

The end of the mining boom? A Western Australian perspective

Philip Maxwell¹

Received: 16 June 2017 / Accepted: 11 August 2017 / Published online: 15 September 2017
© Springer-Verlag GmbH Germany 2017

Abstract Throughout the history of its European settlement, Western Australia (WA) has derived great benefit during its mining boom periods. This was the case with the gold rushes of the late nineteenth and early twentieth centuries. It also occurred in the four decades after 1960 when the state became a major exporter of iron ore, alumina nickel, mineral sands, diamonds and natural gas to Japan, South Korea, Taiwan and other Asian economies as well as its more established production and export of gold into world markets. The present paper assesses developments in the period between 2004 and 2014 and beyond, as the Chinese economy emerged to become WA's major mineral customer. In relation to other Australian states, it particularly reports on Western Australia's economic growth rates, per capita GDP, housing price movements, unemployment and workforce participation rates. There is some consideration as well of the public debt challenges recently facing the state. These have been magnified by low levels of return of Goods and Services Tax revenue to Western Australia by the Commonwealth Grants Commission. This is a reflection of the *de facto* redistribution of WA mining royalties to the other Australian states.

Keywords Mining boom · Western Australia · China · Iron ore · Royalties · Horizontal fiscal equalisation · Dutch disease

The author thanks Bob Murphy for his comments on an earlier draft of this paper.

✉ Philip Maxwell
p.maxwell@curtin.edu.au

¹ Curtin University, GPO Box U1987, Perth, WA 6845, Australia

Preamble

When I received the kind invitation to offer a paper to this special issue of *Mineral Economics* honouring Marian Radetzki on the occasion of his 80th birthday, it was a pleasure to accept. Professor Radetzki has made a major contribution to the field of mineral economics. In perusing the list of books and articles on his website, the breadth and depth of his contribution is immediately clear. He has written widely on mineral markets, minerals and development, state mining enterprises, mineral trade, commodity booms, recycling, energy and climate policy. There are 45 entries alone for his contributions to *Resources Policy*, but he has published in many other journals as well. He has also authored more than 20 books and monographs, many of which are standard references to students in our specialist area. As a result, many authors regularly cite Marian's work, as I have done in this paper.

Introduction

Australia is a mineral-rich nation, and Western Australia (WA), its largest state in the area, is also its richest mineral province. With an area of 2.646 million square kilometres, the estimated population of WA in mid-2016 was 2.617 million, giving a population density of almost exactly one person per square kilometre. Settled by the British in 1829, Perth on the Swan River, close to the south west coast, is the state's capital city. Almost two million people now live in the Perth metropolitan area, which stretches along the coast a distance of more than a hundred kilometres. The rest of the state, which is mainly arid, but rich in minerals, is quite empty. Outside of

metropolitan Perth, there were about 530,000 people, a population density of only about 0.2 persons per square kilometre.¹

Mining, which is based outside the metro area, is the state's main industry. Over the past several decades, it has consistently accounted for 20% and more of Gross State Product. Though capital intensive, it currently employs around 100,000 people directly or in associated activities.² A majority of these are now “fly-in, fly-out” workers. Many live in Perth.

There were approximately 150 mining operations spread throughout WA in mid-2016. These included 29 iron ore mines, 26 gold mines, 15 oil and gas operations (both onshore and offshore), 12 nickel mines, nine mineral sands mines, six salt extraction operations, four base metal mines, three bauxite mines, two manganese mines, two coal mines, a large diamond mine, a rare earths operation and an important spodumene mine (for lithium) in addition to a significant number of quarries and mines for construction materials.

