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The mining boom

Impacts and prospects

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Overview

The biggest mining boom in Australian history since the gold rush of the 1850s is about to change shape. The investment phase of the boom, which has seen $400 billion invested in the last decade, is tapering off. The elevated prices paid for Australian mineral exports since 2003 are falling, and with them, the huge boost they provided to national income and government revenue. As these changes begin to transform the economy once more, this report assesses the benefits and costs of the boom, and points to what policymakers should and should not do next.

Overall, the boom has been good for Australia. It helped the country weather the global financial crisis. It helped fund major government initiatives. Most Australians have prospered.

But the boom has also provoked fears. Some worry that it has benefited mining states, companies and workers, but left the rest of the country worse off. Some believe that the high dollar caused permanent damage to trade-exposed industries such as manufacturing, tourism and international education. Some believe the boom will end in a severe recession. Others believe the Commonwealth Government mishandled the boom by failing to save much of the windfall it has generated.

This report shows that the first two concerns are largely unfounded. Certainly the boom has boosted incomes more in the mining states of Western Australia and Queensland and the Northern Territory. But in the past decade, incomes have increased faster across the country than in the decade before. Regions have grown at different rates but few are left worse off.

Benefits have been spread across the country as the boom helped to offset the impacts of globalisation and technological change on lower-skilled workers.

The boom has made life difficult for industries that compete internationally. Yet history suggests that manufacturing and other trade-exposed industries will bounce back quickly after the boom.

The concern about a possible recession is less easy to assess. There is a risk of a downturn: resources investment will decline, and falls in resource prices elsewhere were often followed by slower growth. But a recession is far from inevitable, and Australia has avoided the big traps in mining booms, such as high inflation.

The fourth community concern is well-founded. The Commonwealth Government has not saved enough of the proceeds of the boom. Tax decreases and spending increases have been larger than Australia can afford in the long run. Some spending was justified by the response to the global financial crisis, and some has been invested, but underlying budget deficits now need to be repaired in more difficult times.

Australian governments need to do more to tighten their budgets, which will permit them to respond strongly if the outlook darkens. Governments should resist temptations to protect industries, but continue to invest in skills and education to help workers and citizens respond to the changing risks and opportunities of a globalised economy. These will be even more important as the longest and largest mining boom in 150 years winds down.

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1.   The boom: its contents and discontents

1.1   The mining boom shaped Australia's economy over the last decade

It is our biggest mining boom since the 19th Century gold rush. In the decade to 2011, rapid growth in Chinese demand for iron ore, coal and other minerals – adding to demand from Australia's traditional mining export destinations, Japan and South Korea – more than tripled the prices Australia gets for its minerals (Figure 1.1).[1]

The historic increase in Australia's terms of trade – the prices paid for Australian exports, divided by the prices paid for imports – increased national income, government revenue, and the income of ordinary Australians (Figure 1.2). From 2000 to 2012, Gross Domestic Product (GDP) – the volume of what Australia produced – grew by around 44 per cent, but real Gross National Income (GNI) – the value of 'dollars in our pockets' – grew by around 63 per cent. The terms of trade improvement alone directly increased national income by around 13 per cent over that time.

The boom can be usefully divided into three overlapping phases: the price increases that began in 2003 and peaked in 2011; the investment phase that grew strongly from 2006 and peaked around this year; and the period of output growth, which is expected to continue for some years as resource extraction and export facilities are completed.[2]

Figure 1.1: Commodity prices, terms of trade and exchange rate
Indices (1982=100)
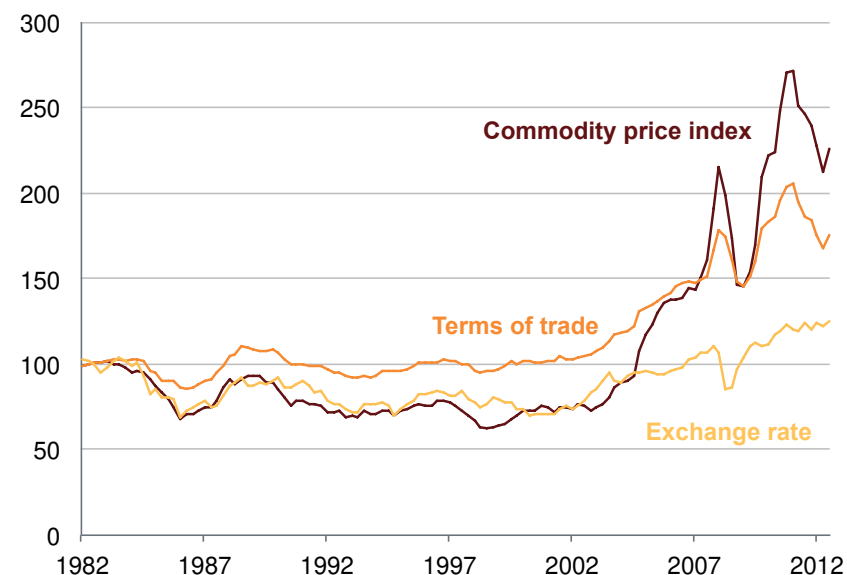
Note: Commodity price index is in SDR; Exchange rate is real trade-weighted.
Source: RBA (2013a), RBA (2013b), Series FRERTWI; ABS (2012d), Table1.

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[1] Battellino (2010)
[2] Bishop, *et al.* (2013) provides an analysis of the three phases.

Figure 1.2: Real GDP, GDI and GNI
Index (2000=100)
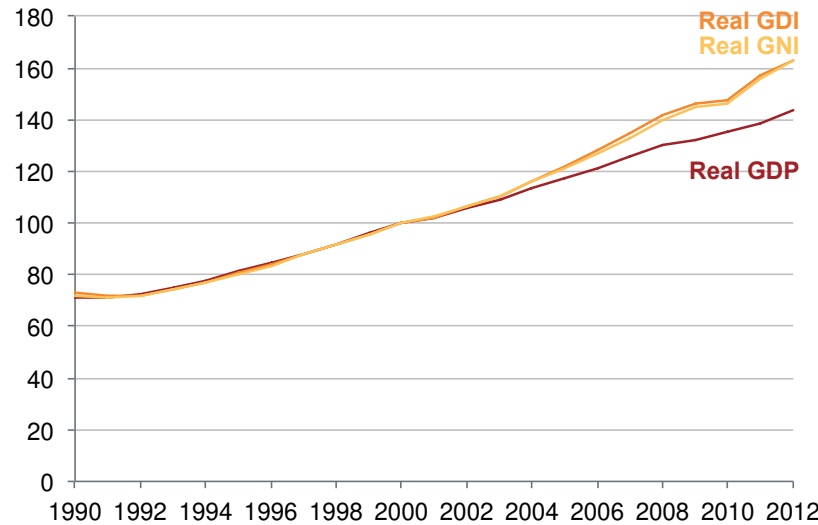
Note: GDP = the value of output produced in Australia assuming constant prices. GDI
        = GDP adjusted for changes in the prices of exports and imports. GNI = GDI
        adjusted for net earnings of Australian residents offshore and of non-residents in
        Australia. GNI has closely tracked GDI in part because the retention and
        investment by mining companies of earnings has not yet resulted in recognition
        in the national accounts of an increase in non-resident income of offshore
        portfolio investors.
Source: ABS (2012b), Table 30

In the first phase, price rises boosted the value of mining exports. Figure 1.3 shows that mining export revenue more than doubled from 2004 to 2008.

Figure 1.3: Exports by sector
$b
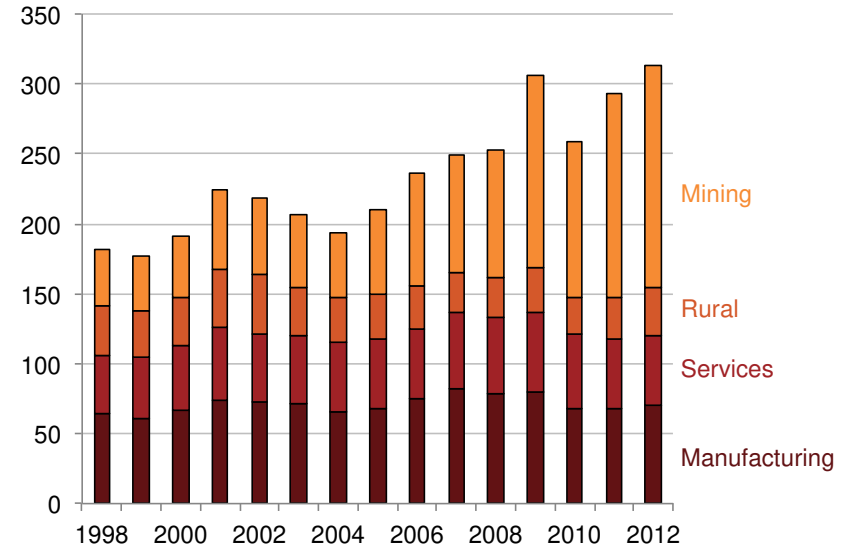
Note: Nominal exports deflated by the GDP deflator.
Source: ABS (2013f), Tables 5 & 11a. ABS (2012d).

As confidence grew that strong resources demand would endure, mining companies reinvested their returns to grow capacity.[3] Before the boom, mining made up about 10 per cent of business investment in dollar terms; today it is about 40 per cent, as Figure 1.4 shows.

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[3] New discoveries, especially in gas, also contributed to the investment boom (Wood and Carter (2013)).

Figure 1.4: Business investment value by sector
Per cent of GDP (private, nominal)
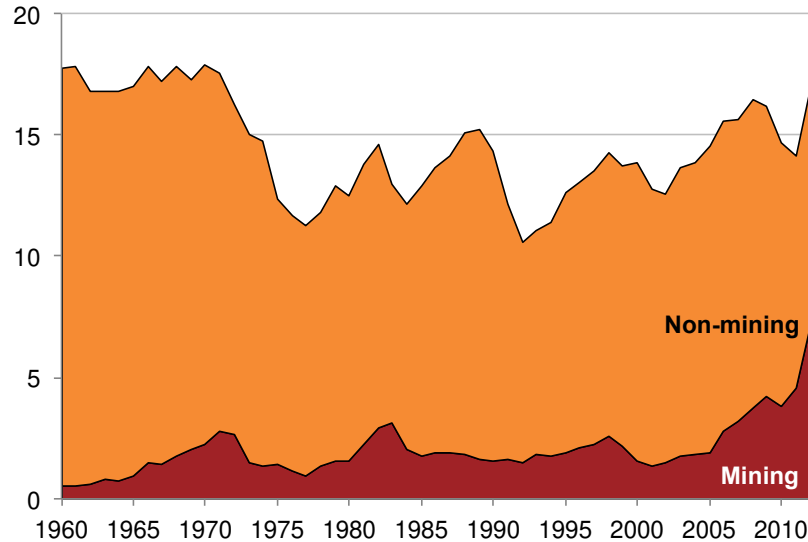
Source: ABS (2012d), Table 1 and Table 52.

To build extraction, processing and transport infrastructure for gas, coal, and iron ore and other minerals, more than $400 billion was invested from 2003 to 2012, with around $80 billion a year in the past three years. In the past eight years, more mining investment was undertaken in Australia than in any other country (Figure 1.5).

Figure 1.5: Global mining investment
US$b, nominal
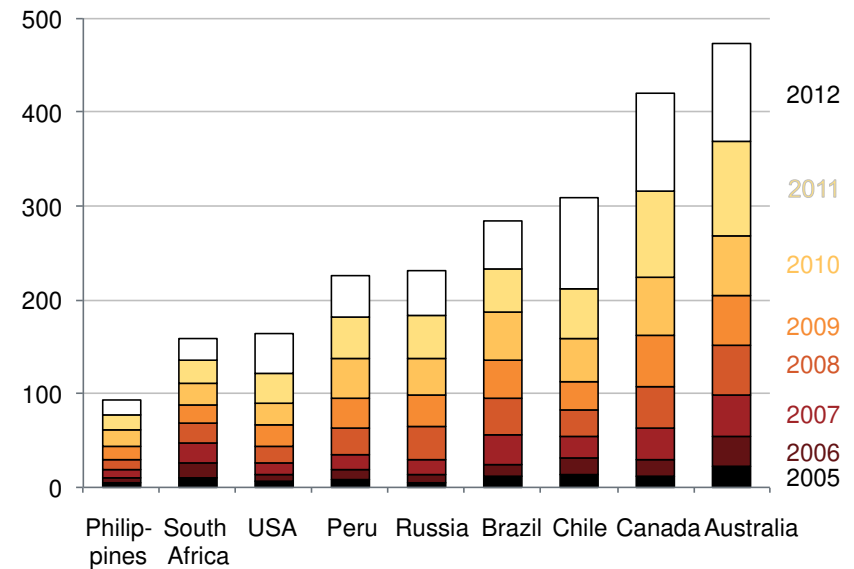
Source: Engineering and Mining Journal Project Survey (2013); ABS (2012d)

As a result of the mining price and investment surge, nearly a fifth of all production in Australia is now in or for the mining sector, by dollar value. Mining's direct share of GDP more than doubled in the past decade, to 11 per cent. When the output of sectors such as construction and professional services that sell to mining is added, the sector is responsible for around 18 per cent of nominal GDP, up from just 9 per cent before the boom.[4]

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[4] Rayner and Bishop (2013)

Figure 1.6: Growth in real value added by sector
Annual real growth, 2000-2012 (per cent)
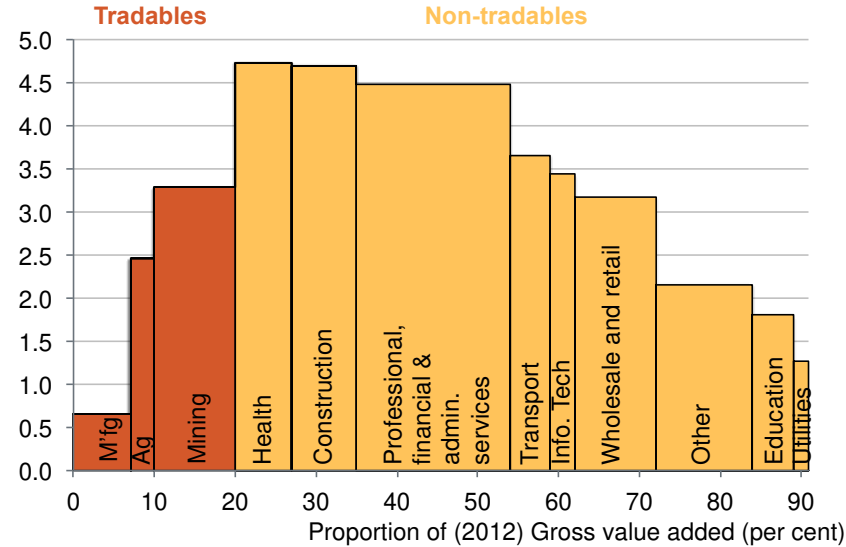
Note: Tourism (tradable) split across multiple categories.
Source: ABS (2012d), Table 5.

However, as Figure 1.6 shows, output also grew strongly in non-tradable sectors that do not sell much to the mining sector (such as health), but were purchased by consumers and governments with incomes boosted by the boom. By contrast, trade-exposed sectors like manufacturing and tourism grew little.

The relative decline of the trade-exposed sectors other than mining and the rise of non-tradable sectors is a hallmark of terms of trade booms. Growing incomes drove demand for both tradables and non-tradables. Strong demand for non-tradables pushed up prices and returns to producers, because only local

producers could deliver them. At the same time, imports could meet growing demand for tradable goods. Australian producers of tradables, forced to match world prices, were unable to pass on rising costs and have lost competitiveness.[5] Non-tradable prices have risen almost 70 per cent since 2000, while tradable prices have risen less than 10 per cent (Figure 1.7).[6]

Figure 1.7: Prices of tradables and non-tradables
CPI components; indices (2000=100)
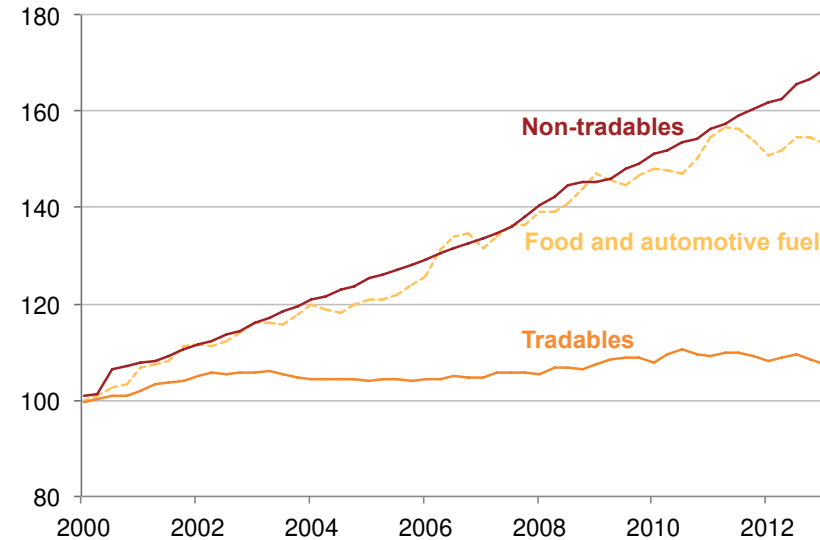
Note: Tradables excludes food and automotive fuel.
Source: ABS (2012f), Table 7; RBA Table G2.

