth of demand but in practice there is a boom-bust cycle of mining investment arising not from discoveries but from peaks in world mineral prices. The usual cause of such a peak is under-prediction of demand by the major mining corporations – it being not entirely coincidental that the high prices which result from under-prediction raise profits. Under-prediction can be associated with unexpectedly high world growth rates, and so with the global trade cycle, but (as now) not always.

Whether allied with the global procession of booms and busts or not, high prices cause customer dissatisfaction and raise the spectre of competing production, so the mining corporations not only operate their existing mines for all they are worth but bring forward investments from their portfolio of prospects. It helps that these investments can readily be self-financed from the additional profits which flow from the high prices. The big miners do not depend on funds raised through stock exchanges, so the resulting mining boom is no longer a stock exchange boom in 'blue sky' mining scrip (except perhaps for a few 'junior miners' with hopes of selling out to the big corporations) but is instead a boom in construction, located wherever the new mines and their associated transport facilities are being developed and reaching back into the sources of supply of construction materials.

Because the corporations do not like tying up capital in half-completed projects each new mine is brought into production as quickly as possible. As soon as construction is finished, the construction workforce moves on and the production workforce takes over. To hasten the return on the capital

invested in each mine it is now usual to provide plenty of mining and processing capacity in relation to the size of the mineral deposit; the result is that mines tend to have production lives measured in years rather than in decades. Production is highly capital-intensive, so the production workforce is small relative to the construction workforce. The days when small cities like Broken Hill and Kalgoorlie could be sustained for decades by production from a single large mineral resource are now over. Instead relatively large workforces are required for the year or two of the construction period, followed by some years of production, followed by a couple of years of mine closure and site rectification works – and then the show is over.

However much construction work on individual mines is hurried, in the major mineral provinces it is usual for there to be a succession of construction projects as long as the boom lasts – hence the construction workforce remains in the region even though it may have to shift camp. Construction proceeds at various sites across the globe until capacity increases to the point where mineral prices are brought back to the marginal cost of production plus any resource rents that may accrue to the owners of high-quality mineral deposits. At this point construction phases down and the required workforce falls to the smaller number required for production plus the workforce engaged in replacement construction. If it turns out that global capacity was over-built during the boom, the construction workforce disappears entirely, leaving only the production workforce. This raises the serious problem of what to do with the specialised mining construction workforce once a construction boom has ended. A further problem arises as to what to do with the production workforce once the production phase has ended.

The problem of what to do with skilled mining workers during mining industry slumps has long been with us. It will be recalled that the labour requirements of the Victorian gold rush phased down markedly in the late 1850s. Fortunately the young state was able to employ the ex-diggers in railway construction and the expansion of farming. Another stroke of good luck attended the phase-down of mine construction at Kalgoorlie, which not only fed labour into Western Australia's growing agricultural industries but coincided with the lifting of depression in the Eastern states so that many of the gold-boom workers were able to return whence they had come. However, there is no guarantee that a construction workforce will be constructively re-deployed at the end of an episode of construction. Take, for example, the City of Latrobe in Victoria, where a succession of brown coal mines was developed, with associated power stations, over a period of around 40 years beginning in 1945. A skilled workforce was attracted to live and invest in the local community, buying houses and settling down. When construction ended in the late 1980s unemployment rose. Only the young and mobile left for opportunities elsewhere, such as they were – the 1991 recession meant that opportunities elsewhere were rather limited. The settled population stayed on in the hope of better times, and to this day the City has a high NIEIR unemployment rate and, in consequence, relatively affordable housing.

The details of each mining boom differ from its predecessors, with a major driving force being the pattern of price increases which precipitated the boom. Some booms concentrate so much on particular minerals that they take their name from the mineral concerned – hence the 'nickel boom' in Western Australia in the 1960s. The peak in oil prices in the decade from 1973 to 1983 was responsible for much of the action on the Western Australian North West Shelf in the early 1980s and, through its flow-on to coal prices, for many of the investments in power-station coal.

## 2.3 The post-GFC mining boom at the global level

The aftermath of a global financial crisis is generally considered an unlikely time for a mining boom, except for gold – gold prices have always been stimulated by financial instability. Other than this, world recessions depress demand for minerals and reduce prices. Recession is currently persisting in North America and Europe, but the prices of natural gas, iron ore and coal remain unexpectedly high. In true cyclical form they took off before the financial boom ended in the GFC but, instead of falling, have remained high. The reasons are slightly different in each case.

The usual reason given for the high price of natural gas is that its price follows that of oil, which has in turn been high due to the exhaustion of low-cost deposits. However, this is only part of the story. Natural gas is not yet in natural short supply like oil. Not only is there plenty of conventional natural gas in the Middle East; with the addition of coal seam methane global reserves have increased markedly, not least in the USA which was hitherto regarded as a potential market for large imports of natural gas. The high price of natural gas is therefore due mainly to delays in matching demand with supply, meaning that boom prices will be competed down as soon as production capacity increases. An important factor has involved changes in transport technology. Natural gas is readily transported overland by pipeline but could not be transported by sea till the development of CNG tankers. Such tankers are now a proven technology, though they require terminals which are very expensive in capital costs and also have significant operating costs due to the energy required to compress and freeze the gas. Because of the very large investments in both production and transport capacity required to return natural gas to cost price, the construction boom may be expected to last for a while, but it will inevitably subside – and perhaps unexpectedly quickly as energy efficiency improves in countries which take their responsibilities to reduce greenhouse gas emissions seriously (see Chapter 4)

The story for iron ore and coal is a little simpler, depending as it does on the unexpected strength of Chinese and to a lesser extent Indian demand for these minerals. The demand for coal is partly for electricity generation and partly as an input to the manufacture of steel and cement, while iron ore is obviously a major input to the manufacture of steel. The rising demand for electricity in China reflects the rising standard of living of a large population, while the demand for steel and concrete reflects the policy of re-housing this large population in multi-storeyed cities, not to speak of the demand for steel to incorporate into manufactured goods. There is some way to go before China's cities are completely rebuilt in steel and concrete but current investments in increasing global production capacity are likely to return the current boom prices to cost-based levels. One need only add that the long-run demand for coal will decline if the world takes greenhouse gas emissions seriously. In Chapter 4 we report that China is beginning to do so.

Finally, as always in times of global financial instability, the price of gold is riding high. This price is unusual in that it depends on speculative stocks of gold as much as it does on the flow of production from mines to gold-consuming manufacturing industries. It is easy to be cynical about the future of world financial reform, and hence easy to be bullish about the gold price.

The coincidence of peak prices for four major minerals has increased annual mining investment to levels which dwarf the mining boom of 1982-84 and its successor in 1996-99. Australia thus has a major minerals boom on its hands.

## 2.4 The post-GFC mining boom in Australia

In February 2011 the Australian Steel Institute commissioned NIEIR to analyse the impact of mining expansion on the economy in general and on the steel-related manufacturing sector in particular. The brief included suggesting strategies to minimise the cost and maximise the benefit of mining expansions both to the industry and to the general economy. The report will be available fully by 2012 at the latest. However, permission has been given for NIEIR to quote high level facts from the report by NIEIR for the ASI as background to the regional analysis of the SOR report. The full empirical justifications of these background numbers from the NIEIR report for ASI will be found in the report when it becomes available.

The model used to generate the indicators in the Appendix is NIEIR's LGA input-output/inter-regional trade flow model which is built on the SOR database.

In the mining boom of 1981-83 investment by the Australian mining industry (broadly defined to include oil, gas, coal and metal ores) topped $8 billion a year in 2009 dollars. It then fell back to normal levels of around $3 billion a year before peaking at $10 billion in 1998-99. This resulted in over-capacity and in 2001 mining investment fell below replacement levels for a year or two. The revival began in 2005 and topped $30 billion a year in 2009. Projects under construction, committed and highly likely to proceed will keep net mining investment over the next five years in the vicinity of $33 to $38 billion a year (estimates from NIEIR for ASI). In addition, investment will be required in facilities to support mining. This is a major boom.

At the national level, mining investment of $33 billion a year may be expected (via input-output tables) to generate the following (all estimates from NIEIR for ASI):

- an increase in investment expenditure on Australian goods and services of around $16 billion a year. The rest of the investment is spent on imports;
- an increase in Gross Domestic Product of $23 billion a year. The increase in GDP is greater than the increase in investment in domestic goods and services due to flow-on effects;
- an increase in net national income of around $20 billion a year. This is lower than the increase in GDP because of two deductions: depreciation allowances and income accruing to overseas investors;
- an increase in household income of around $16 billion. This is lower than the increase in net national income because of the deduction of the Australian-owned portion of the retained profits of mining corporations and the further deduction of corporate taxes;
- an increase in household disposable income of around $10 billion. This is lower than the increase in household income due to the deduction of the increase in household taxes and interest-rate effects on household debt; and
- an increase in household consumption expenditure (excluding the GST) of a little more than $7 billion, it being expected that households will take the opportunity of increased incomes to rebuild their savings. The savings rates of personnel employed with minimal leisure time in remote places are also notoriously high.

Notice how the large headline investment figure diminishes into a much lower household income benefit.

Employment generated by the construction boom is estimated at a little short of 200,000 jobs (full time equivalent – NIEIR for ASI). These jobs will last as long as the construction boom, but once the boom is ended more than half of them will disappear as employment subsides to the number required to operate the new mining facilities. The jobs are concentrated, though not exclusively, in the following regions.

- WA Pilbara Kimberley. The boom here is based on offshore natural gas and onshore iron-ore.
- WA Gascoyne Goldfields where the boom depends on iron ore and gold.
- In Qld Mackay a coal boom is occurring.
- Qld Fitzroy Central West, likewise based on coal.
- NSW Outer Hunter is the third major coal region.

Most of the construction is taking place at three types of sites:

- offshore platforms for natural gas production;
- mine sites for coal, iron ore and gold; and

- ports, at which coal is stockpiled and loaded; iron ore is stockpiled, sometimes beneficiated and loaded, and natural gas is compressed and loaded.

The offshore platforms are nowadays imported complete and any local workers involved in installation are almost necessarily fly-in fly-out. A high proportion of the investment expenditure is financed overseas and goes straight back overseas in imports of materials and equipment.

The iron-ore and gold mines are mostly remote. The construction workforce, and sometimes the production workforce as well, are accommodated in caravans and dachas with frequent use of fly-in fly-out.

The coal mines are somewhat less remote. In the Queensland coal regions there are existing townships to which caravans and dachas can be added to accommodate the construction workforce. The mines in the Upper Hunter are also within driving distance of housing made redundant by the decline of manufacturing.

Finally, the ports are relatively permanent installations. Though construction booms strain their accommodation, they have better long-term prospects than mine sites and the construction stimulus may lead to better facilities for the permanent population. The WA government certainly hopes so.

## 2.5 Meeting the demand for skilled labour

A national increase in the demand for labour of the order of 200,000 looks small compared with the total level of NIEIR unemployment, which is of the order of 950,000. Why not transfer 20 per cent of the unemployed into the jobs generated by the mining boom? Unfortunately there are many reasons why not. The two main reasons are skills mismatches and geographic mismatches.

For many years NIEIR has pointed out that high levels of unemployment can co-exist with unfulfilled demands for labour due to mismatches of skills, where skills are broadly defined to include not only the training and tickets required to work in the vast majority of jobs but the social skills required to work jointly with others and to relate to customers. The NIEIR unemployment measure is based on employer and worker expectations as they were in the era of full employment; since then both formal and informal expectations have risen, while expenditure on the upgrading of workforce skills has stagnated. Needless to say only a small proportion of the NIEIR unemployed are work-ready for employment in construction and the other industries stimulated by the boom. An indicator of this is the persistence of NIEIR unemployment in the regions most affected by the boom – the boom reduces the unemployment rate but cannot eliminate the unemployment of people who simply do not have the right skills.

The geographic mismatches arise because only one of the mining boom regions lies within cooee of an under-employed labour force. This is the NSW Outer Hunter region, which has the opportunity to draw labour made available by the decline of manufacturing in Newcastle. Even so, many of the mine sites are beyond easy driving distance from established homes and once again the problem of skills mismatches intrudes.

At the other extreme, the remote WA mine construction sites are well known for the high wages they pay to attract labour. These wages are highly attractive to footloose workers, some of whom are young, qualified and highly motivated, but others of whom are underqualified and too irresponsible to set in charge of valuable equipment. Beyond these groups, most workers are far from footloose; they have commitments to family and friends, they have houses in established communities. The wages in the Pilbara may be high, but for these people so are the costs of working there – particularly when family relocation and other expenses have to be amortised over the short guaranteed life of the typical construction job. In the present boom there is some evidence that the attraction of high wages has won out over the costs of living in the region, and drawn labour from the rest of the country.

To make up for the workers who have headed north-west, the construction industry has resorted to overseas recruitment. Given the temporary nature of many construction jobs, there has been an emphasis on 'guest worker' recruitment – which gets the work done at the cost of increasing overseas remittances. However, as various European countries have found, 'guest worker' programs often segue into permanent immigration, especially when job prospects are poor in the country of origin. The guest workers thus contribute to the increase in net long-term and permanent immigration. Prior to the current mining construction boom net immigration averaged around 100,000 a year, with fluctuations in part related to the level of construction activity. Since the beginning of the present boom net immigration has more than doubled. Based on the relationship between mining investment and net immigration established over the past three decades NIEIR estimates that, between 2006 and 2010, an additional 400,000 immigrants were added to Australia's population as a direct result of the mining boom (NIEIR for ASI). Given that they brought their families, this would mean an addition of perhaps 150,000 workers and hence that around three quarters of the additional demand for labour resulting from the boom has been met by immigrants. This does not mean that all the immigrants are living in dachas in the Pilbara, but includes both the few directly recruited into mining construction and the many who take jobs vacated by native residents who have tried their luck in the mining boom.

Enhanced immigration means increased population growth. After the construction boom ends, some of the increased population will stay on in the mining regions to operate the enhanced capacity, but most will not; even while the boom proceeds there will be leakage from construction to less demanding work in salubrious places, chiefly the major cities. Population growth is a major driver of the demand for housing. An important short-term effect of the mining boom is accordingly to add to the demand for housing.

## 2.6 Housing and the mining boom

In the *State of the Regions* report for 2010-11 NIEIR provided a detailed account of the reasons why the affordability of housing has declined over the past three decades. Some of these reasons are financial (the boom in land prices was covered in the *State of the Regions* report for 2005-06) but the underlying cause is a shortage of residential land with high accessibility to jobs. In part this shortage was caused by changes in industry structure – the rise of employment in knowledge-based services and finance increased job generation in the CBDs and inner suburbs, while the decline of manufacturing reduced job-generation in outer suburbs, non-capital cities and towns. In part it was caused by failures in planning policy at both the Commonwealth and state levels – failure to encourage the decentralisation of employment and failure to invest in CBD-oriented mass transit.

Mining booms affect housing affordability as follows.

- Other things being equal, the increased rate of population growth reduces affordability.
- A mining boom should draw population away from the capital cities into areas where land is abundant and cheap. This should reduce the land-cost element in the construction of new housing for the increased population and so improve affordability. Unfortunately two factors mitigate against this: the high cost of construction in remote areas and reluctance to build in these areas because of the short expected duration of the construction boom.
- Mining booms directly increase the demand for labour in technical services provided by the knowledge economy, and hence mainly in the metropolitan areas, and also indirectly encourage growth in other CBD-oriented activities. Fly-in fly-out workers also add to demand in lifestyle and metropolitan regions close to airports.
- Finally, the boom in mining construction will tend to draw resources away from residential construction, so increasing the backlog and worsening affordability.

We have already calculated that the mining boom to date has generated a requirement to house an additional 400,000 people – about a third of the population increase that took place from 2005 to 2011. These additional people were attracted to regions which could provide combinations of jobs and accommodation. An indicator of where they went is provided by the acceleration in regional population growth between 2001-2005 (before the boom) and 2005-2011 (after). One might expect a surge of population into the mining regions, and indeed the population growth rate was above national average in the LGAs experiencing major mining developments – from 2005 to 2011, 2.6 per cent a year in the Pilbara and 2.5 per cent in the three most rapidly developing Queensland regional councils, as compared with a national average of 1.8 per cent. However, these areas account for less than 1 per cent of national population growth over the period.

Rather than a surge of population into mining regions, nearly all LGAs experienced an increase in the rate of population growth. If the Pilbara Kimberley region sets the standard at an increase of 2.1 percentage points in the rate of growth, six other regions equal or match it:

- WA Peel South West;
- SEQ West Moreton;
- NT Darwin;
- Melbourne West;
- Perth Outer North; and
- Perth Outer South.

None of these regions is heavily involved in mining (though West Moreton was once well-known for its coalfields). Most of them are urban regions where population growth is being fostered by relatively good job accessibility coupled with relatively low housing costs. The partial exception is WA Peel South West, which includes part of the Perth urban fringe as well as a developing alumina industry and is a favoured home location for fly-in fly-out workers. It can also be argued that the fact that Perth has had a greater surge of population growth than the other state capitals is also an effect of the mining boom.

At the other extreme, the acceleration of population growth was minimal in Tasmania North and low in a number of other rural and lifestyle regions, including (notably) NSW Outer Hunter, which is experiencing significant mining investment.

These geographic patterns force us to refine our thesis. The acceleration of population growth and immigration during the mining boom is not directly due to the demand for labour for mine construction – though it may be necessary to bring in a large number of migrants to yield a few who are willing to work in remote-location mine construction. However, the major connection would have to be through the effect on business and government confidence, permitting relatively expansionary macroeconomic policy. The intention of the policy is to reduce the unemployment rate, but skills and geographic mismatches mean that the policy is not very effective in getting people off disability support payments and the like; instead it spills over into immigration. This is what happens when minimal attention is given to overcoming the training and adjustment problems of the unemployed and underemployed population.

Moving on to the question of how the population increase is affecting the demand for housing, we use a ratio drawn from past experience: under current social conditions, with the current age structure and where housing is readily available and affordable the number of adults per dwelling tends to settle down to around 2.1. This number may differ regionally with different social structures, but it makes a good beginning. The desired number of dwellings can then be calculated by dividing the population by 2.1, and compared with the actual number. We assume that the mining boom will last another five years, and that during this time a further 400,000 additional permanent migrants will be added to the

population and distributed across LGAs in the same proportion as the increase over the second half of the 2000s compared with the first half. We also assume that the rate of dwelling construction will remain as it was in 2005-11.

Using this indicator, the most serious increases in unmet demand for housing will occur in Perth Inner, Sydney Eastern Beaches and Qld Gold Coast, followed by Sydney Central and NT Darwin. These increases in unmet demand (which may also be interpreted as increases in the pressure to share housing by increasing average household size) arise as much from housing supply limitations as they do from increases in the rate of population growth. At the other end of the scale, the regions which are not expected to suffer an increase in unmet demand are those where the population growth surge is moderate and matched by dwelling construction: all of Tasmania and inland non-metropolitan Victoria, SA and NSW (except for NSW Orana, parts of which are participating in the coal boom).

As a result of these changes, and those that went before, it will come as no surprise that the regions which are projected to come closest to adequate housing provision at the end of the mining boom are in Tasmania, where the North West is projected to have 79 dwellings for each 100 potential households. The South Australian regions follow (77 dwellings per 100 potential households in Adelaide South), then most of rural Victoria and NSW Murray Far West. At the opposite extreme, the ratio of dwellings to potential households is projected to be lowest in the resource zone, though not entirely as a result of the mining boom – failure to provide housing for the Aboriginal population is an important cause of the low ratio in NT Lingiari. The problems of Sydney remain, with low provision of housing resulting in high population to dwelling ratios in the relatively affordable regions of Sydney Outer South West and Sydney Parramatta Bankstown.

The short-run impact of the mining boom is not helping with the crisis of housing affordability.

## 2.7 The effect of a mining boom on other industries

Before considering the effect of a mining boom on non-mining industries via economic relationships, we should at least mention the effect via environmental relationships. Mining is good at creating moonscapes and if not properly controlled its environmental effects can be costly in their own right as well as costly to other industries. Over the past two or three decades there have been efforts to control environmental costs, mainly by State governments but also by the various Aboriginal Land Councils and also by local government (when given the power). However bitter disputes can still arise between mining corporations and surface landholders; in other words between the mining and agricultural/pastoral industries, which, unless the state intervenes, are by inherited mining law generally resolved in favour of the miners. Major current disputes involve coal quarrying in Qld Darling Downs South West and NSW Outer Hunter and the salt water by-products of coal seam methane extraction in Qld Darling Downs South West, not to speak of the conflict between gas-based industry and the archaeological heritage of the Burrup Peninsula in WA (involving the cultural and tourist industries).

On the positive side, a boom in mining construction can have highly profitable flow-on effects for manufacturing industries which have the capacity to supply construction materials and equipment to the industry. For over a century this was a major way in which the benefits of mining were spread – consider, for example, the mining equipment manufactured in Ballarat, Castlemaine and Bendigo to supply the needs of the Victorian goldfields. However, in a world free trade and low transport costs mining equipment can be sourced globally and the orders do not necessarily go to Australian suppliers. Indeed, there are good reasons why not. Australian suppliers are frequently not competitive, and much of their lack of competitiveness is a direct consequence of the mining boom.

The first factor linking a mining boom with poor competitiveness has already been discussed. Enhanced demand for skilled labour from the mining construction boom can raise costs in other industries. However, as we have argued, a mining boom is handicapped in its competition for labour by the specificity of its skill requirements and even more by geographic location. We can conclude that competition for labour is not a particularly serious limitation on growth in other industries except for those directly competing for labour in mining regions.

The second consequence of the mining boom is the over-valuation of the exchange rate, which reduces the competitiveness of all Australian trade-exposed industries, whether export-oriented or import-competing.

The third consequence is that mining booms foster complacency in short-sighted governments and the finance sector. Both are contributing to the build-up of a time-bomb. The finance sector continues is overseas borrowing without a thought that it may have to repay at a much reduced exchange rate. The government glories in GDP and employment growth without a thought about how to generate employment once the mining boom subsides. Because of the effect of the high exchange rate on the trade-exposed industries and of the very limited scope for employment generation in mining (due to its capital intensity) most of the growth is in non-tradeable industries.

The high-debt policies pursued by government and the finance sector might be justifiable, though risky, if the revenue resulting from the additional mining exports could be relied on to repay the overseas debts currently being incurred by the finance sector in addition to those already incurred over the past three decades. With a lag, investment increases production. The investments made in the 1981-83 mining boom were especially productive, generating growth in mining output of 8.5 per cent a year from 1984 to 1990 (NIEIR for ASI). Over a longer period, 1979 to 2010, on average an investment of $1 million in mining (2009 dollars) generated $0.34 million a year in additional mining gross product. Therefore the current investment rate of around $30 billion a year should produce around $10 billion a year in mining gross product, or an addition of 7 per cent. This is consistent with the forecasts published by ABARES in March 2011 that mining gross product will increase by 6.2 per cent a year over the next five years. Current mining investments are not expected to be as profitable as those of the 1980s, but are still expected to make reasonable returns for the mining companies. The problem is that the net export revenue will not be sufficient to service the extra debt, other than the extra debt from the mining investment itself – even if mineral prices do not fall, as they usually do, as the boom ends. Past *State of the Regions* reports have emphasised that a debt-repayment crisis is likely sooner or later, and is likely to be accompanied by a devaluation of the Australian dollar. This will upset the Australian financial sector, but at least the trade-exposed industry will become competitive again. The question is whether enough of it will still exist to take advantage of the revived competitiveness.

The economic theories proved wrong in the GFC but still guiding much of the thinking of the finance sector and governments predict not only that mineral export revenues will look after the balance of payments, but that labour rendered surplus by the end of the construction boom will be absorbed painlessly into other industries, guided by changes in relative wage rates. Wrong again. Wage rate differentials do not have the power to redirect skilled labour into other industries. The lesson of the LaTrobe valley has not been learnt. To make matters worse, the high exchange rate which accompanies a mining boom has the power to destroy the capacity to generate jobs in alternative industries.

The Australian dollar exchange rate is market-determined, and at the time of writing was around parity with the US dollar. At this level it is over-valued against the US dollar by about 50 per cent, in the sense that a hundred Australian dollars exchanged into US dollars will buy about $150 Australian of goods or services. (The statistic lying behind this calculation is the purchasing power parity exchange rate.) Nobody knows for sure why the inscrutable market has chosen to over-value the Australian dollar, though one reason would be the high (by world standards) interest rates which the Reserve Bank and the finance sector maintain to control the threat of inflation from the mining boom.

Another reason could be the false expectations we have already noted about future mine-based export revenues. Whatever the cause, the plain fact is that Australian mining booms are accompanied by episodes of over-valuation, while the slumps leave the Australian dollar undervalued – by 20-30 per cent against the US dollar from 1997 to 2003.

The current over-valuation of the Australian dollar is of little concern to the mining industry since its sale prices have increased so much that they are well up even in Australian dollar terms. In any case the high exchange rate provides the opportunity for the industry to import equipment at low Australian dollar prices. The high exchange rate is, however, of concern to the exporters of rural products, who are squeezed between rising Australian dollar costs and falling Australian dollar revenues. It is likewise of concern to exporters of services like education and tourism, whose costs and prices, fixed in Australian dollars, are now more expensive in the currencies of the countries to which they sell and also in relation to competitors such as the USA. It is of paramount concern to manufacturers, who find themselves under-bid by overseas-based suppliers mining equipment and of construction materials like steel and steel fabrications.

The complacent story told by followers of still-fashionable economic theory is that mining has good prospects of profit and capital is accordingly flowing into it. There is a net gain if the flow reduces the capital stock in other industries which, for the time being, have lower prospects of profit. As soon as relative prospects are reversed, capital (like labour) will flow back. Not so. Each episode of exchange-rate overvaluation wreaks permanent damage on the non-mining trade-exposed industries, especially the more sophisticated services and manufacturing – the knowledge-based industries for short. (Not all manufacturing comes under this heading, which excludes simple short-life consumer goods such as baked foods and also manufacturers which are naturally protected by transport costs, such as cement and alumina manufacturers.)

The knowledge-based industries differ from mining in several important respects.

- Their products are not commodities like natural gas, coal, metal ores or indeed the metals themselves, but highly differentiated goods and services which have to be designed to fit into market niches. Marketing expenditure is then required, not just unloading the product at world price.
- Product development is a slow and investment-heavy process. It is true that the mining corporations spend on exploration and on proving-up deposits, but the investment required to bring deposits into production is postponed till it can be financed from cash flow generated by the rising prices which also indicate ready demand. By contrast, product development in the knowledge-based industries begins with research and can include lengthy design and market-trial phases. All of this requires a steady flow of investment funds, and it helps enormously if the businesses concerned have an established cash flow from existing products and services.

Episodes of uncompetitiveness due to high exchange rates cut into the process of knowledge-product development. Not only does this mean that new products are not ready for launch when the mining boom ends and the exchange rate falls; it frequently means that the equipment required to produce new products has not been maintained or has been scrapped without replacement, it means that the skilled labour required to develop knowledge-based products has not been nurtured and it certainly means that overseas competitors who have not suffered from over-valued exchange rates have had the opportunity to get ahead. This can be fatal.