The first profitable mine after European settlement in WA was a lead mine in the Mid-West region near Geraldton, which operated in the 1850s and 1860s. But it was gold mining that transformed the WA economy. The first recorded gold finds were at the remote Hall's Creek in the Kimberley in 1885. This is some 3000 km north of Perth. It was followed by a more substantial discovery at Southern Cross, 360 km east of Perth in 1888. With the rush at Southern Cross effectively over in 1892, Arthur Bayley and William Ford made a key gold discovery at Fly Flat in Coolgardie, some 560 km east of Perth in September 1892. This started a major gold rush leading to the discovery of the Golden Mile at Kalgoorlie, 40 km further east, by Paddy Hannan, Tom Flanagan and Dan Shea in June 1893. Within 10 years, the annual production of gold of around 70 t made WA one of the world's leading gold provinces.

In 1890, the Western Australian colony's non-Indigenous population was 48,502. Eleven years later when Australia became an independent nation, WA had an estimated non-Indigenous population of 193,601. The population of Kalgoorlie and its twin town of Boulder exceeded 30,000 at this time. Kalgoorlie Boulder has been a major gold mining centre now for more than 120 years. It is the home of the “Super Pit” and of the Western Australian School of Mines, and it is the key regional centre for the Eastern and Northern Goldfields region of the state. Other early Western Australian mines were in the South West region—a tin mine at Greenbushes, 240 km south of Perth, started in 1888, and coal mines at Collie, some 210 km south of Perth, began operating in the 1890s.

Mining stagnated in Western Australia after World War I, and it was slow to re-emerge after the end of World War II. As Appleyard (1991, p. 7) noted about much of the period between 1920 and 1980, “agriculture, pastoralism and timber have been the state's major export earners”.

The 1961 *Western Australian Year Book* (Australian Bureau of Statistics b, 1964) reported that while the net value of total primary industry exceeded £108 million in 1961–1962, the contribution of mining and quarrying was only just over £23 million.³ The gold industry, which produced 26.7 t in 1959–1960, accounted for about 60% of the mining total. This was followed in value by coal, asbestos, iron ore and manganese.

In the early- and mid-1960s, however, there were large new mineral discoveries in many regions of the state. These included iron ore in the Pilbara (some 1500 km north of Perth), oil and gas on the North West Shelf (also in the Pilbara), bauxite and heavy mineral sands in the South West, nickel in the Goldfields and diamonds in the Kimberley. Lang Hancock, a colourful cattle station owner, businessman and pilot, was the most prominent person in discovering and promoting the iron ore deposits in the Pilbara. These major finds coincided with the post-World War II emergence of the major Asian economies—particularly Japan but also South Korea and Taiwan. After the repeal of an embargo on iron ore exports⁴ in 1960, attributable in large part to Hancock's political lobbying, it became possible to sell iron ore to these economies.

During the next four decades, mining again underpinned the prosperity of the WA economy. Importantly during this period, the gold industry, which had almost closed in the mid-1970s, also expanded again. This came about because of much higher gold prices in the early 1980s, as well as the introduction of new cost-effective mineral processing techniques and key improvements in mineral exploration and mining methods.

With the dramatic emergence of the Chinese economy particularly after 2000 and the stirring of India, the demand for Western Australia's minerals increased even further. Many established mines expanded their operations, and some new mines commenced. Also the prices of several key minerals, but most notably iron ore, increased strongly. This contributed in a significant fashion to the state's, as well as the nation's, strong economic performance during the 1990s and early 2000s, and then particularly between 2004 and the early months of 2014. After 2014, however, there was a notable fall in iron ore prices and mineral prices more generally. Levels of WA iron ore production and exports did, however, continue to increase.