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[5] Corden (2012); Gregory (2011).
[6] Bishop, et al. (2013), chart 6 shows that growth in the price of non-tradables relative to tradables increased when the terms of trade began to rise in 2003.

The decade of the resources boom, then, has been a decade of significant economic shifts: prices, profitability, output, exports, and investment across sectors have all been affected. But while average incomes also rose, not all Australians see the boom as a good news story. A sense of insecurity has inevitably accompanied rapid economic change. It was exacerbated by the impact of the global financial crisis on household wealth. Looking ahead, many worry that Australia could be thrown into recession as economic growth slows in our major mining customer, China, and it 'rebalances' from investing in infrastructure and industrial capacity towards consumption of consumer goods and services.[7]

Consequently many Australians remain anxious about the state of the economy and their personal prospects. This anxiety is often expressed as concern about the effects of the mining boom.

1.2   Community concerns about the boom

Broadly, there are three significant community concerns about the mining boom. The first is that the boom is great for miners, but has left other workers and communities behind. According to one poll, most Australians recognise the mining sector's importance to the economy.[8] Yet at the same time, Figure 1.8 suggests that most Australians believe the boom has not benefited them personally – and has even driven up the cost of living.

The second concern is that the boom has turned Australia into a 'quarry economy', and that the persistently high dollar has

permanently damaged industries that will be needed once the boom ends.

The third concern is that the boom leaves the Australian economy vulnerable; that when the boom ends, economic growth will fall sharply. Accordingly, the argument goes, governments should have saved more of the windfall from the boom to cushion against this shock.

The next three chapters seek to establish whether these concerns are justified.

Figure 1.8: Community perceptions of personal impacts of the mining boom
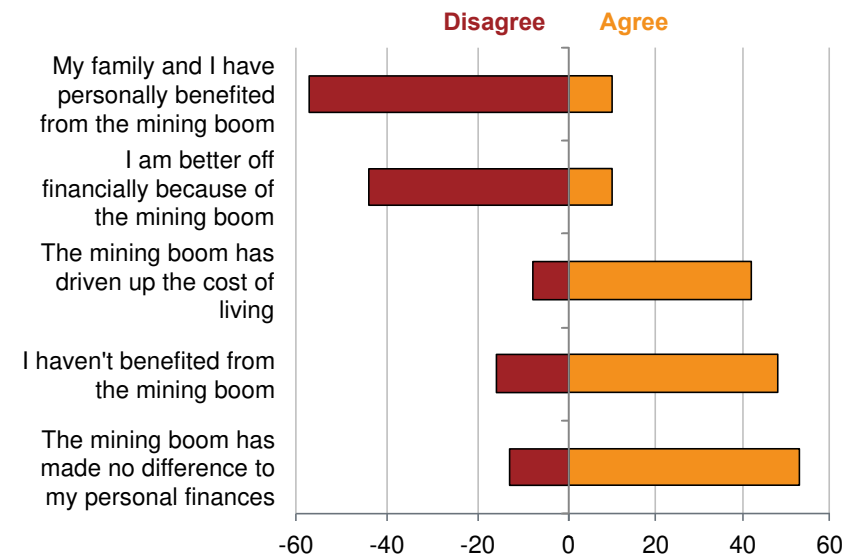
Source: SBS (2012)

[7] Garnaut (2013b)
[8] Newspoll (2013)

2.   The mining boom: only good for miners?

This chapter examines concerns that the resource boom only helped mining states, companies and workers, while leaving other states, firms and workers worse off. In particular, we ask:

- How has the boom affected wages, incomes and employment in Australia?

- Have non-resource states and regions been excluded from the benefits of the boom?

- How do the impacts of the boom compare to other forces affecting income distribution and disadvantage?

We find that, contrary to fears, the benefits of the boom have been widespread. On average, wages and household incomes have grown strongly through the boom. The spread of full-time earnings broadened, but the boom has increased wages in less skilled occupations. Unemployment remains low and the rate at which firms lay off workers has changed little.

Households and workers in both mining states and other states have benefited from the boom.

By pushing up the dollar, the boom has accelerated the reshaping of the manufacturing sector. Yet even among regional centres that have lost manufacturing and tourism jobs, only in a minority did employment decline as a share of population.

2.1   Wages, incomes and employment have grown strongly during the boom

Since 2000, Australian GDP, wages, household incomes and employment have all grown steadily and strongly. The mining boom has contributed directly to wage and income growth in two main ways.

First, the doubling of the terms of trade – the prices paid for our exports compared to the prices we pay for imports – has raised national income substantially, as Figure 1.2 shows. In the 2000s the terms of trade kept real income growth above 2 per cent, despite slowing productivity growth (Figure 2.1). The additional income ended up in people's pockets via wages, business income and dividends, and through the tax-transfer system.

The rising real exchange rate has transferred income from miners and from the producers of other trade-exposed goods and services to consumers. Consumers pay lower prices for traded goods and services. As incomes have risen, so has household spending on discretionary items.[9]

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[9] Phillips, *et al.* (2012)

Figure 2.1: Contributions to growth in average incomes by decade
Percentage points, annual average
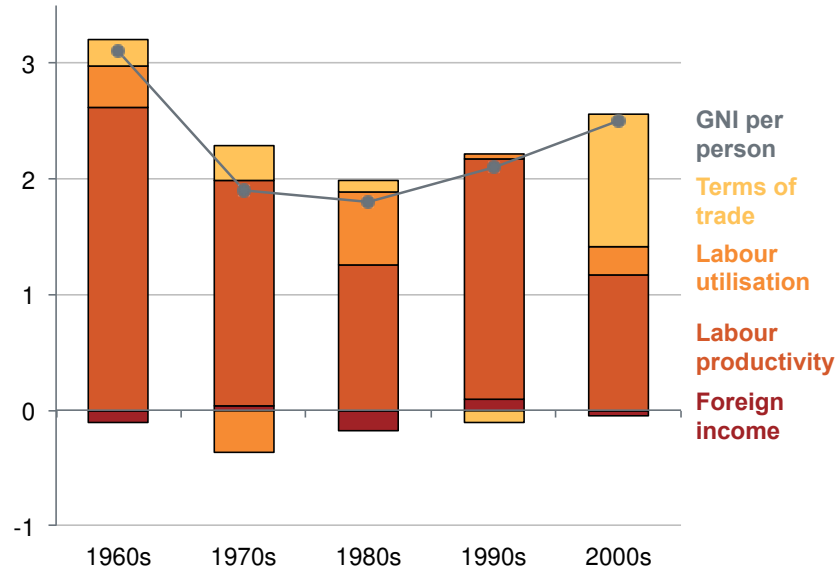
Source: Gruen and Dolman (2012), Chart 1.

Second, increasing mining activity and the very large increase in investment have contributed to steady growth in employment and output well beyond the mining sector, particularly in the period after the global financial crisis, as Section 1.1 sets out.[10]

2.2   Wages and incomes have increased broadly, with some rise in inequality

Lower-income workers have shared in the benefits of the boom, but higher-earning workers have done even better: inequality of wages has increased, particularly among men (Figure 2.2).

Figure 2.2: Growth in real weekly full-time earnings by decile
Per cent growth (2000-2011)
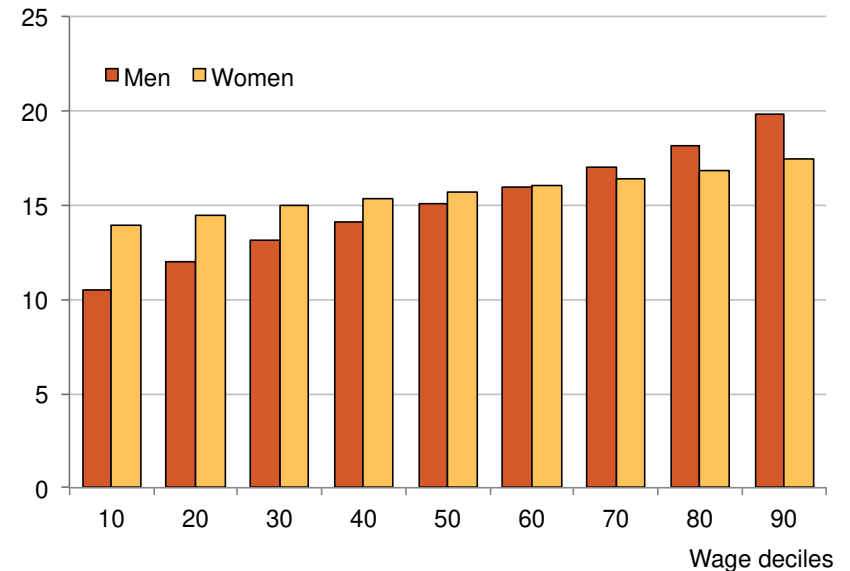
Source: Grattan analysis of ABS (2012g)

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[10] Stevens (2013)

The underlying causes of rising wage inequality are not clear. Wages have also become more unequal in other OECD countries.[11] Changes in technology may be part of the explanation, though as shown in Section 2.5, the income gap between highly skilled and less skilled workers has not risen as much in Australia as elsewhere.[12]

There is little evidence that the mining boom has contributed much to rising wage inequality in Australia. As Section 2.5 shows, the investment phase of the boom may have increased wages for workers with relatively low formal educational qualifications.

Unemployment, a major driver of disadvantage and social exclusion, fell below 6 per cent at the start of the resources boom in 2002-3 and averaged 5.2 per cent from 2009 to 2012. Long-term unemployment has also remained low.[13] An increase in labour force participation has supported lower income households while increasing the number of workers on relatively low wages.[14] Partly as a result, household income inequality (Figure 2.3) has grown less than ull time earnings inequality (Figure 2.2).

Figure 2.3: Growth in household post-tax real income
Per cent growth, 2000 – 2010, mean of quintile
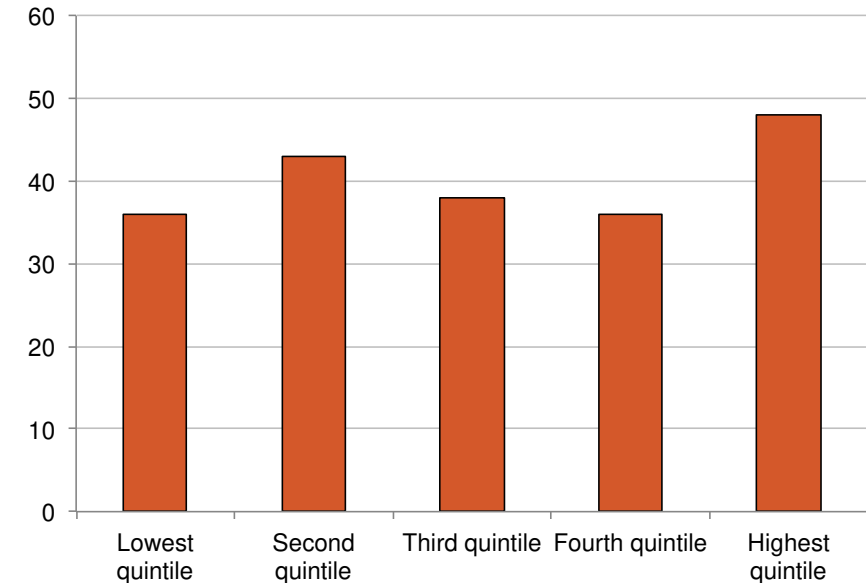
Note: Growth between financial years 1999-2000 to 2009-10. The ABS changed its measure of income in 2006 to include fringe benefits, which may affect the comparability of income in different periods.
Source: ABS (2011a), Detailed tables, 2009-10.

Nor are job turnover rates unusually high. Section 3 below shows that tourism, manufacturing and other sectors that compete internationally have been under pressure. Yet aggregate rates of job turnover have changed little. Figure 2.4 shows that layoffs ('involuntary separations') did increase somewhat as the economy slowed at the time of the global financial crisis. The resumption of the mining boom helped to maintain economic growth after the financial crisis and so is likely to have limited the rise in layoffs.

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[11] OECD (2011); Daley, et al. (2013); Greenville, et al. (2013). Mining wages rose strongly and hospitality and tourism wages fell during the boom (Lowe (2012), which may have contributed to the widening of the wage distribution.
[12] Autor, et al. (2008); OECD (2011); Autor (2011)
[13] The rate of underemployment did not improve substantially through the period (Borland (2011), Figure 22). The fraction of the population on disability support rose through the 1990s until the early 2000s but has remained almost unchanged since 2003.
[14] Connolly (2011); Borland (2011) Figure 4. Much of the increase in labour force participation was among older workers (Borland (2011), Figure 9) and in lower income households (Greenville, et al. (2013) Figure 3.11). This probably supported the growth in measured wage inequality.

Figure 2.4: Rate of job changes by cause
Proportion of those employed at some stage in the year (per cent)
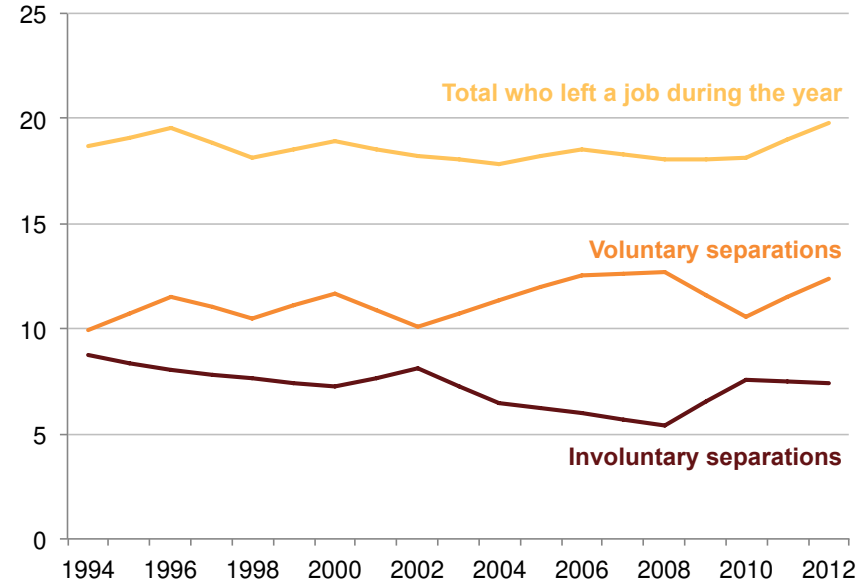
Note: Breaks in data are interpolated. Voluntary separations exclude workers who
       have changed locality but not employer.
Source: ABS (2012i)

Figure 2.5: Economic growth and its drivers in mining and non-mining states
Indices (2002-03 = 100)
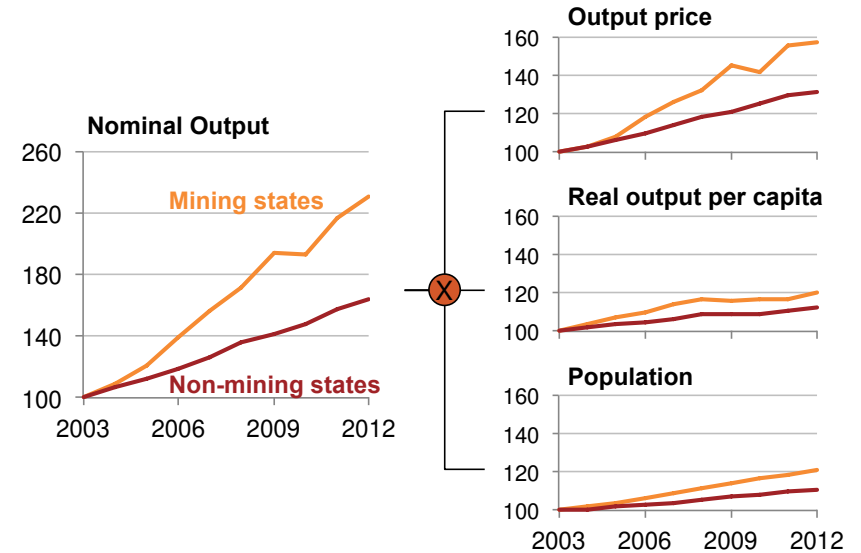
Note: Mining states are Western Australia, Queensland and the Northern Territory.
Source: ABS (2012a), Table 4 (population), ABS (2012f) Table 5; ABS (2013d) Table
         13A-G; ABS (2011a)– Detailed tables 2009-10 table 1.1 A; ABS (2012c) Table 1.