Technically, the permanent damage to non-mining industries caused by a mining boom is called crowding-out, and an episode of crowding-out due to an over-valued exchange rate is often called the Dutch disease, so named when manufacturing in the Netherlands was made temporarily uncompetitive by a high guilder after the discovery of oil in the Dutch part of the North Sea.

## 2.8 Australian evidence on the flow-on from mining

If mining is to benefit the Australian economy as a whole rather than just the mining corporations, an increase in mining production should be followed, with a lag, by an increase in non-mining production. At the simple econometric level this is not so; over the period 1989 to 2010 mining booms and busts left the rate of growth of the rest of the economy more or less untouched. The measure used for this calculation is net national product or income, which is a more relevant measure than Gross Domestic Product (it allows for the overseas incomes generated by mining and also for depreciation). This is a good result in a way; even if there are no net flow-on benefits from mining to the rest of the economy, at least there is, at this very aggregate level, no evidence of flow-on disbenefits or of crowding out. This calculation provides prima facie evidence that the mining adds to net national income by about the increase in mining net production, no more, no less.

Given that a rise in mining investment raised Australian net national product by around the same amount as the increase in net national product from mining, what was the effect on household incomes? The answer is next to no effect. The percentage increase in net national income attributable to a mining boom was about the same as the percentage increase in national population attributable to the boom. Average household incomes were unaffected, up or down. The effect of the boom was to provide Australian-level incomes to thousands of immigrant households, but not on average to raise the incomes of the 'original' households.

This could-have-been-worse result applies at a very aggregate level. At the state level there is evidence of the crowding-out of non-mining capacity during mining booms. The primary measure used in this calculation derives from a NAB survey of investment intentions, which covers both existing capacity and desired additional capacity in industries other than agriculture. NIEIR has adjusted the figures to exclude mining and calculated desired capital capacity for each non-mining, non-agricultural industry. These desired capacities can then be related to national and state investment in mining. A little econometrics for the same period as the aggregate equation reported in the previous paragraph – 1989 to 2010 – indicates that a 9 per cent increase in national mining investment results in a 1 per cent decline in the growth of non-primary capacity (NIEIR for ASI). Since the non-mining industries are larger than the mining industry, the 1 per cent capacity loss in these industries reduces net national product by about the same amount as the additional mining capacity increases it.

These two calculations yield different results. The calculation from aggregate variables indicates that net national income has risen by the amount of additional mining net income while the calculation from investment intentions indicates that there has been complete crowding-out. The two results can be reconciled by a third factor – the increase in household debt, which created demand that allowed net national income, and production of non-tradeable goods and services, to increase despite the crowding-out of capacity in non-primary industry more generally. This in turn tallies with the view that a major effect of mining booms is to encourage governments and the finance sector to adopt expansionary policies which particularly benefit the non-tradeable industries. The problem is that this cannot go on forever; no more than household debt can be increased forever. What's worse, the end of the mining construction boom is likely to be accompanied by a jolt to confidence, at which point the reduction of capacity in the non-mining industries will hit just as this capacity is needed to support employment.

In Appendix 3 we provide regional estimates of the positive impact of a typical boom year in mining construction, compared with a year without any mining construction. The estimates basically reflect the input-output table and therefore under-estimate effects not taken into account in the table, such as the enhanced demand for political and administrative services in the ACT. This said, the estimates chart the boom, with major increases in employment and gross regional product in the mining regions (notably WA Pilbara Kimberley, WA Gascoyne Goldfields, Qld Fitzroy Central West and Qld Mackay). The benefit to NSW Outer Hunter is less, because that is a more diversified region than the others.

Urban regions gaining from the boom in mining construction include NT Darwin, followed by Perth and Sydney (basically as supplier of financial services). The other cities also gain, while non-mining rural regions derive little benefit, particularly those in Tasmania.

## 2.9 The aftermath of the mining boom: regional effects

The growth of mining at the expense of other tradeable industries, especially the knowledge-based industries, has inevitable regional effects. To assess these effects, we compare the situation as it is likely to apply after the current mining construction boom has ended with the situation before the boom started. In the aftermath case mining production has increased as a result of the investment but mining construction employment has fallen back to pre-boom levels. Workers are available to increase employment in the non-mining industries but, as a result of the boom, knowledge-based products have not been developed, capital has not been invested and capacity has been permanently lost.

The severity of the aftermath of a mining boom depends on several factors.

- The continuing positive effect of employment in mine production.
- The severity of the negative effect on the non-mining industries for each year of mining construction boom.
- The duration of the mining construction boom.

The positive effect of employment in mine production is calculated to increase national employment by around 0.6 per cent over what would have been the case had there been no boom. Though in itself a positive, this is a reduction from the employment generated by mining construction, which may be estimated at a 1.9 per cent increase over the no-boom base case. The poor job yield of the mining industry in the production phase of a mining boom is because mining is capital intensive and yields few jobs per million dollars invested. The reduction compared to the construction phase is not good, not only because of the need to find jobs for a decade's natural increase in the population but because the immigrants brought in to Australia to service the boom will have added to the population seeking jobs.

Regional estimates of this positive effect are provided in Appendix 3 under the heading 'gross expansion'. Not unexpectedly, the pattern is similar to that of the construction effect, but much more restrained. Thus WA Pilbara Kimberley is projected to experience a 64 per cent increase in employment for every year of mining construction boom, but only a 10 per cent increase in production employment for a year's construction. Increases outside the mining regions are predicted to be of the order of 0.2 per cent.

The negative effect on non-mining industries arises largely through the high exchange rate which accompanies the mining construction boom, but also from competition for skilled labour. The effect depends on industry mix, but is projected to be most severe in regions with trade-exposed knowledge-based industries. In the estimates reported in the appendix NIEIR has assumed that the long-lasting effects of failures to invest in product development are worse in manufacturing than they are in tourism or education – a debateable assumption. NIEIR concedes that the intensity of the adverse impact is also debateable, and has therefore calculated a 'worst case' effect, reported in the appendix as 'gross crowding out'.

To obtain a net effect, it is necessary to offset the negative effect of production lost due to reduced investment in industries shouldered aside by the mining expansion and the positive effect of increased mining output due to the mining expansion. The extent of the negative effect is debateable, so we provide two scenarios: full offset (or full crowding out) and half offset (or half crowding out).

The longer the mining construction boom lasts, the more its positive and negative effects accumulate: mining production accumulates and the negative effects of the boom also accumulate. The Appendix therefore provides four alternative measures:

- The effect of a single-year's mining construction boom with full crowding out.
- The effect of a single-year's mining construction boom with half crowding out.
- The effect of a five-year mining construction boom with full crowding out.
- The effect of a five-year mining construction boom with half crowding out.

These measures are variants on a theme and yield similar patterns, differing mainly in intensity. If the mining boom lasts five years and seriously reduces output in alternative industries, its effect on national employment once the mining construction boom is over is projected to be slightly negative (-0.2 per cent). However, 15 regions (all WA and NT regions plus Qld Mackay, Qld Fitzroy and NSW Outer Hunter) are projected to receive net employment benefits, some of them substantial (63 per cent over pre-boom employment in WA Pilbara Kimberley and 39 per cent in WA Gascoyne Goldfields tapering down to 50 per cent in NSW Outer Hunter and Perth Outer North). The corresponding reduction in employment is shared across the other 52 regions with typical reductions in employment of 1-2 per cent, rising to 3-4 per cent in regions in the Melbourne manufacturing belt.

This may be considered an extreme case. However, it is highly unlikely that the mining boom will have no adverse effects on other trade-exposed industries. NIEIR therefore offers an optimistic case, in which only half the possible crowd-out effect occurs. In this case, national employment after the end of the mining construction boom is up by 1.6 per cent compared to the situation before the boom. The benefits of the boom are still highly concentrated, with 20 regions better off and 47 worse off. The patterns are similar for hours of work available, the value of output and for resident employment.

Though this is considered an optimistic case, it makes no allowance for the economic growth which would have taken place in the absence of the mining boom, or under a mining boom differently managed. Neither does it take into account the additional population growth induced by the boom. When the additional population is taken into account, the per-capita results of the boom become much less impressive.

An over-estimated national dividend of 1.6 per cent from a boom of this order is indeed a disappointing outcome which contrasts acutely with the results of the classic nineteenth century mining booms and even with some of the more recent booms. The reasons have already been pointed out. Nineteenth century mining was relatively labour intensive, particularly at the production stage, so yielding relatively large labour incomes. Its relatively modest capital requirements were met largely from local sources, both financially and physically. There was little established economic activity to crowd out (except that labour rushed to the goldfields when they were first discovered, only to realise that more assured incomes could be made by supplying the miners than by mining oneself). There were opportunities for labour after the subsidence of the rushes, and no fluctuating exchange and interest rates to destroy the industries which would supply those opportunities.

### 2.9.1 How much crowding out?

The evidence to date, as reviewed in the report by NIEIR for ASI, suggests that the optimistic, half crowding out case is close to reality. However, on a per capita basis (after taking into account the inflow of population to support mining construction) the full crowding out case is likely to be closer to reality. See the report by NIEIR for ASI for details.

The data given in the mining boom panel for each region in Appendix 3 of this report is on a gross, not a per capita, basis and, therefore, the half crowding out case is the appropriate reference benchmark.

### 2.9.2 The impact of the duration of the boom

Although the net effects calculated for the half and full crowing out cases are for production impacts only and therefore apply after the construction phase has ended, a long construction phase will not stop negative impacts occurring while elevated construction activity is still occurring.

Thus, for Sydney Central (see Appendix 3) resident employment increases 1.6 per cent compared to what otherwise would have been the case for every year of continued mining construction at approximately current rates. As mining production comes on stream, both the mine production and crowding out effects come into play (respectively 0.3 and -0.6 per cent for each year of the mining construction boom). If the construction impact is divided by the annual net crowding out effect, which for Sydney Central varies between -0.3 per cent for full crowding out to -0.03 per cent for half crowding out, the result is the number of years in which Sydney Central will receive an overall positive impact from continuation of the current mining expansion. For the full crowding out case the region receives net positive benefits for no more than 4.4 years but in the half crowding out case there is a little risk that Sydney Central will have a negative outcome so long as the construction phase continues.

Table 2.1 provides a preliminary estimate of the duration of net benefit from a continuing mining boom, before the negative crowding-out effect catches up with the positive construction and mine production effects. The table summarises a large mass of data, including input-output relationships, calculations of industry profitability and investment reactions to profitability.

Regions expected to receive long-term benefits from a continued boom in mining construction include the mining regions themselves – not only the major boom regions, but most regions where mining-related construction is present. The benefiting regions also include the capitals of the major mining states – Perth and SEQ. Judging by recent performance they should probably also include the ACT.

The regions expected to receive negative benefits within a few years include the following. The list includes regions moving to negative benefit after six years of mining boom under the half crowding out scenario, equivalent to moving to negative benefit after two years if full crowding out takes place.

- All of Tasmania.
- Most of Victoria, spreading into SE NSW.
- Adelaide plus SA Fleurieu and SA North.
- Sydney Parramatta Bankstown and Sydney Outer West.
- SEQ Gold Coast. Judging by recent performance, other tourism-dependent regions such as Ald Far North Torres should probably also be added.

Even if mining investment continues at high levels, after a few years these regions would have been better off if the mining boom had not occurred. This of course depends on a continuation of current policies. The result could be quite different if tax revenue from the mining expansion is increased and used to support economic development in the adversely impacted regions.

This illustration shows how difference between the fast and slow parts of the so-called 'two speed economy' can be expected to become more severe as the mining boom proceeds, even if high levels of mining investment continue.

It is important to recognise that much of the construction impact is already in the data. Any further employment increases in the future will depend on investment going significantly above the average levels of the last three years. This is projected to be the case for 2011-12. However, this largely reflects the increase in LNG investment which has import content approximately twice the average for mining investment outside oil and LNG. Therefore, though investment will increase the impact on additional construction employment is likely to be muted and not significantly different from the past.

This does not mean that an increased skill shortage will be avoided. However, this is more likely to be driven by the workings of the 457 Vision system with its guaranteed outflow of skilled labour as guest worker visas expire. There may be a need to increase net immigration to offset these outflows.

### 2.9.3 Crowding out and unemployment

Figure 2.1 plots the NIEIR unemployment rate against the net full crowding out effect after five years. Those regions with strong positive production effects are excluded. The figure shows that for around half the SOR regions exhibited in the figure, a high net full crowding out effect occurs in regions with high unemployment rates. For the other half of the regions, the reverse is the case.

The significant number of regions with high unemployment rates that are also at risk with high net crowding out impacts from the current mining expansion has an important statistical consequence. It is no longer appropriate to use the all-Australia headline unemployment rate as an indicator of general labour market conditions. As crowding out gathers momentum in those regions which are both significantly adversely affected and have high levels of unutilised labour, the headline unemployment rate will not increase and may well go down, due to the well-nigh automatic transfer of workers who lose their jobs in these regions out of the labour force.

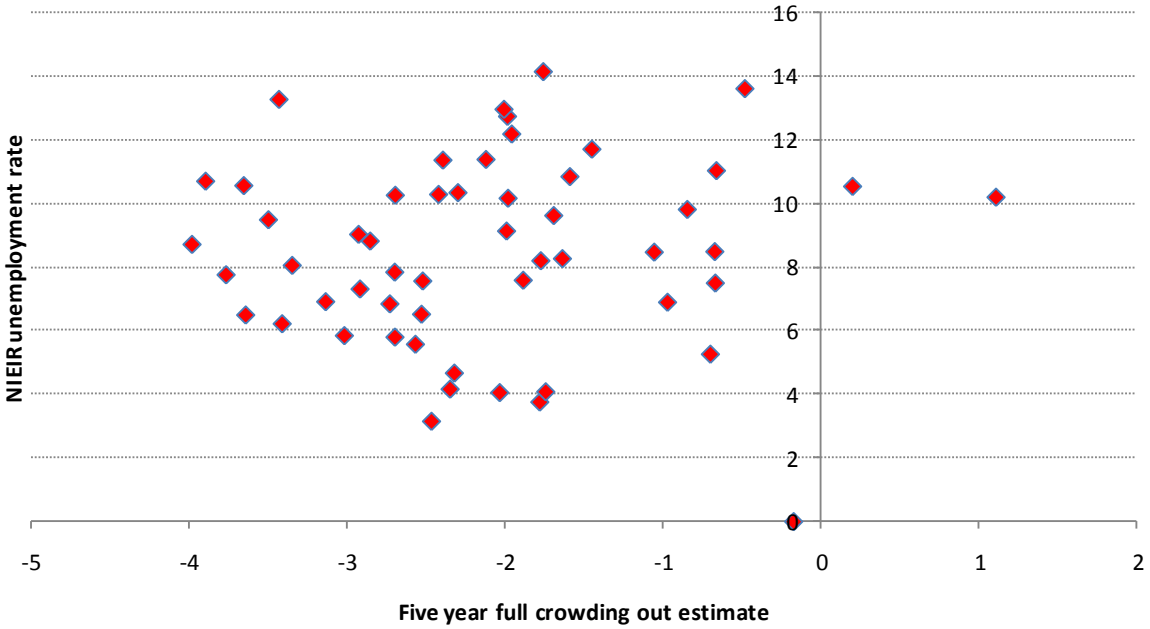
As further evidence of this, Figure 2.2 documents a weak and perverse relationship between the changes in the headline unemployment rate 2006 to 2011 and the change in the ratio of full time equivalent employment to the working age population ratio over the same period for all 567 LGAs in the NIEIR SOR database.

| Table 2.1 Mining investment continuing – years to regional net negative outcome (number) | | |
|---|---|---|
| | **Full crowing out** | **Half crowding out** |
| Sydney Central | 4.4 | 27.4 |
| Sydney Eastern Beaches | 2.1 | 6.6 |
| Sydney Northern Beaches | 4.2 | 20.0 |
| Sydney Old West | 2.3 | 7.0 |
| Sydney Outer North | 3.0 | 11.2 |
| Sydney Outer South West | 2.1 | 7.4 |
| Sydney Outer West | 1.6 | 4.5 |
| Sydney Parramatta Bankstown | 1.6 | 4.6 |
| Sydney South | 2.3 | 7.1 |
| NSW Central Coast | 2.4 | 7.9 |
| NSW Central West | na | na |
| NSW Illawarra | 6.9 | na |
| NSW Mid North Coast | 2.3 | 6.9 |
| NSW Murray Far West | 9.6 | na |
| NSW Newcastle | 14.7 | na |
| NSW Northern Inland | 4.3 | 23.1 |
| NSW Northern Rivers | 3.4 | 10.1 |
| NSW Orana | na | na |
| NSW Outer Hunter | na | na |
| NSW Riverina | 2.9 | 12.1 |
| NSW South Coast | 1.4 | 3.9 |
| NSW Southern Inland | 1.2 | 3.2 |
| Melbourne City | 1.7 | 14.3 |
| Melbourne Eastern Inner | 1.3 | 4.5 |
| Melbourne Eastern Outer | 1.0 | 2.8 |
| Melbourne Northern Inner | 1.1 | 3.6 |
| Melbourne Northern Outer | 0.9 | 2.5 |
| Melbourne Southern Inner | 1.2 | 3.8 |
| Melbourne Southern Outer | 0.9 | 2.4 |
| Melbourne Western | 1.0 | 3.2 |
| VIC Geelong | 1.0 | 3.2 |
| VIC Gippsland | 1.9 | 32.9 |
| VIC Grampians | 0.8 | 2.3 |
| VIC Hume | 1.0 | 2.8 |
| VIC Loddon Mallee | 0.9 | 2.4 |
| VIC South West | 1.7 | 11.0 |
| SEQ Brisbane City | 7.8 | na |
| SEQ Gold Coast | 1.8 | 6.4 |
| SEQ West Moreton | 3.7 | na |
| SEQ Logan Redland | 2.4 | 23.9 |
| SEQ Moreton Bay | 4.4 | na |
| SEQ Sunshine Coast | 2.1 | 7.1 |
| QLD Darling Downs South West | 5.7 | na |
| QLD Far North Torres | 13.1 | na |
| QLD Fitzroy Central West | na | na |
| QLD Mackay | na | na |
| QLD Townsville North West | na | na |
| QLD Wide Bay Burnett | 4.5 | 86.2 |
| Adelaide South | 1.2 | 6.3 |
| Adelaide North | 1.1 | 3.6 |
| SA East | 2.0 | 11.8 |
| SA Far North and West | na | na |
| SA Fleurieu | 0.9 | 3.2 |
| SA North | 1.4 | 5.9 |
| Perth Central | na | na |
| Perth Outer North | na | na |
| Perth Outer South | na | na |
| WA Gascoyne Goldfields | na | na |
| WA Peel South West | na | na |
| WA Pilbara Kimberley | na | na |
| WA Wheatbelt Great Southern | na | na |
| TAS Hobart South | 0.4 | 1.0 |
| TAS North | 1.3 | 4.0 |
| TAS North West | 0.6 | 1.7 |
| NT Darwin | na | na |
| NT Lingiari | na | na |
| ACT | 1.0 | 2.8 |
| Australia | 21.8 | na |

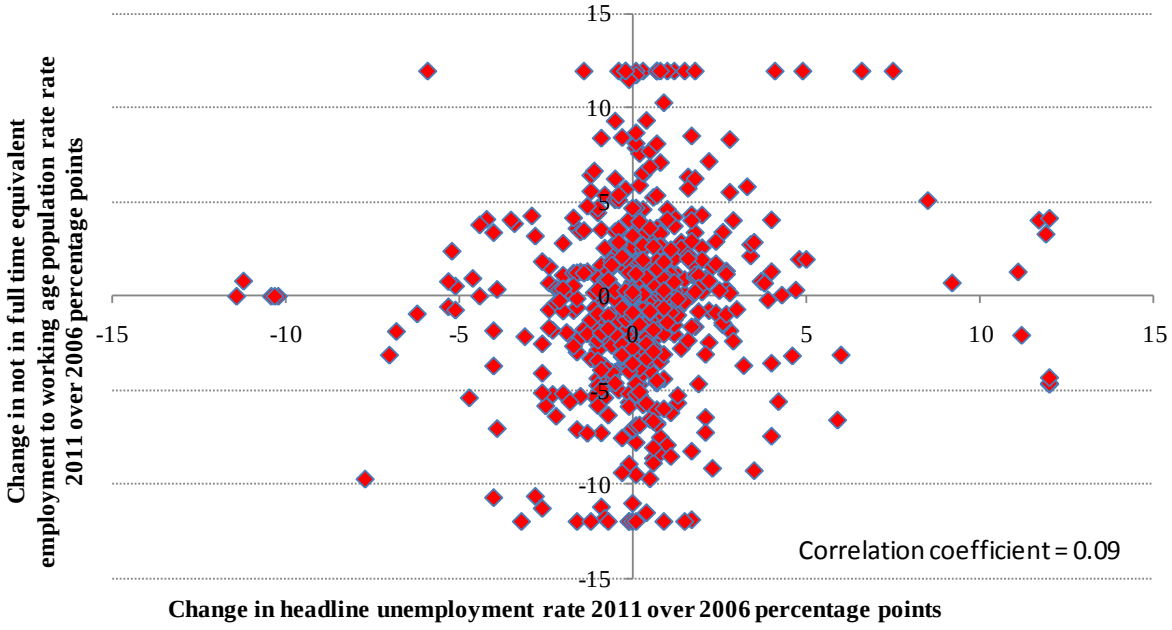
*Note:* 'na' (not applicable) means that a region receives a net positive impact as least as long as the mining expansion continues.


*State of the Regions Report 2011-12 made possible with the assistance of Jardine Lloyd Thompson*

## Figure 2.1: Five year full crowding out estimates versus NIEIR unemployment rate by SOR region (excluding resource regions)




## Figure 2.2: Change in headline unemployment ratios and not in employment ratios by Australian LGAs





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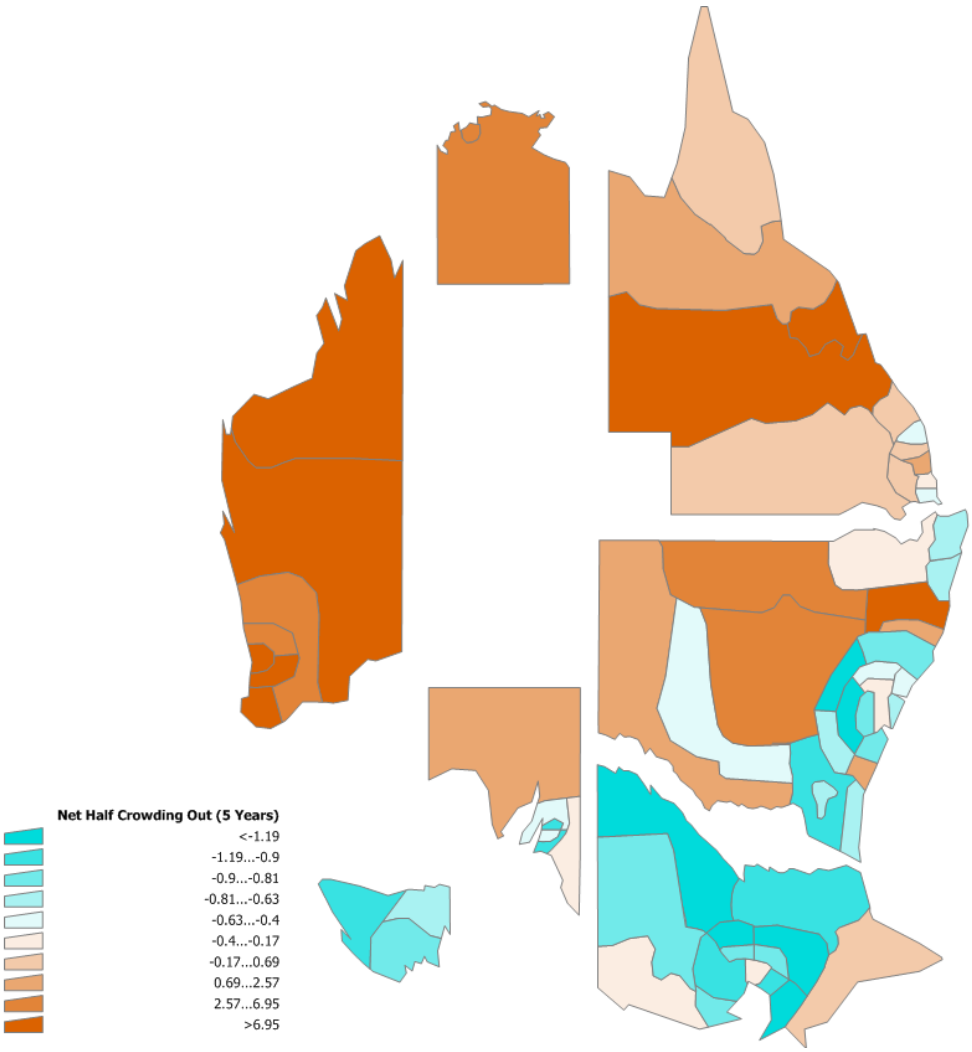
## Figure 2.3: Net half crowding out (5 years) (% gross local product)





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## Figure 2.4: Net full crowding out (5 years) (% gross local product)