The graphs in Fig. 1 show the extent and the growth of the value of the state's mineral production in nominal and real

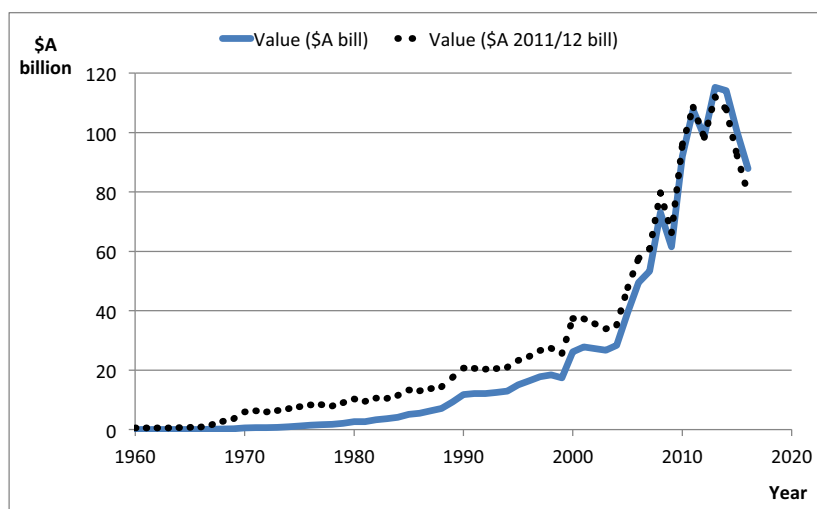
¹ Almost 76,000 Aboriginal and Torres Strait Islanders lived in the state, with about 45,000 of them outside of Perth. Relatively larger groups of Indigenous peoples lived in the Kimberley and Pilbara regions in the north of the state.

² More detailed estimates are available from the Department of Mines and Petroleum Western Australia (various years).

³ Australia changed its currency from the Australian pound (£A) to the Australian dollar (\$A) in early 1966. At that time, one Australian pound exchanged for two new Australian dollars.

⁴ The Australian Government introduced this embargo in 1938.

Fig. 1 Value of mineral production in Western Australia between 1960 and 2015–2016 (\$A billion) – in \$A 2011/2012 and nominal \$A



terms over more than half a century.⁵ Using data from WA’s Department of Mines and Petroleum, deflated to 2011/2012 prices, the value of Western Australia’s mineral production rose from just under \$A 600 million per annum in 1960 to more than \$A 18 billion by 1990. This expansion continued with the real value of mineral sector output rising to more than \$A 30 billion per annum in 1999–2000 and \$A 40 billion in 2004–2005.

During the decade-long China-driven mineral boom from 2004 to 2014, it rose to almost \$A 112 billion in 2009/2010, dropped to \$A 99 billion in 2010/2011, and increased to nearly \$A 115 billion in 2011/2012 before falling back to \$A 92.6 billion in 2014–2015 and around \$A 80 billion in 2015–2016.

With the rise of a more diversified mining sector in the state, Perth became established after 1970 as a major mining service centre. Its professionals began offering a broad range of specialist services to mining companies both within and outside Western Australia. Soon they were travelling all over the world—to Asia, Africa, the Americas and Europe—to provide their services. Maxwell (1999) has described this development in some detail. In a complimentary vein, the investment banker, Chris Wiggins—Wiggins (1993)—described Perth as the “Silicon Valley” of mining at that time. During this period as well, there was significant growth and development of the Western Australian School of Mines, which expanded its operations from Kalgoorlie into Perth, and also of the University of Western Australia activity in the area of mining education.

Because the major focus of this paper is on the mining boom period between 2004 and 2014 and its aftermath, it is important initially to appreciate the nature and frequency of mining booms. This is the focus of the second section while the third section briefly identifies the timing of these earlier

mining booms in WA. The fourth section focuses on the movement of indicators during the recent boom, while the fifth section reflects on what has happened in the subsequent “mining bust”. The focus of the final two sections is on assessing when the recent downturn will be over and then in making some other concluding remarks.

Mining booms, resource booms and commodity booms

Commentators typically use the above terms interchangeably. Yet, one might argue that mining booms are a subset of resource booms and commodity booms. Whereas *mining booms* are associated mainly with higher prices and greater production and use of base metals (such as aluminium, zinc, lead, copper and nickel), precious metals (such as gold) and bulk commodities (such as iron ore and coal), *resource booms* cover traditional mining but seem additionally to include oil and gas. *Commodity booms* can include agricultural, forestry and fishery products as well as the energy and non-energy minerals.