2.3   Workers and households in non-mining states have benefited from the boom

The mining boom has supported rapid output growth in the mining states of Western Australia, Queensland and the Northern Territory (Figure 2.5). The dollar value of output in mining states has grown by over 120 per cent, compared to 63 per cent in the non-mining states. The difference in growth in real output per person is much smaller but still striking: 20 per cent in the

mining states and 12 per cent in the non-mining states. As a result, wages and incomes have grown faster in the mining states. In the decade to 2012-13, real wages grew by 2.7 per cent in the mining states, almost triple the 1.0 per cent a year in the non-mining states. Strong wage growth attracted international and

Figure 2.6: Wages and incomes in mining and non-mining states
Average annual growth (per cent)

Mining states   **Non-mining states**

Average weekly earnings

Household income per person
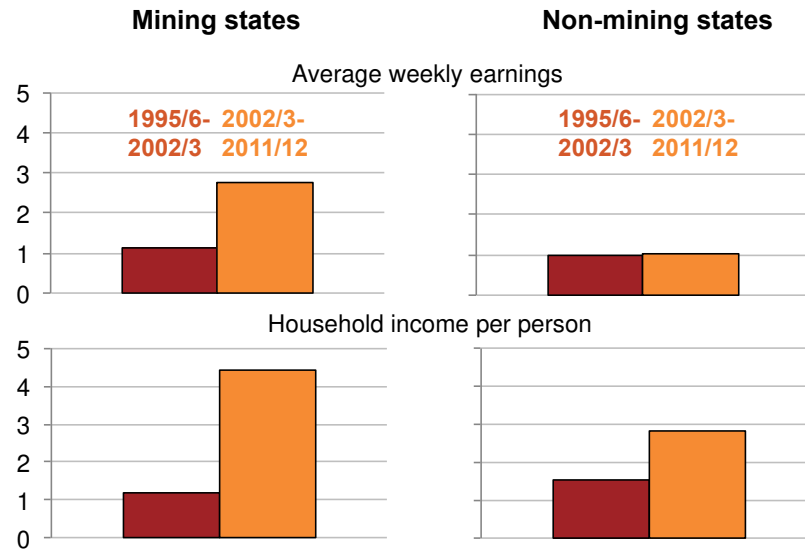
Note: GSP is deflated using ABS GSP deflators. Wages include full and part-time workers; series deflated using the relevant capital city CPI.
Source: ABS (2012a), Table 4, ABS (2012f) Table 5; ABS (2013d), Table 13A-G; ABS (2012c), Table 1; ABS (2012c), (report version) 2002-03 and 2011-12; RBA G12.

interstate migration and fly-in, fly-out workers.[15] Household income per person grew faster in the mining states: over 4 per cent per year, compared to 2.8 per cent in other states.

Nevertheless, wages and household incomes have continued to grow even in non-mining states. Wage growth has been just as rapid in the non-mining states during the boom as before.

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[15] Lowe (2012)

Figure 2.7: Unemployment rate in mining and non-mining states
Per cent of the labour force
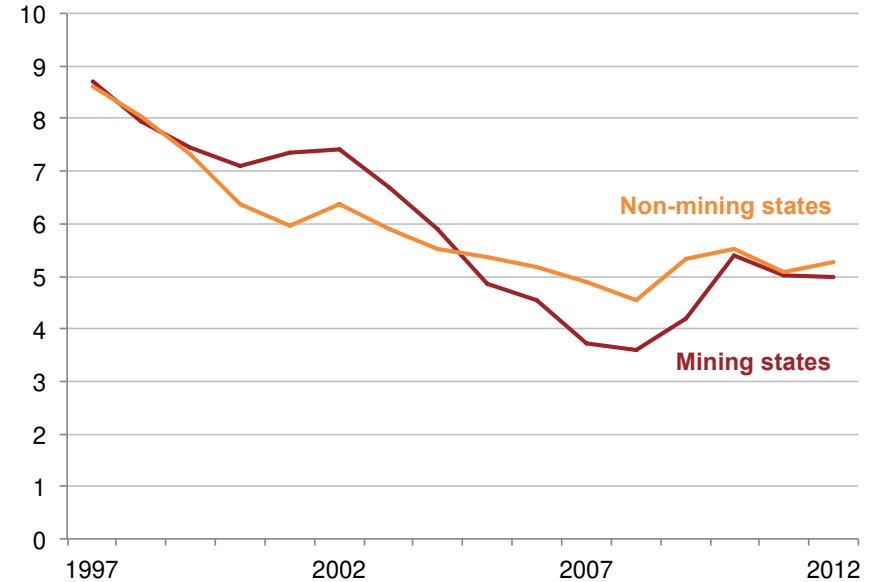
Source: ABS (2013g),Table 12.

Household incomes in non-mining states grew significantly faster during the mining boom years than in the seven years before, as Figure 2.6 shows.

Nor has unemployment differed much between non-mining and mining states. Figure 2.7 shows that from 2002 to 2008, unemployment fell faster in the mining states than elsewhere, before rising more sharply from 2008 to 2010, during a pause in mining investment. By 2012, unemployment rates in the two groups of states were almost identical.

2.4   The boom has disadvantaged a few regional centres

Some smaller regional centres have done better than others through the boom. As Figure 2.8 shows, towns with rapidly growing trade-exposed industries -- particularly mining -- tended to have rapid overall employment growth between 2006 and 2011.

Figure 2.8: Changes in tradables and total employment in regional centres
Change in employment shares 2006-2011 (per cent of population)

Change in total employment
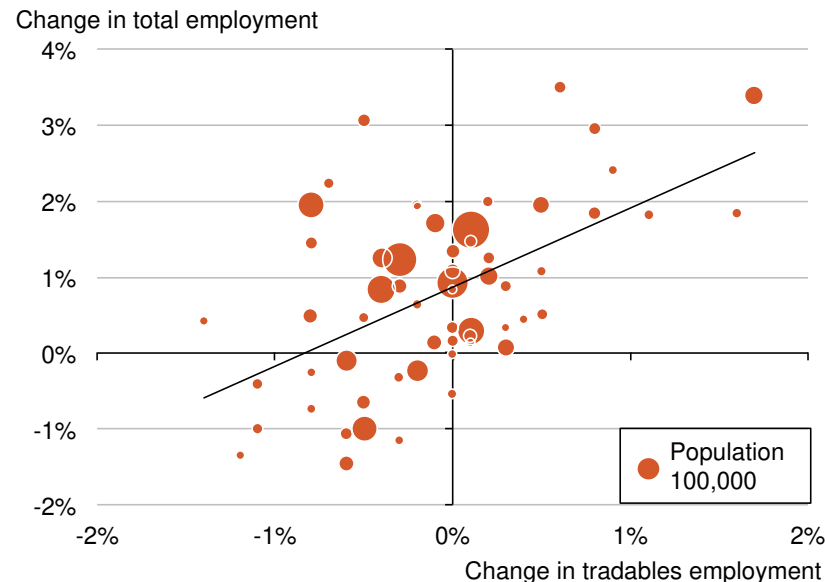
Note: *All regional centres with population between 15,000 and 300,000. Tradables are manufacturing, accommodation and foodservice, and mining. Agriculture excluded due to volatility.*
Source: *ABS (2007), ABS (2012e).*

But even among regional centres with rapidly shrinking trade-exposed industries, most still experienced rising employment, thanks to steady economy-wide growth. Only 14 centres, with a combined population of 600,000, experienced falls in employment as a share of population, and no centre lost more than 2 per cent employment share.[16]

2.5   The boom has supported wage growth for workers with lower formal qualifications

Those in the bottom 20 per cent have generally prospered through the boom, but not as much as those at the top. Even so, strong demand from mining has countered a trend, visible internationally and in Australia, towards increasing inequality, and a widening gap between those with and without formal educational qualifications.

Industries that employ more highly educated workers have tended to grow faster, as shown in Figure 2.9. Industries with fewer tertiary educated workers have created fewer jobs; and unemployed workers are more likely to report that their previous jobs were in those industries.[17]

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[16] Lowe (2012) shows that the spread of unemployment rates across regions declined during the boom (Graph 6, p 105). There were larger falls in manufacturing employment in NSW and VIC than in WA and QLD (Borland (2011), Figure 23).

[17] For discussion of the relationship between technology, occupations, education and earnings, see Goldin and Katz (2008); Borland (2011); Autor (2010); Autor (2011); Acemoglu and Autor (2012); Autor, *et al.* (2012).

Figure 2.9: Educational qualifications: high and low-growth industries
Per cent of workforce in 2011
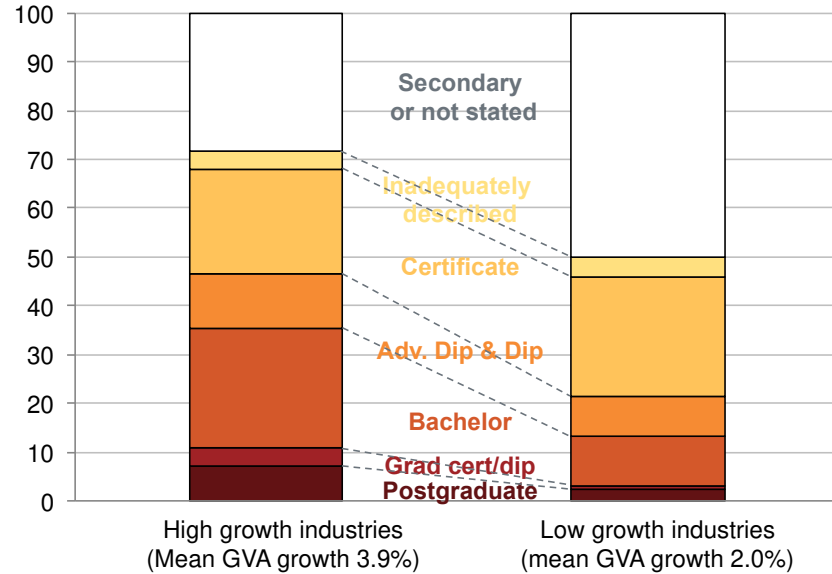
Note: Growth in gross value added, chain volumes from 2002 to 2012. *High growth industries are Mining, Utilities, Health, Professional and scientific, Wholesale, Construction, Education, Public Sector, Arts and Recreation and Finance. Low growth industries are Agriculture, Manufacturing, Other Services, Retail, Transport, IT & Media, Hospitality, Real Estate, and Administration.*
Source: ABS (2012e); ABS (2012h) Table 11 and UQ2_may-01 data cube.

The broader trend towards jobs requiring more education is also evident in higher employment growth in skilled occupations, as Figure 2.10 shows. Management and professional employment grew by 50 per cent from 1997 to 2011. Labouring and sales employment grew by just 5 per cent.

Figure 2.10: Employment and real wage by occupational skill level
Growth from 1997 to 2011, per cent

Source: ABS (2012g), Data Cube Employee Earnings Time Series (03/04/07);ABS (2012g), Data Cube Employee Earnings Mean Time Series;ABS (2012f), Tables 1 & 2; 1220.0, Data Cubes; ABS (2012h), Data Cube E08_aug96; ABS (2013a), Data Cubes; ABS (2009)

Yet despite big differences in job growth across skill levels, wage growth has been close to uniform.[18] That suggests that the supply

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[18] At first sight, this result may seem inconsistent with the increase in wage inequality noted above, but wage inequality is also affected by changing shares of workers at different wage rates and by the growth of enterprise bargaining, which supported larger variation in wages across industries and firms.

Figure 2.11: Real wage by occupational skill level
Annual growth, per cent
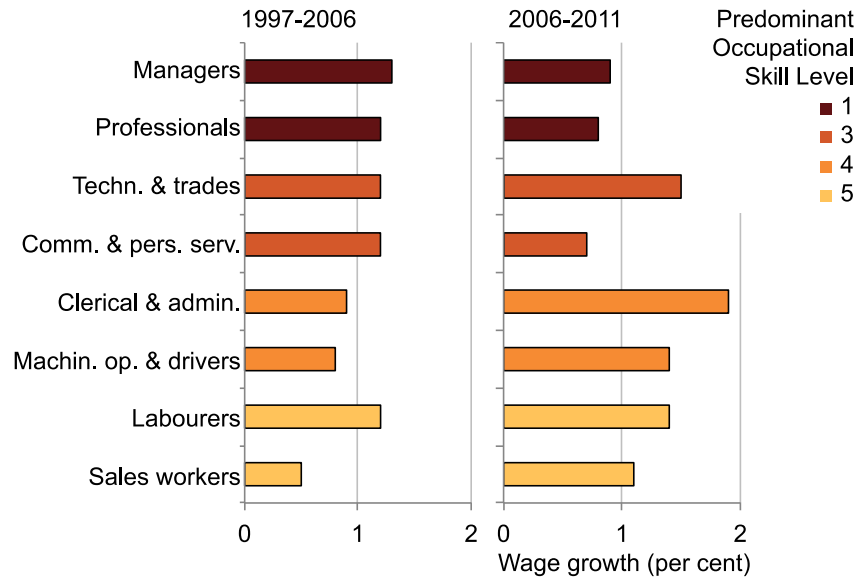
Source: per Figure 2.10.

of more skilled labour has grown in line with demand, while wage growth has remained strong in low-skilled occupations because there were relatively few people to do these jobs.[19]

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[19] As shown in Daley, *et al.* (2013), Figure 30, the higher education earnings premium in Australia remained steady from 2000 to 2010 while the OECD average increased sharply. Skilled migration made a significant contribution: Connolly and Spence (2011); Borland (2011) Fig 11.

Figure 2.12: Unemployment, employment growth, and tertiary education by industry
Per cent
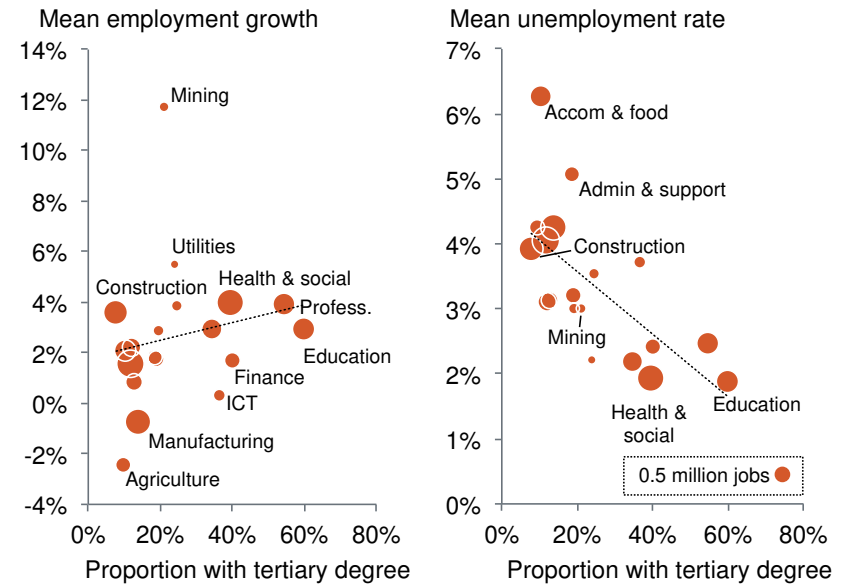
Notes: Growth is for the period (2001-2012). Unemployment is the industry of last employment reported by the unemployed; average 2001-2012.
Source: ABS (2012e)); ABS (2012h)Table 11 and UQ2_may-01 data cube

The up-skilling of the Australian workforce is a significant success story, but the mining boom also helped support wages in less skilled occupations. Figure 2.11 shows that wage growth for lower skilled occupations was typically higher from 2006 and 2011 than from 1997 to 2006. The reverse is true for high skilled occupations. The investment phase of the mining boom (which began in around 2005 and persists to the present) may have supported rapid wage growth for labourers, machinery operators,

and technicians and trades, all of whom are heavily represented in mining and construction.

Further evidence that the mining boom supported wages for less formally skilled workers is shown in Figure 2.12: few workers in mining have tertiary degrees, and mining employment grew rapidly. Construction employed many more workers without tertiary qualifications and grew relatively fast in the decade to 2012, partly in response to the growth in mining investment. Nevertheless lower levels of education continue to be a significant factor in unemployment, as shown by the right side of Figure 2.12.

2.6   To address disadvantage, government should focus on transition, skills and participation

The benefits of the mining boom have been substantial and widespread. The increase in the terms of trade has supported steady income and wage growth despite weak productivity growth. Non-mining states have enjoyed income growth that was faster than before the boom.

The generally buoyant conditions of the mining boom have supported strong employment growth and an increase in labour force participation, particularly among older workers and workers on lower incomes. Even among regional centres that have lost jobs in manufacturing and tourism, only a minority have had a fall in the proportion of the population in work.

Many of the jobs created in the mining investment boom have required relatively low formal qualifications. This may have offset longer-run forces that favour highly educated workers. Such support cannot be relied on in the next phase of the boom: as

investment ramps down, wages and opportunities for less educated workers may grow more slowly. This is why work to strengthen the Australian education system remains vital.

To ensure widespread benefits from the next phase of the boom, policymakers should not seek to defend particular industries or regions.[20] In addition to broader policies supporting productivity, flexibility and growth, policymakers should focus on labour force participation and on helping workers to improve skills and adapt to economic change.

[20] Daley and Lancy (2011)

3.   Has the boom turned Australia back into a quarry?

The resources investment boom has put pressure on other industries. The high exchange rate linked to the mining boom has disadvantaged firms that export or compete with imports. The high dollar also provoked fears the boom has permanently damaged industries such as tourism and manufacturing. A trade unionist, a business group representative and a journalist express this view:

"We need to make sure that we keep this industry alive because if we don't, the impact on manufacturing centres across Australia will be drastic, it'll be severe and it'll create a type of society that I don't think most Australians want."
Paul Howes, Australian Workers' Union[21]

"We have grave concerns that there could be a hollowing out of the economy. And when the dollar depreciates, when the resources boom drops off in the future, we will not have the industry structure that we have today."
Tony Webber, Federal Chamber of Automotive Industries[22]

"When the commodity boom ends, manufacturing income will not rebound…. The death of manufacturing is the permanent loss of the skills and intellectual property that enables such a ramp up to occur."
David Llewellyn Smith, *Macrobusiness*[23]

In this chapter we ask:

- How have the trade-exposed sectors fared through the boom?

- Is the boom the main driver of change in these sectors?

- Has the boom cause long-term damage to industries and capabilities that will be needed after the boom is over?

We find that the main trade-exposed sectors, notably manufacturing, tourism, education of overseas students, and agriculture, have survived the boom in reasonable shape. They are producing goods and services at or above their levels prior to the boom. Agriculture and education exports have grown strongly, reflecting strong demand from the same growing Asian economies that have driven the mining boom. Yet tourism and manufacturing output have hardly grown over the period, and their exports experienced outright declines after 2008.