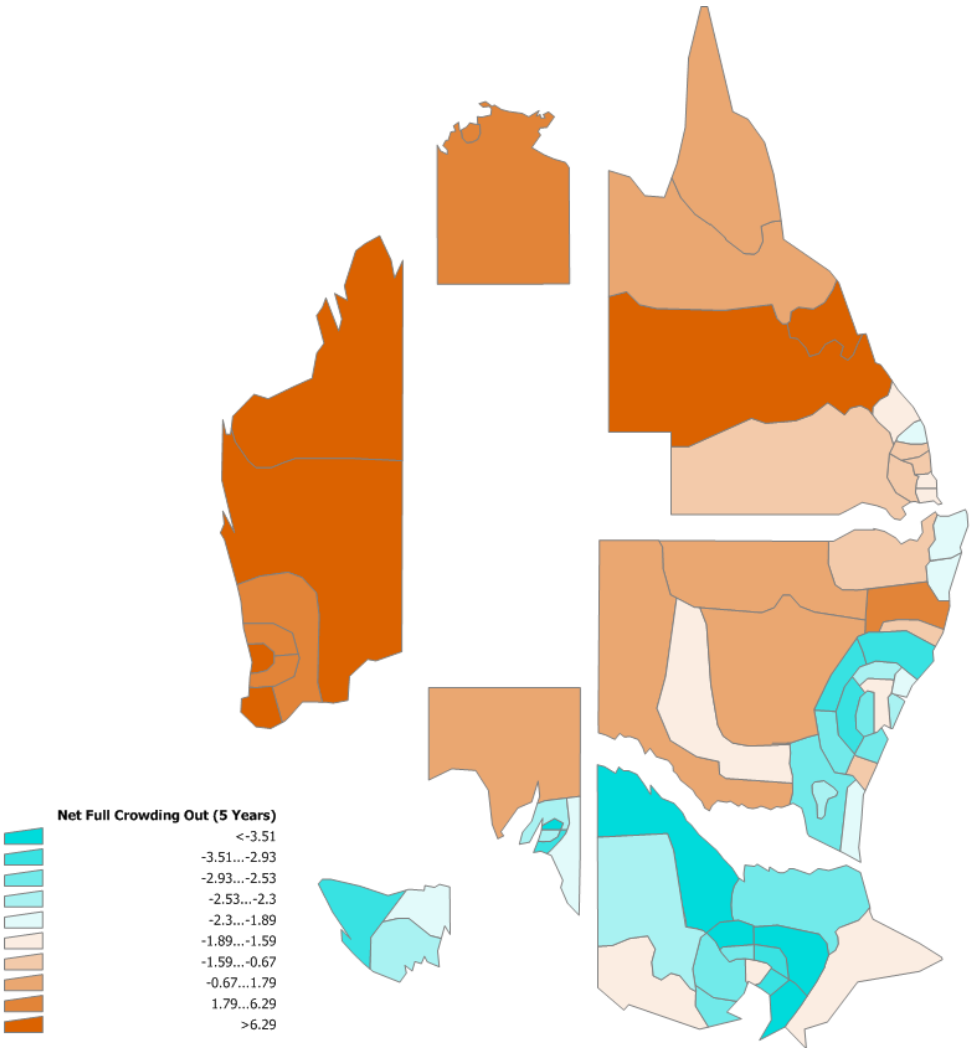



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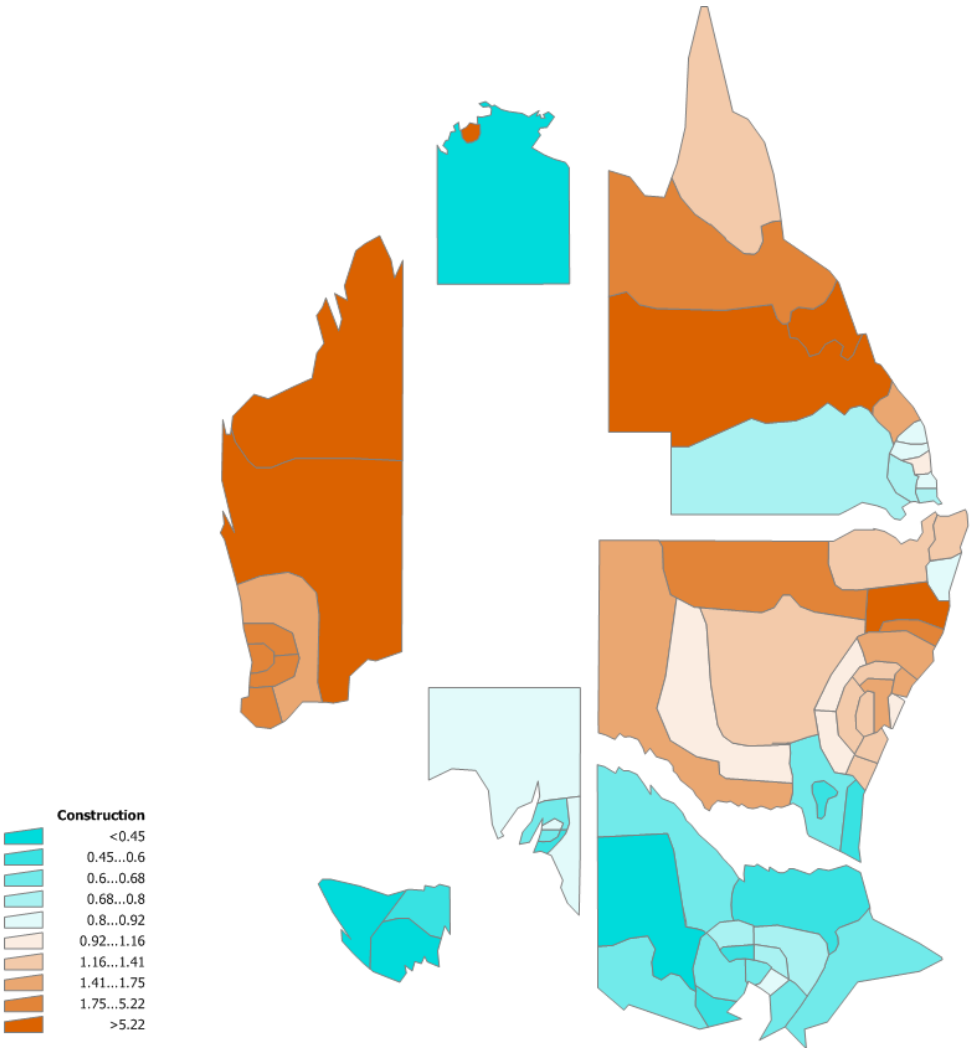
**Figure 2.5: Benefit from mining construction (% gross local product)**




## 2.10 Norway's mining boom

It also cannot be said that the unhappy results of the current mining boom for most of Australia are totally unexpected. When Australia was undergoing the 1980s mining boom there was considerable discussion of the possibility that the boom would absorb capital and generate few jobs (e.g. Sheehan, Crisis in Abundance, pp23-6). The present boom is bigger, so it is surprising that the considerable international analysis of past mining booms and of mining booms in other places has not been brought to bear on it. This said, even in the 21st Century mining booms need not have the unsatisfactory results for the host country which can be predicted for Australia. The shining example is Norway.

With the oil producing countries moving towards the formation of OPEC in the early 1970s, the major world oil corporations showed interest in the North Sea. The continental shelf resources under this sea are divided between several bordering nations including the Netherlands, which as we have noted suffered an over-valued exchange rate as a result of its oil wealth. The government of Norway, which also held title to part of the North Sea oilfields, responded in 1973 with a report which outlined its intended policies. The report took the view that the State must directly influence the process of resource exploitation so as to avoid the Dutch disease. It argued that local capacity creation and education, with procurement policy, could be used to build local supply chains, especially chains

running backwards from the oil and gas exploration, extraction and refinery industries to the metals and machinery industries, logistics and high value-added business services.

The first step in gaining the power to implement these policies was to establish a high level of direct government ownership in oil extraction. In return for approval to explore and extract, the oil majors signed up to local content targets and to joint ventures with local State-owned and private companies, the latter with the aim of raising Norwegian competency and competitiveness in oil extraction and related industries.

The Norwegian local content targets were not binding, but were subject to transparent audit which ensured that local suppliers were awarded appropriate contracts when they were competitive on quality and price. The government ensured that local suppliers were notified of coming tenders well ahead of their issue, giving time to prepare their bids.

The agreements with the oil majors also provided for the payment of royalties plus company tax, which on 'excess profits' could rise to 80 per cent. The State also received dividends from its participant companies. Part of the additional revenue was recycled as direct support to Norwegian manufacturing industry, running at the rate of 2 per cent of GDP. Programs of skill formation, technological capacity building and outright subsidies ensured that local suppliers got their share of mining industry supply contracts. Joint ventures and partnerships were used to underwrite R and D and to transfer knowledge and experience from the oil majors to the local industry and to integrate Norwegian firms into world business, not only oil and gas but more general engineering and value added business services.

The Norwegian policy framework extended well beyond the issue of local content. It was recognised that macroeconomic balance had to be maintained if long-run benefits were to accrue. High levels of immigration were avoided not only by training local personnel but by using credit, interest rate and fiscal policies to eliminate excess demand. These policies prevented Australian-style blowouts in non-tradeable production and hence ensured that there was little need for immigration. Cost-push inflation was managed by using centralised wage determination to limit wage breakout in the mining and related sectors and by allocating significant resources to increasing general workforce skills. The exchange rate was stabilised, at first against the German Mark and then against the Euro, initially by interest rate policy and in due course, as funds accrued, by setting up a Sovereign Wealth Fund. The long-term aim of this fund is to provide resources after the oil runs out, but the short-term benefit is that fund transactions can be used to stabilise the exchange rate.

The results compare favourably with Australia. Norway has remained a diversified economy where significant manufacturing supplements incomes from the resource sector, generates employment and provides a buffer against the inevitable decline of mining output. The ratio of employment to working age population is five percentage points higher than in Australia and real total gross product per capita has grown more rapidly – from less than Australia's in the early 1970s to 20 per cent over Australia currently. Norway has also accumulated overseas assets, in stark contrast to Australia's accumulation of overseas debt. These results contrast very favourably with those of Australia's 'leave it to the market' approach.

## 2.11 Alternative Australian policies

Both Commonwealth and State governments have failed in their duty to harvest mining sector booms for the national benefit. However, it is too late to impose a full Norwegian approach. In particular, it has proved very difficult to charge reasonable royalties or to tax the industry. The main scope for imposing elements of the Norwegian approach lies in the control of investment. Use could be made of the foreign investment approval process and the environmental impact approval process to increase the local content of mining investment, for example by requiring that contracts be assessed using the purchasing power parity exchange rate (around 70 Australian cents to the US dollar) rather than the

market exchange rate. Similar requirements can be attached to local employment, training and skills transfer, as they already are (with some success) in the mining agreements reached by the Aboriginal Land Councils.

Tax incentives are also possible, for example through the changes to the resources rental tax or corporation tax. Accelerated depreciation could be allowed for projects which satisfy local content and skills transfer criteria. Royalties and resource rental taxes could be increased for future projects which do not meet local content and skills transfer requirements, on the grounds that without increased local content the projects simply are not worthwhile from a state or Australian point of view.

Local governments could also be given full power to recoup expenses attributable to mining.

Like Norway, these would be but first steps. A whole of government approach would be required to ensure that the local enterprises benefiting from the policy could do so at least cost, and then build up their physical capital and skill bases to increase their business in world markets. Similarly much improved macroeconomic management would be required to ensure that mining booms do not beget booms in the non-tradeable industries, while vastly improved skills upgrading policies would be required to ensure that labour requirements are met locally, and not from excess immigration.

# 3. Telecommunications

## 3.1 Introduction

Telecommunications were last reviewed in detail in the *State of the Regions Report 2005-06.* At that stage the Commonwealth was emphasising competition as the panacea for all that was wrong with the Australian economy. From this point of view the telecommunications industry, which from its inception had been run as a government monopoly, was an obvious blot on the landscape. From the mid-1990s the overarching priority of the Commonwealth, as owner of the industry, was to introduce competition.

The traditional argument against monopolies is that they raise prices and generate monopoly profits. This argument did not apply to the government-owned telecommunications industry, since popular political pressure kept prices down. The introduction of competition could not therefore be guaranteed to benefit the public by cutting monopoly prices – indeed, the danger was the reverse, with the abolition of government management providing opportunities for the privatised industry to seek monopoly profit. Instead, the main arguments in favour of competition were that it would improve service standards, foster innovation and reduce costs. Allied with technical change, the reform of the industry is gradually having these effects, but there has been plenty of confusion along the way.

In 2005 the structural reform of the industry was half-complete. A number of competitors had been introduced and were achieving a degree of success, particularly in mobile phone services. Telstra had been half-privatised. With hindsight, its share price of $8 in 1999-2000 reflected market expectations that it would be able to exploit its incumbent position to generate monopoly profits. The partial success of competition may be measured by the fall in Telstra's share price to around $5 in 2000, which price was maintained to 2005. However, Telstra's competitors were still constrained by Telstra's ownership of the copper land lines which connect subscribers to exchanges. It was recognised that these lines were a 'natural monopoly' in that a single land line is all that households and businesses need and that installing a second competitive line merely doubles costs. Though the Commonwealth mandated competitor access over Telstra's lines, the quality of service was less than satisfactory. Debate over telecommunications in 2005, as covered in the *State of the Regions* report, therefore concentrated on how the capacity of land-line connections could be improved to cater to rising demand from internet users, the assumption being that Telstra would provide the line and its competitors would have regulated access.

The years from 2005 to 2010 saw the industry in turmoil. While theoretically in favour of competition, the Commonwealth was looking forward to full privatisation and increasingly found itself trying to protect Telstra's hope of monopoly profits and hence its share price. Doubts about this hope led to a fall in the price of Telstra shares, which hovered around $4.50 in 2007-09 – just long enough for the Commonwealth to unload its remaining holdings. Meanwhile demand for telecommunications services rose, particularly mobile and internet traffic, and an argument developed as to which technologies should be used to meet this growth. The shouting may have gone on for ever had not the corporatist countries – notably Japan, South Korea and some in Europe – decided that fibre to the premise (FTTP) was the way to go and instructed their national telecommunications providers to get their country cabled. The result was that countries averse to public investment – including Australia and the USA – found themselves with inferior internet connections, only some of which were explicable by longer distances and lower population densities. They began to fear that the knowledge economy – which they had done so much to initiate and foster – would shift to countries with better telecommunications.

As far as the major players in the telecommunications industry are concerned, the debate was settled late in 2010. There will indeed be competition in Australian telecommunications and the competing businesses will be privately owned. They will include such entities as:

- owners and operators of bulk long-distance transmission assets, such as the fibre-optic cables connecting the capital cities;
- owners and operators of mobile telephone services;
- landline service providers;
- internet service providers; and
- various other value-added telecommunications and internet service providers.

However, fibre landlines to most premises will be owned by the National Broadband Network Company (NBNCo), which will provide a standard service and operate as a regulated monopoly. At least for the present it is Commonwealth owned – a reversion to mixed-economy principles. Where it is not economic to provide FTTP, NBNCo will provide fixed wireless connections or, as a last resort, will subsidise satellite services. Under the settlement, both mobile and land-line services will be available, the expectation being that they will be increasingly complementary.

This settlement has not been universally acclaimed, even though it has been accepted by the major industry participants including Telstra (whose share price is down to around $3 and no longer contains anticipations of monopoly profits). Three kinds of opposition can be identified.

- The most stalwart objections come from those who are against public investment on principle. In this Report we challenge these critics with an estimate of the benefits of the NBN over a 'no investment' base case.
- A slightly less ideological criticism is the claim that, like the PMG before it, the NBN will stifle innovation and provide poor customer service. The answer to this criticism is that the NBN addresses a natural monopoly problem, in which some form of regulation is inevitable. A regulator is required, and can enforce service standards using international comparisons of technical efficiency. This service has been fenced off from the add-on services where competition is indeed delivering innovation and improved customer service. There may come a time when land-line connections lose their natural monopoly status, but not till then will the extension of competition to land-line services be appropriate.
- Finally, the claim is being made that land-lines have already lost their natural monopoly status due to developments in mobile telephony. While it is probable that the spread of mobile phones was responsible for much of the decline in market anticipations of Telstra monopoly profits, mobile and fixed-line telephony still remain separate though interconnected markets, with fixed lines offering qualities of services which mobiles cannot match or can match only at considerable cost. We will discuss the relationship of mobile and fixed-line telephony in greater detail in Section 3.3.5.

Under the national telecommunications settlement local government has two clear interests:

- advocacy to ensure that the best possible standard of service is provided in each LGA. This will involve dealing with NBNCo, but also with other telecommunications service providers – all of whom, including mobile operators, will to some degree utilise the assets of the NBN; and
- more important, local government should assist businesses, households and non-profit agencies to prepare for the challenges of improved telecommunications: both the threats and the opportunities.

Both these tasks will require familiarity with the technology and with the technologies and their uses. In this report we provide:

- some historical background, so that the momentous current changes in telecommunications can be compared with past developments in the technology;
- an assessment of the roles of current technologies; and
- an evaluation of the benefits of FTTP.

## 3.2 Historical background to current developments

A defining characteristic of the human animal is that we live in groups which require the members of each group to communicate with each other. In this broad sense, communication may be verbal or may not – a smile or a frown often says more than words. It may be serious, it may be frivolous; it may be formal; it may be as a gift but it may also command, and sometimes it is accompanied by exchange of goods or services. It has been said that the boundaries of a society are defined by who communicates with who, and also that who is entitled to say what to whom (and be obeyed) is an important indicator of power relationships within the society.

With communication so embedded in the fundamentals of human society, it should be obvious that the analysis of communication is no simple matter. It is particularly difficult to evaluate investments in communication technologies, if only because technologies inevitably change the list of who can readily communicate with whom and so change the boundaries of society and also, potentially, the power relationships. On top of this, particular communication technologies are of different effectiveness for different classes of communication – some rely solely on sound and some are purely visual; some demand concentrated attention and some can be merely scanned or quietly ignored. Communication affects the way ideas are formed, including the formation of wants and desires. It thus bursts the bounds of regular economic analysis, with its assumptions of fixed social boundaries and independent individuals who form their wants and priorities without reference to the opinions of other people.

Communication is intimately related to transport, the two having been particularly close in the days when communication could only take place face-to-face. However, long-distance communication – beyond shouting distance – has a history as long as civilisation, starting with the interpretation of smokes on the horizon. A major event was the invention of writing, so that messengers could carry texts without having to memorize them or even having to know their meaning and contents. The writing of messages goes back for thousands of years and seems to have been independently invented in various places in Eurasia. Written messages were a particular advantage in war and commerce, and literate peoples came to dominate non-literate groups.

### 3.2.1 Printing

In 1450, in one of the minor German principalities, J Gutenberg began operating a printing press using moveable type. This allowed the low-cost production of multiple copies of texts and so inaugurated the era of ready communication from single authors to multiple readers via books, pamphlets and eventually newspapers. Historians credit the Gutenberg revolution with pervasive effects, lasting over centuries as literacy spread and affecting the very way people thought – information now came through the eyes from the printed page, rather than through the ears from preachers and mentors. It did not take long to extend the printed word from commercial, religious and political purposes to entertainment.

The earliest regular newspapers were government gazettes, which in English-speaking countries developed a boring, legalistic reputation but which remain the sole type of newspaper in various totalitarian countries. Government monopolisation apart, several philosophies have been applied to newspapers, ranging from the evangelical approach (the newspaper as mouthpiece for the proprietor's views and enthusiasms) to profit maximisation (newspapers should cost their proprietors as little as possible compatible with sales and attracting advertising revenue). A rather more attractive philosophy was the newspaper – the 'fourth estate' – as the provider of disinterested public information and critic of wrongdoing, whether by governments, businesses or individuals. Though a free press has been lauded as a foundation of democracy, no democracy (and that includes Australia) has been able to guarantee newspapers against the power of governments, advertisers and the political and business interests of press barons.

Whether hand-written or printed, for thousands of years the maximum speed of long-distance messages was that of men running, or horses in relays, or ships sailing. However, improvements were still possible. Post offices were first organised in the 17th Century, and in 1840 the uniform penny post was established across the UK. In the Australian colonies, as elsewhere, post offices were subsidised as an essential service, especially to people living far from the major cities.

As great long-distance trading enterprises developed and armies and navies elaborated the arts of war and plunder, the need for messages to be transported physically was felt as more and more constrictive. Various methods were tried to speed transmission, including pigeons, heliographs and semaphores, but none were very satisfactory. The answer eventually came from developments in basic science. A variety of inventions including electric batteries, electrical switching, electromagnets and galvanometers were brought together to begin the history of telecommunications.

### 3.2.2 The telegraph

The first electric telegraphs, invented in Germany and the UK, involved multiple wires and visual indicators to display the message. From the beginning they were associated with railway safeworking – the first commercial installation by the (UK) Great Western Railway was put in place in 1837. To this day the moving needle indicator of the early British telegraph systems survives in the signal boxes of many of the world's railways, particularly those in low-wage countries. The railways continued to apply the two-state telegraph technology to safeworking, inventing sensing devices (in particular track circuits) and, using electrical relays, they had developed automatic signalling by the early years of the twentieth century. These early applications of telegraphy to remote control show that the 'internet of things' is as old as the telegraph itself, even though its full burgeoning had to await the invention of electronic sensors and control devices.

In 1844 S.F.B. Morse took out a US patent for a single wire telegraph, which he originally intended should be confined to the transmission of numbers. However an associate of Morse, Alfred Vail, developed the fully alphanumeric 'Morse code', and this became world standard. The first Morse telegraph instruments made marks on paper, but operators soon realised that they could decipher the message just by listening to the clicks. A telegraph line not only accompanied every new railway but the wires spread way beyond the rail system, single-wire telegraphs being much cheaper per mile than railways. They could also run under-sea. Australia was connected with the Empire in 1872, though Perth had to wait till 1877. Governments and merchants found the telegraph so useful that lines were extended without much thought of cost-recovery.

Gradual technical improvements did away with the need for the repeater stations which were a prominent feature of the Australian Overland Telegraph, and later the ticker-tape machine allowed automatic printouts from Morse code inputs. However, following a great burst of investment from 1850 to 1880, the telegraph became a mature technology, surviving with little change until the last Australian telegrams were manually typed from traditional sounders in the early 1960s.

The economic and social impact of the telegraph is difficult to disentangle from the impact of other contemporary innovations, particularly the railway. Without telegraphs, railways would have been very difficult to operate, but without improved transport (not only railways, but ports and steamships) it would have been much harder to take advantage of the commercial opportunities which arose from the rapid transmission of information via telegraph. On the other hand, telegrams were too expensive for other than brief messages and so did very little to displace postal traffic.

From a 21st Century point of view, an intriguing feature of the telegraph was that it was essentially a digital (0,1) technology, and can therefore be directly compared with current technologies. In terms of the unit of transmission speed used later in this report, its speed rating was approximately 0.000001Mbps (megabits per second).

### 3.2.3 The plain old telephone

Unlike the telegraph, with its essentially (0,1) signal, the classic telephone depends on an analogue signal which provides an electrical equivalent to the sound waves of human speech. The signal is created by a microphone and reconverted to sound by a speaker. As with the telegraph, the telephone therefore required an accumulation of inventions: not only microphones and speakers but developments in AC and DC circuitry. With the invention of the telephone, analogue signals became the mainstay of telecommunications, and so lasted for a little over a century. The date for the commencement of telephone service is usually recorded as 1876, when the US awarded a patent to A.G. Bell. However, it took several decades for telephones to prove their usefulness and in Australia the great age of investment in telephones was early in the twentieth century.

The telephone offered little or no advance in speed of transmission vis a vis the telegraph. It main advantage was that it did not require skilled operators. The ability to chat on line, hitherto the preserve of telegraph operators, was extended to all. However, significant investment was required, which helps to explain why the telephone system was slow to develop. Instead of a single telegraph wire, often of indifferent quality, telephones connected callers by twisted pairs of copper wires connected to each other at manually-operated exchanges which in turn had to be installed, operated and maintained by new varieties of skilled workers.

Though it represented a step-change in technology, in Australia the public switched telephone system was simply added to the telegraph responsibilities of the state post offices. At federation the Commonwealth Postmaster General took responsibility for both telegraphs and telephones and began investing heavily in the telephone system. Initially the system mainly provided communication between the subscribers to each particular exchange, but exchanges were gradually interconnected by 'trunk' lines and long-distance calls became possible (Melbourne-Sydney in 1907, but Perth was not linked to the Eastern States till 1930 and Hobart had to wait till 1935).

At first long-distance transmission was poor in quality and high in price – hence the continued use of telegrams for long-distance messages. Microwave transmission, developed during the Second World War, supplemented the trunk lines during the 1950s. This increased capacity but quality still left much to be desired: analogue signals tend to degrade with distance, unlike digital signals such as the telegraph which can remain intelligible despite considerable interference. The ultimate solution for this was the conversion of analogue signals to digital – now with transmission speeds very much faster than the telegraph. This occurred from around 1970, signalling the end of the telegraph after more than a century of service. Meanwhile, the replacement of manual by automatic exchanges reduced costs. Despite this technical progress, as far as telephone subscribers were concerned there were no remarkable step-changes in the telephone service – just continued gradual extensions to the range of people who could be contacted by phone, at reasonable cost and with good voice quality.

The telephone system took much longer to reach maturity than the telegraph system. Eight decades elapsed between the first Australian phone exchanges and the completion of a system which served virtually all households and businesses in the country. The slow adoption of the telephone reflected many factors.

- Through a system of post offices and runners (latterly telegraph boys on bikes) the telegraph connected all urban premises in the country within a couple of decades of the technology being invented. By contrast, the telephone system required individual connections, which meant that the benefit of connecting to it depended on how many others were also connected. Households did not consider becoming subscribers till the people they wanted to ring became subscribers.
- The telephone system was developed in a period of relatively slow economic growth. Wars and depressions hindered growth in take-up.
- The technology improved much more gradually than the telegraph. In particular, demand was dampened by the high cost and poor quality of early trunk calls, which encouraged families to maintain long-distance contact by letter with telegrams for emergencies and wedding greetings and ensured that business continued to use the telegraph (or telex) for routine long-distance messages.
- As already mentioned, the investment required was daunting: it required copper wire connections to each point served. (The comparison here is with electricity distribution, which generally followed telephone connection.)

In the early years, the social and economic impact of telephones was greatest in rural areas. It enabled farmers to ring the businesses, health facilities and other services in town, frequently over party lines (which were installed, often roughly, by the farmers themselves). Farmers invested in telephone connections at about the same time as they were buying their first motor vehicles. Combined, the two new technologies reduced rural isolation and indirectly led to increased productivity. In the country towns, by contrast, social networks were geographically small and people continued to maintain contact by 'popping in' on each other. Except for those who had farm relatives, they felt no need for telephones until the improvements in long-distance telephony made it practical to ring people in the next town or the city.

Among urban households the telephone was at first regarded as a convenience rather than a necessity. However as the suburbs spread people found that they could no longer easily visit their friends and relatives and found the telephone of considerable help in maintaining contact. Though developments in transport (trams, trains, buses, private cars) provided the main impetus to the growth of suburbs the telephone helped to make the suburbs liveable.

Even more than the telegraph, the economic and social impact of the telephone is hard to disentangle from the effects of the other innovations of its era: improvements in transport and electricity prominent among them. However, by comparison with the telegraph, one can hazard a few generalisations.

- The telephone, like the telegraph, provided essentially one-to-one communication. Though the newspapers came to depend on the telegraph and telephone in gathering news, one-to-many communication (including advertising) was still mainly the province of printed material, newly supplemented by recorded sound. The gramophone was a contemporary of the telephone and evolved like the telephone with the application of electronics to recording and playing. Gramophone records (and the subsequent tapes and CDs) were akin to books in that they could store messages over time and could be physically transported from place to place.
- The telephone did not offer any advance for the 'internet of things'. Though telephone lines could be used for control messages and interactions, the technology was essentially that used in telegraphy.

- Except for country people living away from telegraph stations, the telephone did not offer any advance in the speed of important commercial and government messages.
- On the other hand, the telephone vastly increased the scope for personal messages, replacing much written correspondence. However, it provided no substitute for correspondence where a permanent record was required – at least until the fax machine was introduced in the 1980s.
- The telephone also made possible real-time interaction at a distance between people other than telegraph operators and allowed business discussions to take place without the need to meet physically. It therefore generated a vast amount of new messaging which would not have taken place under the slower reaction times of written correspondence. It probably also displaced a great deal of local 'over-the-back-fence' conversation.