Radetzki (2008) defines *commodity booms* as being associated with the following:

.... sharp simultaneous increases in the real prices of a broad group of commodities.

In a notable address on “Mining Booms and the Australian Economy”, Battellino (2010) argues further that

.... the distinguishing features of a mining boom are significant increases in mining investment or mining output, usually both, that go on to have important macroeconomic consequences.

⁵ Further details about the contributions of key mineral sectors over time appear in the two Appendix tables—Tables 5 and 6.

Rising mineral prices increase mining company profits, and this encourages increased investment and greater mineral production.

In a mining boom, one would typically expect mineral demand to rise in the short run, with the real price of metals, non-metals or energy minerals increasing sharply. In the mineral producing nations, this will lead to significant increases in the value of mineral exports and of their real Gross Domestic Product. It may also increase the value of their exchange rates in relation to those of their trading partners. When additional mineral supply comes on stream as new mines are developed, mineral prices will typically fall back, export values may fall and economic growth will also slow.

As this paper is written, there is apprehension also that the recent policies of the Western Australian government, in combination with inflexible and inappropriate tax-sharing arrangements with the Australian government, have placed the state in a difficult medium-term and even longer-term fiscal position.

Taking a global view, Radetzki (2006) identified three commodity booms since the end of World War II. These were as follows:

- The 1950–1951 Korean War boom, caused by a build-up of inventories as a response to the possibility of another world war. Fortunately, these fears were quickly allayed. This period was associated more with record wool prices, and higher prices for some metals but not with higher food or energy prices.
- The 1973–1974 period where a combination of crop failures and disciplined oil market management by OPEC led to a tripling of the oil price
- Finally, a third boom driven by the expansion of the Chinese economy. Commentators now agree that this began in 2004 and ended in 2014. Driven by China's almost insatiable demand for minerals to facilitate its urbanisation and industrialisation, this brought greater urban infrastructure with dramatically increased consumption of key minerals such as iron ore, coal and the base metals as well as a strong price surge in them, particularly between 2004 and 2007.

Focussing particularly on the role of mining in Australia's historical experience since European settlement, Battellino (2010) identified five major "mining boom" periods in Australia since European settlement in 1788. These were as follows:

- The 1850s gold rushes (in New South Wales and Victoria)
- The late nineteenth century mineral boom in Queensland, Western New South Wales, Tasmania and Western Australia (including its gold rush)
- The 1960s/early 1970s mineral and energy boom
- The late 1970s/early 1980s energy boom
- The 2004 to 2014 boom, which he described as "the current episode, which is again a minerals and energy boom"

The differing findings of Radetzki and Battellino are largely a reflection of their respective global and national perspectives and the time periods selected for analysis. Yet in the period after 2004, the influence of China both globally and in regions in a range of nations was dramatic. It was particularly the case in Western Australia.

The Western Australian economy and mining booms

A historical graph presenting estimates of Australian and Western Australian economic growth since 1860 appears in Fig. 2. The data points are derived from the decade-by-decade annual average real GDP growth estimates from 1861 until 1990 by Cashin⁶ (1993) and since 1991 by the Australian Bureau of Statistics (2015).

There were considerably higher real GDP growth rates in WA than nationally in three extended periods. These were the following:

- During the WA gold rushes (particularly between 1880 and 1910)
- During the 1930s when gold prices increased
- Between the 1960s and 2000 when the state's mineral economy grew and diversified as WA became a world-class province for the supply of iron ore, bauxite/alumina, nickel, LNG and mineral sands, as well as for gold.

The major destination of its production by 2000 was still Japan, though Chinese imports of these minerals grew strongly after 1990.