Aside from agriculture, these trade-exposed sectors grew more slowly than the rest of the economy. With mining expanding rapidly, and strong demand for non-traded goods and services, the GDP share of other trade-exposed sectors has declined.

Yet the mining boom is not the prime cause of manufacturing's declining share of GDP. Rather, the boom has temporarily accelerated a long-term decline. Manufacturing has declined as a proportion of the economy in Australia and most other high-income economies for decades. As incomes have risen,

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[21] Paul Howes, Australian Workers' Union, interview transcript ABC (2011).
[22] Tony Webber, Federal Chamber of Automotive Industries, quoted in Hoy (2013)
[23] Llewellyn-Smith (2013)

households have spent more on services. The shift to an open Australian economy with lower tariffs that began in the mid-1970s has also played a role. As well, the global manufacturing sector has relocated much of the manufacture of less complex goods to China and other economies where costs are lower.

The boom has even helped parts of manufacturing industry. Demand from the resource sector for Australian manufacturing sector output has risen by about 0.6 per cent of GDP through the decade, partly offsetting the pressure caused by the high exchange rate.[24] At the same time, Australian production and export of more sophisticated manufactures (including technical equipment and pharmaceuticals) and new services has continued to grow strongly during the boom.

The experience of other countries that have been through a big shift in exchange rates suggests that Australian manufacturing is unlikely to have suffered permanent damage. If exchange rates decline, manufacturing is likely to bounce back to trend within a few years. Services exports are likely to respond strongly, too.

Yet the experience of comparable countries may not be an entirely reliable guide. In those countries, exchange rates were typically elevated by about 20 per cent for five years. In Australia, the exchange rate has been elevated by more than 30 per cent above its pre-boom level for almost a decade.

What should governments do? The risk of permanent damage to the trade-exposed sectors is low and does not warrant temporary intervention to protect affected industries. There is little evidence

that intervention to protect or prop up any industry is cost-effective. Policy to lower the real exchange rate can help, but as noted in Section 3.5 the only way to sustain a lower real exchange rate is to reduce domestic expenditure. The recent shift towards tighter fiscal policy and lower interest rates is helping to achieve this.

3.1 The mining boom has squeezed other tradable industries hard

In dollar terms, the fortunes of the resources sector and other tradable industries have been starkly different through the boom, as Figure 3.1 shows. High resource commodity prices and the high real exchange rate have reduced the share of nominal GDP contributed by other trade-exposed sectors. Export shares have changed even more starkly. Non-mining exports plummeted from around 78 per cent of exports by value in the late 1990s to 50 per cent in 2012, while mining rose from around 22 to 50 per cent.[25]

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[24] Bishop, *et al.* (2013), Graph A2.

[25] See Connolly and Atkin ibid. for a review of the experience of Australian exports during the high exchange rate period.

Figure 3.1: Output and exports: mining and non-mining tradables

Per cent of nominal GVA   Per cent of nominal exports
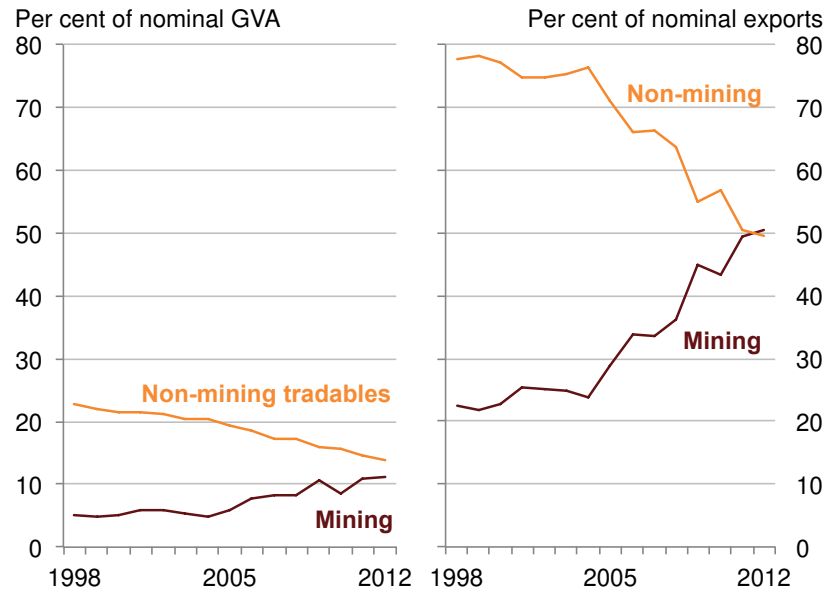
Notes: *Non-mining tradables GVA include agriculture, manufacturing, tourism (from Tourism Satellite Account). Mining includes metal ores and minerals, coal, coke and briquettes and other mineral fuels. Non-mining exports includes all other goods and services. GVA excludes ownership of dwellings.*

Source: *ABS (2012d), Table 5; ABS (2013f), Table11a and b and 32a; ABS (2013e), Table 7.*

Nevertheless, the *volume* of goods and services produced in the trade-exposed, non-resource sectors did not fall (Figure 3.2). Exports of all broad export-oriented sectors remain above their 2002-03 levels, though below their levels of 2007-8 (with the exception of the rural sector). After resources, manufacturing remains the largest trade-exposed sector and the largest export sector.

Figure 3.2: Output and exports: non-mining tradable sectors
$b, chain volumes
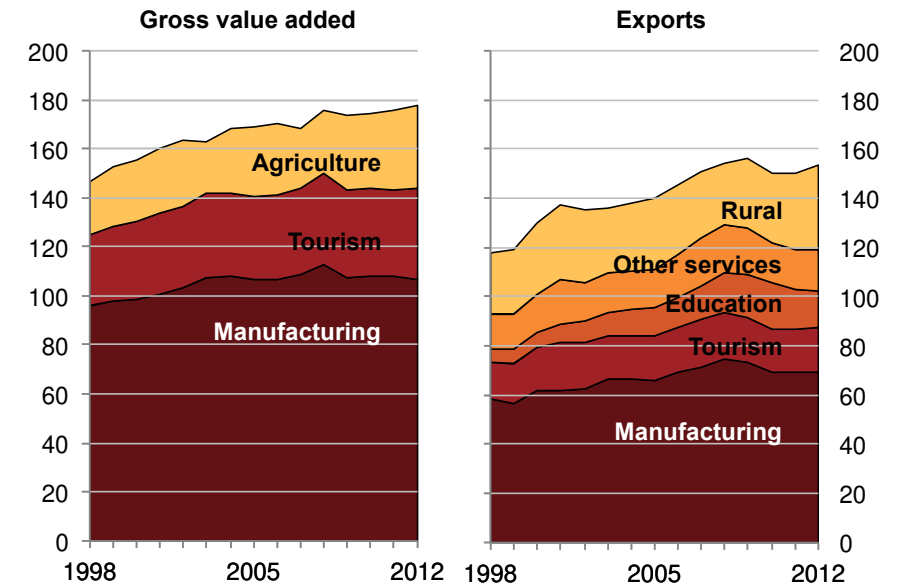
Source: *ABS (2012d), Table 5; ABS (2013f), Table 11a and b and 32a; ABS (2013e), Table 57, 63, 68, 110; ABS (2013c), Table 1.*

Investment levels indicate how the trade-exposed sectors regard their future prospects. Figure 3.3 shows that investment in manufacturing increased through the early 2000s, peaking in 2006 and then declining somewhat. Yet the fact that the volume of investment remains above its level in the late 1990s and early 2000s suggests that many manufacturing firms see a viable future.

Figure 3.3: Business investment volumes by sector
Index (2002-03=100)
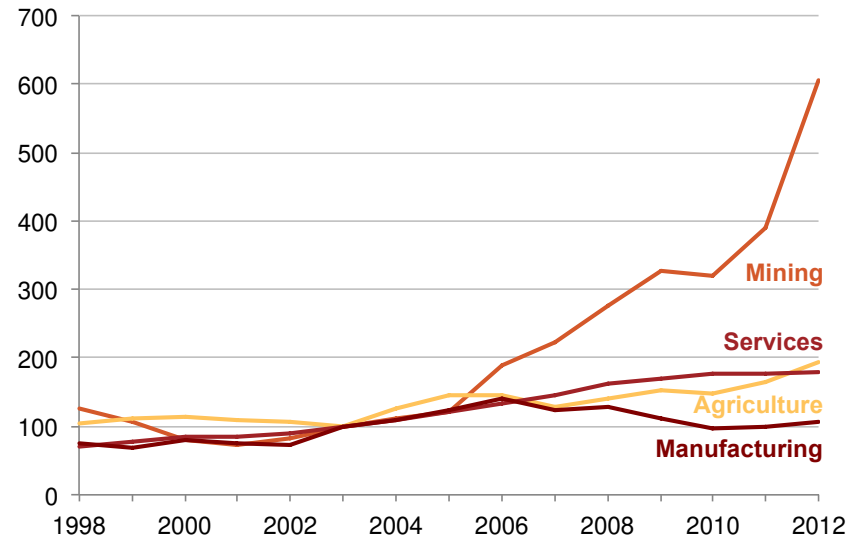
Source: ABS (2012d), Table 64.

Certainly, the non-resources trade-exposed sectors did it tough through the boom. Even so, taken as a group they are producing more output than before the boom, and they continue to invest.

3.2   Factors other than the boom are reshaping Australian manufacturing

The high exchange rate has hurt many trade-exposed businesses, including manufacturing. But it would be wrong to conclude that the boom is primarily responsible for the relative decline of the manufacturing sector, or for the sharper declines of individual industries, such as car manufacturing. Longer-term trends are at work.

As Figure 3.4 shows, manufacturing in the high-income economies has a long trend of relative decline. Manufacturing value-added as a share of GDP has declined in Australia, as in most high-income economies, for decades. The manufacturing sector lost GDP share more rapidly in Australia than elsewhere in some periods, such as when trade barriers were reduced in the late 1970s and 1980s. In the 2000s, manufacturing's relative decline continued even in economies that did not experience Australia's exchange rate appreciation. While manufacturing remains a significant industry, it would probably have continued to lose GDP share even if the mining boom had not occurred.

Figure 3.4 also shows an apparent contradiction: manufacturing *exports* have trended up as a proportion of GDP in many OECD countries. Greater trade and specialisation reflect in part falling transport, travel and communication costs and the rise of Asia as a market and as a producer, among other factors.[26]

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[26] Countries where manufacturing accounts for a large proportion of trade (such as Singapore) are often have much lower value-add. Businesses import, assemble and then re-export goods.

Figure 3.4: Manufacturing value-added and exports: Australia and the OECD
Per cent of GDP
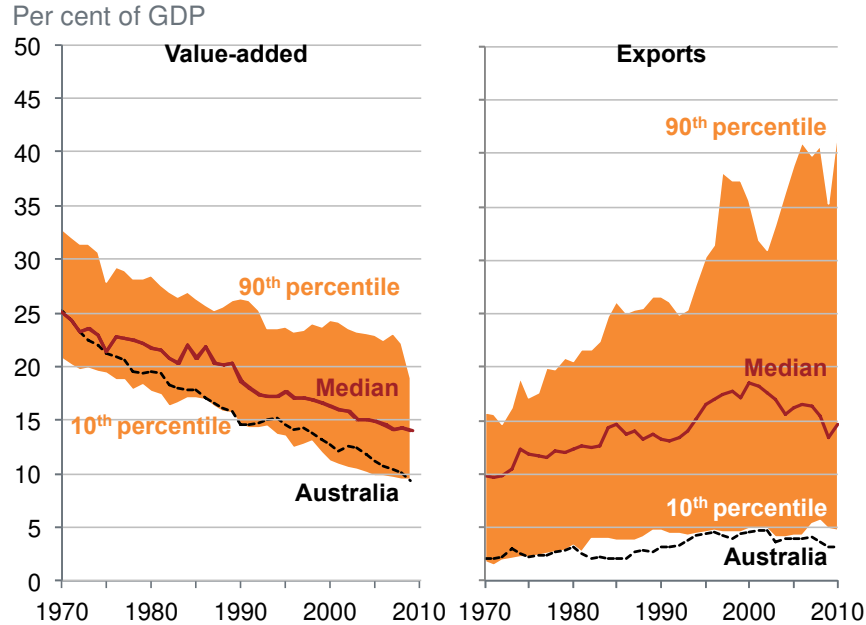
Note: *Manufacturing value-added % GDP and Manufacturing exports % GDP, current prices – OECD members in 1970 plus Australia & New Zealand. Manufacturing exports chart excludes Luxembourg and Switzerland due to lack of data.*
Source: *The World Bank (1960-2011), OECD Stat STAN Indicators C15T37*

High-income economies focus on sectors in which they have a comparative advantage, while lower-income economies focus on lower-value products in which labour remains a major cost. Value chains have become more complex, with growing trade in components and part-finished goods. That explains why

Figure 3.5: Import prices and employment by manufacturing subsector
Per cent change (2001-2012)
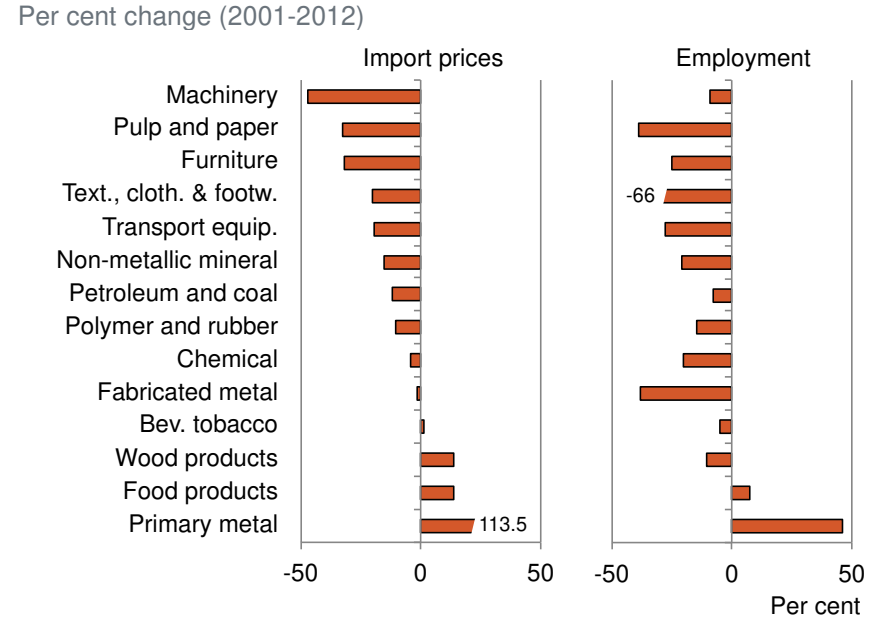
Source: *ABS Cat. 6457.0 Tables 14 and 15; ABS Cat. 6457.0 Tables 1, 3 and 12; ABS datacube e06_Aug9; ABS Cat. 6427.0 Table 12.*

manufacturing exports have risen even in economies where manufacturing output has fallen as a share of GDP.[27]

These shifts in global manufacturing are reflected in the diverse outcomes within the diverse Australian manufacturing sector. As Figure 3.5 shows, import prices in manufacturing subsectors

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[27] See Kelly and Cava (2013) for an analysis of Australian value-added trade.

generally fell over the last decade, in part due to the appreciation of the exchange rate.

But prices varied. Australian manufacturing employment tended to fall more in sectors where prices declined more (such as pulp and paper and textiles, clothing and footwear) reflecting Australia's declining comparative advantage in those sectors.[28]

In a few sectors, prices rose, reflecting strong global demand deriving from the same strong Asian growth that supported the resources boom. In those sectors, employment declined little or even increased. Other factors such as productivity growth reduced employment even in some subsectors where prices changed little.

Manufacturing exports have also shifted substantially towards higher-skilled sectors, as Figure 3.6 shows. Growth in exports at all skill levels has slowed since 2008, due to the high real exchange rate and subdued world demand.

Figure 3.6: Manufacturing export volumes by skill level
Volumes ($b)
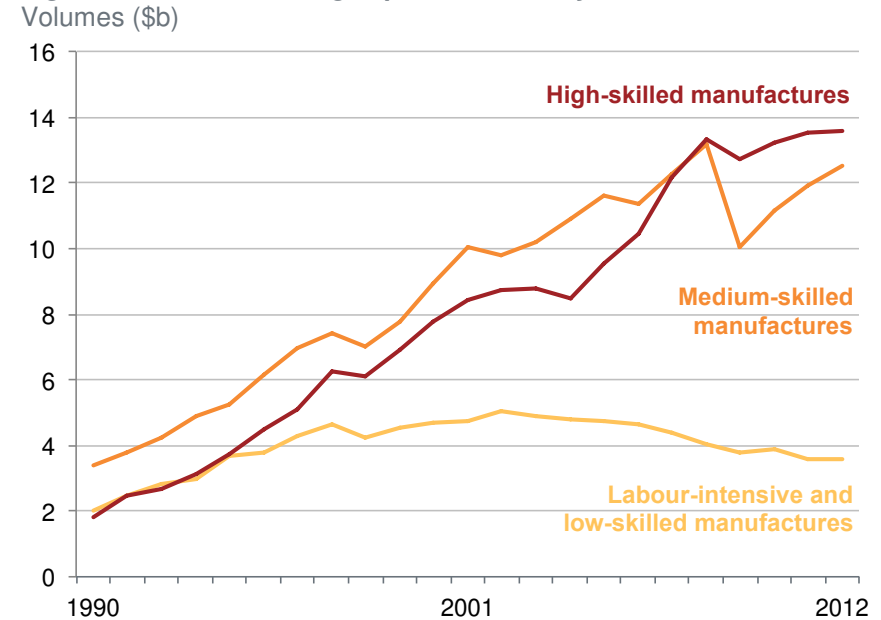
Note: Base year is 2011. Reproduced from Connolly, E. and Atkin (2013). Based on UNCTADstat definitions; excludes iron and steel exports.
Source: ABS, RBA; UNCTADstat.