Though the telephone found immediate business use, it was not, like the telegraph, intimately associated with any new transport technology, neither did it broaden market interactions substantially beyond those established by the telegraph. Accordingly one would expect a social impact more fundamental than the commercial impact.

### 3.2.4 Radio

The microphones and speakers which found their initial application in telephones became essential inputs to the next wave of development in telecommunications, the experiments which led to the development of analogue radio.

The principles for broadcasting, without wires, from a central source to any person with equipment to receive the signal were described in the 1890s, but (as with the telephone) reliable radio required development of a wide variety of components. Much of the development work is associated with the name of G Marconi, an Italian who worked in the UK. It was not till the 1920s that radio broadcasting became widespread.

Though radio removed the need for a physical connection between the source and destination of messages, it was subject to major limitations:

- messages, once broadcast, could be received by anybody within range who had the appropriate equipment. Unlike printed material, broadcasts could not be private. They could not be sold to their listeners;
- radio reception faded with distance and was subject to natural interference from thunderstorms and the like; and
- even more fundamental was the limit of spectrum, which brought the risk that radio messages would become intermingled and even jammed (not to speak of intentional jamming).

Governments in totalitarian countries reserved the spectrum for themselves. Following public debate the government of the USA allocated it wholly to commercial broadcasters financed from advertising, the British government allocated it to the BBC (subject no doubt to negotiations with neighbouring countries within jamming-range) and the Australian government split it between the ABC and commercial stations.

Radio was originally developed using the medium-wave part of the spectrum, and once that range was occupied broadcasting extended into short-wave, which, while subject to much interference, carried further than medium-wave and in the 1950s became the playground of radio hams and government propaganda stations. Meanwhile the medium-wave spectrum was reserved for free-to-air and frequencies were also set aside for official and commercial uses where the occasional eavesdropper could be tolerated and there was no substitute – as for communication to and from aircraft. Radio

served air traffic in the same way as the telegraph had served the railways – it made safe commercial aviation possible. The war uses of radio also developed quickly.

By the 1940s it had been established that the spectrum extended further into the microwave range. As regards telecommunications, microwaves differed from the medium and short wave spectrum in two important respects:

- they can be transmitted in narrow beams – hence non-intersecting beams on the same frequency will not jam each other, an important property when optimising spectrum utilisation; and
- they are essentially line-of-sight, which means that antennae are generally mounted on towers. The curvature of the earth limits the distance between towers while hills limit reception in valleys and reception is always subject to atmospheric conditions.

It thus became established that spectrum suitable for general broadcasting was indeed a limited resource while microwave could be treated as essentially a wireless telephone line.

The spread of free-to-air radio was hindered by the Depression and the Second World War, but the industry quickly reached maturity in the early 1950s – a similar pattern to its contemporary, the cinema. Broadcast content emphasised entertainment and topical information, with plentiful advertising on the commercial stations – not altogether different from newspapers, magazines, popular novels and the movies. Radio offered very little competition for the sorts of books which accumulated in libraries and found very little commercial use apart from air travel and advertising. Its primary impact was therefore on how consumers spent their time and money. It is difficult to distinguish this impact from other contemporary technologies, in particular recorded music, the cinema and motoring. Mass entertainment was substituted for do-it-yourself entertainment and for live entertainment.

### 3.2.5 Television

Entertainment was even more the raison d'être of free-to-air analogue television, introduced in the 1950s in black and white and upgraded to colour in the 1970s. As with radio, television had the limitations of being free to air and making demands on the spectrum. These latter were so considerable that there was no room for more than four or so channels in any metropolitan area. Spectrum was allocated by governments using the precedents developed for radio – fully commercial in the USA, BBC in the UK and mixed ABC and commercial in Australia. The limited number of channels and the costs of studios meant that television was slow to move beyond mass entertainment and popular news. It has been claimed that the social impact of television was profound, but not so much the economic impact – television grew at the expense of cinemas and to some extent at the expense of popular magazines but it did not have much to contribute to techniques of production outside entertainment and advertising.

Coaxial cable, which was invented in 1880, comprises an insulated central conductor surrounded by a tubular second conductor, further insulated. It has the property of conveying radio-frequency current without acting as an antenna and accordingly came into its own as a component of radio and television transmission systems. The conditions for successful television transmission are more demanding than radio and transmitters are located to command line-of-sight to as many homes as possible. Coaxial cable is used for transmitting television from the studios to the broadcast antennae and for the local delivery of signals from receiving antennae to areas in free-to-air shadow. Cable was also used in early non-entertainment applications of television, such as security monitoring and in the remote control of machinery and traffic signals.

In later developments, two technologies, satellite and cable television, were used to market television to individual buyers rather than broadcasting it free-to-air, including the provision of additional channels not otherwise possible due to spectrum limitations. Satellite dishes are unavoidably cumbersome so the two techniques are often combined, with local-area coaxial cable networks fed

from satellite as well as by coaxial cable from broadcasting studios. The technology became commercially available in the 1970s but did not arouse the interest of government-owned broadcasters, who were happy with free-to-air. The private sector took the opportunity to develop networks, but only in rather special circumstances.

- Regulations had to be favourable. Cabling was easiest in countries where there were no legal restrictions either on aesthetic grounds or to protect the telephone system or free-to-air TV.
- There had to be plenty of potential consumers per cable-kilometre. Thus only high-density urban areas were candidates.
- There had to be sufficient difference in content to persuade consumers to buy.

The middle-class parts of Indian cities were cabled in the 1980s – there were no regulations to prevent small-scale entrepreneurs from draping cable across the tops of buildings; customer density was high and the offerings of government-controlled free-to-air television were decidedly uninspiring. In Australia, Telstra and Optus rather belatedly provided coaxial cable coverage to a total of 2.6 million premises, mostly in Sydney and Melbourne. Similarly Foxtel provides satellite television to those who install the required dishes. The primary purpose of this coverage is pay television and the take-up rate has not been particularly high. For many potential customers, the demand for diversity in television programming was met more cheaply by the video shops.

### 3.2.6 Mobile telephones

Developments in radio and television technology from the 1980s on allowed a much finer allocation of the radio spectrum. One beneficiary, in some countries more than others, was public-interest FM broadcasting. A more pervasive technology was the mobile phone. Initial experiments with mobile radio technology built on experience with aircraft and involved relatively high-powered transmitters. Specialised systems, such as city-wide radio control for taxis, followed from the 1960s on. The crucial innovation was, however, the mobile phone tower, designed to communicate using hand-held devices.

Mobile phones rely on radio transmission in the 800-2200 Mhz (megahertz) range – frequencies bordering on the microwave, and hence placing a premium on line-of-sight (the mobile phone providers would probably rather operate at lower frequencies which are less constrained to line of sight, but this part of the spectrum is already crowded). The first step in becoming a mobile phone operator is to gain rights to a suitable portion of spectrum – a prerequisite which of itself limits the number of possible operators, though some aspiring operators have become virtual operators by contracting to use other operators' infrastructure and spectrum. The second step is to invest in an array of towers commanding lines of sight. Calls are transmitted by radio between mobile phones and the nearest tower. The use of low power minimises the demands on the mobile phone's battery (and perhaps also the electromagnetic effects on the user's brain) but also limits the range to a maximum of 25 km or so outdoors – hence the need for an array of towers transmitting on the same wavelength. As a mobile phone leaves the range of a tower, it either cuts out (falls into a black spot) or is transferred to an adjacent tower of the same service provider. The area served by each tower is called its cell – hence the American term 'cellphone'. On the 'land' side of the towers, messages are routed via a mixture of purpose-built microwave and cable links (some of which are usually owned by the mobile phone provider) plus links to the public switched telephone network.

The first Australian mobile phone system, an analogue (1G) system operated by Telstra, opened in 1981. The mobile phones used in this system were large and were installed in cars. The first hand-held mobile phones were introduced in 1987 and the first digital (2G) mobile phones in 1993. To conserve spectrum, the analogue system was shut down in 2000. In compensation the Commonwealth subsidised the construction of additional 2G towers in rural areas. The mobile phone was at first limited to the spoken word but display screens and texting were soon added and with the coming of 3G phones from 2003 on mobile phones have a variety of data-related capabilities.

Leaving aside the added capabilities of 3G mobile phones, the 1G and 2G mobile were particularly effective in fostering productivity gains in industries with individuals engaged in dispersed activities, particularly construction, logistics and mobile sales forces. It is too soon to pontificate on their social effects, other than to expect them to be considerable. We shall return to mobile phones in our discussion of contemporary technologies.

### 3.2.7 Computers and the internet

The telegraph was essentially a digital device and so had the important advantage that its signals were not easily interfered with. It takes a lot of noise to render a dit-dah pattern unintelligible, whereas much lesser levels of noise can distort an analogue signal to the point where it becomes meaningless. The switch from the digital telegraph to analogue telephony came when the invention of the microphone allowed analogue signals to be generated at the speed of speech, and the telephone, radio and television were all developed as analogue technologies. However, the reader will have noticed that all three are now either fully digital, or mixtures of digital and older analogue equipment. The advantage of this change-over is that signal quality greatly improves at the same time as demand on the spectrum falls. The key to the change is the computer, which can convert an analogue signal (such as speech or sight) into a succession of dit-dahs millions of times more rapid than those produced by the telegraph-operator's sounder.

In the 1960s computers were programmable calculating machines with voracious appetites for electricity and punched cards. They had a fundamental similarity to telecommunications in that they operate electronically, and as computers became more compact and powerful they were soon incorporated into the telecommunications system. From the beginning of computing it was usual to increase analytical power by linking computers, though in the absence of long-distance links data was also fed in using punched cards, later replaced by tapes and floppy discs. Around 1970 protocols were developed so that computers could be linked by plug-in cables without resort to specific programming. It also became possible to plug them in to the public switched telephone system and transmit data computer to computer, though it was necessary to ensure in advance that the pair of computers concerned could recognise each other's signals.

In a parallel development, electronics was applied to sensing and remote control. When the railways pioneered remote control they relied on their in-house telecommunications system, but the new generation of remote control devices was largely radio-connected, thus creating new demands for spectrum.

During the 1980s specialised computers were developed which could digitise analogue signals, so opening the way for the reintroduction of digital signals into telecommunications. At the same time the technologists and administrators worked on a system by which messages could be routed from any compliant computer connected to the public switched telephone system to any other compliant computer so connected. The links were not direct, but ran via computers operated by internet service providers (ISPs). The architecture to do this was complete by 1995, and so began the internet of emails and websites. As remote control and sensing devices became connected to this system, rather than their own closed circuit communications, there also began the 'internet of things'. The resulting surge in telecommunications traffic was initially met by excess capacity in the existing telephone system – partly inherent (in most cases telephone connections had surplus capacity beyond that required to carry voice) and partly due to the release of additional capacity as analogue transmission converted to fully digital. However, it did not take long for the internet to strain the capacity of the system. The Australian telecommunication settlement referred to in the introduction to this section is intended as an answer to this problem.

### 3.2.8 A guide to the future?

The history of telecommunications has been marked by a number of major innovations. Two of these innovations – the telegraph and telephone – required major public investment in networks of wires, and in this are comparable with the investment in fibre optic cables now under way. The other major innovations – radio, television and mobile phones – did not require as much public investment, but raised the question of public management of a limited resource, spectrum. An important aim of the national telecommunications settlement is to tie all this together, with investments in fibre diverting demand for spectrum onto cable and so reserving the airwaves for those applications for which radio has no substitute.

The national telecommunications settlement differs from its predecessors, the telegraph and telephone systems developed by the nineteenth-century colonies and then by the Commonwealth Postmaster General, in a number of important respects.

- Unlike the monopoly services offered by the PMG, it will be a complex system with the NBN limited to local connections while a variety of other businesses providing services using these and other connections.
- Unlike the previous systems, it will not connect relatively simple devices like telephones, but will instead connect computers of widely varying size and function.
- Unlike the telegraph, with its close association with railways and steamships, or the telephone with its association with motor vehicles and suburbanisation, or radio with its association with air travel, the telecommunications settlement is not associated with any major developments in transport – indeed, probably the reverse, for the need to economise on fossil fuels is likely to reduce personal and freight mobility at the same time as the speed of telecommunications increases.

The national telecommunications settlement is therefore without real precedent. However, the precedents, such as they are, indicate that the benefits of investment are closely bound up with social and economic developments in general – they influence the course of history, and make much more than marginal changes. Evaluation techniques which work for small changes cannot be relied on for the large, or even for parts of the large – as the NBN is but part of the bundle of changes associated with the national settlement.

Before going on to consider the NBN in more detail, we pause to consider the variety of current telecommunications technologies.

## 3.3 Current technologies

From the simple technology of the telegraph, which lay people can understand easily enough, telecommunications has developed into a specialised and arcane field of engineering. In this chapter we discuss some of the complexities from a lay point of view, hoping not to make too many misleading statements.

### 3.3.1 Speed and capacity

A paradox of telecommunications channels is that, though they transmit messages at the speed of light, they still have capacity limits.

- The theoretical limit to the speed of messages through a telecommunications channel is not far short of 18 million kmph. This does not mean that speed is inconsequential; satellite

transmissions in particular are plagued by 'slow' speeds, so that even when all is well it can take up to a second for a message to travel from origin to destination. This can be noticeable in conversation.

- Like roads, telecommunications channels can become congested. Unlike roads, this does not mean that the speed of transmission is slowed. Instead, messages go into queues and are temporarily stored before dispatch. This not only slows them down, but long messages are broken into sections which arrive sequentially. If demand exceeds temporary storage capacity, messages are refused transmission – the sender gets an engaged signal.

The capacity of a telecommunications connection is measured in bits per second. The capacity of any connection can be increased by transmitting at multiple wavelengths, though in the case of wireless transmission the capacity to do this is limited by spectrum allocations.

Some typical estimates are:

- telegraphs – around one bit per second, that is 0.000001 megabits per second (Mbps);
- copper land lines – 20 Mbps with the latest transmission equipment using multiple bandwidths over short distances, trailing off to 10 Mbps at around 3 km. Measured capacity in Australian metropolitan areas can approach these speeds, but outside the metropolitan areas the measured average capacity is more commonly 1 Mbps or less. The capacity required for a plain old telephone conversation is around 0.05 Mbps, at which capacity the fade-with-distance problem does not generally arise except in remote areas;
- radio transmission via satellite – not much more than 12 Mbps;
- fixed wireless connections (microwave): capacity depends on the equipment used and bandwidth available. Where fixed wireless is used for connections to individual premises speeds of up to 12 Mbps are regarded as realistic over distances which vary according to the wavelength used;
- mobile connections are restricted by spectrum available in much the same way as fixed wireless connections. The main difference from a fixed wireless connection is that there may be multiple claims on a particular connection. Such claims further reduce the capacity available to any one mobile user. When twenty or more users are actively connected to one tower, the speed can no longer be regarded as broad-band though it will be adequate for a telephone conversation; and
- fibre optics – 100 Mbps for a standard connection, but with multiplexers to transmit multiple wavelengths the capacity of a fibre can be increased to well over 1,000,000 Mbps. Multiple fibres can be included in a single cable.

Capacity in this sense is sometimes referred to as bandwidth (hence broad-band), though this usage can easily be confused with radio or frequency bandwidth by which slices of the radio spectrum are measured in hertz. The measure of capacity in Mbps is also a measure of speed – if the capacity of a connection is known, the number of seconds it will take to transmit a message (or collection of messages) of known bit-size can readily be calculated.

An early reaction to capacity limitations was the design of asymmetric systems with more capacity devoted to 'download' than to 'upload'. Internet service providers designed these services for households who use the telecommunications system for voice, emails (both requiring small uploads and downloads) plus downloads from the internet (which typically require larger capacity). When describing an asymmetric service, it is necessary to quote two speeds – upload and download. In business applications, upload and download requirements were thought to be similar so that asymmetric connections were not generally offered to businesses, meaning that business connections tend to make greater demands on capacity.

The smaller the capacity of a connection, the more time it will take to transmit any given quantity of digital data, till the point is reached where slow and stuttering connections are useless. Two such points can be identified:

- transmission may be too slow for messages where real-time is critical, such as voice messages and more commonly video (which requires much greater capacity than voice); and

- similarly the critical point for data transmission depends on message size, in that eventually slow downloads and slow uploads effectively prevent users from sending and receiving ('uploading' and 'downloading') large messages. For this purpose, text messages make negligible demands, emails a little more, complex websites a lot more, and large accounting and scientific data sets more again.

As computing power increases, so does the capacity to generate large inter-computer messages which test the capacity of the links between computers.

### 3.3.2 Links

Except for closed circuit systems, each message over the telecommunications system moves over a series of links.

- At a minimum, a plain old telephone message involves the link between the sender's phone and the exchange and a link between the exchange and the recipient's phone. In most cases it also requires links between exchanges.
- At a minimum, a mobile phone message involves a link from the sender's phone to a tower, links from the tower to an exchange and then on to the tower which transmits to the recipient's phone. Links between exchanges are also generally required, particularly when the sender and recipient subscribe to different mobile networks.
- At a minimum, a land-line internet message involves a link from the sender's computer to an exchange and automatically on to the sender's ISP, thence (generally via exchanges) to the provider of address lists and possibly via other service providers (e.g. email service providers) eventually to recipient's ISP, thence via an exchange to the recipient's computer.

In all three cases it is possible to distinguish the primary connection to the subscriber from the other links, which are generally known as backhaul. Under the plain old telephone system the distinction is clear – anything on the subscriber side of an exchange is primary connection, anything between exchanges is backhaul. More recent technologies are blurring the distinction and the NBN has introduced the concept of a transit link interposed between the primary link and backhaul.

The NBN is chartered to provide primary connections at wholesale level. Individual subscribers will deal with retail service providers. These providers will employ the NBN links in conjunction with backhaul services (which the service provider will select) and their own switching and charging services. This requires all messages using the NBN to pass through a 'Point of Interconnect', being the junction between the NBN and other providers. In the copper-based system, each Telstra exchange is (by regulation) a potential Point of Interconnect between the primary connections owned by Telstra and backhaul provided by others. Under the NBN a complete system redesign is under way and the number of Points of Interconnect will be considerably reduced.

The NBN target is that 93 per cent of primary connections to premises will be fibre optic cables with capacity of 100 Mbps or so. Subscribers will be grouped into 'building block areas' of approximately 3000 premises, several of which may be aggregated into a 'fibre serving area'. The purpose of these areas is to group subscribers to share cable, which may be done using passive splitters but may also require the installation of fibre exchanges with message-routing functions. Though the cables carrying

grouped messages will have higher capacity than the primary cables, the capacity of individual services will be less than 100 Mbps if everybody transmits at once. The fibre connections between fibre exchanges and points of interconnection are termed transit links and NBN intended-coverage maps show that the routes of these links will influence the provision of broad band services.

In the case of mobiles, the primary connection is to the tower. Using NBN terminology, towers are connected by transit links which may be dedicated microwave links but may also be connections to the public switched telephone system, generally using fibre optic cable. These transit links convey the messages to exchanges, whence they enter the backhaul system. It is probable that, as NBN rolls out fibre, a NBN connection will become the preferred means by which mobile providers arrange transit from towers to backhaul.

### 3.3.3 Backhaul

We will here use backhaul to mean high-capacity long-distance capacity between exchanges, excluding transit links. Currently backhaul in this sense is mostly provided by fibre-optic cable, which has very high capacity but in some places is still supplemented by microwave. Backhaul connections have two important characteristics.

- Because of the need for multiplexers and other transmission equipment, backhaul terminals are expensive. Long-distance cables therefore have few if any break-out points.
- The volumes of internet traffic over backhaul routes are such that more than one cable can reach remunerative levels of utilisation. This provides a contrast to the telephone system, where traffic on backhaul routes was seldom, if ever, sufficient to justify multiple microwave routes, let alone multiple fibre optic cables – though multiple routes were sometimes provided for system security.

The growth in backhaul traffic due to the internet has therefore made it possible for governments to insist that multiple backhaul facilities should be in different ownership and should compete. Inevitably this competition is regulated, for several reasons.

- The number of providers on any backhaul route is limited by demand.
- Entry into a backhaul market requires substantial investment and frequently government assistance in securing the right-of-way for cable.
- There is considerable potential for profit by collusion between backhaul providers and even more by their amalgamation into a monopoly.

Not surprisingly, countries inclined to the corporatist approach to public affairs have not bothered with fostering backhaul competition and rely solely on regulation, usually through state enterprises. Australia prefers to promote competition. While the several providers of inter-capital backhaul services are deemed to be sufficient competition, there has been concern as to lack of competition on routes involving non-metropolitan cities. An example was the Perth-Geraldton leg, where the Commonwealth recently promoted construction of a second backhaul cable to compete with that operated by Telstra.

The existence of competitive backhaul has become an important element in the interpretation of the NBN charter. The NBN says it will provide Points of Interconnect at places served by multiple, competitive backhaul providers. This design specification raises difficult questions. Should the Points of Interconnect be limited to places currently served by multiple backhaul providers, or should they include other places where competitive multiple backhaul could be provided? To what extent, if any, should current backhaul cables connecting Telstra exchanges be incorporated into the NBN network as part of the connection between subscribers and Points of Interconnect – that is, converted from

backhaul to transit links? With the broad strategy for telecommunications settled, debate will increasingly concentrate on questions of system design, like these.

Under the telecommunications settlement, the backhaul system will be used in common by the two main types of customer connection – mobiles and the NBN. In addition, the NBN will be expected to provide transit links between mobile towers and the more general backhaul system, replacing microwave and copper where these are currently in use. Before we discuss these two systems of primary connection, it will clear the air to dispose of several contenders which have no role in the current telecommunications settlement.

### 3.3.4 Technologies not included in the telecommunications settlement

An important component of the NBN is that the familiar copper wires will disappear from the public switched telephone network, though not from the internal connections within houses and business premises. The limitations of copper will be recalled from the 2005 *State of the Regions* report.

- It can only carry internet traffic if its exchanges are equipped with DSLAMs – the exchange equivalent of the user's modem. Though the larger exchanges were quickly equipped, there remain many small rural exchanges which are not internet-enabled.
- Some copper land lines include devices which optimise their use for telephone services but prevent them from carrying internet traffic. These limits can be removed, and have been removed in some places, but removal is costly and some remain to this day.
- Most seriously, the capacity of copper connections declines with distance, 5 km from the DSLAM being regarded as more or less the outer limit for internet traffic with shorter limits for higher speeds. Three kilometres is now quoted as maximum distance for copper-based service with a guaranteed speed of up to 12 Mbps. This looks quite impressive compared with dial-up internet (which had speeds considerably less than 1 Mbps) but is already less than some of the broad-band plans being offered by internet service providers. For example, iiInet has a plan which offers download speed of up to 20Mbps (1 Mbps upload), which with copper connections can only be realised within 1.5 km of the exchange.

The first two of these disadvantages can be overcome by investment, and the third can be ameliorated by Fibre to the Node, which reduces the distance which messages have to cover on copper by running fibre from the exchange part-way to a group of premises. This could raise capacity to around 20 Mbps, and also had potential as a half-way-house to FTTP. In the event it was rejected as part of the telecommunications settlement, on two grounds.

- Projections of capacity requirements were constantly revised upwards, so that the full hog became more attractive than the half-way house.
- Fibre to the node would not have removed investor expectations that Telstra would be able to exploit its natural monopoly of copper connections.

A second technology which is being considered for broad-band in some countries is coaxial cable. Though it provides a considerable capacity advance on telephone copper, coaxial cable has many of the disadvantages of copper including fade with distance. As with copper, speed falls when multiple loads are carried on the same cable. Coaxial cable was a non-starter in Australia given the limited coverage of existing pay-TV systems and the need to upgrade them to bring them to internet standard.

Concerning technologies not yet mature, research is under way into using power lines as telecommunications conduits. Power lines have bigger cross-sections than telephone wires, which would help with speed. The obvious advantage is that power lines are already in place, both as backhaul connections and to premises. The problems to be overcome are finding foolproof ways to route the telecommunications messages round switchgear and other breaks in the electrical system,

and to and from the electrical system to the low-voltage telecommunications terminal equipment. Rather than use the electricity wire to carry telecommunications, an alternative is to use electricity pole-lines to carry fibre optic cable. It is surprising that this alternative has not been much investigated in Australia.

### 3.3.5 Mobiles

Mobile technology here refers to roaming telecommunications connections via towers and not to either fixed wireless connections or satellite connections. These will be discussed under the NBN.

Two mobile telephone technologies are currently in use in Australia, 2G (CDMA) and 3G (NextG), plus WiMAX (which is argued to be a half-step ahead of 3G). The same three operators (Telstra, Optus and Vodafone) provide 2G and 3G services, while WiMAX coverage is provided by Vivid Wireless.

Using either 2G or 3G technology, the hand-held mobile has proven its usefulness as a telephone and a conveyor of simple messages and data that can be displayed on a small, hand-held screen. 3G technology has obvious additional usefulness in connecting portable (laptop) computers.

It is sometimes claimed that mobile technology can substitute for land lines in connecting immobile computers, or at least will be capable of doing so when 3G gives way to 4G, the implication being that the NBN is a waste of money. At the opposite extreme are the claims that the mobile system, as it stands, has a long way to go before it provides satisfactory mobile service and that the NBN will make a major contribution to improving mobile services. We will first consider the adequacy of the existing mobile system and then consider the argument that extension of this system could make the NBN unnecessary.

The two main limitations of mobile phones in Australia concern coverage and capacity. Mobiles are sold on the basis that they can be used anywhere, but this is far from the case. Many parts of Australia lack tower-based mobile coverage, but the extent of these areas is hard to map, for several reasons.

- Indoor coverage is generally less than outdoor.
- Coverage without an aerial is generally less than with one.
- Coverage varies with other obstacles such as buildings, hills and trees.
- Coverage varies with atmospheric conditions.
- Coverage varies by service provider – in general Telstra has the widest coverage but Vodafone and Optus are not far behind and indeed cover some areas which Telstra doesn't.
- Connection may occasionally be denied due to system overload.

In other words, mobile coverage is not just on-off; there are considerable areas of marginal service where capacity is barely sufficient to support voice (let alone data transfer) and where connection can easily be lost, particularly from moving vehicles. There are also black spots, some of them quite close to the relevant tower. In favourable circumstances, such as on a treeless plain or shore-to-sea, connection may be available for considerable distances from towers, but 25 km from the tower may be taken as the practical limit for reliable voice communication. Further, if shortage of spectrum forces mobile operators up into higher frequency bands the effective distances over which service is available fall. As a result of the limited range of towers, most of remote Australia has no mobile service at all apart from satellite-based services.