With reliable annual state and territory estimates of real GDP growth in Australia after 1990, it is appropriate to continue these comparisons *annually* in Fig. 3.

Between 1990 and 1991 and 2015–2016, the Western Australian economy grew faster than the rest of the Australian economy in 21 of the 26 years. It consistently grew more slowly only from 1998 to 2000 (the years of the so-called Asian economic crisis).

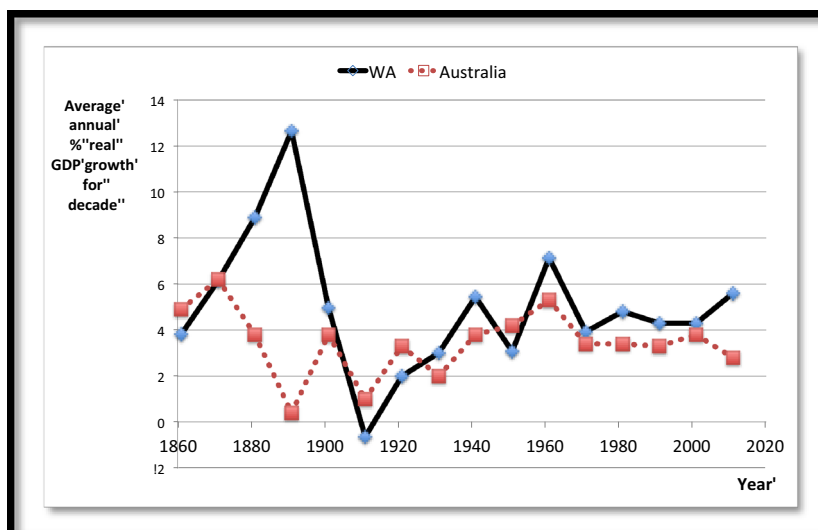
The China boom (2004 to 2014) and Western Australia

What happened in China?

Most commentators identify the origin of the recent economic rise of China with the adoption of its "Open Door" policy by Deng Xiaoping after 1978. Over almost four

⁶ Cashin uses data on monetary aggregates of the Australian colonies and New Zealand and assumes that the income velocity of each of the colonies equals that for Australia.

Fig. 2 Decade-by-decade real GDP growth rates—Australia and Western Australia 1861 to 2015. Source: Cashin (1993), Australian Bureau of Statistics (2015)



decades, the country has experienced rapid urbanisation, industrialisation and an increasing openness to world trade. Between 1980 and 2014, the Chinese economy grew at an average rate of 9.8% per annum. This was associated with a dramatic increase in its use of minerals, as well as an impressive rise in the incomes of the average citizen. It also occurred against the background of the “one child” policy, which meant that China’s population increased relatively slowly during this period. As a result, the country’s GDP per capita (in 2011–2012 prices) grew from around \$US 200 in 1980 to \$US 6300 per annum in 2015.

By 2005, the Chinese economy ranked fourth in Gross Domestic Product behind the USA, Japan and Germany. While many other economies struggled, China was suddenly a recognised as a key contributor to the success and prosperity of the world economy.

Over the next decade, Chinese real GDP increased by approximately 140%. In mid-2010, China’s Gross Domestic Product passed that of Japan to make her the world’s second largest