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[28] Employment in the US manufacturing sector, too, has been reshaped by the rise of China as a manufacturing power (Autor, David H. et al. (2012)).

3.3 Manufacturing (and other tradable sectors) bounce back when the currency falls

Many are concerned that the high exchange rate caused by the mining boom has inflicted permanent damage on trade-exposed industries.[29] The concern is that even if the exchange rate were to drop, industries like manufacturing will not recover lost ground.[30]

Leading economist Ross Garnaut expresses concern that there will be a delay of some years before strong export growth resumes. He writes that "large increases in exports from the services, manufacturing and agricultural industries … [have] to be preceded by large increases in investment in these industries: you cannot fatten a pig on market day".[31] As he put it in an interview,

> "There are long lead times for investment in these industries. If we want strong export growth in four, five or 10 years' time, the investment has to come now.[32]

Nevertheless, the experience of other countries that have had big shifts in real exchange rates suggests that trade-exposed sectors, and manufacturing in particular, will bounce back quickly. We identified 13 episodes between 1980 and 2011 in countries comparable to Australia in which the real exchange rate rose significantly and then fell rapidly, as Figure 3.7 shows.[33]

Figure 3.7: Exchange rates: episodes of big changes
Real effective exchange rate index

Year before / after steepest depreciation
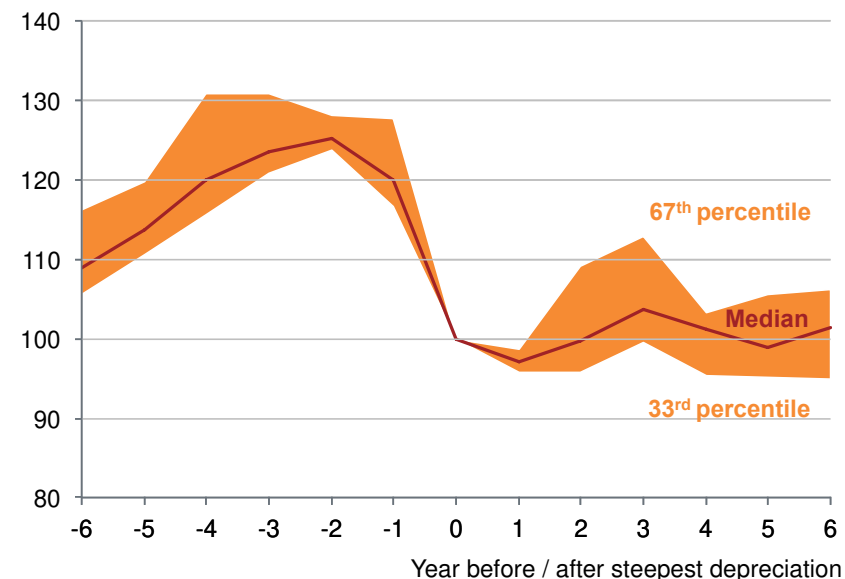
Note: Sample of 13 exchange rate episodes in economies comparable to Australia
Source: Grattan analysis of data from BIS (2013) and The World Bank (1960-2011).

In these countries, manufacturing and total exports typically hardly grew as a share of GDP in the years of high exchange rates, as Figure 3.8 shows.

But within a year of a large depreciation, manufacturing and services exports usually grew rapidly (Figure 3.8). Within three years, manufacturing exports as a share of GDP had risen by more than a third on average.

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[29] The quotes at the beginning of this chapter provide a sample of views.
[30] This concern is related to the literature on trade hysteresis (Krugman (1987)).
[31] Garnaut (2013a)
[32] Murray (2013)
[33] Section A.1 of the Appendix details the approach for selecting comparable economies and identifying episodes.

Figure 3.8: Exports through exchange rate episodes
Estimated constant-price values, median country, per cent of GDP

Year before / after steepest depreciation

Note: Manufactures series shows 13 countries. Exports are in constant USD at market
          rates; GDP is in constant domestic currency (in order to minimise price effects on
          the ratio of exports to GDP), and thus is close to a volume measure.
Source: Grattan analysis of data from BIS (2013) and The World Bank (1960-2011)

Such a rapid response is consistent with the broader 'open
economy macroeconomics' literature on how trade responds to
changes in the exchange rate.[34]

Figure 3.9: GDP growth through exchange rate episodes
Annual real GDP growth (per cent)

Year before / after steepest depreciation
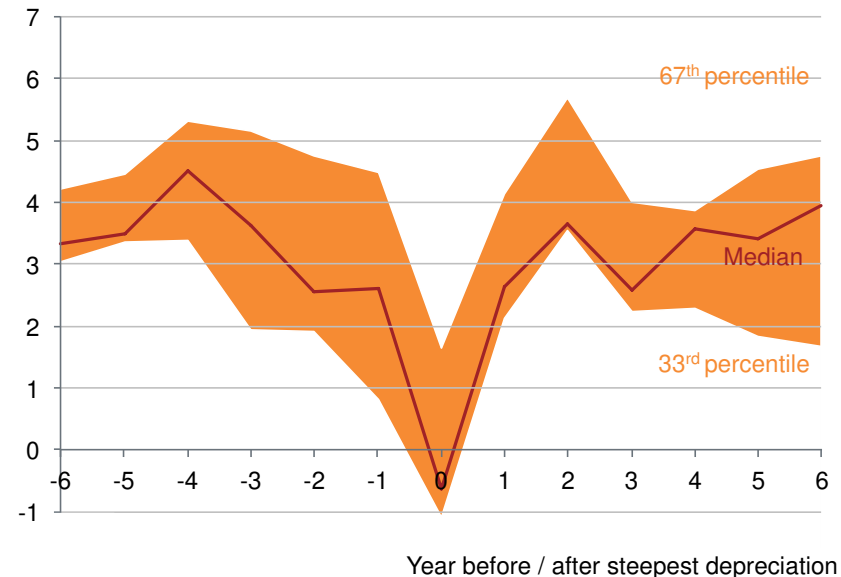
Source: Grattan analysis of data from BIS (2013) and The World Bank (1960-2011)

The growth in exports as a share of GDP after depreciation in
Figure 3.8 is not due to falling GDP. As Figure 3.9 shows, GDP
growth typically declined during the period of elevated exchange
rates, culminating in a GDP contraction in the year of biggest
depreciation. Yet GDP growth was typically higher in the years
following the depreciation than before.

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[34] Typically a real depreciation causes export volumes to grow, and import
volumes to fall. For economies that started with a trade deficit, trade volumes
change enough to offset the impact of the depreciation on the trade deficit within
5 to 15 months. This effect is sometimes referred to as the "J-curve". See

Marwah and Klein (1996); Gupta-Kapoor and Ramakrishnan (1999); Petrovic
and Glicgoric (2010).

Over the longer term, manufacturing exports and production typically grow back to their long run trend within a few years of the end of a period of substantial exchange rate elevation, as Figure 3.10 shows.

Therefore temporarily high exchange rates in economies comparable to Australia have not had long-lasting effects on export volumes and the added value of manufacturing. Manufacturing output growth stalls while the exchange rate is high.

The real appreciation of the Australian currency, shown in Figure 1.1, has been larger and has lasted longer than the median in the sample, so the after-effects this time may last longer after any future depreciation. But this analysis suggests that output and exports usually bounce back rapidly and reach trend within a few years.[35]

Figure 3.10: Exchange rates, manufacturing output and exports
Indices (100 = value in year of steepest depreciation)

Real effective exchange rate

Manufacturing export volumes, per cent of GDP

Manufacturing value-added, per cent of nominal GDP

Year before / after steepest depreciation
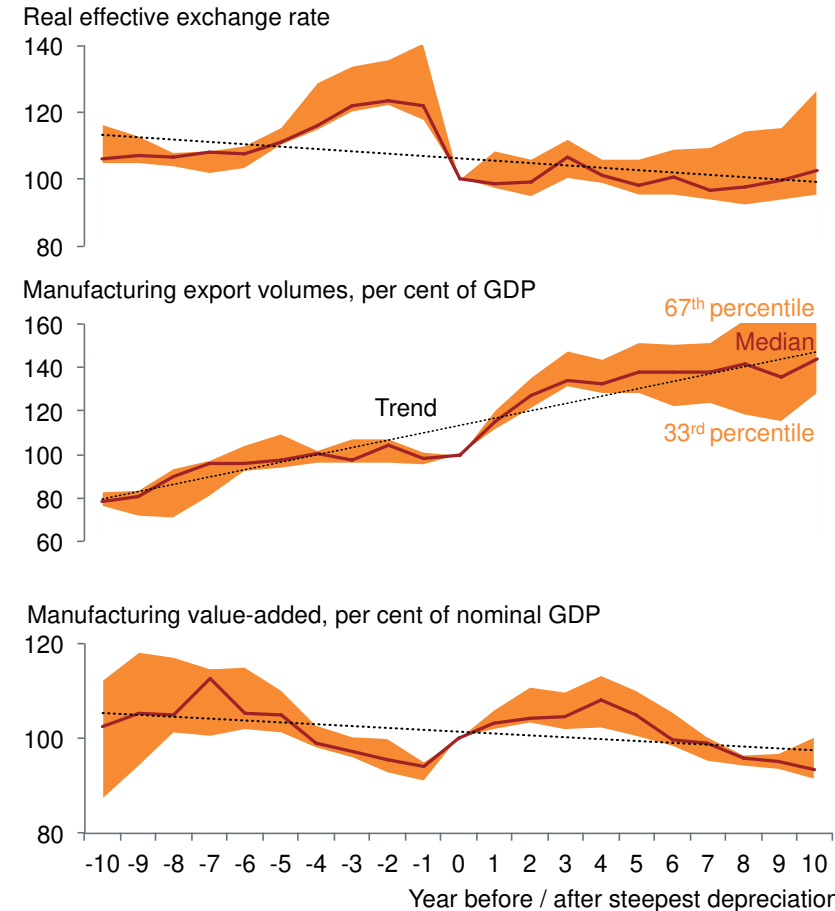
Note: Manufacturing export volumes are for 13 episodes; manufacturing value-added is for 11 episodes for which data is available..
Source: Grattan analysis of BIS and World Bank data.

[35] This analysis only shows that should the exchange rate fall, there are grounds for expecting a rapid export response and a strong recovery. The analysis does not validate any view about future exchange rates – e.g. that the exchange rate should or will depreciate. That depends on global demand, resources prices, resource export volumes and domestic demand conditions.

3.4   Protecting industries is costly and ineffective

Some argue that Australian governments should assist vulnerable industries through the boom:

"We have reached a crucial point which demands government action in coordination with industry to ensure the sector is given the sustained support necessary to emerge through the current structural pressures and to prosper beyond the boom"[36]
Heather Ridout, then CEO of the
Australian Industry Group

"What we seek to do is to preserve the capabilities in the bad times, so that we can expand when conditions improve."[37]
Senator Kim Carr, Minister for
Innovation, Industry, Science and Research

However, plausible levels of budgetary support could not have maintained manufacturing's nominal GDP share (or even its nominal output value). As Figure 3.11 shows, manufacturing's share of GDP declined far more than the total value of support to the industry. Exceptionally large budgetary support, or exceptionally high trade barriers, would have been needed to offset the various forces driving change in the sector.

The case against industry protection is well rehearsed.[38] Trade barriers can protect some trade-exposed industries for a while, but they hurt consumers and other industries more.

Figure 3.11: Manufacturing gross value added and net government assistance
Per cent of nominal GDP
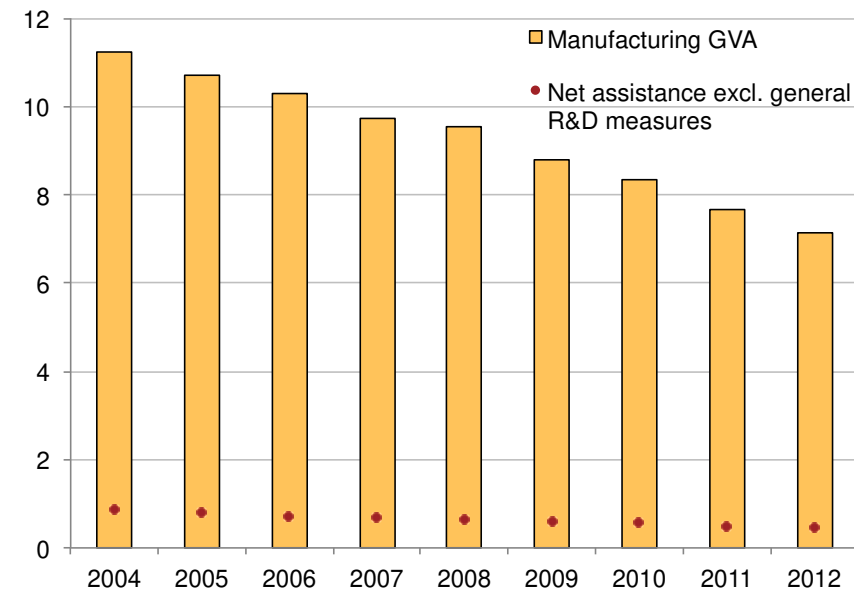
Note: Commonwealth assistance only.
Source: ABS (2012d), Productivity Commission (2012b) Appendix A.

The cost of government support via subsidies or trade barriers is high. Funds have opportunity costs: they could be used to retrain workers rather than to prolong careers in unviable sectors. Since 2003, government has provided more than $63 billion of

[36] Williams (2011)
[37] Carr (2012)

[38] Corden (2012)

assistance to the manufacturing sector – about $70,000 for every person employed in manufacturing.[39] More of that money could have been directed to helping affected workers to restart their careers.

Industry intervention also produces 'deadweight' losses: the total costs to taxpayers, consumers and other firms and workers exceed the benefits to the protected industry. For example, tariffs or quotas that increase the costs of traded goods reduce the gains from specialisation and trade. Ultimately Australian consumers bear the costs in the form of lower living standards.[40]

Finally, governments that show a willingness to protect industry can find themselves beset by requests for help. Businesses that fail to adjust tend to be the ones that ask for support; recipients of support that had been seen as temporary tend to ask for extensions. When firms see the government giving generous assistance with little accountability, they are less likely to innovate to improve their viability. Unviable firms waste resources in tapping governments for support.[41] Government can certainly help to address market failures and provide public goods. But protecting industries from market prices is almost never the way to do it.

3.5   Exchange rate intervention does not appear warranted

Some commentators have urged policymakers to depreciate the currency to support the trade-exposed sectors. Most have focused on interest rate cuts or intervention in foreign exchange markets.[42]

If the economy is close to full employment, the only way to achieve a lasting real depreciation is via policies that reduce domestic expenditure. That permits a 'rebalancing' of the economy, with a smaller non-traded sector and a larger trade-exposed sector.[43] One way to achieve this could be to run tighter fiscal policy, offset by lower interest rates. For such a real exchange rate depreciation to be effective, an increase in the relative price of tradable goods and services must be permitted.[44]

At this stage in the boom, with the exchange rate having declined somewhat from its peaks, little evidence of large capital inflows, the trade balance close to zero, and the prospect of a decline in resources investment tending to reduce domestic expenditure in future, the case for further intervention now to reduce the real exchange rate is not strong.

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[39] Including R&D support. Source: ABS (2013b), Table 3.
[40] Banks (2011)
[41] Ergas (2012)

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[42] van Onselen (2012)
[43] Corden (2012). Denniss and Grudnoff (2012) canvasses one approach of slowing down the pace of resources investment.
[44] That may require permitting CPI inflation to exceed its 'over the cycle' target zone of 2 to 3 per cent for a period. See Garnaut (2013a).

3.6 To support growth, government should focus on economic stability, while making structural reforms

Australia's trade-exposed manufacturing sector is under pressure. Concern about the sector's future is based on the cumulative impacts of long-term developments in the world economy, plus the more recent pressures of a high real exchange rate.

Yet the case for costly industry intervention to support specific firms or industries is weak. Much of the relative decline would have occurred even without a high exchange rate. Australia is increasingly specialising and gaining share in more skilled manufactures and services. There is little evidence of lasting impacts of temporary exchange rate elevations.

Ultimately, to drive growth, there is no avoiding the conventional prescriptions: maintain macroeconomic stability, avoid the temptation to subsidise industries in decline, and pursue reforms to enhance participation, responsiveness and productivity. In these areas there is strong evidence of net benefit. Government should focus on them.[45]

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[45] Banks (2012)

4.   Is our luck running out, and have we failed to save our windfall?

The mining boom has provided Australia with one of the largest income boosts in its history. But that bounty brings uncertainty. History shows that resources prices can fluctuate sharply. Countries with large resources sectors tend to have more uneven economic growth and tax revenue over time. Has Australia strayed into risky territory? Should it have done more to build a buffer against future downturns in resources prices?

This chapter addresses four questions:

- Will a larger resources sector subject Australia to large swings in GDP and income?

- Is an economic downturn likely if the terms of trade fall sharply?

- Has Australia saved enough of the windfall from the boom?

- Can government do more to manage the transition to the next phase of growth?