Commercial decisions about extensions to coverage are made by system operators, who balance the capital and operating cost of extra towers (and in many locations extra backhaul) against expected additional revenue. It is believed that the industry takes into account not only revenue from calls made through the new tower but revenue from customers who choose systems on the basis of their coverage maps. According to these commercial rules the systems are more or less mature. This need not prevent councils in areas where mobile coverage is less than complete from seeking improved coverage – in other words, the construction of more towers. This can be done directly, by trying to persuade system operators that commercial potential exists or by contributing to tower construction costs. It can also be done indirectly, by lobbying for improved transit connections to the proposed tower site. Conversely, there is often resident opposition to tower construction, and councils which oppose the construction of additional towers must accept the consequence that, for lack of towers, mobile coverage in their area may be unreliable and/or of limited capacity.

An important feature of mobile phone technology is that the link between the tower and the phone is contestable, meaning that the capacity available from any particular tower is divided among the phones currently linked to that tower (that is, phones in actual operation, not dormant or switched-off phones). This reduces the capacity available to each active user. When a user has a tower to herself, capacity may accordingly be large – competitive with fixed wireless (up to 25 Mbps with reasonable proximity) if not with fibre. However, the effective capacity of links to popular towers (say those which attract 20 or more concurrent users) can fall to well below 1 Mbps per user. A partial remedy is, of course, more towers and more transit links to and from these towers; but by its nature mobile technology is contestable and capacity guarantees therefore cannot be given. The effectiveness of the remedy may also be limited by public resistance to the proliferation of towers on aesthetic grounds.

Using 3G and 4G technology, the mobile system can be used as a broad-band connection provided capacity is available from the relevant tower at the time of transmission. Unfortunately the capacity requirements of broad-band data transfer are considerably greater than for voice, hence the degree to which the services of any particular tower are in demand for data transfer becomes an important determinant of speed. This raises the question of whether it is appropriate to use mobile technology for data transfer to and from stationary broad-band users. Such users do not require the roaming capability which allows mobile calls to be transferred from tower to tower but make considerable demands on the capacity available from their local tower. This is one of the important arguments that the NBN and mobile telephony are complementary rather than substitutes – the more data transfer between immobile computers can be carried out by fibre, the less the demands on the mobile system and the better its ability to serve users who move around.

Mobile capacity can be increased by diversion of radio spectrum to the mobile phone operators. The problem here is that the spectrum is already fully allocated and diversion therefore requires prioritisation. A current example is that the mobile phone companies are lobbying for allocation of the 1800 MHz band for extension of their operations, shouldering aside the Australian Railway Association which currently uses the band for its train radio systems.

Though it is desirable to reduce the load on the mobile system, this does not necessarily require resort to FTTP. An alternative radio technology merits consideration: plain old 1950s microwave with a dedicated connection from each broad-band customer to a tower shorn of roaming facilities. This does away with the problem of contested connections, reduces spectrum demands and also offers greater security against eavesdroppers. In NBN terms it is termed ‘fixed wireless’, and it is proposed to form part of the NBN system. We will consider it below.

Given the inherent limitations of mobile technology (deriving both from spectrum and from the tower system) it appears that mobile services and land-lines are essentially complementary, the former designed for voice and for limited data transmission essentially involving portable laptops; the latter designed for heavy-duty data transfer but also providing voice service. An indication of the limits of mobile technology for the ‘internet of things’ is provided by Energy Networks Australia, the peak body for electricity distributors, who in a recent submission noted that ‘commercial wireless carriers

have been unable to provide cost-effective prices, or the level of reliability and ubiquity, that electricity network businesses require for mass employment of smart technologies.' They are accordingly investing in their own wireless technologies, involving yet more towers – but given that all their connections are to and from immobile sites, this is arguably a misuse of spectrum. Similarly businesses and government entities which need to transmit large data sets cannot see their needs as being provided by mobile technology. These demands are unsuited to tower-based mobiles, and will form the core demand for heavy-duty fixed-line service and hence for FTTP. In addition, the more that broad-band demand can be diverted from mobile to landline the less the need for additional towers, the better the service provided by existing towers and the less the problems of spectrum allocation. An important method of diverting calls away from towers will be to route mobile communications which originate or terminate inside premises fitted with FTTP connections directly onto the fibre connection using within-building radio connections.

### 3.3.6 The NBN technologies

As we have noted the primary 'last mile' technology proposed for the NBN is fibre to the premise (FTTP). This means fibre to a connection on the subscriber's property; internal connections within the property, whether fibre, copper or radio, will not be affected. FTTP is nominally rated at 100 Mbps, way in excess of most subscribers' current requirements but extendable if required by using additional terminal equipment, without need of additional cable. As described above, the NBN proposes to group connections and employ transit links, which means that there will be an element of contestability in its network. However the capacity of these grouped connections can be expanded, if required, without replacing the cable.

The major cost of providing FTTP is certainly not the cable itself. The cost of associated equipment (splitters, fibre exchanges, joints and terminations) is more significant, but the most important component of cost is the civil works required to install the cable and equipment. The NBN Implementation Study assumes that the costs of connection will vary with distances to be covered and hence with the density of premises. This would be broadly true if all fibre is to be placed in new trenches, though the costs of insertion of new trenches into high density urban areas are likely to be higher, per metre, than equivalent broad-acre costs. Costs are likely to be less if existing conduits can be used (and the agreement with Telstra opens up this possibility) or if fibre can be installed in the process of installing other utility services (as will be the case in new housing estates and as was the case when gas reticulation was extended in Tasmania). Costs may also be relatively low if existing pole lines are used. Though the old PMG pole lines have mostly given way to microwave, the country is well served by electricity pole lines, some of which also carry coaxial cable which will become redundant once the NBN is in place. A limitation to the use of electricity pole lines for telecommunications is the existence of sufficient space below the electricity wires to allow the fibre-optic cable to be strung, but even so it is surprising that the NBN Implementation Study does not contain any reference to existing pole lines. All of this means that the costs of FTTP will vary considerably with local circumstances and that until these circumstances are known in detail both NBNCo and its critics will have no more than rough estimates of the cost of fibre rollout and rough ideas of where rollout will be feasible. There is an obvious opportunity here for local government to assess local rollout costs and to point out to NBNCo where fibre can economically be extended.

Current NBN plans include the use of fixed wireless connections in places where customer numbers are sufficient to justify a tower connected by fibre to the rest of the NBN system. Towers may be built in locations where densities are too low to justify FTTP, or may supplement FTTP by connecting outlying subscribers. The towers will provide individual microwave connections. For spectrum scarcity reasons very high frequencies are likely to be used, which will restrict connections to line-of-sight locations within seven kilometres or so. In addition to a modem, most customers will need an outdoor high-gain antenna with associated cabling and installation costs. Current NBN intentions are to guarantee no more than 12 Mbps using such connections, though rather higher rates have been quoted as within wireless capability.

This leaves the remainder of the country, slated for subsidised satellite connections. Satellite connections have been available in Australia for 25 years and their strengths and limitations are well known. The great strength of satellite phones is their theoretically universal availability, though in practice black spots are reported. The weaknesses of satellite phones are their cost, susceptibility to atmospheric conditions and, most important, their demands on the limited number of antennae and hence on the capacity which can be fitted on a satellite. This limited capacity can be contested by numerous users, resulting in very slow user-speeds. The limited capacity of satellite antennae has caused satellite service to be rationed to the 'sky' TV channel and services for areas where alternative telecommunications are too expensive to provide – that is, the oceans and land with low population densities. The current practical speed is up to 12 Mbps, marred by occasional interference and frequently reduced by contestation; however the NBN considers that this speed can be guaranteed for users who do not have access to FTTP or fixed wireless, and is committed to subsidise such use.

It will be noted that the NBN is planned to provide a three-speed system. Connections to nearly all premises will have greater capacity than those currently in place, though as will be seen in Section 3.4 the benefit to some is fairly marginal. The stated reason for limiting the rollout of FTTP to 93 per cent of households is cost, but the time may come not many years hence when the cost of completing the fibre rollout has to be faced. The extent to which the proposed non-fibre connections are satisfactory will depend on the rate at which demand for capacity develops; this in turn will depend mainly on website and software developments overseas. This brings us back to the threat which the NBN was designed to combat: that the corporatist countries which have invested in improved telecommunications will steal the knowledge economy from the neo-liberal countries.

### 3.3.7 The role of local government in the national telecommunications settlement

There are very strong reasons for councils to do all that is in their power to ensure that FTTP and adequate mobile services are both available in their areas. The role of local government will be largely as advocate, though councils are directly involved through planning permissions (especially for mobile towers but also as administrators of rights of way).

When dealing with NBNCo it will be important to remember that it is a new and somewhat stressed organisation. It will be important for councils to know what they are talking about, since local decisions will depend on fine balances of cost. Councils which have access to advice from a local telco will have an advantage in this area; otherwise they will almost certainly have to seek technical advice. Backhaul and transit links and the costs of local fibre installation will all be important determinants of the extent of local coverage, including the coverage provided to towers for improved mobile coverage.

The basic argument for FTTP is that it provides as much telecommunications capacity as is likely to be required for decades hence to all connected premises. However, this is not an unalloyed benefit: it will threaten some classes of local employment through competition from internet-connected places near and far. In the following chapter we consider the balance of benefits and costs.

## 3.4 Evaluating the costs and benefits of the national telecommunications settlement

In Section 3.2 we argued that past major innovations in telecommunications combined with the transport innovations of their day to change the course of history. The complementarity with transport innovations means that, even with full hindsight, it is next to impossible to apportion all the benefits which arose to the telecommunications innovation rather than to the transport innovation; indeed it means that it is very difficult to imagine an alternative history to that which actually took place, and hence develop a base case against which the impact of the innovation can be assessed. In principle, similar uncertainties apply in the current case, save, as noted at the end of Section 3.2, there is no

major transport innovation in sight – at best, transport seems slated to undergo a period of adjustment marked by rising costs and falling capacity and speed. By contrast, we saw in Section 3.3 that telecommunications and information technology can look forward to an era of falling costs and increasing capacity.

To put the same point more technically, past major innovations in telecommunications were complementary with innovations in transport; the two supported each other. If the current major innovations in telecommunications depend for their success on yet faster, cheaper transport they are doomed. However, if the telecommunications innovations turn out to be substitutes for transport, they will have a bright future. This proposition underlies the following analysis.

### 3.4.1 The NBN: basic costs and benefits

The NBN is an investment and therefore has an upfront cost. It is also a major technological change, part of a larger scheme for upgrading the Australian telecommunications system. As a bit-part in a major upgrade, it is threatening to a variety of business and occupational interests. The most direct threat was to the owner of the copper telephone system but Telstra has recognised this and negotiated a settlement. Within the telecommunications industry it also threatens the business plans of possible entrants to the provision of wireless connections, but again the national settlement includes a trade-off supported by the major mobile operators. The major threats therefore arise from increased telecommunications capacity per se, and the groups threatened include local accountants, lawyers and other professional service providers who will suddenly find themselves competing with services provided from a distance via telecommunications. By the same token, the improvements to telecommunications will benefit local business in two ways:

- increases in productivity, chiefly by reducing the cost of service inputs – for example, farmers will pay less for those same accounting, legal and other services whose local providers find themselves subject to competition. Increases in productivity can also arise through improved information flows; and
- the ability to market much more widely, benefiting not only local producers of tradable goods such as farmers but also, potentially, the service-providing groups now subject to increased competition, provided they can meet the new competition.

The construction phase will also bring temporary bursts of employment to local areas, but nationally the effects will depend on macroeconomic circumstances, as outlined with respect to the mining boom in Chapter 2. In this assessment we confine ourselves to the effects of improved telecommunications on local business, and observe:

- the productivity improvements will increase the profitability of industries which are able to cut costs, but in the process will reduce local employment, either in the industries concerned or by local service providers to these industries. The major exceptions are non-profit industries like health services and education, where total employment is determined by a conjunction of government budgets and consumer expenditures. In these industries the improvement in productivity is likely to be expressed as improved service at unchanged employment; and
- the marketing opportunities which arise directly from improved telecommunications and indirectly from improved productivity will unambiguously increase both local income and employment, provided local people take advantage of them.

The twinning of benefits and threats mean that a very important role for local government will be to ensure that local businesses and residents are aware of the threats but are also poised to take advantage of the opportunities.

A possible strategy for local governments which expect to lose professional service employment as a result of improved telecommunications would be to resist broad-band expansion. This will indeed postpone the evil day when the professional employment is lost, but at the cost of denying other local businesses and services the improvements in productivity which broad-band allows. As broad band extends elsewhere these businesses will become uncompetitive and the costs of the strategy will become apparent: local business as a whole will collapse, rather than just the professional services. This is not a good outcome.

At this broad level the role of local government with respect to developments in telecommunications is therefore to ensure that local people get the best possible deal and to ensure that they are ready for the threats and opportunities. However, there is still a great deal of discussion about the more precise costs and benefits of the national telecommunications settlement. The following chapters will provide a more formal analysis, including consequences for local government.

### 3.4.2 Formal methodology

In its account of the benefits of broad-band in the 2005 *State of the Regions* report, NIEIR:

- identified e-journey stages – essentially a sequence of adoption of IT technologies ranging from basic computer use to internet-integrated management;
- correlated these with export propensity; and
- correlated export propensity with productivity.

This methodology provided a fairly crude estimate of the benefits of broadband (not necessarily fast - in 2005 speeds around 0.2 Mbps were still regarded as broadband). The estimate was, however, high enough to show that potential benefits were likely to be substantial. .

Since 2005, as expected:

- there has been a general progression through e-journey stages;
- at least one new e-journey stage has appeared – characterised by cloud computing and maybe also videoconferencing, depending on the type of business; and
- the relationship between productivity and exporting probably remains important.

But can we really be sure that further increments in telecommunications capacity will continue to drive increases in productivity? One approach to this question has been to consider the opportunities industry by industry, but a more generalised approach is also possible, pioneered in Europe and including an EU study[1] and a more detailed study for Germany[2].

The European studies suggested that a major effect of broadband utilisation was the displacement of value added from manufacturing industry to business services (anything up to a 13 per cent shift) accompanied by an increase in labour productivity but loss of jobs either in the manufacturing sector itself or among local providers of business services. The displacement sometimes meant that work went offshore (e.g. to service providers in India), but gains were also possible as local business service providers widened their sights to address the world market. By comparison with Europe, Australia has already weakened its manufacturing sector, but similar productivity and job

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1 Martin Fornefeld, Gilles Delaunay and Dieter Elixmann, (2008) *The Impact of Broadband on Growth and Productivity - A study on* behalf of the European Commission (DG I*nformation Society and Media).*

2 Fornefeld, Oefinger and Braulke, *Macroeconomic impacts of broadband use in Germany (MICUS Management Consulting for the Federal Republic of Germany)* 2006.

displacement effects may be expected from agriculture, transport and indeed from businesses across the board.

At the company level, the European studies reported that broadband increases productivity, displaces activity to business services but supports innovation. The productivity and displacement effects reduce employment but the innovation effect increases it with a lag, so one can expect employment to fall, then rise. In the business services sector, by 2007 computer penetration was complete and all growth in the sector was IT-facilitated. The sector gained jobs from other sectors by outsourcing but lost them due to its own productivity improvements. The net effect was positive.

Another important conclusion is that the benefits of broadband depend on its effect on outsourcing. For advanced economies this tends to mean that simple business services go offshore but more sophisticated services gain offshore sales. Hence Australia is quite likely to lose relatively low value services offshore but can gain in the provision of specialist services such as services to mineral exploration and urban planning.

This study concentrates on the benefits of investment in the NBN, and not on the costs and not on the direct investment cost, stated to be $43 billion over a decade. (To set this in context, the mining industry invests nearly as much as this during a single year.)

### 3.4.3 The evaluation strategy: comparison of two cases

The impact of fast broadband on Australian's regions may be assessed by comparing a base case where current telecommunications services are maintained but not extended versus an alternative case where fast broadband is introduced. The strategy involves describing the geography of the two cases and then assessing the impact of the two cases on the economy.

The base case for this study is not a 'business as usual' case in the sense of a prediction of what would have happened had the national telecommunications settlement been reached in 2010. Had the confusions of 2005-10 continued, it is probable that there would have been considerable but piecemeal private investments in fixed wireless technologies in the years 2010-2020. It is also possible that, if assured of its monopoly of land-line connections, Telstra would have extended fibre to the node but would also have extracted monopoly rents. In this study we contend that increases in speed requirements coupled with spectrum limitations would, by 2020, have rendered the telecommunications system thus amplified seriously inadequate. It is therefore unlikely that non-fibre technologies could provide the same benefit even in the short period to 2020. As regards ADSL this is mainly due to the distance from the exchange problem. Admittedly, where this problem is absent exchange technology upgrades may be able to deliver capacity near full productivity potential requirements for a decade or so. However, between 2020 and 2030 the capacity of alternative fixed-line technologies is likely to be capped relative to the increasing potential of fast broadband. Similarly, as far as can be seen, wireless technologies (whether satellite, fixed or mobile) are likely to remain capped at around the 12Mbps level. While a considerable advance on many existing connections, this cap falls well below the speed expected to be required for full exploitation of fast broadband from around 2015 on. Even if these limits are eased, by 2040 the NBN is likely to be the only system able to deliver minimum requirements.

Either alternative – amplified-copper infrastructure or improved wireless – is likely to deliver adequate capacity for less than a decade. Compared to the FTTP alternative, it is likely to prove a poor investment. The belated extension of FTTP once the limitations of non-fibre technologies are realised would require the premature write-off of many of the investments made in the period from 2010 to 2020, plus the cost would be the business opportunities lost as a result of capacity limitations in the years prior to the installation of FTTP. On these arguments, a 'business as usual' case is not worth pursuing, hence our use of a base case in which telecommunications capacity is frozen.

### 3.4.4 Base case

In this case it is assumed that, over the next decade and beyond, fixed line broadband is restricted to a maximum of 16 Mbps except for the CBDs of the state capital cities where download speeds are assumed not to be a limiting factor. Mobile coverage and speeds improve to make mobile internet a significant competitor for fixed-line services, but capacity is limited and demand creates congestion which limits available speeds.

In the base case fixed line internet services across most of the country become ossified at the current stage (ADSL2 or ADSL2+) using existing copper connections. Under this assumption, distance to the exchange becomes a crucial determinant of the capacity of subscriber connections, with 3 kms regarded as the outer limit for broadband at 12 Mbps. NIEIR has calculated the proportion of the resident population living within 3 kms of an exchange. The distribution has the following features.

- Almost all residents of the inner suburban LGAs of Sydney, Melbourne, Adelaide and Perth live within 3 km of an ADSL-enabled exchange. This reflects the exchange location policies pursued by the PMG up to the Second World War, with exchanges not much more than two kilometres apart. (In this scenario, businesses in the CBDs have the further advantage of fibre connections.)
- High ADSL coverage is also to be found in LGAs which comprise compact country towns or provincial cities, without surrounding rural areas. The prime example is Narrogin (T) in WA, but high values also apply in LGAs like Queanbeyan and Albury in NSW, Roxby Downs in SA and Burnie in Tasmania.
- In most suburbs developed during and after the 1950s only 40-70 per cent of premises lie within three kilometres of an enabled exchange because, in the interests of economy, the PMG and its successors increased the distance between suburban exchanges as the suburbs exploded. Actual coverage in these areas is mostly lower than estimated due to the presence of devices which block ADSL transmission.
- Rural areas are divided between towns, where the residential areas tend to cluster round an enabled exchange located at the centre of town, and rural areas which almost by definition are more than three kilometres from the exchange. The resulting 3-km coverage tends to reflect the urban/rural balance of each LGA, resulting in average coverage rather similar to the newer suburbs.
- Finally, a select group of low-population and remote LGAs has no ADSL coverage at all.

Professional businesses tend to be located closer to exchanges than dwellings, so the proportion covered will be somewhat higher than estimated here.

### 3.4.5 The NBN case

In the NBN case FTTP removes the constraint on broadband functionality in most of Australia, and hence removes limits to the full exploitation of the productivity benefits of communication technologies and their associated applications. However, in areas served by NBN satellite and wireless, an initial improvement in functionality runs into a cap, set at 12 Mbps. Throughout the country mobile coverage and speeds improve as in the base case, but similar to satellite and wireless are capped at speeds at or below 12 Mbps.

NBNCo is still in the throes of designing its rollout but has published an indicative list of places likely to be served with FTTP. Residential population density was the primary criterion in selecting areas for coverage, tweaked by proximity to a NBN transit link. No allowance was made for business demand and business premises were not given priority – indeed were not taken into account. As noted

in Section 3.3, it was assumed that costs of provision would reflect housing density and nothing else. A noticeable feature of the distribution is the high coverage of coastal retirement settlements and the omission of country towns which do not happen to lie on the proposed transit links.

Features of the distribution include the following.

- Virtually complete coverage of all the metropolitan areas and of most provincial cities.
- Elsewhere coverage is restricted to built-up areas. The proportion of the resident population covered in each LGA depends on its urban/rural balance and its relationship to planned transit links. Proposed coverage in country LGAs is generally less than 70 per cent and a considerable number are not expected to have any coverage at all.

Along the transit links a number of mainly semi-rural areas are projected to receive fixed wireless, but large tracts of the inland are consigned to satellite connections. (For maps, see the NBN website.)

Given the layout of ADSL and FTTP, different areas will change their status as follows.

1. From fibre to fibre: the CBDs, i.e. constant at 100 Mbps.
2. From good ADSL to fibre, i.e. from up to 12 Mbps to 100 Mbps.
3. From good ADSL to fixed wireless or satellite, i.e. from up to 12 Mbps to guaranteed 12 Mbps.
4. From poor or no ADSL connections to fibre, i.e. from less than 1 Mbps to 100 Mbps.
5. From poor or no ADSL connections to fixed wireless or satellite, i.e. from less than 1 Mbps to guaranteed 12 Mbps.

Though it is arguable that all areas will benefit from the NBN the obvious winners are the areas which gain FTTP, especially when they do so after having had poor or no ADSL (group 4). The obvious (relative) losers are areas in group 3.

The major winners are suburbs in the metropolitan areas and provincial cities – areas which, for the most part, are served by ADSL-enabled exchanges but are too far from the exchange to benefit.

All of the losers are non-metropolitan. They are shires with towns which achieved ADSL status but do not meet NBNCo's preliminary population criteria for FTTP. Most of them have the additional disadvantage of being away from the proposed NBN transit links so that connecting them to the system will be expensive – unless, perhaps, an existing Telstra fibre link can be used.

The question arises about small settlements which lie on the NBN transit links. The current intention is not to provide FTTP, perhaps because of break-out costs on the transit link. However, NBNCo is under pressure to provide break-outs to mobile towers located along its transit links and there would seem little reason why these break-outs should not also serve townships en route.

### 3.4.6 Setting up the comparison

We have adapted the framework adopted by the MICUS group in their seminal study on the impact of broadband for the European Commission, discussed above. The framework derives from experience 2000-2010 and is expected to apply for a further decade or more in Australia, given that Australia is currently lagging on the e-journey. This framework links industry productivity to broadband speed.

We build on an insight prominent in the 2005 *State of the Regions* and MICUS reports, which is that evolving applications and hardware will require higher speeds over time. This assumption has held good over the past two decades, and there is no reason to expect it not to continue to hold over the next decade or two. This is summarised as the first of the 'rules' (assumptions) we have made in our model of broadband impacts.

**Rule One: The required Mbps to fully exploit the productivity benefits of communication technologies, or fMbps, will increase as applications become more sophisticated and complex.**

The assumed values for fMbps for selected years for Rule One are given in Table 3.1.

| Table 3.1 | Required speed for full productivity exploitation (fMbps) |
|---|---|
| 2000 | 0.3 |
| 2010 | 3.00 |
| 2015 | 15.0 |
| 2020 | 30.0 |
| 2025 | 55.0 |
| 2030 | 80.0 |

The justification for this assumption lies primarily in the rapid growth of internet speed requirements in the recent past, which the assumption projects will continue. It is also worth noting that self-sufficient computer networks currently in use run at speeds far in excess of current internet offerings, so the assumption is primarily that the internet will catch up with existing speeds in stand-alone systems. Speeds of up to 3,000 Mbps are reported on existing internal computer networks run by commercial health service providers in the USA. The rate of increase in the internet speed necessary to obtain full productivity benefits will be determined internationally and is likely to be particularly rapid if vigorous competition in software development arises between the US, India and China.

Once FTTP is deployed in a region the required speed for full productivity exploitation (fMbps) is instantly available – though whether businesses take full advantage of it is another matter to be considered below. However, in the NBN case we assume that 12Mbps is the maximum speed available from satellite or wireless.

Table 3.1 has two consequences:

- By 2015 ADSL2+ will begin to constrain productivity exploitation, even for customers close to the exchange.
- At the same time, satellite and wireless connections (including mobile internet) will begin to be a constraint.
- By contrast, FTTP connections are expected to be adequate to 2030 and beyond.

We now assume that potential productivity benefits are released as higher speeds become available and are taken up. This is expressed in Rule Two.

**Rule Two: The potential productivity benefit from broadband depends on fMbpd.**

The MICUS study found that the labour productivity impact of broadband adoption was 5 to 20 per cent for each step on their e-journey indicator, depending upon the type of sector. We calibrate in relation to the maximum speed shown in Table 3.1. The benchmark productivity benefit is set at 10 per cent for the increase in broadband take-up in 2000-10. By 2030 the full productivity benefit is assumed to reach 23 per cent. This rule was calibrated by MICUS in Germany using detailed industry-level studies. Similar data is not available for Australia, though there is abundant anecdotal evidence of the potential for productivity gains.

As with MICUS, we recognise that some sectors will benefit more from broadband than others, as specified in Rule 3.

**Rule Three: Industries will have different productivity responses compared to the benchmark rate.**

Empirical investigation in Europe, and anecdotal evidence in Australia, shows that knowledge-economy industries not only have greater opportunities for productivity improvements than the more staid industries; they take advantage of them more quickly. The assumed industry differentials are given in the appendix.

We know that FTTP can accommodate the increasing requirement for speed (fMbps in Table 3.1 above). However, we also know that much of Australia will be obliged to rely on wireless or satellite broadband and will not gain the speeds required for full productivity exploitation. This leads to rule 4.

**Rule Four: The extent to which the maximum potential productivity benefit for each industry can be exploited will depend on the average speed available in a region relative to the fMbps.**

In this case we have assumed that a speed shortfall has but mild effects on productivity growth at first, but that the effects accumulate and that large discrepancies have serious effects.

For benefits to be garnered, not only must broadband be available physically, but users must be willing and able to exploit the opportunities made available. Take-up in this sense is more than merely connecting to NBN and paying; it is taking advantage of the improved technology.

**Rule Five: The extent to which the effective potential productivity benefit is exploited will depend on the take-up rate.**

It should always be remembered that gains are only available to businesses which take the initiative and exploit the opportunities of broad-band (including, with a lag, those which are forced to do so by competitors). This rule provides for there to be a delay while the benefits are recognised and taken up. There will be a role for local government in minimising the delay.

The assumption used in the modelling is that businesses in each industry and region will improve their productivity by a percentage of the gap between actual and potential productivity as defined under Rule 4. The assumed take-up rates are 4 per cent a year up to 2019, 5 per cent 2020-25 and 6 per cent a year thereafter. It should be remembered that the gap is continually widening as a result of Rule 1.

It will be noted that these projected take-up rates are much lower than the rates assumed in much of the planning for fast broadband. There are two reasons for this: first, counting as it does only those

businesses which take action to improve productivity, the definition of take-up is stricter than mere connection and second, to ensure that the benefit estimates err on the conservative side.

**Rule Six: A portion of the productivity benefit for an industry will be due to the transfer (or outsourcing) of employment to other industries.**

In this study we use the simple definition of productivity as output/employment. If productivity increases, either output will increase or employment fall. We assume that the immediate effect is a fall in employment in the industry experiencing productivity growth though there may be subsequent output responses to improved competitiveness.

The growth in productivity in most industries is due to the transfer of workload to specialists in the business services and information technology industries, who can do the work more efficiently. For each job lost due to productivity growth, we assume that 0.6 of a job is created in the business services and information technology industries, not necessarily in the same LGA.

**Rule Seven: The productivity gains from broadband were split between real wage increases for the remaining employees in the industries directly affected and improved competitiveness, 50 per cent each.**

This rule implies that half of the improvement in productivity will raise the incomes of local people per hour worked while the other half is translated into reduced prices or perhaps into investment and innovation. With the rolling-out of broadband across Australia the price reductions will be fairly general and so do not yield much in the way of sales advantages except for exports at the national level, which the model duly took into account.

When operating the model the difference between the cases is triggered when NBN becomes available. Allowance was made for speeds in the NBN case to fall a little short of those theoretically available while speeds in the base case were frozen at 2010 levels.

**Rule Eight: Fast broadband is defined as that speed for upload and download which allows the full potential of internet-based technologies to be exploited.**

In technical terms fast broadband technology was defined to exist when the actual speed available came within 95 per cent of the speed required to fully exploit broadband – remembering that this represents a contest between continually rising full-exploitation speeds (as defined in rule 1) and step-changing available speeds. By definition once FTTP is installed full-productivity speed requirements are met up to at least 2030 (Table 3.1 above) and will require only marginal additional investments to meet any subsequent increases in required speed.

We have already noted that the base case is not a 'business as usual' case in that it does not specifically allow for the development of radio-based technologies that is likely to take place in the immediate future in the absence of the NBN. However, it does allow for fairly general availability of 12 Mbps speeds, these being the maximum guaranteed speeds of the technologies in question.

**Rule Nine: Australia is not a closed economy. Among the responses to the introduction of fast broadband will be leakage of demand for outsourced workers to overseas. Fast broadband will increase the rate of off-shoring.**

In this context off-shoring describes the relocation by a company of a business process to overseas—sometimes an operational process, such as manufacturing, but more frequently a supporting process,

such as accounting. The economic logic is to reduce costs. Fast broadband contributes to both outsourcing and off-shoring by allowing the rapid transmission of both the data to be processed and the results of processing. In terms of quantitative rules, the rate of off-shoring was set at 20 per cent of the rate of outsourcing. This is a net rate after allowing for increased overseas sales of professional services, etc. by Australian businesses.

**Rule Ten: Total hours worked in the provision of government services remain constant despite productivity savings in the production of these services.**

In other words, tax rates remain constant and the money so raised finances increased production of government services, to the extent of the improvements in productivity. An alternative assumption would have been to keep service provision constant and cut taxes, but this is considered unrealistic since demands for government services are increasing, if only due to population ageing.

### 3.4.7 Conclusion

Like the telegraph and the telephone before it, the national telecommunications settlement involves major investment in new technology, not only by the Commonwealth in the NBN, but by investors in complementary telecommunications businesses and by business in taking advantage of the opportunities. On the other hand, much of the required business and household investment in computers and in the skills required to use computers effectively has already been made so that the NBN promises to unlock productivity increases without requiring major investment by business or households.

The examples of major technological change, such as the telegraph and telephone, testify to the foolhardiness of attempts to predict the social and economic changes that will result from major technological change, such as broadband. Nevertheless, investments in new technologies will not be made if benefits cannot be foreseen. This chapter set up a fairly simple exercise to estimate the economic benefits expected from the NBN. The exercise accordingly disregards a whole range of social costs and benefits in order to concentrate on the strictly economic benefits, expressed in the first instance as increased productivity of businesses which exploit the opportunities provided by fast broadband.

The evaluation contrasts a simple base case in which telecommunications speeds are held constant at 2010 levels and a NBN case based on investment intentions published in 2010. The base case includes productivity benefits available from increased uptake of existing facilities, but caps the benefits at the speeds available. The NBN case depends on preliminary indications of where FTTP will be provided, indications which will doubtless change as the roll-out proceeds. However, the indications are sufficiently concrete to identify broad geographic patterns.

Though the base and NBN cases are conceptually simple, productivity improvements are complex in their interaction with the economy as a whole – hence the list of assumptions, or rules, laid out in this Chapter. These simplify the analysis without abandoning its chief features. More detail on the assumptions and methodology is provided in the Appendix to this section. In Section 3.5 we comment on the results.

## 3.5 The impact of the NBN on Australia's regions

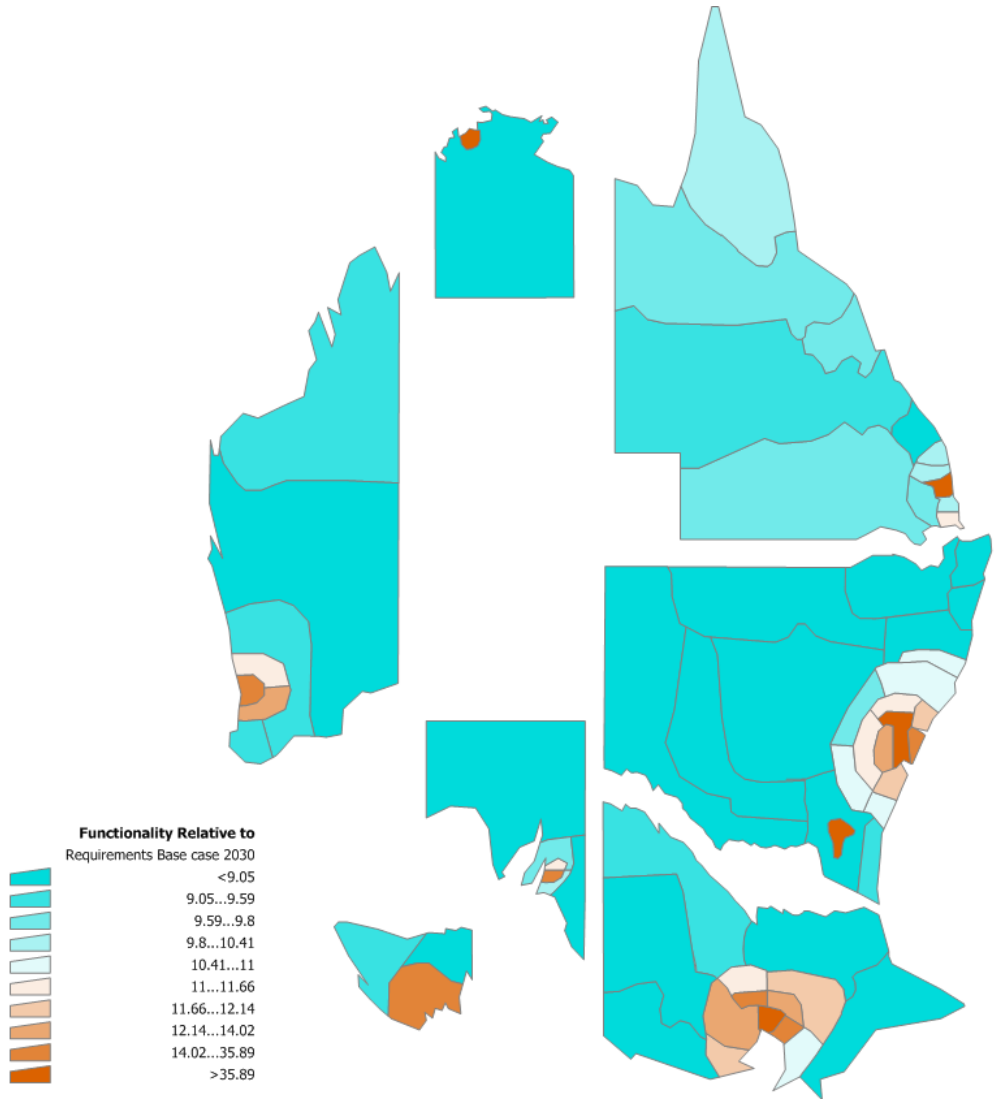
In Section 3.4 two cases were developed – a base case in which telecommunications speeds are frozen as at 2010 and a NBN case in which FTTP is extended to the areas where installation has been foreshadowed by NBNCo and either fixed wireless or subsidised satellite connections, in both cases of limited capacity, are provided elsewhere. We also set out a series of assumptions or rules which

### 3.5.1 Base case

In the base case telecommunications speeds are fixed at 2010 levels (documented regionally in Section 3.4.4). By 2030 only the CBDs have full access to telecommunications-related productivity improvements, since only they have FTTP. Because of the superior ADSL coverage in the inner suburbs, these regions have access to around 11-14 per cent of potential productivity improvements, while access in virtually all rural regions has fallen to the assumed lower limit of 9 per cent. These data are reported in the appendix under the heading 'functionality relative to requirements'.

Despite these limitations, the take-up of broad-band continues to expand with consequent increases in productivity, up to the point where the cap on capacity prevents further telecommunications-related productivity improvements. Following the rules adumbrated in Section 3.4.6, this exploitation is estimated to increase national productivity (defined as output per hour worked) to around 4 per cent over the 2010 benchmark by 2030. The increase is particularly pronounced in the CBDs of the capital cities, since these are already provided with FTTP. In all other regions growth in productivity from increased utilisation of broad-band is capped by the limits of current capacity. In the CBDs productivity growth is around 12 per cent by 2030, but elsewhere it is capped at around 1.5 per cent except for a few inner suburbs and provincial cities with good ADSL coverage. As time progresses and the speed required for full productivity benefit increases the productivity harvest in the base case falls further and further behind. These data are reported regionally in the appendix under the heading 'actual productivity extraction'.

**Figure 3.1: Functionality relative to requirements – Base Case – 2030**




### 3.5.2 NBN case

In the NBN case the telecommunications capacity constraint is removed in areas provided with FTTP and relaxed but not removed in areas provided with fixed wireless or subsidised satellite connections. All parts of all metropolitan regions (save parts of SEQ West Moreton) gain access to all telecommunications-related productivity gains but FTTP coverage is patchy in all other regions, with access to benefits depending on coverage. The regions with the lowest coverage are NT Lingiari, SA East and WA Wheatbelt Great Southern.

Compared to the base case, the smallest gains in access to telecommunications-related productivity gains are the CBDs, with low gains in NT Lingiari, SA East and WA Wheatbelt Great Southern reflecting low FTTP coverage in the NBN case. The greatest gains in access are in the outer suburbs of the metropolitan areas (especially Sydney and SEQ) and in NSW Illawarra, NSW Central Coast, NSW Newcastle and Tasmania North (Launceston), reflecting the considerable leap from present limited ADSL coverage to full FTTP in all cases except Tasmania North.

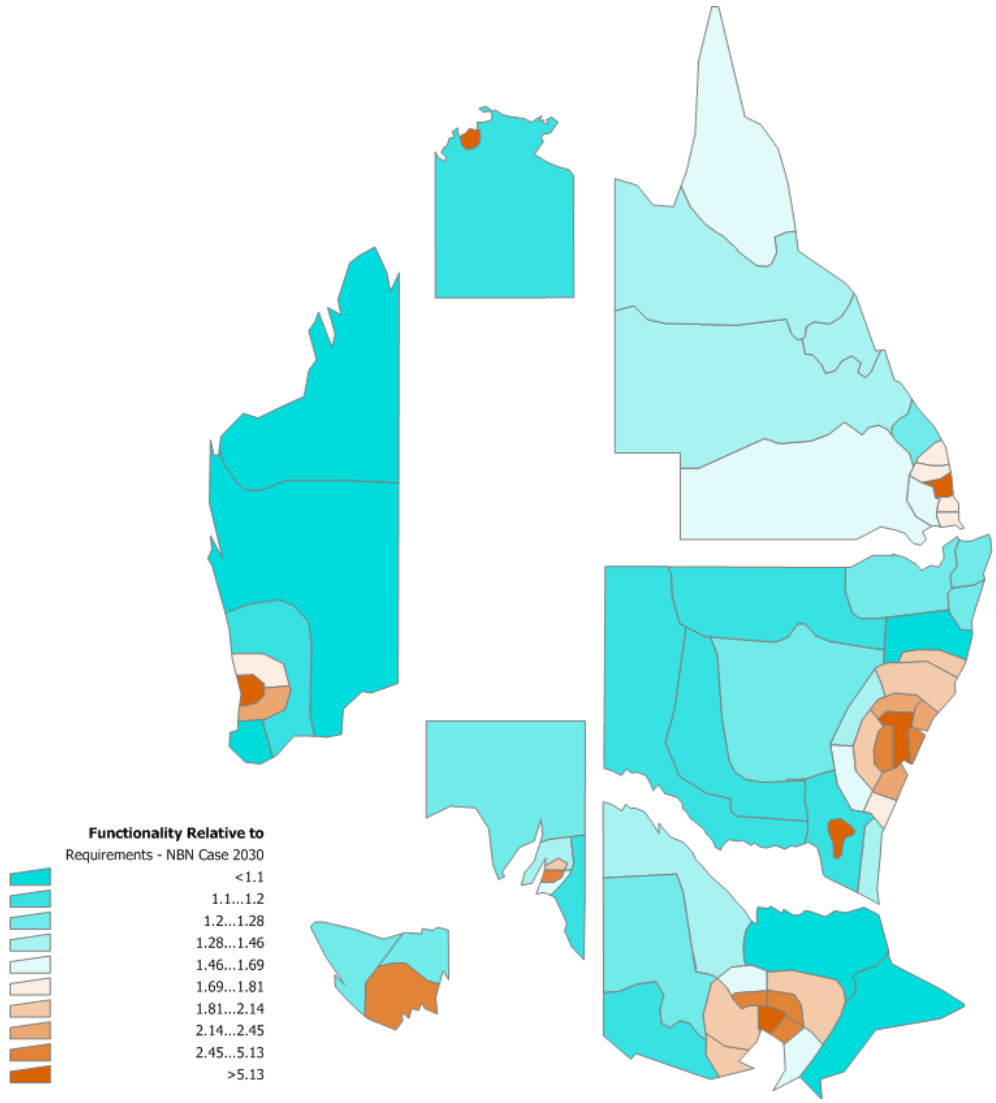
Under the assumptions set out in Section 3.4.2 the improvement in productivity depends on three main factors, FTTP coverage, broadband take-up and industry mix. FTTP coverage is important because, beginning in 2015 and with increasing severity as time passes, the capacity cap for fixed wireless and satellite falls below the requirements for full productivity exploitation of broad-band. Take-up (in the sense of not only signing on but taking action which harvests at least some of the potential productivity gain) is of obvious importance. Industry mix is important because some industries, particularly knowledge-economy industries, have much more potential for productivity benefits from broad-band than others such as mining, where much of the available benefit is already captured by the in-house telecommunications systems of the big mining companies.

Nationally, the gain in productivity through exploitation of broadband technologies is projected to be around 9 per cent by 2030, though the timing is uncertain.

Because they have similar FTTP coverage in both cases, the improvement in productivity in the CBDs is similar in the NBN case to the base case – that is, around 12 per cent. The productivity gain by 2030 in the non-metropolitan regions is 5-6 per cent range, lower than the national average due to low FTTP coverage and industry mix weighted away from business services and the like, which have the highest potential productivity gains. On the other hand, Tasmania, coastal NSW and the Queensland provincial cities gain relatively high coverage and their industry mix provides opportunities for productivity growth. Within the metropolitan areas, the suburbs draw level with the CBD as regards telecommunications capacity but not as regards productivity growth. Thus productivity gains of the order of 11-12 per cent are projected for 2030 in Sydney Central and the City of Melbourne, whereas the equivalent gains in most of the suburban regions of these two metropolitan areas (and in Perth, Adelaide and SEQ) are between 7 and 9 per cent. The difference is mainly due to industry mix, with knowledge-based industries currently concentrated in the CBDs. Even after the suburbs and the provincial cities gain FTTP it will take some time for industries which depend heavily on high-speed telecommunications to decentralise from the CBDs.

In all regions except the CBDs the NBN case generates significant increases in productivity, affecting not only business but non-profit employers and governments. What are the more general economic consequences? In the following discussion the base case and NBN case will not be described separately. We will instead concentrate on the difference between them.

## Figure 3.2: Functionality relative to requirements – NBN Case – 2030



## Figure 3.3: Increase in functionality relative to requirements – NBN compared to Base Case – 2030

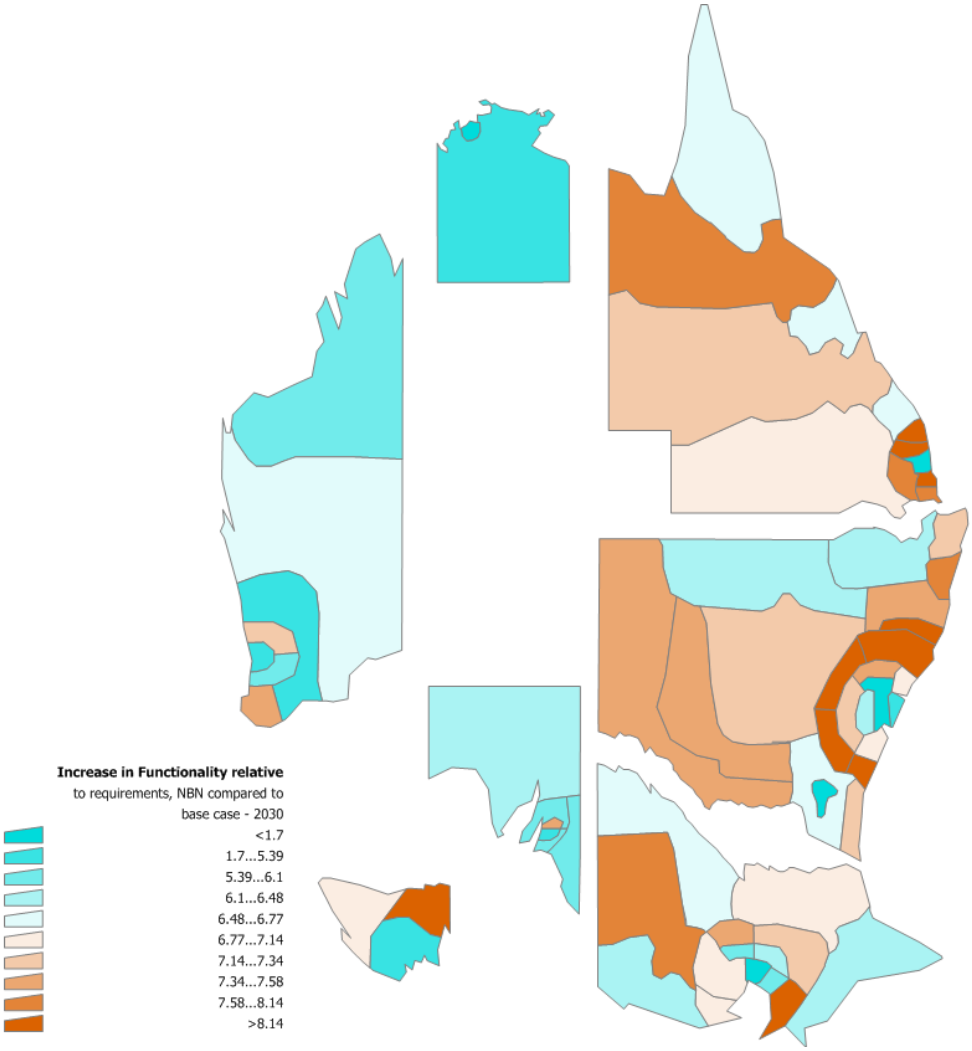




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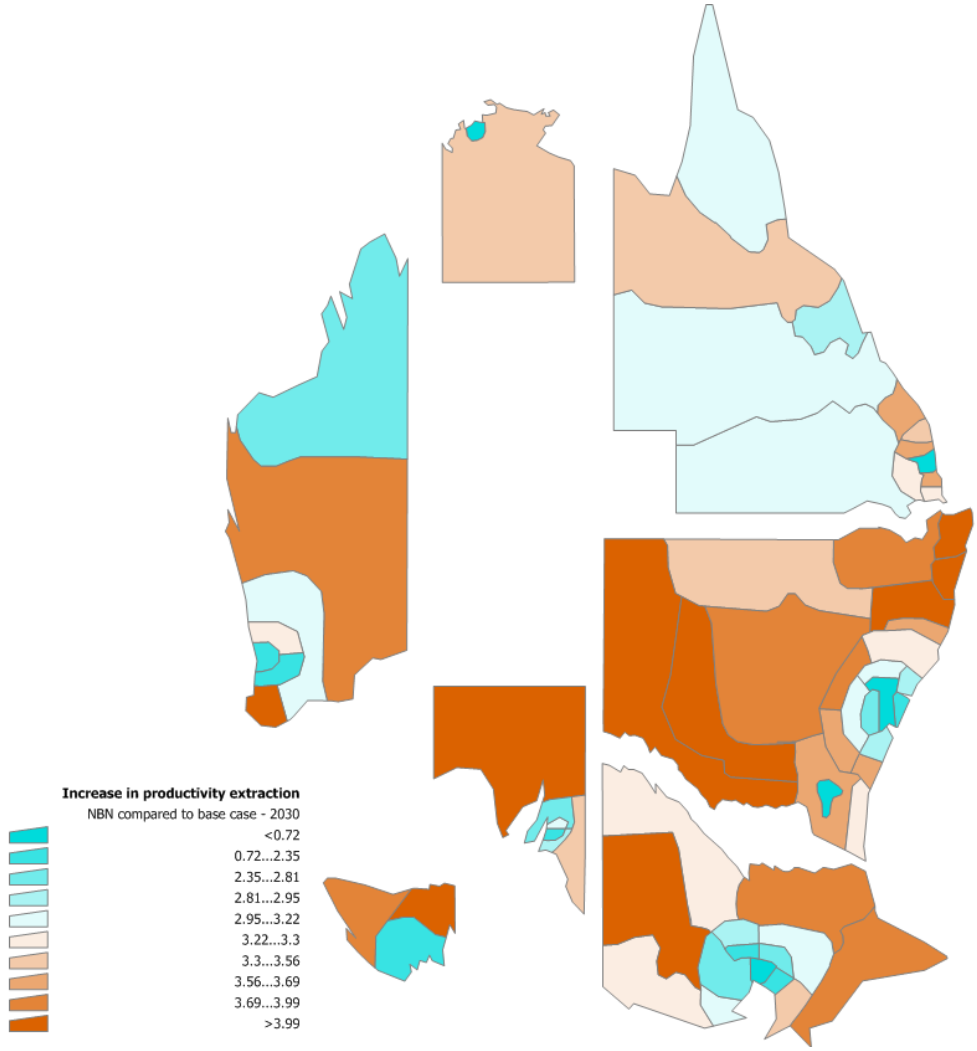
**Figure 3.4: Increase in productivity extraction – NBN compared to Base Case – 2030**



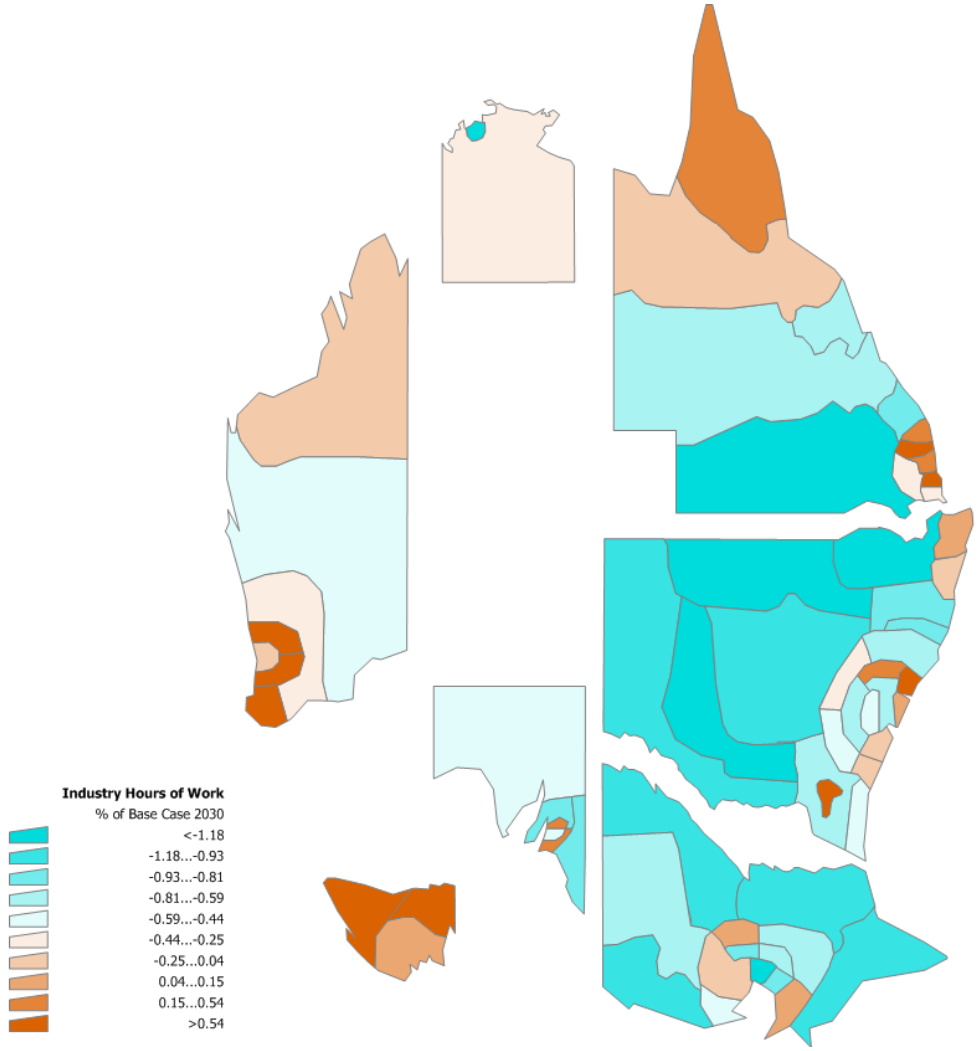

### 3.5.3 Hours worked and resident employment

Where productivity is defined as output per hour worked, the first-round effect of an increase in productivity will inevitably be some combination of increased output and reduced hours worked. However, employment losses may be regained as output bounces back due to price reductions and increases in investment, particularly in innovation. On this basis, the productivity gains expected to result from the NBN are projected, at the national level, to lead initially to a small loss in hours worked by around 1 per cent, with the loss regained by 2040. Significant differences in regional patterns are, however, expected. Regions where knowledge-economy businesses and personnel are working at less than full capacity are expected to benefit. These regions are best exemplified by Sydney Northern Beaches – a region to which professional personnel are attracted but which has hitherto had difficulties with local job generation due to its relative isolation within the Sydney metropolitan area. Regions can also gain hours worked if they elect to take their productivity gains from an increase in employment rather than in the form of increased real wages. In the model runs, the regions which most exemplify this policy are Tasmania North and Tasmania North West. Other regions projected to gain hours of employment include the two outer Perth regions, the two outer Adelaide regions (Adelaide North and SA Fleurieu), the coastal outer Brisbane regions, NT Darwin, the ACT and some of outer Melbourne.