Economic growth tends to be more variable in countries with larger resource sectors. Yet Australia has long been different, achieving remarkable stability in recent decades. Its relatively well-designed economic institutions and policy practices contributed to stability. Preserving them will help manage any instability caused by the resources sector.

The Australian resources boom will not inevitably end in recession. In comparable countries, downturns in the terms of trade were followed by more frequent recessions and, in some cases, prolonged downturns. But countries that pursued good macroeconomic management while their terms of trade were rising had faster growth after the terms of trade peaked. Australia's economic stability through the boom provides grounds for optimism that it will avoid a deep recession.

Nevertheless, the current Australian terms of trade boom is one of the biggest experienced by any comparable economy in the last half-century. Investment in Australia's resources is one of the highest, as a share of GDP, of any developed economy. So the historical record does not guarantee that an economic contraction will be avoided if the terms of trade fall sharply. Even if a recession can be avoided, a fall in the terms of trade would reduce national income and government tax receipts.

The Australian Government has not saved enough of the windfall from the boom. National saving has been strong, and household saving has been high in recent years. But public sector saving has been too low. Governments have made spending and tax decisions that have produced almost no net savings from a decade of elevated resources prices.

What should government do? A tougher reappraisal of policy to drive productivity growth is needed. Public saving should be increased now, so that governments are not trying to do so in harder times. Careful review of the case for a more

comprehensive minerals resource rent tax is warranted. Government should also adjust current budget rules to remove the implied licence to spend resource boom windfalls.

4.1 A larger resources industry will not unsettle the Australian economy much

For a developed economy, Australia is unusually resource-intensive (that is, resources are a large share of the economy). They contribute more to exports and income than in the average OECD country, as Figure 4.1 shows. The value of resource exports and rents jumped from 2002 as prices rose sharply. Output then grew more rapidly, further increasing export values.[46]

Yet many people see a downside, worried that the increasing size of the Australian resources sector makes the broader Australian economy vulnerable to disruption from fluctuating prices, output and investment in the resources sector.

It is true that output and domestic income in resource-intensive countries tend to be more variable. Figure 4.2 shows that:

- More resource intensive economies tend to have less stable output and income.

- Income is more unstable than output and is more affected by resource intensity (because resources prices change income directly as well as by changing output).

Figure 4.1: Resource exports & resource rents: Australia and the OECD
Per cent merchandise exports (left); per cent GDP (right)
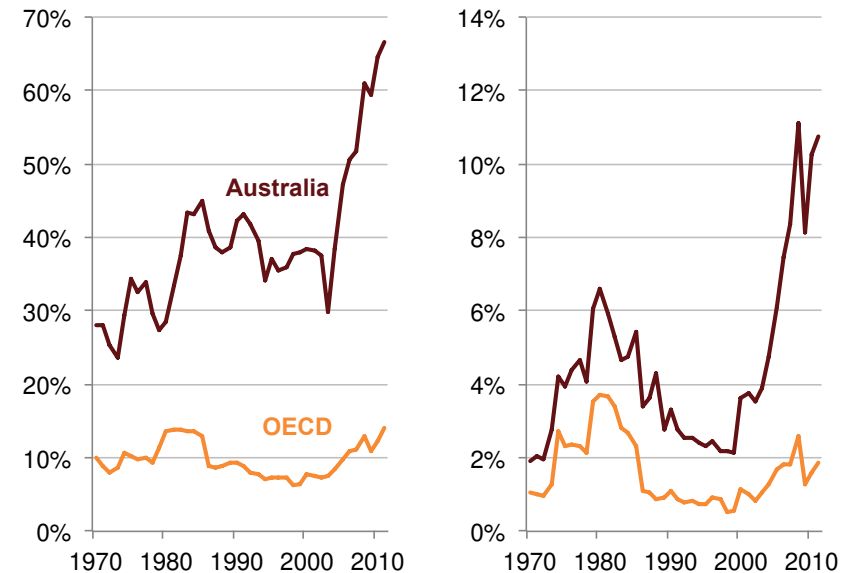
Note: Resource exports includes fuel, and ores and metals. Resource rents are a World Bank estimate of natural resources revenue minus extraction costs.
Source: The World Bank (1960-2011).

- Resource intensity only accounts for about 20 to 30 per cent of economic instability.[47]

- Australia has long been a 'stability star', with lower volatility than almost all other economies.

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[46] Bureau of Resources and Energy Economics (2013), Figure 9, p.14.

[47] Further analysis of the data shows that volatile economies tend to be smaller and lower-income, have little diversity, and have poorer quality institutions.

Figure 4.2: Resource intensity and economic instability
Volatility index
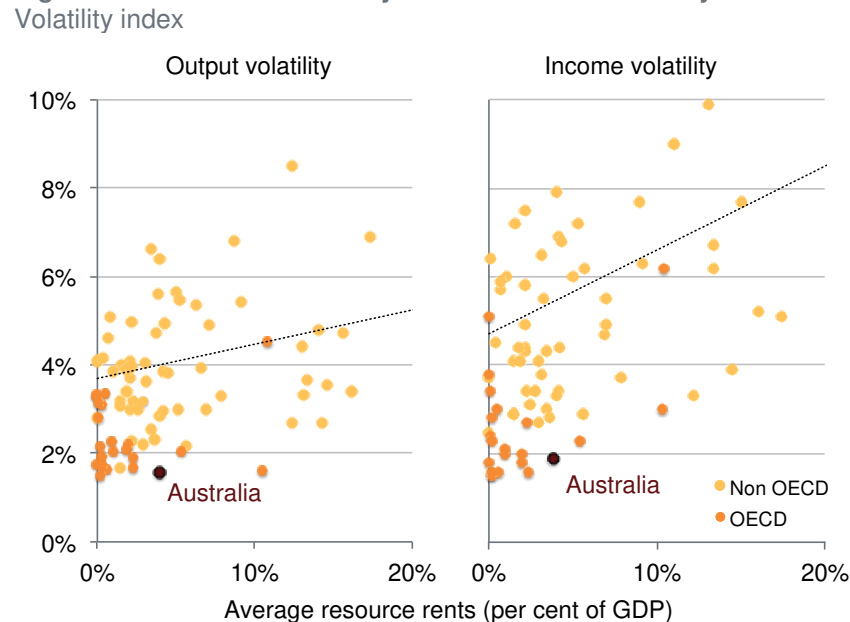
Notes: *Volatility index is the standard deviation of real annual per capita growth over four decades (difference from 10 year moving average). Resource rents = market price minus extraction cost. Regression line is for all 88 countries for which data is available for 1970-2010 (output [GDP]) and 1970-2008 (income [GDI]), including some outside the charted range. Regression equations: Output volatility = 0.03 + 0.10 * resource rents; t stats 15.4, 5.0; R^2 = 0.22. Income volatility = 0.04 + 0.23 * resource rents; t stats 10.8, 6.5; R^2 = 0.33.*
Source: *The World Bank (1960-2011), Statistics NZ (2013) Table e1-2*

Australia's relatively stable economy reflects a mixture of relatively good policy institutions and settings, low exposure to industries prone to sudden contractions such as capital goods manufacturing, and perhaps a degree of luck.[48]

Many policy institutions and settings have contributed to stability. Over the last decade, the labour market has been flexible enough to allow wages to reflect conditions in each sector; wages were not set with reference to a leading sector. The value of the dollar has adjusted to resource prices, helping to shift demand to imports and maintain domestic demand at a level consistent with price stability.[49] Australia's relatively low trade barriers have allowed producers and consumers of a broad set of tradable goods and services to adjust to the appreciating real exchange rate. Macro policy settings – interest rates and the fiscal stance – have contributed to stability by averting recession through the global financial crisis, although government budgets should have been tighter through the boom, as discussed below.

Looking ahead, the Australian economy is expected to become more resource-intensive. But it has a good prospect of remaining one of the most stable economies, so long as other risk factors remain well controlled. The current large capital investment program is expected to produce minerals volumes that are about 25 percent above 2002 levels by 2018, and LNG volumes that are about 3 times larger than in 2010.[50] By then GDP will be about 15

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[48] Williamson and Bhattacharyya (2011) discuss the factors contributing to Australia's relative stability through previous resources booms.
[49] By contrast, Australia experienced inflation during previous booms, including the 1970s mining investment boom, when government set the nominal exchange rate. See Plumb, *et al.* (2013) and Gruen (2006).
[50] Bureau of Resources and Energy Economics (2013); Gruen (2011); Wood and Carter (2013)

per cent larger than today if the economy grows at 3 per cent a year.

The resources sector will, then, be larger as a share of GDP. That is unlikely to transform Australia into an unstable economy, provided that Australia preserves and refines the economic institutions and policy settings that have served it well over the last decade.

4.2 Australia does not have all the risk factors for a deep downturn, but the risk cannot be ruled out

The vulnerability that causes the most concern is that the boom could come to a sudden stop, triggering a recession.[51]

Yet a history of comparable countries suggests that Australia does not inevitably face a recession if resource prices fall sharply. We analysed twelve episodes of rising and falling terms of trade in nine countries comparable to Australia (Note that this set of countries is different to the comparator countries with big changes in exchange rates discussed in Section 3.3).

The analysis samples only economies that, like Australia, are middle or high-income, resource intensive and economically diverse. It identifies every episode of over two years in length in which the terms of trade rose by at least ten per cent, then fell by at least ten per cent, and remained low for at least two years thereafter.[52]

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[51] Sheehan and Gregory (2012) show that the combination of falling investment and falling resources prices could pose a large adjustment challenge.
[52] Data on resources investment would have been valuable but was unavailable. Appendix Section A.2 provides detail on the methodology.

Figure 4.3: Terms of trade: episodes of big changes
Terms of trade index (peak = 100)

Year before / after terms of trade peak year
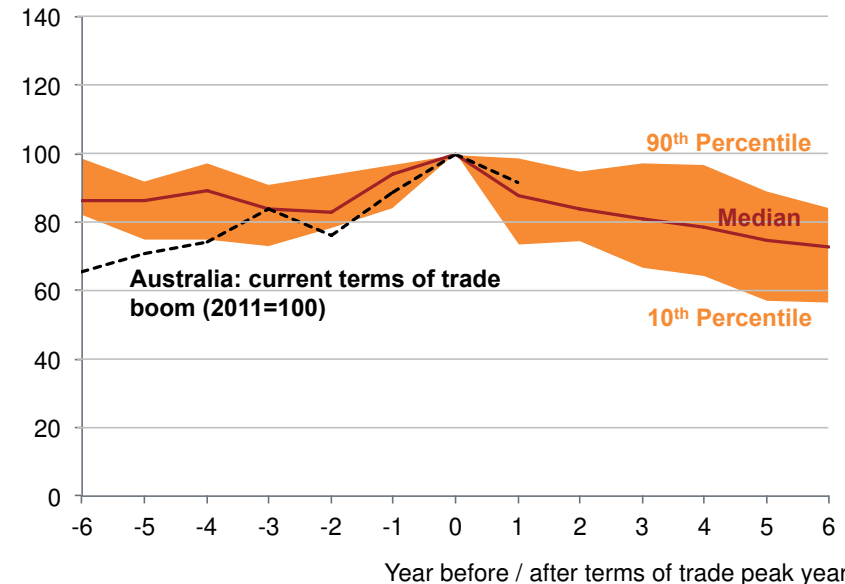
Notes: *Based on all 12 episodes of increases of at least 10% in the terms of trade lasting at least two years, followed by falls lasting at least two years, experienced by any resource-intensive country meeting criteria of similarity to Australia (middle-or-high income, medium-or-large and economically diverse.)*
Source: *The World Bank (1960-2011); Statistics New Zealand (2011); ABS (2012d), Table 1; Grattan analysis.*

As shown in Figure 4.3, on average the terms of trade increased by around 15 per cent in the two years before peaking, then fell by just under 15 per cent in the following two years. There were some larger booms in the sample. The current Australian terms of trade boom has run for longer, and risen higher, than most of the sample.

Figure 4.4: GDP growth through terms of trade episodes
Real GDP per capita growth (terms of trade peak = 100)
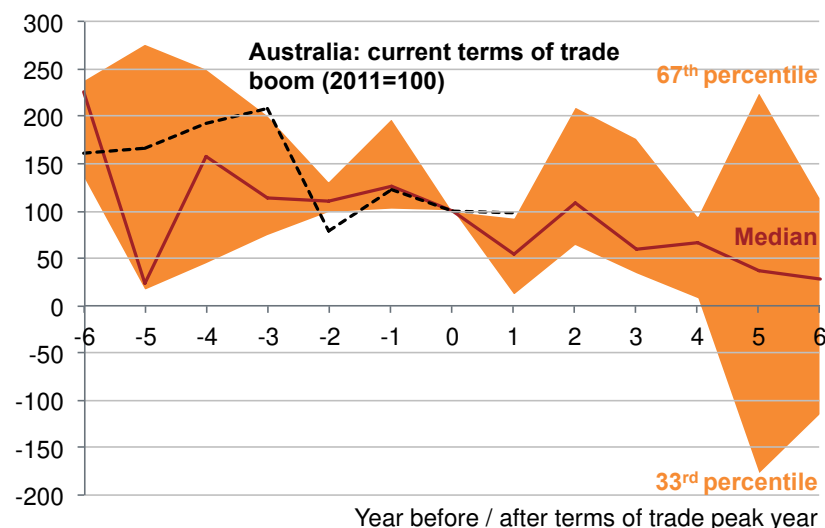
Note: Based on all 12 episodes of increases of at least 10% in the terms of trade lasting at least two years, followed by falls lasting at least two years, experienced by any resource-intensive country meeting criteria of similarity to Australia (middle-or-high income, medium-or-large and economically diverse.
Source: The World Bank (1960-2011); Statistics New Zealand (2011); ABS (2012d), Table 1; Grattan analysis.

As Figure 4.4 shows, GDP per capita growth was typically lower after the terms of trade peaked. Recessions were more frequent and rapid growth less frequent in the years following a terms of trade peak (Table 4.1). Three-quarters of the sample experienced at least one year of negative year-on-year growth.

Table 4.1: Frequency of recession and rapid growth
Years per decade

	Years in decade after a terms of trade boom[a]	Years in median decade[d]
Deep recession[b]	2.0	1.6
Rapid growth[c]	1.0	2.2

Notes: a) Decade from three years prior to the terms of trade peak to six years after the peak. b) Years per decade with negative year-on-year real GDP per capita growth). c) Years per decade (1960-2011) with year-on-year real GDP per capita growth greater than 4%. d) Median of decade averages (eg 1960-69, 1970-79).
Sources: The World Bank (1960-2011); Statistics New Zealand (2011) (GDP); Statistics New Zealand (2012) (CPI); Grattan analysis.

Terms of trade booms that were followed by slower or negative economic growth were almost always associated with high inflation in the boom period, as Figure 4.5 shows. Countries that had high inflation during the boom struggled to deal with the shock of lower prices for their exports at the end of a boom. A larger boom (and bust) of the terms of trade is also associated with slower subsequent growth.

Factors other than resources prices and inflation also affected growth in these countries. The Latin American debt crisis slowed growth sharply in Mexico, Argentina and Brazil in the 1980s. Disinvestment and sanctions as part of the international campaign to end apartheid slowed growth in South Africa in the 1980s.

Figure 4.5: Correlates of GDP per capita growth after terms of trade peaks

	Terms of trade boom[a]	Terms of trade fall	Inflation before peak[b]	Cumulative GDP growth after peak[c]
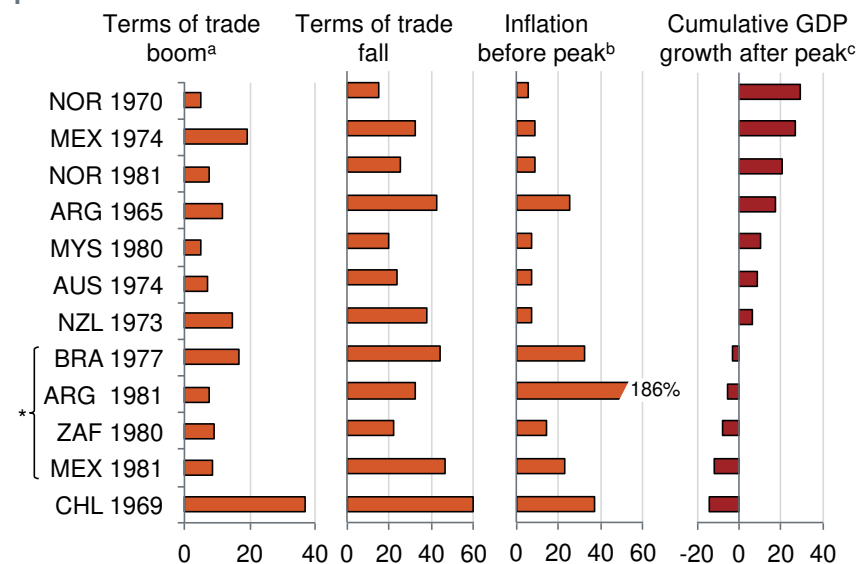
Notes: a) Average elevation of the TOT above its 21 year moving average, per cent. b) Average annual GDP deflator increase during the period of the terms of trade boom (except NZ, where CPI is used). c) Cumulative growth in real GDP per capita in the 6 years after the terms of trade peak, per cent of starting value. * Affected by Latin American debt crisis or sanctions (South Africa).