Regions which are projected to generate less employment hours as a result of the NBN include the CBDs (obviously, since they lose some of their competitive advantage) and most rural regions, which lose professional services to specialise providers in the cities. This is not to say that all rural LGAs will lose – those which develop internet-based services stand to gain. However, this gain will not happen automatically, but will require local effort.

The results for resident employment are broadly similar to those for hours worked.

**Figure 3.5: Industry hours of work – per cent of Base Case – 2030**

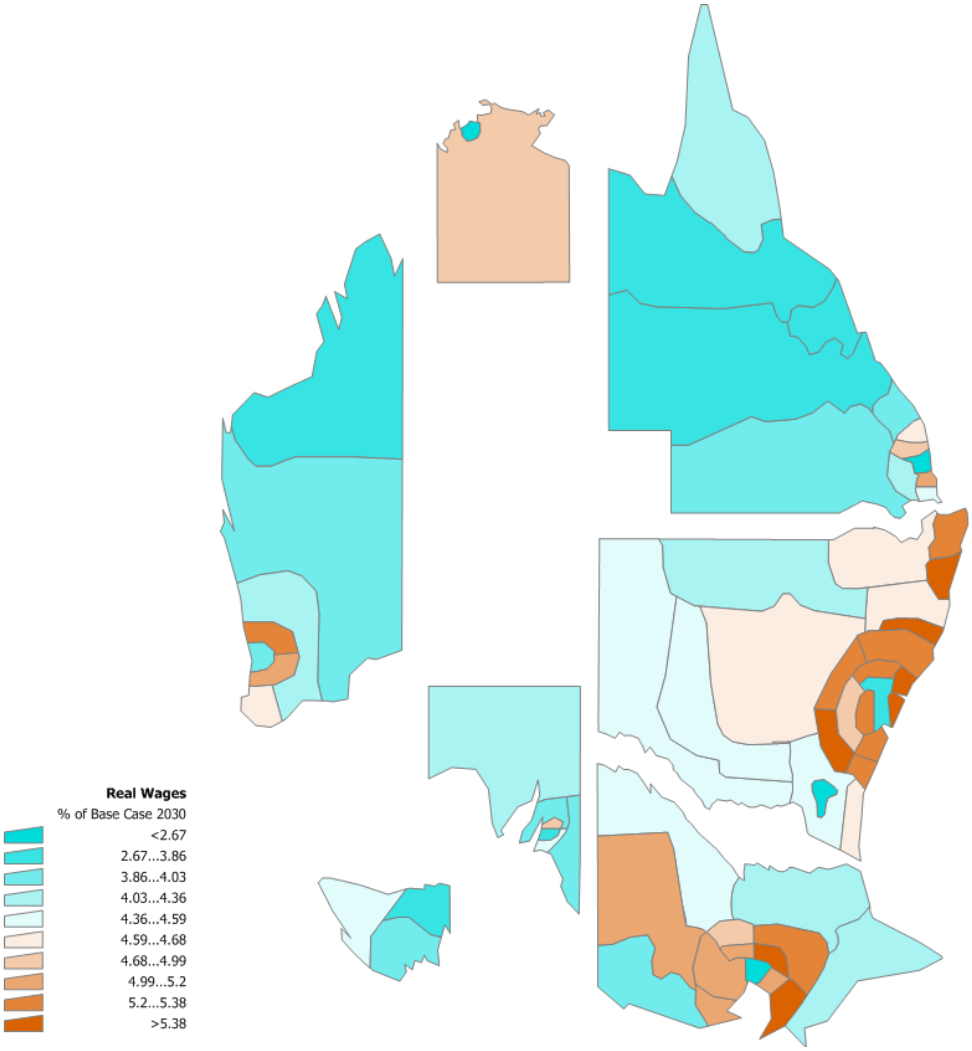



### 3.5.4 Real wages

Whereas an increase in productivity has ambiguous effects on hours worked, it unambiguously allows an increase in returns to labour and capital. The increase in productivity in the NBN case is expected to raise average earnings in all regions, but particularly in the suburbs of Sydney, Melbourne and Perth and also much of the NSW coast including Newcastle and Illawarra. However, Tasmania is projected to benefit more from increased hours than from increased wage rates; NSW mid-north coast is projected to benefit more from increased wage rates than from increased hours, and Sydney Northern Beaches is projected to benefit from both.

As for hours worked, the CBDs benefit relatively little, as do rural regions with low concentrations of industries advantaged by improved telecommunications.

**Figure 3.6: Real wages – per cent of Base Case – 2030**




### 3.5.5 Local gross value added

Local gross value added reflects wages earned plus mixed income earned in local businesses, but excludes local contributions to the profitability of corporate businesses. The national increase by 2030 is of the order of 4 per cent, while the pattern of gains is similar to that for real wages and employment, with the greatest gains in Tasmania (North and North West) and Sydney Northern Beaches. Gains of 5 per cent or more by 2030 are also widespread in suburban regions in Sydney, Melbourne, Brisbane and Adelaide and also on the NSW coast. These benefits to suburban and lifestyle regions reflect their attractiveness to providers of business services, the industry with the greatest potential to gain from improved telecommunications – as well as the industry with the greatest potential for loss of production in regions which fail to retain knowledge-economy personnel.

As before, the regions with least gain comprise a mixture of those with poor gain in FTTP coverage (the CBDs, which are well covered in the base case, plus various rural regions such as WA Wheatbelt Great Southern which gain poor NBN coverage) plus regions with limited gains due to industry mix reasons (such as WA Kimberley-Pilbara).

In relation to the productivity harvest from the NBN, the greatest gains in value added are projected to occur in Tasmania and SA Fleurieu.

### 3.5.6 Resident incomes and consumption

After allowing for commuter patterns, the increase in resident incomes as a result of the NBN is expected to be strongest in Tasmania North, Tasmania North West and Sydney Northern Beaches, with significant increases also on the NSW north coast. The lowest increases, in relation to the increase in real wages, are projected for the resource-based regions of WA and the NT. Overall productivity gains are not particularly high in these regions, and are mainly exhausted in real wage increases without room to generate extra employment. This pattern of benefit is, to a degree, the reverse of the pattern of benefit from mining developments and could even be defended as a means of spreading the benefit from mining developments to the rest of the country.

Increased resident incomes permit increased consumption. Because they are less constrained by mortgage debt, residents in the country regions are able to increase their consumption a little more, in relation to their income increases, than metropolitan residents.

### 3.5.7 Further factors

The total impact of the NBN scenario compared to the base case will depend on additional positive influences that may further limit the decline in hours of work which is the primary effect of the increase in productivity in the NBN case. An important additional positive influence arises from the rate at which fast broadband is introduced in overseas jurisdictions. Adherence to the current NBN timetable means that Australia will obtain first mover advantage in fast broadband, at least in relation to the English-speaking world. Delaying its introduction compared to other countries will mean that the benefits assessed in this study will be reduced: the longer the delay, the greater the reduction. This is because other countries' competitiveness in the outsourced services market will increase significantly compared to Australia. In technical terms, the off-shoring coefficient could increase from 20 per cent to 40 per cent and above if the delay is lengthy.

Even so, the modelling allows time for businesses to realise the productivity opportunities presented by broadband and act on them. These delays in the build-up of fast broadband benefits may lead some to conclude that the issue is not a pressing short-term problem. However, the greater the delay the lower the exploitation of potential benefits and the lower the potential benefits will be at any given future date.

The discussion has emphasised the way in which productivity gains from fast broadband are strongly associated with the outsourcing of business services. The regional differentials in employment and income gains reflect the strength of business services in each local economy. The implication is that, if the regional benefits of fast broadband outlined in the study are to be fully exploited, the building up of regional capacity to supply these services should commence now and cover all policy areas including regional skill formation capacity, migration targeting and internet skills enhancement programs. Not only do such programs have the capacity to improve outcomes in regional areas; they can also help to speed take-up and hence bring the benefits forward.

### 3.5.8 Comparisons with previous studies

At the national level, the results reported here are consistent with the few previous studies of the impact of broadband on productivity and growth. This study draws upon and extends the MICUS analysis for the EU, noted earlier[3]. That study assumes a productivity increase from e-business ranging from 5 per cent (e.g. manufacturing) to 20 per cent (specialist business services), based on company-level studies (MICUS, Table 14). MICUS argues that this is verified by experience in Cornwall (Fig. 57). At the macroeconomic level, MICUS finds a productivity improvement of 0.14 per cent in the manufacturing sector and 0.32 per cent in the services sector (MICUS, p 101).

In terms of output, MICUS found the impact on growth depends on the maturity of markets in different countries. For the advanced countries, broadband related growth was estimated to be worth 0.89 per cent of GDP (p103). Across all 27 EU countries, in the "best case" the contribution to GDP growth was estimated as 0.71 per cent by 2015 (Table 22). In this study, we find a growth contribution of 0.85 per cent.

Most economic models of fast broadband benefits make assumptions about productivity benefits. A paper which reviewed two Australian studies by the Centre for International Economics (CIE, for an unknown client)[4] and Access Economics (for Telstra)[5] quoted the Productivity Commission as finding that ICT investment generated multi-factor productivity growth (MFP) growth of 0.15 to 0.2 per cent pa over the 1990s[6]. This is about one fifth of the MFP growth seen recently. The CIE assumed a growth in MFP due to the NBN of 0.2 per cent pa.

Our study finds an extra 0.34 per cent (including 0.07 per cent in the Base Case) per annum increase in labour productivity (output per hour worked) from fast broadband over the period from 2010 to 2040. Multi-factor productivity (MFP) looks at output divided by a composite of capital and labour; it attributes some labour productivity to capital deepening. The sum of the growth in MFP and capital deepening equals the growth in labour productivity. The relativities fluctuate a bit but, roughly, MFP growth is half the growth in labour productivity. If we assume none of our 0.34 per cent is due to capital deepening, it can be compared directly with the CIE's 0.2 per cent. In practice, the 0.34 per cent would be a little smaller with capital deepening.

The review paper also looks at a public study by Access Economics for Telstra. That study assumed 70 per cent FB coverage without the NBN (it was 38 per cent in 2008) increasing to 90 per cent with the NBN. The difference between its two main scenarios is worth only an extra 0.05 per cent pa MFP growth.

We would expect significant gains from a "general purpose technology"[7] like fast broadband. Taking an earlier major breakthrough, the steam age, the impact of steam technology on the growth in labour productivity in the period 1830-1850 contributed 0.2 per cent pa and 0.04 per cent pa to labour and productivity growth respectively. High pressure steam was deployed in 1850 and in the period 1850-

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3 MICUS: *The impact of Broadband on Growth and Productivity*, 2008, www.micus.de.

4 Centre for International Economics *Impact of Genuine Broadband for Australia,* November 2008.

5 Access Economics, *Impacts of a high speed national broadband network*, March 2009.

6 J de Ridder (2009) *"Broadband – How big are the benefits" www.deridder.com.au*.

7 A GPT has the following three characteristics: (a) *Pervasiveness*: It spreads to most sectors. That is why impacts should be measured at a higher level than the firm or individual sectors. Only higher levels of aggregation capture the externalities or spill-over impacts that arise at firm and sector levels, (b) *Improvement*: GPTs get better and better, lowering the costs to users and (c) *Innovation spawning*: GPTs make it easier to invent and produce new products or processes. That is, they allow us not only to do things better but to do better things. New possibilities are created and specialisation raises productivity.

1870 these contributions rose to 0.41 per cent and 0.21 per cent respectively. These figures represented about a third and half of total labour and MFP growth over these periods.

The 0.21 per cent MFP contribution from steam looks similar to the CIE's 0.2 per cent per annum for the NBN. But it is too conservative to equate the NBN with steam:

> "*The impact of ICT on the rate of productivity growth exceeded that of steam in any period even at the time of the so-called Solow productivity paradox while since the mid-1990s the MFP growth contribution in the US has been about 3 times the peak of steam in the UK. These results may suggest that society is getting better at rapid exploitation of general purpose technologies which might reflect more investment in human capital, greater government support for R & D, superior scientific knowledge and/or better capital markets*"[8].

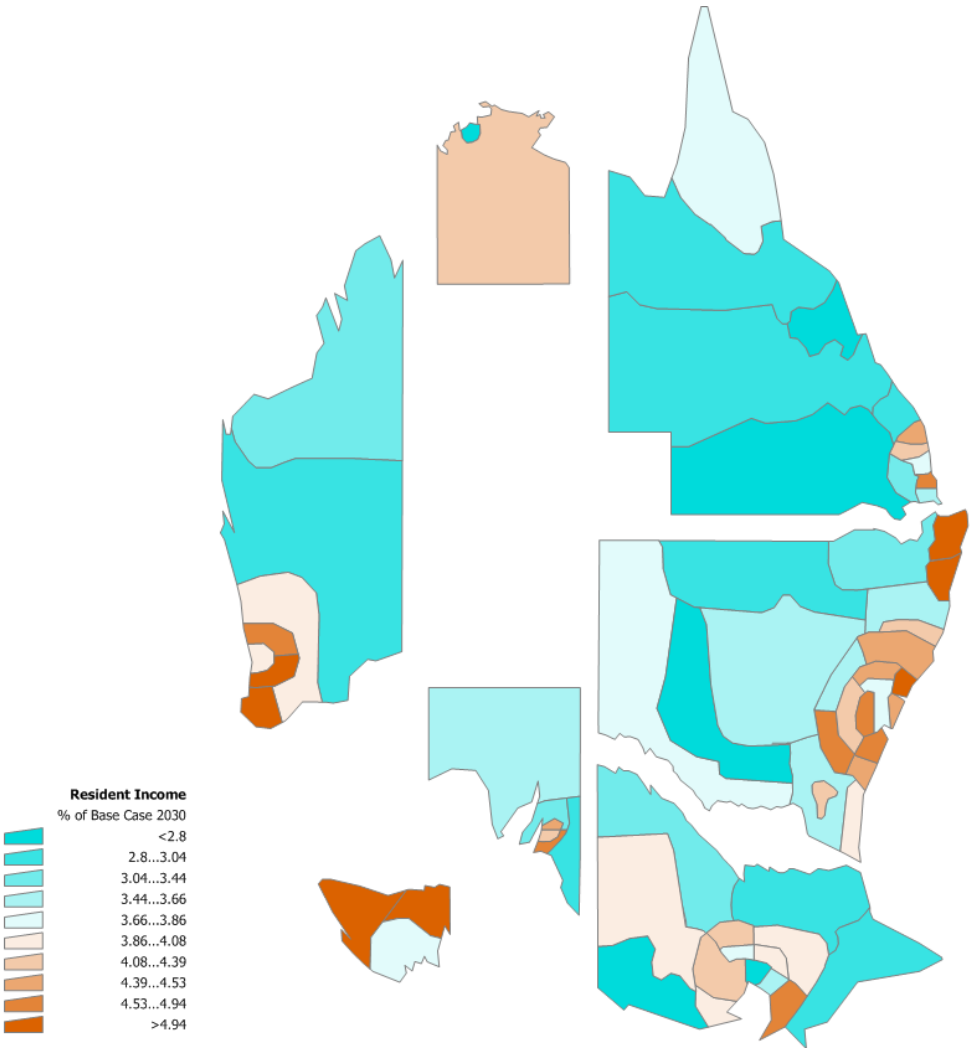
### 3.5.9 Consequences for local government

The introduction of fibre to the premise represents a step change in the capacity of the telecommunications available in Australia. At various points in this series of chapters we have asked what local government can do to maximise benefit and minimise local loss. There are two important points:

- do all that is possible to ensure that fibre is provided, and not fixed wireless or satellite; and
- do all that is possible to ensure that residents and businesses are aware of the threats and geared up for the opportunities.

[8] Crafts, N. (2004), *Steam as a General Purpose Technology: a Growth Accounting Perspective*, Economic Journal, 114, 338-351.

## Figure 3.7: Resident income – per cent of Base Case – 2030





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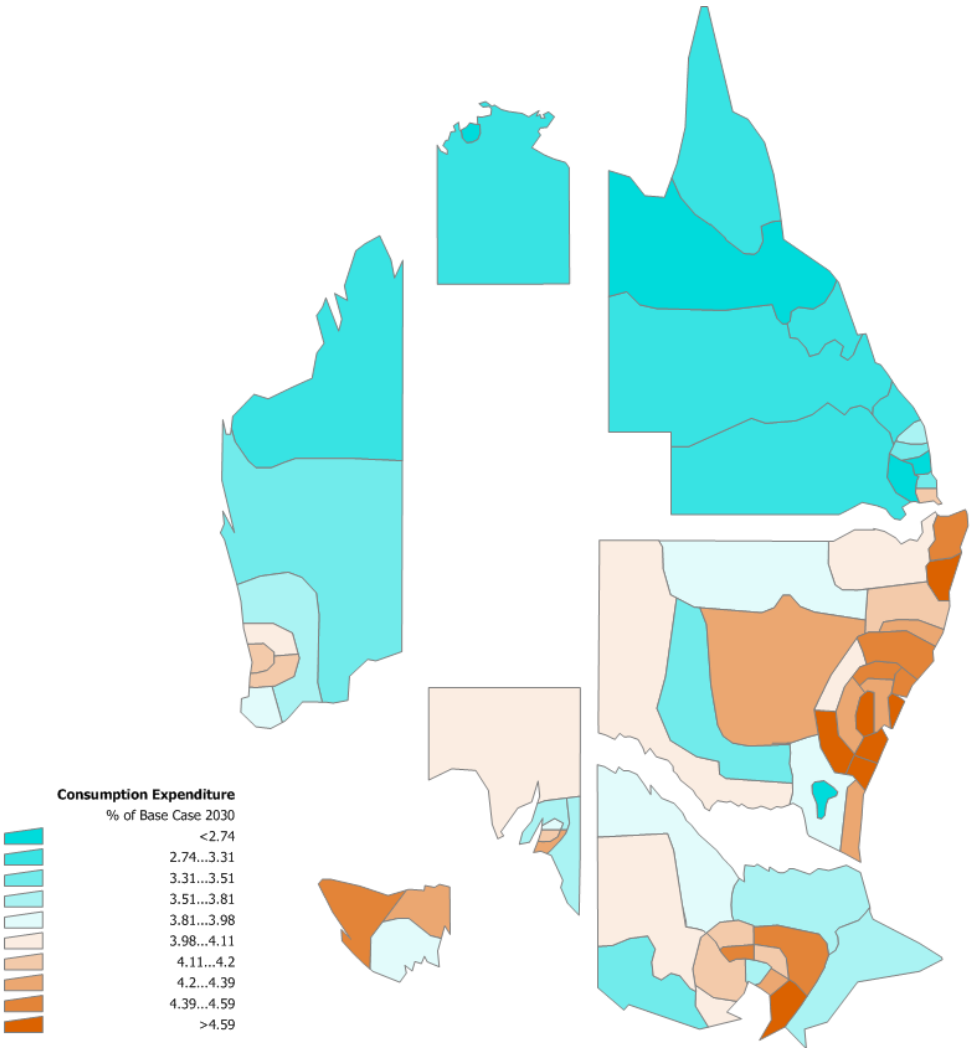
## Figure 3.8: Consumption expenditure – per cent of Base Case – 2030





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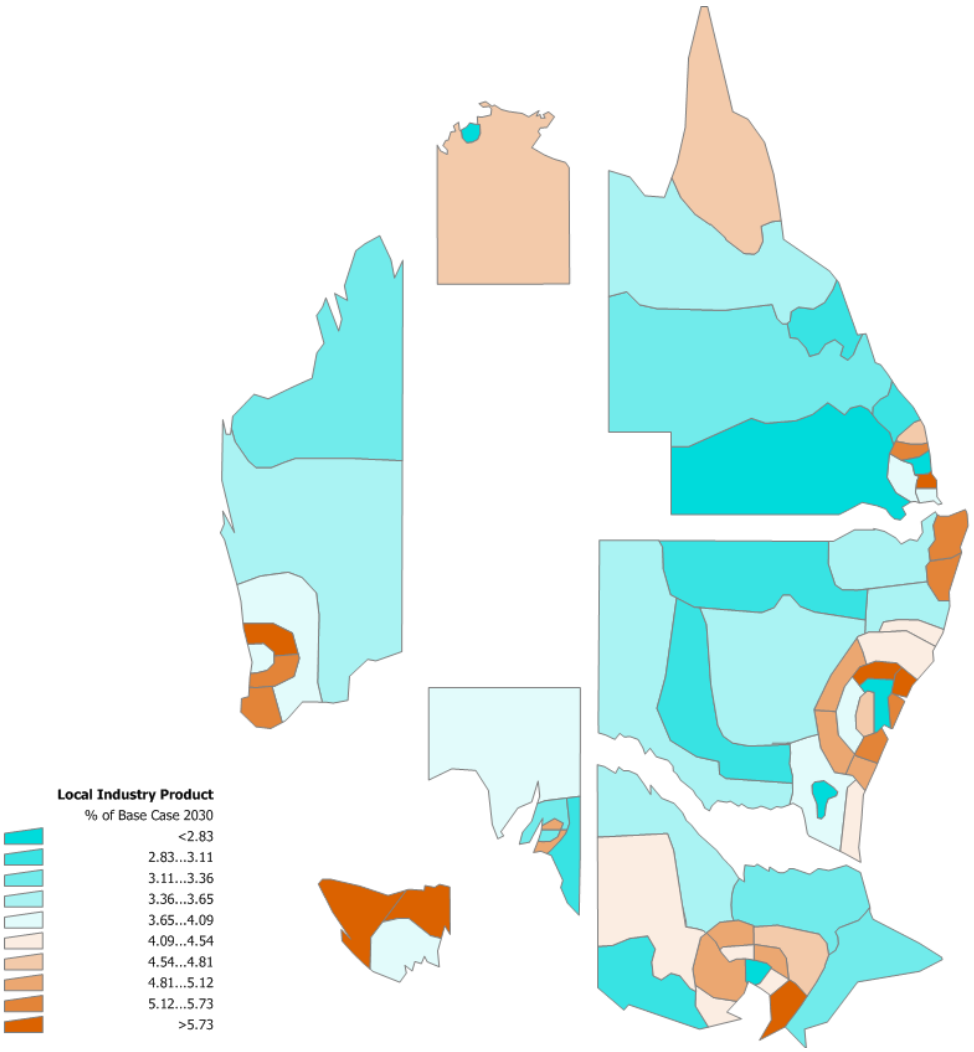
## Figure 3.9: Local industry product – per cent of Base Case – 2030





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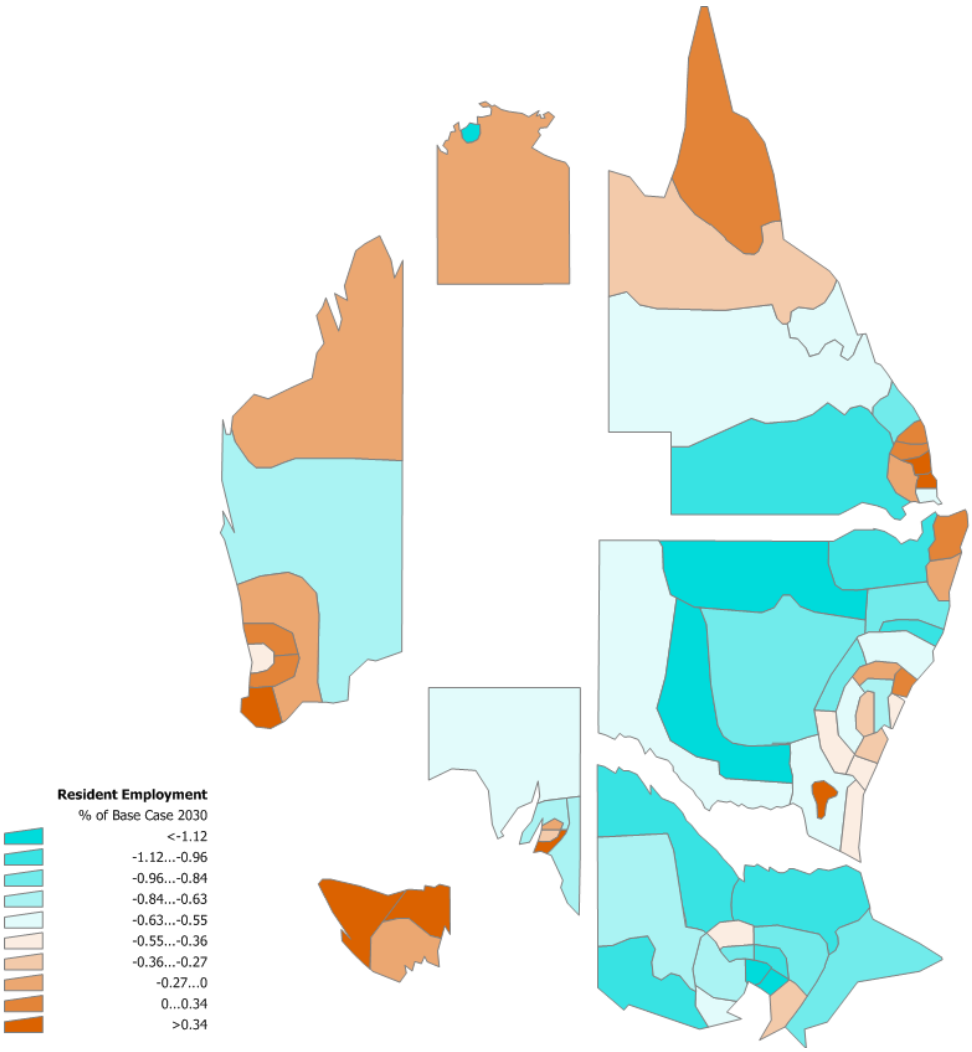
## Figure 3.10: Resident employment – per cent of Base Case – 2030





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# 4. Climate change – an international update

The CSIRO published its first climate-change predictions for Australia in the mid-1980s. NIEIR took them on board and in 1987 made its first attempt to project the economic consequences of climate change. Then, in the early 1990s, NIEIR carried out a major study of policies for greenhouse gas emission abatement. The two main conclusions of this study have stood the test of time.