Sources: The World Bank (1960-2011); Statistics New Zealand (2011) (GDP); Statistics New Zealand (2012) (CPI); Grattan analysis

In summary, booms followed by drops in the terms of trade are indeed linked to output growth slowdowns and more frequent recessions. Yet other factors play a significant role.[53] Many

economies that kept inflation low during the terms of trade boom grew strongly in subsequent years. Australia was one of them.[54]

There are grounds for cautious optimism that Australia will avoid a sharp slowdown even if the terms of trade fall sharply. While the boom in Australian minerals prices and investment is exceptionally large, Australia lacks some of the risk factors for a hard landing. Policies to permit adjustment and macro stability while the boom persists may prove vital to Australia's growth performance in the event that the terms of trade fall.

4.3   Government should save the benefits from a resource price windfall

How much should government save of what could prove to be a temporary windfall, and what form should that saving take?

Governments in resource-intensive economies are usually advised to build a buffer during the initial period of elevated resources prices. As a recent IMF report put it, "a cautious approach – which maintains fiscal buffers while gradually incorporating new information to allow a smooth adjustment to potentially permanently higher prices – is a sensible way forward".[55]

There are three main rationales for higher public sector saving when the terms of trade are unusually high. First, saving during the boom means that levels of government expenditure on

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[53] Atkinson (2003) observes: "the countries where growth has lagged are those where the combination of natural resource, macroeconomic and public expenditure policies have led to a low rate of genuine saving".

[54] Gruen (2006) shows that inflation was not as well controlled in the Australian boom of the 1970s as the current boom.

[55] International Monetary Fund (2012). See also Venables (2011), Collier and Venables (2009), OECD (2008).

welfare and services are smoother over time, instead of payments rising during the boom and falling afterward. Saving reduces the risk that governments will need to make painful spending cuts or raise taxes increases if the terms of trade fall. Governments that do not automatically pass on gains in revenue in the form of tax cuts or increased spending help households maintain smoother expenditures over time.[56] Although households could save more during the boom (and aggregate household saving has increased strongly since 2008), many households lack this discipline.[57] It can also be fairer to future generations to save part of large terms of trade windfalls that derive from exhaustible resources.[58]

The second rationale for higher public sector saving during a terms of trade boom is that it reduces the risk that governments will run up large liabilities should the terms of trade fall. Governments find it difficult to prune expenditures and entitlements and to increase taxes. Their budgets can easily fall into deficit as the terms of trade fall, even if output growth continues at normal levels.

Finally, saving while the terms of trade is high may also relieve pressure on trade-exposed industries by reducing the real exchange rate, as noted above in Section 3.5. Assuming that households do not fully offset changes in public sector saving, higher public sector saving would result in depreciation of the real

exchange rate, and reduce price pressure on trade-exposed industries such as manufacturing.[59]

Government must decide how much to save of the windfall from the terms of trade before it knows how big the windfall will be. Setting a target stock for public sector wealth might accommodate this uncertainty. In the early phases of a period of strong terms of trade, government should seek to increase the stock of public sector wealth. Once this stock is a material fraction of the cumulative benefit from the terms of trade, government should feel more comfortable in gradually increasing public sector service provision and transfers, or in making tax reductions.

A few governments in countries with large resources sectors have developed approaches to save commodity price windfalls. Chile, a major copper exporter, has explicit budgetary rules for revenues related to copper prices.[60] Norway reserves its oil revenues largely into a sovereign wealth fund, which now stands at over 160 per cent of GDP.[61] The funds are invested offshore, helping to reduce domestic expenditure and thereby limit the rise in the real exchange rate.

A less frugal treatment of Australia's commodity price windfall can be defended. Australia came into the boom with low net public sector debt and has had high economy-wide saving, especially in recent years (see Section 4.4 below). Australia is expected to mine iron ore and coal for longer than Norway is expected to

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[56] The Treasury's 'wellbeing framework' includes 'the overall level and allocation of risk' and 'the sustainability of opportunities over time' as two of its five dimensions (Gorecki and Kelly (2012)).

[57] The usual arguments against paternalism apply to the smoothing of transfers and taxation – see Shafir (2008) for a discussion of behavioural economics and policy.

[58] See Van Der Ploeg (2012) and Hartwick (1977).

[59] The effectiveness of this approach depends on whether domestic expenditure is reduced. See Corden (2012) for a discussion.

[60] de Mello (2008); de Gregorio and Labbé (2011); Frankel (2011); Fuentes (2012)

[61] Bjerkholt and Niculescu (2004); Gruen and Garton (2012)

pump oil and gas.[62] Mining's contribution to exports and to the budget is smaller in Australia than in Norway and Chile. Australian tax revenues from mining may rise even if the terms of trade fall, because gas, coal and iron ore output will probably rise strongly. There is also the concern that very large stocks of public sector wealth could reduce the public appetite for economic reforms that would increase incomes.

But as the next section shows, the Commonwealth Government actually saved little of the windfall.

4.4 Australian governments have not saved much of the windfall from the boom

Governments that enjoy resource windfalls tend to give away or consume too much, and save too little.[63] In the first decade of the current boom, the Commonwealth Government has followed this pattern.

There is no broad national crisis of under-saving during the boom. The left panel of Figure 4.6 shows that the gap between national investment and national savings narrowed in 2008 and has remained low since then. National saving as a percentage of GDP in Australia actually strengthened over the decade.[64] The right

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[62] Gruen and Garton (2012)

[63] Venables (2011)

[64] See Bishop and Cassidy (2012) for a recent assessment of national saving and investment. Since 2009 the Australian national saving rate has exceeded those across most of the developed world, including Canada (where resources investment is also high), Germany and Japan (traditionally high-saving economies). Australia's national saving rate has been about double the rate in the UK and the US (IMF, World Economic Outlook Database, April 2013).

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panel shows that net foreign liabilities (particularly debt) have increased somewhat as a percentage of GDP during the boom. It is not a cause for concern that the largest investment boom in Australia's history should result in a rise in foreign liabilities alongside a very large increase in the capital stock.

Figure 4.6: National saving, investment and foreign liabilities
Per cent of nominal GDP
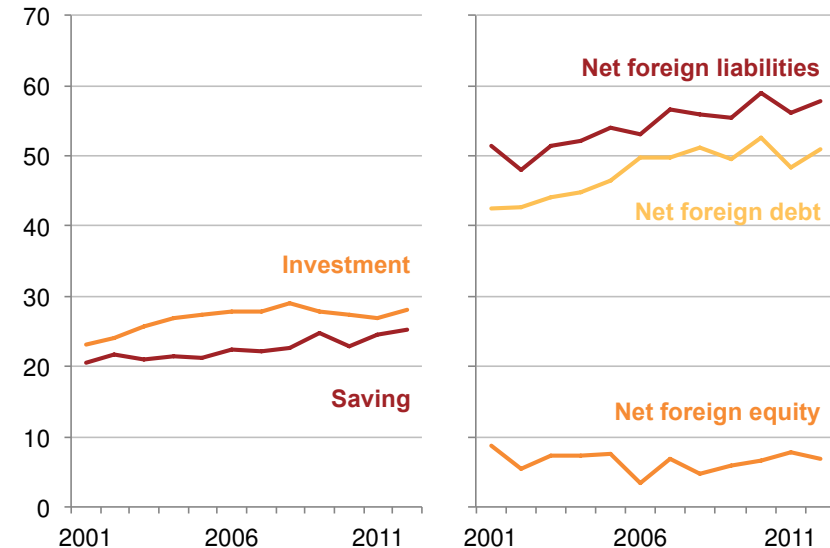
Note: Investment includes all sectors Gross Fixed Capital Formation, net changes in inventories, acquisitions less disposals of non-produced non-financial assets and statistical discrepancy. Saving is National Gross Saving and Net Capital Transfers.

Source: ABS (2013e), Table 2; ABS (2012d), Table1 and 8.

Figure 4.7: Commonwealth receipts, payments, and net debt
Per cent of nominal GDP
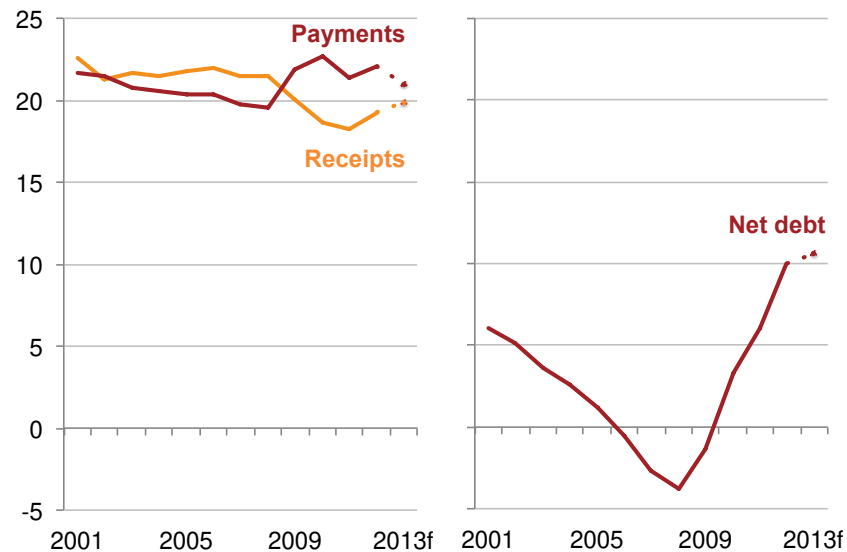
Notes: *Excludes GST. Payments include national government final consumption expenditure, subsidies, secondary income payable, and gross fixed capital formation. Receipts includes national government gross operating surplus, taxes on production and imports, total property income receivable, secondary income receivable, and property income payable.*

Source: *ABS (2012d), Table 1; ABS (2011b), Table 1; Government of Australia (2013c), Table 1, Table 3; Government of Australia (2013b) and earlier years, Appendix C, Table C3*

The Commonwealth Government cash budget position turned sharply over the last decade. During generally buoyant conditions before the global financial crisis, receipts exceeded payments and net debt declined, as Figure 4.7 shows. But with the onset of the financial crisis, receipts fell steeply, and payments as a

percentage of nominal GDP rose somewhat. As a result, net debt increased.

4.4.1 Structural budgets and the terms of trade

Figure 4.8 shows that the Commonwealth Government cash budget balance can be considered as the result of three factors: the business cycle (and other temporary factors affecting revenues, such as asset prices); the terms of trade; and so-called 'structural' factors, including the combined effects of policy settings (whether stemming from active decisions or not) affecting tax revenues and expenditures.[65]

The business cycle boosted the cash budget position until 2008, peaking at over 1 per cent of nominal GDP. Since the downturn, the business cycle has tended to drag on budget outcomes.[66]

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[65] This analysis is based on the recent Treasury estimates of the structural budget balance of the Commonwealth Government (Duggan, et al. (2013)), with changes as noted below. That paper cautions that structural estimates can be useful for "broad guidance", but are "sensitive to the assumptions and parameters underpinning the estimates". From the 'structural terms of trade' scenarios used in that paper we selected the one that comes closest to the starting value of the terms of trade in 2002-03: their average value between FY 1985/86 and FY 2010/11, as used by the OECD (2012). The budget value of the assumed temporary component of the terms of trade is therefore close to the budget value of the uplift from 2002-03. (In fact the OECD average value is slightly above the 2002-03 level, so the numbers presented here may be underestimates of the value of the terms of trade uplift).

[66] We have included in the business cycle impacts the full value of fiscal stimulus (The Treasury (2009)), although some would argue that some of this spending, particularly in more recent years, is not truly attributable to the downturn. We also added depreciation allowances on company tax receipts, as they grew by over 1 percentage point of GDP due to the strong growth in the private sector

Figure 4.8: Commonwealth underlying cash budget balance and aggregate drivers: annual impact
Per cent of nominal GDP
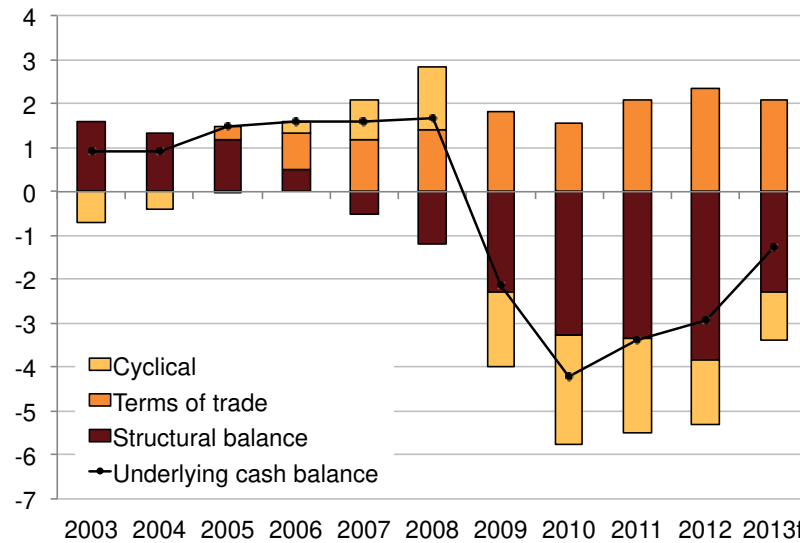
The business cycle affected the cash budget position mainly through lower tax revenues and the cost of the stimulus packages.

The strengthening terms of trade also provided a boost to the budget over the decade, peaking at just under 2.5 per cent of GDP, also shown in Figure 4.8. The elevated terms of trade increased the real value of taxable income and potential tax receipts.

The estimated 'structural balance' of the Commonwealth budget progressively declined each year until the most recent year, as Figure 4.8 shows. It declined almost 5 percentage points of GDP over the nine years from 2002-3. Most of the decline occurred in the five years from 2004-5, at a steady pace of about 0.8 of a percentage point of GDP a year. There was a 1.5 percentage point improvement forecast in the May 2013 budget papers for the 2012-13 financial year, but even so, the structural balance remained more than two percentage points in deficit. Current policy settings would result in a cash deficit of over 2 percentage points of GDP in 2012-13 if the terms of trade were at their pre-boom level and the business cycle were 'at neutral'.

The estimated structural deficit has exceeded the terms of trade uplift every year since 2007-08, as Figure 4.8 shows. The uplift from the terms of trade has not been converted into improved cash budget outcomes since then.

capital stock over the period. These two assumptions increase the estimate of the 'cyclical' drag on the budget since 2009, and therefore reduce the estimated structural deficit.

Less than a tenth of the *cumulative* boost provided by the terms of trade to Commonwealth budgets over the decade to 2012-13 translated to better cash balances. Figure 4.9 captures the accumulated net effect of the three drivers on annual budgets over the decade.

Figure 4.9 shows that:

- The uplift in the terms of trade over 2002-3 levels provided support to accumulated budgets over the decade of about $190 billion.

- Structural budget balances summed to an accumulated deficit over the decade of about $180 billion.

- The business cycle (including the value of the stimulus in recent years) produced a net drag on accumulated budgets of about $100 billion.

- The cash budget was in net deficit over the decade of about $100 billion.

Figure 4.9: Commonwealth underlying cash budget balance and aggregate drivers: cumulative impact
2012-13 $b
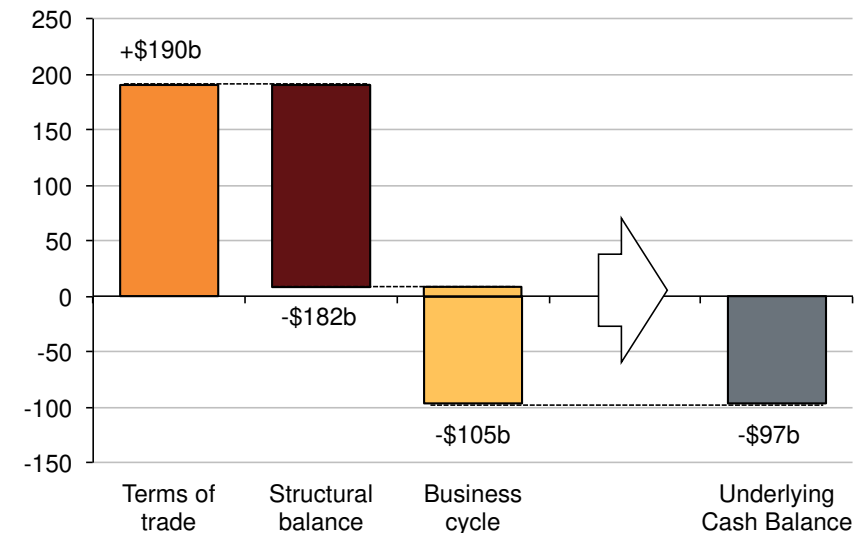
Note: *2012-13 dollars; values deflated using financial year GDP deflator (ABS (2012d), Table 4) for 2002-03 to 2011-12. For 2012-13, the average of 3 available quarters is used to approximate the GDP deflator for 2012-13 (ABS (2012b), Table 5).*

Source: *Grattan analysis of Duggan et al. (2013); ABS (2012d), Table 1; ABS (2012b), Table 5; Government of Australia (2013a); Government of Australia (2013b); Government of Australia (2013c); a); ATO database 2002-03-2010-11; Parkinson (2013); McDonald et al. (2010); The Treasury (2009).*

4.4.2 Contribution of income and expenditure changes to the structural balance

Income decreases and expenditure increases both contributed to the deterioration in the budget position, as Figure 4.10 shows.[67]

The estimated 'structural receipts' of the Commonwealth government declined by over 3 per cent of nominal GDP from 2002-03 to 2010-11, before starting to improve (see left panel of Figure 4.10). 'Structural receipts is the income that would have resulted if cyclical influences on taxation (and other income) were zero. Major contributions to the decline in receipts share were reductions in personal income tax rates, more generous tax concessions to superannuation, and shifts in the economy towards activities that attracted lower taxation.[68]

The estimated 'structural payments' of the Commonwealth also increased over the period. Structural payments are an estimate of the payments that would have resulted if there had been no cyclical or temporary influences. Estimated structural payments rose by around 3 per cent of GDP over the decade, if the terms of trade increase since 2002-3 is considered temporary, as the upper line in the right panel of Figure 4.10 shows.