- Though carbon pricing will be an important component of any coherent abatement policy, complementary policies are required to speed and affirm the price responses.
- The more delayed the implementation of abatement policies, the higher the cost of meeting any specified future abatement target.

The report was ignored. A new bandwagon of interest groups, fresh from its victories over tariffs, was promoting the gospel of free markets and extending it across the economy. The enthusiasm for competition and small government relegated questions like climate change, which could not easily be solved by competition, to the bottom of the list of priorities. Worse, the market approach to electricity and transport emphasised cutting capital costs, resulting in the deliberate selection of low-capital, high-emission technologies. From 1995 to date the only policy actions taken to promote greenhouse gas abatement have been marginal and have completely failed to halt the increase in Australian emissions.

## 4.1 Stasis in Australian policy

In the mid 2000s, thanks to the improving scientific documentation and events such as the accelerated melting of the Greenland ice cap and despite choruses of denial and scepticism, climate change could no longer be ignored. The 2007-08 and 2008-09 *State of the Regions* reports contain extensive coverage of the inevitability of climate change; of ways to adjust to moderate climate change and of measures to limit change. The reports argued that the Commonwealth was misled by its economic advisers, particularly in Treasury, who insisted that emissions trading would be a complete and sufficient response to the need to reduce emissions. A much broader program is required, including measures to promote 'no regrets' measures (investments which would reduce emissions and increase incomes at the same time) and measures to facilitate the major investment task required to shift from high-emission to low-emission production. These additional measures, which include a variety of actions best implemented by local government, would be essential to speed the response to carbon pricing and to reduce if not minimise its cost.

As the Commonwealth government geared up to introduce emissions trading it came under strong political attack. The high-emission industries waged a campaign to have emissions trading watered down while the environmentalists wanted it pepped up. The government procrastinated. It was not necessary to include a climate change update in the 2010-11 *State of the Regions* report and indeed in this 2011-12 report there is still no need for an update on Australian policy. Climate change has been put forward as implicated in recent severe droughts, floods and storms, but the dithering continues. However, there has been movement on the international scene.

## 4.2 Copenhagen and its aftermath

In the approach to the 2009 UN conference in Copenhagen, climate change was framed as an aspect of the ongoing conflict between rich countries and poor. The poor countries argued that the rich were responsible for nearly all the increase in atmospheric concentrations of greenhouse gases and accordingly should be the first to cut back. This principle had been included in the Kyoto agreement

and it was expected that it would be maintained, requiring the developed nations to commit to greenhouse gas abatement targets which in turn would underpin a global system of emissions trading. Developing countries would be drawn into this system by undertaking abatement actions for which they would be rewarded by the committed countries. It will be recalled that the Commonwealth Treasury, in 2009 (before Copenhagen), looked forward to Australia meeting its abatement targets cheaply by the import of permits generated by developing countries which promised to reduce emissions from a range of low-cost sources such as the preservation of forests.

The Copenhagen conference did not yield any form of global abatement agreement, but instead dampened expectations by demonstrating the strength of political groups which either wanted no action at all or wanted action by somebody else. Given these expectations, the following conference, held in 2010 in Cancun, was regarded as a diplomatic triumph in that 193 countries agreed in principle to reduce carbon emissions. However there were no quantitative commitments and no financial commitments apart from setting up a UN fund to assist with abatement in developing countries. There is now little likelihood that a global emissions trading scheme will be implemented and national abatement strategies predicated on concerted global action have become irrelevant.

Yet climate change refuses to go away. Indeed improved scientific description is changing its character away from the relatively benign global warming to the more alarming prediction that the frequency of extreme weather events will increase.

## 4.3 Consequences of the rising cost of petroleum

Meanwhile events are moving on a related front – 'peak oil'. The relationship is close, because oil is the source of a lot of the post-industrial $CO_2$ now present in the atmosphere and could effectively be the source of a lot more if the increasing cost of conventional oil renders high-emission liquid fuels economic (including oil from coal, oil from tar sands and fuels from shale gas). The major difference is that oil is regarded as a scarce resource and enjoys a global market. By contrast, the Copenhagen conference demonstrated that the various nations continue to regard the absorptive powers of the atmosphere as free and non-marketable.

Over the past three years the growing demand for oil in China and India has been accommodated by recessed demand in North America and Europe. Maybe the recession will continue – neither the USA nor the EU has addressed its underlying structural problems – but even if it does the underlying fact remains that the supply of low-cost oil is dwindling. Two responses are possible.

- Maintain existing oil-using technologies by scavenging oil which would previously have been considered unrecoverable and by moving to unconventional fossil fuels such as oil sands, shale gas and coal-to-liquids.
- Shift out of fossil fuels to nuclear and renewable technologies, of which solar power has the greatest potential. This will require the decarbonisation of electricity and the electrification of transport. (No way has been found to electrify air transport, which if it is not to be abandoned will have to be repowered somehow, possibly by biofuels.) A significant improvement in energy and transport system efficiencies will also be required.

The first option is emission-intensive and will require an increase in fuel prices, but has relatively low investment requirements, not least because it would leave petroleum-powered transport intact. In the absence of concern about climate change it would almost certainly be the primary market response – just as, in the absence of concern about climate change, coal would remain the major fuel for electricity generation across the world. Not surprisingly, the first option is being promoted by the petroleum and coal industries. This leads to it being favoured by governments in a select group of countries characterised by:

- major fossil-fuel resources;
- powerful industries committed to fossil fuel production and use;
- a commitment to market responses;
- investor preferences for short-term returns; and
- media and other groups prone to deny climate change.

By contrast, the second option is more likely to be favoured by governments in countries characterised by:

- imports of fossil fuels, which are regarded both as a burden on the balance of payments and a threat to national security;
- willingness to undertake the necessary investment programs (including generating sufficient savings to finance the investments); and
- a relatively high level of concern about climate change among the governing elite.

Countries which fall into the first group include the OPEC countries, Canada, Russia and the USA (though in both Canada and the USA particular states and provinces take positions quite different from the national government). Members of the second group include the EU, Japan, South Korea, China, India and Brazil. It will be noted that both groups include both developed and developing countries. International negotiations about greenhouse gas emission abatement are likely to change as a result, with less emphasis on conflict between the developed and developing countries and more on conflict between abating and non-abating countries.

The classification of India and China as abating countries may be surprising, since both have been increasing their imports of coal and petroleum. However, these increased imports have been due to rapid economic growth and both countries are implementing policies to reduce fossil fuel dependence and cut the carbon-intensity of GDP. China, in particular, is investing heavily in the shift out of fossil fuels, concentrating on investments in the development of low carbon intensive technologies. The long-term threat to Australian coal exports is obvious.

A second major change over the past few years in the international politics of peak oil and climate change is that concern for national security is increasingly given as a reason for reducing dependence on fossil fuels, particularly imported fossil fuels. Security concerns have arisen in part because military powers do not wish to be heavily dependent on imported fuels but also from fear of the consequences of climate change. Military planners, even if those who believe that their own country can weather climate change, fear that other countries will turn aggressive when they are disrupted by drought, flood or other climate-change related events. The more that climate change response becomes a matter of security calculation rather than environmental economics, the more likely it is that abatement will trump business as usual. Security concerns have a proven ability to justify the imposition of substantial costs on national economies and if they rise to prominence we could well see high-cost abatement plans being implemented.

## 4.4 The three pillars of abatement policy

This brings us to the content of abatement policies – how to abate efficiently and at relatively low cost, even at this late stage. NIEIR first encountered Michael Grubb in the course of its research into greenhouse gas emission abatement policies in 1995 and is pleased to report that he has maintained his interest including acting as a negotiator on behalf of the UK and EU at various international conferences. In his forthcoming book, *The Carbon Connection* (Earthscan), he distinguishes three 'pillars' of abatement policy. They are:

- policy, based on behavioural economics, to persuade people to take action which reduces the demand for fossil fuels, usually by increasing energy efficiency. Various polices are already in place in this area – for example, the star rating system on white goods – but there is room for further ingenuity and, dare one say, regulation in increasing the speed of public and business response to opportunities for reduced energy consumption and improving compliance with energy efficiency policies;
- carbon pricing, based on classical economics, mindful that the chief purpose of carbon pricing is to provide an incentive to replace high-emission equipment with low-emission equipment (e.g. coal-fired power stations with gas and renewable power). NIEIR has therefore emphasised the need for a predictable carbon price (so that it can act as an investment signal) and also for measures to ensure that funds are available to finance the necessary investments; and
- policy, based on evolutionary economics, to ensure that investment programs cohere to ensure that the economy takes a low emission trajectory. For example, local government investment in cycle paths contributes to emission-abatement in transport. Policies on the investments in the energy-using area should be coupled with policies to encourage research and development in low-emission technologies. Grubb points out that the energy and mining industries do not have a strong record in research and development, so considerable public prodding is likely to be necessary.

In this scheme, carbon pricing requires complementary policies if abatement policy is to be effective. However, it remains central to the three pillars of coherent policy. In the behavioural direction, policies to direct equipment choice and building standards in an energy-efficient direction make good sense if it can be pointed out that they reduce the impact of carbon prices, improve energy security and increase productivity and affordability. In the evolutionary direction, overall investment and technology development strategies to reduce emissions in transport and manufacturing make extra good sense if emissions are priced. In a world without universal carbon pricing there is, however, the problem of carbon leakage.

## 4.5 The problem of carbon leakage

As the Commonwealth government is finding out, go-it-alone carbon pricing puts employment in emission-intensive industries at risk when domestic industry has to pay the carbon price while overseas industry does not. Jobs are lost as Australian producers lose sales on both the domestic and overseas markets. The obvious solution here is to treat carbon-intensive products in the same way as alcohol is already treated: that is, a tax on domestic production which is rebated for exports coupled with a tax on imports levied on alcohol content at the same rate as for domestic production. In this way, international trade in alcoholic beverages is conducted at tax-free prices while each country levies its own tax rate. This principle should not be hard to extend to carbon emissions, since emission-intensive products are but a small proportion of world trade – beyond cement, smelted metals and fuels emissions pricing has relatively little effect on competitiveness. The World Trade Organisation, often cited as a potential impediment to carbon pricing, is reported to support this 'border adjustment' principle for carbon pricing. There are, however, two potential difficulties.

- Even within closely-specified product categories, not all products are equally emission-intensive, depending on their source. An obvious example is Australian aluminium, which is emission-intensive compared to aluminium smelted in Canada, Norway, Iceland and the like using hydro or geothermal electricity. Given the logic of carbon pricing, border adjustments should not be applied when the importer can prove that he is importing from a low-emission source. Border adjustment, properly applied, will not help the Australian aluminium smelters, and indeed, from a world point of view, it is doubtful that the Australian aluminium smelting industry should continue – especially given its dependence on subsidised electricity prices.

- The developing countries have objected to previous attempts by the USA to enact an emission trading scheme which includes border adjustments, on the grounds that the border adjustments interfere with the Kyoto principle that developed countries should reduce their emissions first. The suggested answer to this objection is that revenue from border adjustments should be rebated to the exporting country on condition that it uses the rebate to finance emission-abatement programs.

Though border adjustment is the logical response, the industries likely to be affected by carbon taxation have been arguing for compensation for loss of competitiveness by being granted free permits (in the case of permit schemes) or tax exemptions (in the case of carbon taxes). In the first, trial EU permit scheme the number of emission permits was limited but large numbers of permits were issued free to trade-exposed industries to maintain competitiveness (for both exports and imports) and also in the hope of restricting price rises on the home market. In practice the industries receiving the permits increased their domestic prices to reflect the scarcity of permits, thus converting their free permits into windfall profits which in many cases they distributed to shareholders rather than invest in updating their equipment to reduce emissions. Governments which learn the lesson of this experience will be careful to restrict claims for compensation for loss of competitiveness to border adjustments. Any further assistance for affected industries would be tied to investments which reduce emissions – in other words, they would be tied to Grubb's third pillar of abatement policy.

Another area where there is a degree of action at the inter-government level is that of international treaties on investment. In the past these were sought by the home countries of overseas investors largely as a way of protecting investors, but there has been a recent trend to include environmental provisions to encourage low-emission investments.

Though the claims of businesses for compensation for carbon pricing must be treated carefully, claims from low-income households are in a different category since they reflect the increased costs of living which will result from carbon pricing – more so for some households than others, depending on patterns of energy use. Though there is some comparison with the GST – carbon pricing has broad incidence - there are strong arguments that compensation should take the form of assistance in improving household energy efficiency rather than straight cash compensation, as was implemented for the GST. From this point of view it was very unfortunate that the Commonwealth mal-administered its program for improving the energy efficiency of houses. In this instance there is a strong case to try again, using sound local advice for a change. There are many programs where local knowledge is required if energy and transport efficiency are to be pursued, and hence many opportunities for local government involvement.

## 4.6 Conclusion

According to Michael Grubb, the world is now emerging from an 'age of innocence' in which climate change was always somebody else's problem, or even if it wasn't, a low-cost fast-fix would be available – in Australia's case, emissions trading and permit imports. Following the failure to negotiate global emission caps at Copenhagen the world is gradually dividing into countries which take abatement seriously and those which are still in effective denial – with the latter group including countries like Australia whose governments are still trying to find ways to counter climate change without affecting the capital values of high-emission industries. Current political predictions are that the Commonwealth of Australia will continue to dither and to take comfort in the lack of a binding international agreement on abatement. This is short-sighted, since the outlook is that the abating countries, by reducing their dependence on energy imports and increasing their efficiency of energy use and so increasing productivity, will within a decade or less gain the economic strength to dictate terms to countries which are still refusing to take climate change seriously.

# 5. Population growth, housing shortages and the mining boom

It is self evident that the mining construction boom is directly linked to the issue of housing shortages. The view put forward in the forthcoming report by NIEIR for the Australian Steel Institute is that the current mining expansion has increased Australia's population by 400,000 to support the construction boom, directly and indirectly. This may well go higher in response to the expected peak in construction activity over the next five years, which will exceed the peaks of the past five years. By itself this would explain a large proportion (approximately 150,000 to 200,000 dwellings) of the increase in Australia's housing shortage over the past five years.

However, the headline figure does not explain why housing markets failed to respond by constructing new dwellings to meet the new demand and reduce the pre-2006 shortages. Part of the explanation is that mining booms not only induce population increases; they make it harder to house the increased population.

## 5.1 The Australian dwelling construction zones (DCZs) – dwelling affordability

Dwelling construction zones are the LGAs on the fringes of the capital cities which have significant vacant land for new dwellings.

The central argument of the 2010-11 SOR report was that the main reason for the emergence of a steadily increasing dwelling shortage over the past decade was the failure of these dwelling construction zones of Australian capital cities to supply the required housing stock. The proximate reason for this was the failure of some construction zones, and the Sydney construction zone in particular, to generate prices for existing dwellings that were safely above the costs of newly constructed dwellings. Potential buyers therefore tended to opt for existing dwellings, leaving little incentive to developers or builders to construct new dwellings.

More fundamentally, the reason for this outcome was the failure of the labour catchments of the dwelling construction zones to supply sufficient hours of work at an appropriate rates of pay to support the mortgage payments that would have justified higher existing dwelling prices and made new dwellings affordable. (The labour catchment of a DCZ is estimated to include all jobs within a 45 minute travel time budget.)

An update of the statistics to 2011.2 reveals that nothing has changed over the past year. Indeed, Table 5.1 indicates that very little has changed since 2008. The average price of an existing dwelling in the Sydney DCZ is well below new construction costs. However, the Melbourne DCZ has had a significant improvement since 2008 with established house prices increasing relative to new construction costs.

If the ratio of the maximum mortgage payment to household income is set at 35 per cent, the prices for existing dwellings are at their maximum value given the DCZ catchments' ability to support household income (Table 5.2). In South East Queensland (SEQ) the ratio is well over the conventional maximum, which indicates that a supply shortage is ahead.

Table 5.3 indicates that the average mortgage on a new dwelling in all but the Perth DCZ are dangerously high in relation to available incomes, so that it is difficult to justify new dwelling construction. Table 5.4 indicates that growth in the average hourly earnings of DCZ residents has been subdued or stagnant except for the capital cities of the resource states. Table 5.5 provides a check that the average hourly earnings of residents reflects the average each catchment.

Table 5.6 indicates that, as the SEQ DCZ moves westwards it is leaving the jobs behind, resulting in a net reduction in the hours of work available within the catchment.

| Table 5.1 | Dwelling construction zones – ratio of new construction costs to market dwelling prices (ratio) | | | |
|---|---|---|---|---|
| | 2006.3 | 2008.2 | 2010.2 | 2011.2 |
| Sydney | 1.53 | 1.62 | 1.50 | 1.51 |
| Melbourne | 1.47 | 1.35 | 1.21 | 1.21 |
| SEQ | 0.94 | 0.82 | 0.89 | 0.94 |
| Adelaide | 1.44 | 1.20 | 1.17 | 1.18 |
| Perth | 0.95 | 0.99 | 0.96 | 0.99 |

| Table 5.2 | Dwelling affordability – average mortgage on existing dwelling to catchment income support | | | | | |
|---|---|---|---|---|---|---|
| | 1997.3 | 2001.3 | 2006.3 | 2008.2 | 2010.2 | 2011.2 |
| Sydney | 25.5 | 33.6 | 39.7 | 36.1 | 39.4 | 39.0 |
| Melbourne | 17.3 | 22.4 | 27.3 | 28.9 | 34.4 | 34.7 |
| SEQ | 29.1 | 29.1 | 47.7 | 51.9 | 49.5 | 46.7 |
| Adelaide | 16.0 | 20.4 | 30.0 | 34.5 | 36.1 | 35.8 |
| Perth | 18.1 | 19.7 | 42.8 | 38.1 | 36.6 | 34.1 |

| Table 5.3 | Dwelling affordability – average mortgage on new dwelling to catchment income support | | | |
|---|---|---|---|---|
| | 2006.3 | 2008.2 | 2010.2 | 2011.2 |
| Sydney | 60.6 | 58.6 | 59.2 | 58.9 |
| Melbourne | 40.0 | 39.0 | 41.8 | 41.9 |
| SEQ | 44.6 | 42.6 | 44.1 | 44.1 |
| Adelaide | 43.4 | 41.4 | 42.2 | 42.3 |
| Perth | 40.6 | 37.6 | 35.0 | 33.7 |

| Table 5.4 | Dwelling construction zones – average 2008-09 $/hour earned by resident workers | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1991.3 | 1996.3 | 1997.3 | 2001.3 | 2006.3 | 2008.2 | 2010.2 | 2011.2 | Per cent change 2011.2 over 2006.3 |
| Sydney | 28.14 | 28.71 | 29.70 | 30.23 | 34.37 | 34.91 | 36.19 | 36.17 | 5.2 |
| Melbourne | 27.22 | 27.18 | 27.83 | 28.82 | 33.08 | 34.30 | 32.92 | 32.88 | -0.6 |
| SEQ | 26.37 | 24.81 | 24.93 | 27.16 | 30.62 | 32.27 | 32.20 | 33.85 | 10.6 |
| Adelaide | 26.56 | 26.65 | 28.16 | 27.81 | 30.15 | 31.42 | 31.83 | 30.84 | 2.3 |
| Perth | 30.96 | 27.72 | 27.01 | 28.40 | 35.78 | 37.13 | 40.85 | 40.59 | 13.4 |


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| Table 5.5 | Dwelling construction zones – average 2008-09 $/hour of work for industry within travel catchment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1991.3 | 1996.3 | 1997.3 | 2001.3 | 2006.3 | 2008.2 | 2010.2 | 2011.2 | Per cent change 2011.2 over 2006.3 |
| NSW | 29.5 | 30.8 | 32.0 | 34.0 | 39.1 | 39.6 | 40.8 | 40.9 | 4.7 |
| VIC | 28.2 | 29.4 | 30.5 | 33.0 | 37.6 | 39.3 | 37.9 | 37.9 | 1.0 |
| QLD | 27.0 | 26.9 | 27.4 | 30.1 | 33.1 | 35.0 | 34.8 | 36.3 | 9.6 |
| SA | 27.8 | 28.8 | 30.4 | 30.7 | 33.7 | 35.6 | 36.3 | 35.4 | 5.0 |
| WA | 27.0 | 28.2 | 28.4 | 31.1 | 36.9 | 39.0 | 42.6 | 42.7 | 15.6 |

| Table 5.6 | Dwelling construction zones – average annual hours of work per capita working age population within travel time catchment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1991.3 | 1996.3 | 1997.3 | 2001.3 | 2006.3 | 2008.2 | 2010.2 | 2011.2 | Per cent change 2011.2 over 2006.3 |
| Sydney | 1284.9 | 1316.7 | 1310.6 | 1330.2 | 1329.3 | 1374.2 | 1323.3 | 1342.3 | 1.0 |
| Melbourne | 1284.4 | 1331.8 | 1333.5 | 1334.6 | 1389.6 | 1380.5 | 1379.0 | 1387.9 | -0.1 |
| SEQ | 1181.8 | 1216.6 | 1226.5 | 1207.9 | 1279.4 | 1282.6 | 1263.1 | 1223.6 | -4.4 |
| Adelaide | 1226.1 | 1261.6 | 1264.0 | 1245.9 | 1330.2 | 1339.9 | 1304.8 | 1334.5 | 0.3 |
| Perth | 1263.6 | 1351.4 | 1358.4 | 1321.9 | 1390.9 | 1439.7 | 1367.9 | 1429.1 | 2.7 |

## 5.2 Dwelling construction zones – dwelling supply potential

Table 5.7 uses the latest projections of state planning agencies to indicate where the growth in the new dwelling stock is expected over the next decade. Table 5.8 translates the percentages of Table 5.7 into the expected increase in new occupied dwellings. It is obvious that, on the basis of existing trends, the Sydney DCZ has no chance of achieving its planning target. The problems of housing supply in Sydney are of long standing – the actual outcome over the last decade from was a little more than a third of what is expected over the next decade (Table 5.8). Melbourne has done better in the recent past but, on current trends, is likely to have increasing difficulties in achieving its targets. However, it is SEQ that is likely to emerge with a major issue in its ability to meet its housing requirements.

Table 5.9 indicates that projected population increases are in line with the growth rates over the past decade. However, as Table 5.10 makes clear, population growth from 2001 to 2011 was achieved at the cost of increasing housing shortages. It can only be expected that these will intensify over the next decade.

| Table 5.7 The LGA membership of construction zones by state | | |
|---|---|---|
| | | **LGA share of state increase in required occupied housing stock 2011-2021** |
| **New South Wales** | Auburn (A) | 1.9 |
| | The Hills Shire (A) | 5.2 |
| | Blacktown (C) | 8.2 |
| | Camden (A) | 7.3 |
| | Campbelltown (C) | 3.8 |
| | Fairfield (C) | 1.3 |
| | Holroyd (C) | 1.7 |
| | Liverpool | 5.1 |
| | Maitland | 2.3 |
| | Penrith (C) | 3.1 |
| | Wollondilly (A) | 1.0 |
| | Wollongong (C) | 2.1 |
| | Wyong (A) | 3.7 |
| | Rest of NSW | 53.4 |
| **Victoria** | Ballarat (C) | 2.1 |
| | Bass Coast (S) | 0.9 |
| | Baw Baw (S) | 1.0 |
| | Brimbank (C) | 1.2 |
| | Cardinia (S) | 4.9 |
| | Casey (C) | 9.5 |
| | Frankston (C) | 2.4 |
| | Greater Bendigo (C) | 2.7 |
| | Greater Dandenong (C) | 1.5 |
| | Greater Geelong (C) | 4.4 |
| | Hume (C) | 5.0 |
| | Melton (S) | 6.8 |
| | Whittlesea (C) | 7.6 |
| | Wyndham (C) | 9.5 |
| | Rest of Victoria | 40.5 |
| **Queensland** | Cairns (R) | 3.6 |
| | Gold Coast (C) | 13.6 |
| | Ipswich (C) | 11.0 |
| | Logan (C) | 6.7 |
| | Moreton Bay (R) | 9.3 |
| | Redland (C) | 2.8 |
| | Sunshine Coast (R) | 8.6 |
| | Rest of Queensland | 44.5 |
| **South Australia** | Gawler (T) | 3.4 |
| | Mount Barker (DC) | 4.4 |
| | Onkaparinga (C) | 12.4 |
| | Playford (C) | 10.6 |
| | Port Adelaide Enfield (C) | 6.8 |
| | Rest of South Australia | 62.5 |
| **Western Australia** | Armadale (C) | 5.8 |
| | Cockburn (C) | 7.4 |
| | Kwinana (T) | 3.3 |
| | Mandurah (C) | 7.2 |
| | Rockingham (C) | 8.1 |
| | Swan (C) | 11.0 |
| | Wanneroo (C) | 16.3 |
| | Rest of Western Australia | 40.9 |


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| Table 5.8 | Construction zones – required and recent performance in net expansion of occupied dwellings | | |
|---|---|---|---|
| | 1991-2001 | 2001-2011 | 2011-2021 |
| Sydney | 100615 | 48489 | 132168 |
| Melbourne | 113276 | 133203 | 187738 |
| SEQ | 133559 | 116739 | 392368 |
| Adelaide | 13438 | 15384 | 32592 |
| Perth | 47837 | 54520 | 73396 |

| Table 5.9 | Construction zones – adult population growth rates | |
|---|---|---|
| | 2001-11 | Projected, 2011-21 |
| Sydney | 1.6 | 1.8 |
| Melbourne | 3.0 | 2.3 |
| SEQ | 3.1 | 2.4 |
| Adelaide | 1.6 | 1.6 |
| Perth | 4.3 | 2.7 |

| Table 5.10 | Construction zones – adult population per dwelling | | | | |
|---|---|---|---|---|---|
| | 2001.3 | 2006.3 | 2008.2 | 2010.2 | 2011.2 |
| Sydney | 2.35 | 2.36 | 2.42 | 2.50 | 2.52 |
| Melbourne | 2.27 | 2.29 | 2.34 | 2.38 | 2.38 |
| SEQ | 2.15 | 2.27 | 2.31 | 2.37 | 2.39 |
| Adelaide | 2.04 | 2.09 | 2.11 | 2.13 | 2.13 |
| Perth | 2.19 | 2.27 | 2.32 | 2.40 | 2.42 |

## 5.3 Dwelling construction zones and the mining boom

Adverse current trends in DCZs that are undermining housing affordability will be reinforced over the next five years as the crowding-out effects of the mining expansion build up. From the analysis of Chapter 2, under the full crowding out case the DCZs of Sydney, Melbourne and Adelaide can all expect total hours of work to decline by between around 3 to 4 per cent compared to what would have happened in the absence of the mining boom. The impact on the SEQ construction zone will be about half that of Sydney and Melbourne.

The only way to offset the adverse impact of the mining boom on housing affordability in capital city DCZs is either to use policy to redistribute hours of work directly from the resource regions (or foreign countries) to the DCZs (as is clearly happening in Perth) and/or to tax the proceeds of the mining boom revenues more heavily to directly support dwelling supply expansion in the key DCZs.