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[67] We extract estimates of structural expenditure from Duggan, *et al.* (2013). The only components of spending affected by the business cycle in that model are the fiscal stimulus and the deviations in unemployment benefit payments from their structural level. Adding the residual structural balance to this structural expenditure gives of estimate of structural income.

[68] Structural income estimates are sensitive to modelling assumptions – see ibid. for sensitivity analysis. Government of Australia (2013a) and Parkinson (2013) note the unexpectedly slow revenue recovery in recent years, some of which may be misattributed to declining structural income in this estimate. See Daley, *et al.* (2013) for analysis of factors driving changes in government revenues.

Figure 4.10: Estimated Commonwealth structural receipts and payments
% Nominal GDP
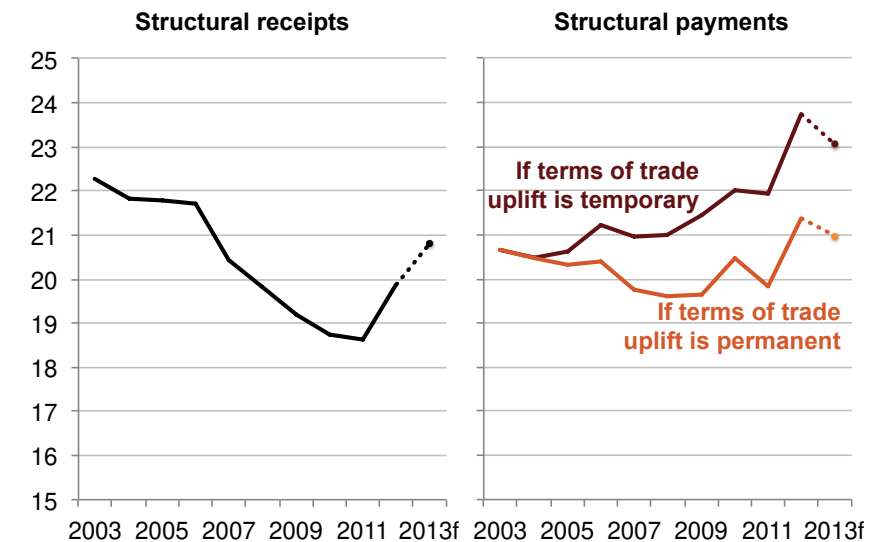
Notes: Structural receipts represent structural balance plus structural payments. Both exclude GST. Structural payments represent total payments, less stimulus and the cyclical component of unemployment benefits (plus the terms of trade benefit in the 'temporary' case). The terms of trade uplift is the deviation from long – run average as defined in Footnote 65.

Source: Grattan analysis of Duggan et al. (2013); ABS (2012d), Table 1; ABS (2012b) Table 5; Government of Australia (2013a); Government of Australia (2013b); Government of Australia (2013c); ATO database 2002-03-2010-11; Parkinson (2013); McDonald et al. (2010); The Treasury (2009).

In other words, there was a large increase in Commonwealth payments that was effectively masked by the increase in nominal GDP due to the strong terms of trade. Contributions to increased

payments include increases in family allowances and pension rates and expenditure on health, education and infrastructure.[69]

Even if all of the terms of trade uplift were assumed to be permanent, estimated structural expenditure still increased by about 1 percentage point of GDP beyond the rapid pace permitted by rapidly growing nominal GDP (as the lower line in the right panel of Figure 4.10 shows).

4.4.3   Adjusting for public sector investment

The above analysis concerns changes to the Commonwealth budget balance. Government *saving* is the budget balance plus Government investment in capital. Making the required adjustments to the budget balance estimates shows that the Commonwealth saved little of the terms of trade uplift.

A narrow measure of government investment includes only fixed capital such as infrastructure.[70] A broader measure considers public sector expenditure on health and education as investment in human capital, because it adds to the productive capacity of the economy or yields other enduring benefits.[71] The allocation of that expenditure can thus be considered a broad form of saving.

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[69] See Daley, *et al.* (2013) for analysis of changes in government expenditures.
[70] See ABS (2012d), Tables 30 and 32 for a decomposition of government net lending into gross saving and fixed capital investment.
[71] This point is recognized in the literature on saving from potentially temporary improvements in the terms of trade. See International Monetary Fund (2012), p.150 for a brief discussion.

Figure 4.11: Narrow and broad measures of public sector investment
Share of total expenditure
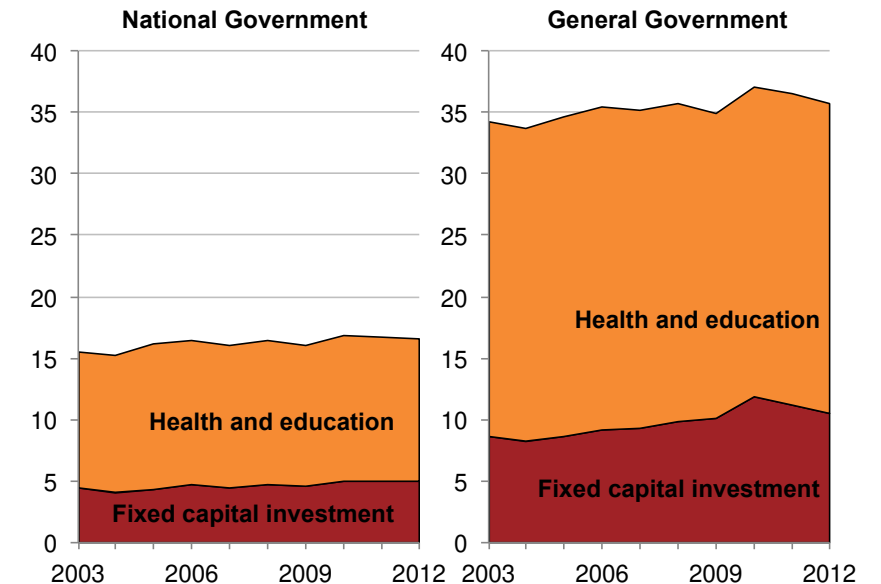
Note: Health and education is final consumption expenditure (FCE) only. Fixed capital investment includes health and education investment. The remainder of national government expenditure includes payments to the states for health and education. General Government is all levels of government.
Source: ABS (2012d), Table 1, 8, 30, 32, and 35

Figure 4.11 shows that about 15 per cent of 'National Government' (almost entirely Commonwealth) expenditure directly funds health, education, and infrastructure. The remaining National Government expenditure includes transfers to the States that fund the same categories; the right panel of Figure 4.11

shows that they absorb about 35 per cent of 'General Government' (all levels of government) expenditure.

The share of National Government expenditure going to the broad measure of investment rose by around 2 percentage points, or 0.4 per cent of GDP, as Figure 4.11 shows. The share of General Government expenditure thus allocated grew by around 3 percentage points, or around 1 per cent of GDP. The Commonwealth can take credit for some, but not all, of that increase.[72]

Thus, there was some increase in expenditure on investment-like categories, but it was not big enough to overturn the conclusion that Commonwealth Government did not save much of the windfall from the elevated terms of trade.

Successive Commonwealth governments appear to have treated the terms of trade windfall largely as if it were recurrent income: at least four-fifths of the decline in the structural balance from 2004-5 to 2011-12 – a decline equal to five percentage points of GDP – was due to falling tax revenue, and increasing expenditure at the pre-boom expenditure shares of government consumption, transfers and investment. At most, one fifth of the decline in the structural balance – one percentage point of GDP – was due to heavier expenditure on investment.

4.5 To manage risks, government should exercise fiscal prudence and focus on economic flexibility

Concerns about the economy's stability due to the resource: boom and a larger resources sector are not fully borne out by the experience of comparable countries. There is cause for cautious optimism that the risks of the resources boom can be managed without a recession in the near term or much disruption in the longer term.

Australian governments should strengthen the policies and institutions that have long supported stable growth and permitted adjustment through the current resources boom. They include inflation-targeted monetary policy, a floating exchange rate, decentralised wage setting and low trade barriers.[73]

The Commonwealth Government also needs to save more while the terms of trade remain high, as long as growth remains close to trend. In correcting the current loose budget position, the Government should reduce expenditures that least benefit the community, and increase taxes that least distort the economy.

It should also reframe its budget strategy. The current medium term strategy seeks to constrain taxation as a share of GDP below its 2007-08 level, and to achieve budget surpluses on average over the medium term.[74] Those guidelines permitted spending to rise in line with nominal GDP as it was boosted by the terms of trade. Moreover, the base year for tax share of GDP was

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[72] It is difficult to apportion changes in the mix of State government expenditure to State and Commonwealth governments as their respective funding decisions are not independent.

[73] Gruen (2006); Productivity Commission (2012a)
[74] Government of Australia (2012), Part 3, Fiscal Strategy and Outlook

a year of unusually strong revenues. Tax cuts from around that time have eroded the revenue base.

The Commonwealth should adapt its medium term fiscal strategy to explicitly recognise the budget uplift from the terms of trade and to return to saving most of it. Should the terms of trade remain elevated for an extended period, this saving target might be relaxed, but only after a significant buffer had been built. This formulation would focus attention on whether the changing budget position is sustainable.

5. Priorities for government

This report assessed community concerns about the resources boom. It found that:

- The boom was not only good for miners. It also increased incomes broadly, with few losers. Economic growth supported low unemployment and high workforce participation. Strong demand for less formally qualified workers in mining and construction may even have offset trends in the economy towards more skill-intensive jobs, at least for a time.

- While the boom put businesses in the trade-exposed non-mining sectors under intense pressure, longer-term trends affecting the global location of manufacturing have been the dominant drivers of change to Australian manufacturing, even through the course of the boom. Trade-exposed industries seem unlikely to be permanently damaged: across countries they bounce back when the exchange rate adjusts.

- There is some risk of a downturn as the mining boom slows, but the historical record suggests that a deep downturn is not inevitable should the boom suddenly end, provided that economic policy remains disciplined.

However, public sector saving has been too low through the boom. Spending and tax decisions played important roles. The Commonwealth Government must now repair its budgetary position in more difficult times.

What else should the Commonwealth Government do?

- It should continue to invest in education and skills. Both are increasingly important to produce economic growth and to enable broad participation in its benefits.

- It should move into budget surplus while economic growth remains near trend. The Commonwealth's fiscal strategy should be amended to set spending targets so that a windfall from the terms of trade does not result in unsustainable spending increases or tax cuts. Over the longer term, it should maintain a higher rate of public sector saving until it is in a comfortable position to spread whatever benefits of the boom remain.

- It should resist the temptation to protect trade-exposed industries. Protection is not a sensible way to promote the interests of the disadvantaged, support growth, or reduce risk. Instead, government should maintain a floating exchange rate, inflation-targeted interest rates, low trade barriers, decentralised wage determination and strong competition regulation. Finally, it should refocus on a robust productivity agenda.

Methodological appendix

A.1   Exchange rate episodes and the manufacturing industry

This section provides additional detail on the exchange rate episodes analysed in Section 3.3.

A.1.1   The main sample of exchange rate episodes

We identified 13 episodes of real exchange rate variation in countries comparable to Australia. To select countries we started with the members of the OECD in 2012, plus several others for which data was available: Argentina, Brazil, Bulgaria, Taiwan, Colombia, Ecuador, Egypt, Greece, Hong Kong, India, Indonesia, Malaysia, Romania, Singapore, South Africa, Thailand and Ukraine.

Within this group we identified currency episodes using the following criteria.

1.   Large and rapid shock: A fall in the in the Real Effective Exchange Rate (REER) of at least 15 per cent, occurring within three years. The bottom of the deviation is where the year-on-year rate of decline slows to below 10 per cent year on year.

2.   Enduring impact: At least two years until the REER again reaches half the value of the peak

3.   Discard external demand shocks: We eliminated several episodes that occurred during the Asian financial crisis in

1997, and the world financial crisis in 2008. These had both exchange rate and export demand effects.

Table A.1 Sample of 13 real effective exchange rate episodes

Country	Bottom of currency shock	Country	Bottom of currency shock
Australia	1986	Singapore	1986
Brazil	1999	South Korea	1986
Finland	1992	Spain	1993
Italy	1993	Sweden	1993
Japan	1997	Turkey	1994
Mexico	1982	United States	1987
Mexico	1995		

Grattan analysis of data from BIS (2013) and The World Bank (1960-2011)

The 13 episodes are listed in Table A.1. The 13 episodes range from 1982 to 2002. Mostly were in the mid-1980s and mid-1990s. They are geographically diverse, including countries in Latin America, North America, East Asia and Europe. The large

depreciation Australia experienced in 1984-86 is included.[75] Across the sample, manufacturing value-added accounted for an average 22 per cent of GDP. All the episodes selected occurred after 1980, because the necessary manufacturing industry data is available from this date.

The aim is to understand the effects of a depreciation caused by factors unrelated to the manufacturing sector on the manufacturing sector. The remaining sample may still include depreciations triggered at least in part by negative export demand or terms of trade shocks. This would tend to reduce the measured responsiveness of exports to exchange rate changes, not increase it.

A.1.2   Separating real and nominal effects of depreciations

Changes in the exchange rate affect the value of output. For example, an appreciation reduces the domestic currency value of manufacturing exports compared to GDP, even if manufacturing export volumes and GDP in volume terms were unchanged.

As the aim of the analysis is to search for lasting effects on real manufacturing exports of temporarily elevated exchange rates, an approach was developed to reduce these valuation effects. We use the foreign currency value of manufacturing exports at market rates, and the domestic currency value of GDP. Indices of these are taken, based on their value at the date of most rapid depreciation of the real exchange rate. Taking the ratio of these indices gives an estimate of changes in the ratio of exports to

GDP that largely excludes the direct affect of price on the value of those exports. In other words, it is close to a volume measure.[76]

The GDP share of production is more difficult to adjust for valuation effects. Long-period volume indices are not available historically, and they are in any event difficult to compare to GDP because the production mix and prices change over time. The nominal gross value added as a share of GDP, therefore, includes price effects. However, the analysis uses a long (21 year) sample that permits us to confirm whether there is an enduring effect of temporary appreciations on manufacturing's share of the economy. The size of the temporary impact of the exchange rate on manufacturing value added share of GDP does include both volume and price effects.

A.2   Terms of trade episodes and GDP growth

This section provides additional detail on the terms of trade episodes analysed in Section 4.2.

We selected the resource-intensive countries most comparable to Australia, and identified historical terms of trade boom elevations that were followed by a significant fall. We asked what happened to GDP growth following those price reversals.

A.2.1   The sample of countries

We selected countries that are similar to Australia using four criteria that cover average income, resource-intensity, economic

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[75] See Blundell-Wignall, *et al.* (1993) for a discussion of the factors contributing to the depreciation of the Australian dollar from 1984 to 1986.

[76] The valuation effect of depreciation on exports is not completely eliminated with this approach, because exporters that sell differentiated products maximize profits by permitting their margins to rise as the currency depreciates.

size, and economic diversity. We began with the The World Bank (1960-2011) dataset (198 countries, excluding aggregates).

To ensure the historical record was relevant to Australia, we selected every economy that was: middle to high income; resource intensive (resource rent greater than 2% of GDP); medium to large economy (average in constant USD over 1960-2011 greater than $45b); economically diverse (source). Eleven countries met these criteria.

A.2.2 The sample of terms of trade boom episodes

We then identified terms of trade booms that ended sharply. We identified 12 episodes that occurred in nine countries between 1960 and 2011. We selected every episode for the sampled countries in which the terms of trade rose by at least 10 per cent above the moving average, stayed elevated for at least two years, then fell by at least 10 per cent followed by a period below the long-run moving average of at least two years. [77] Figure 5.7 shows the boom episodes in aggregate. The episodes are listed in Table A.2.

On average the terms of trade increased by around 15 per cent in the two years before the terms of trade peak, then fell by just under 15 per cent in the following two years. The sample includes some bigger episodes that are similar in size to Australia's current boom (Chile, Mexico, Brazil). Australia's terms of trade have risen much more, and remained high for much longer, than the median episode in the sample. They rose 50 per cent in the five years to 2007, and a further 30 per cent to 2011, and fell by more than 10 per cent in the two years following.

Table A.2: Sample of 12 terms of trade boom episodes in resource-intensive economies comparable to Australia

Country	Terms of trade peak	Country	Terms of trade peak
Argentina	1965	Mexico	1974
Argentina	1981	Mexico	1981
Australia	1974	New Zealand	1973
Brazil	1977	Norway	1970
Chile	1969	Norway	1981
Malaysia	1980	South Africa	1980

Grattan analysis of data from BIS (2013)BIS (2013)The World Bank (1960-2011)

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77 We took the 21-year centred moving average for each country's 'long-run average' terms of trade. The World Bank World Development Indicators database provides series only from 1960-2011. The centred averages are progressively truncated at the start and end of each country's terms of trade series, down to a minimum of 11 years. At the start of the series, the moving average is a forward moving average; at the end, the moving average is a trailing moving average. To illustrate, the long-run average series begins in 1960, using an 11-year average for the years 1960-1970. The following year, 1961, uses a 12-year average 1960-71.

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