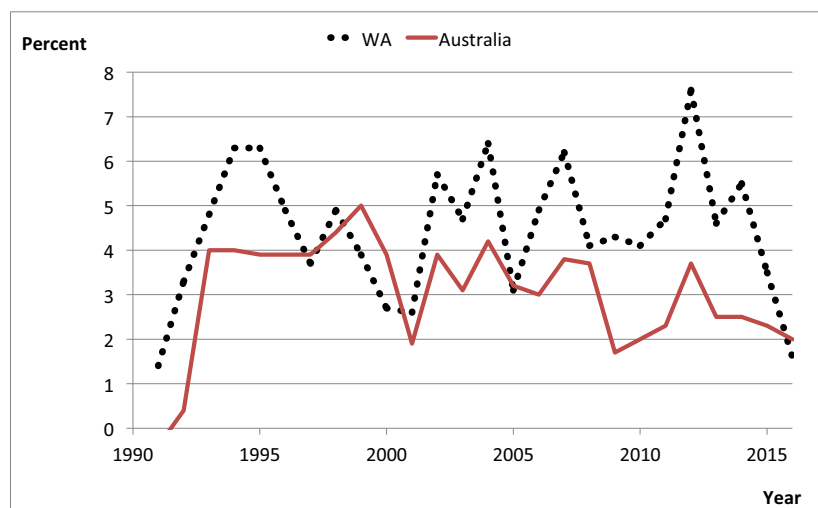
economy, after the USA. In that year, China also became the largest consumer of minerals. By 2015, China had an estimated Gross Domestic Product of \$US 11 trillion for its population of 1.3 billion. This compared to the USA whose GDP then stood at \$US 18 trillion for its population of 320 million.

As Menzie et al. (2004) note, transforming the Chinese economy required major investment in the following stages:

- Infrastructure (which particularly requires cement and other construction materials but also needs large amounts of steel for housing construction, bridges, railways etc.)
- Light manufacturing, (requiring copper, other base metals and steel)
- Heavy manufacturing (iron ore, steel and aluminium)
- Consumer goods (aluminium, energy minerals, specialty steels and industrial minerals)

These stages tend to follow on from each other. Menzie et al. (2004) observe that in the case of South Korea, it took around

Fig. 3 Annual percentage growth rates in real Gross Domestic Product—Western Australia and Australia—1990–1991 to 2015–2016



20 years to pass through each stage. China's progress has apparently been more rapid than this, with some of the stages overlapping.

In driving its economic growth, by the late 1990s China had become the world's leading steel maker. At this time, Western Australia had become China's major iron ore supplier, taking advantage of its high-quality iron ore deposits and relative geographical proximity.

In 2004, China produced 272 million tonnes of raw steel, which was just over a quarter of world production. This had risen to almost 823 million tonnes by 2014, which was almost 50% of the world total. It fell back to 804 million tonnes in 2015 and increased marginally to 808 million tonnes in 2016. By this time, Australian iron ore exports, overwhelmingly from WA, made up 62.5% of China's iron ore imports.

The major contributions to this mineral trade have been iron ore exports from Western Australia and coal exports from Queensland and New South Wales. In 2004–2005, Australia exported \$A 8.12 billion worth of iron ore and pellets. About 40% (\$A 3.3 billion) went to China. By 2013–2014, the value of WA iron ore exports had reached \$A 70.2 billion. Around \$A 54 billion (77%) went to China (Department of Mines and Petroleum Western Australia, various years). Whereas Australian iron ore producers exported 80 million tonnes of iron ore to China in 2004, this trade had reached 600 million tonnes by 2015.

Major iron ore suppliers struggled to meet Chinese demand for their product in the decade after 2004. This drove up the price of iron ore for much of the period. Higher mineral prices stimulated economic activity in the Australian mining states—especially Western Australia. Eventually, Chinese steelmakers began investing in iron ore mines in other nations in a vertical integration strategy to control their supply costs and thereby enhance their profitability.

Finally, by 2014 Chinese economic growth slowed to 7.3% per annum in association with a softening construction sector. This was associated with a major decline in iron ore prices as several new mines came into production. In terms of Australian dollars, the price of 62% iron ore fines fell from \$A 135 per tonne in December 2013 to \$A 60 per tonne 2 years later.

The effect on the Australian economy

Assessing the macroeconomic impacts of mining during this period is an important exercise. One notable attempt in this area is the study by the Reserve Bank of Australia economists, Downes et al. (2014). Using a large-scale structural econometric model of the Australian economy (AUS-M), they estimated that in the decade preceding 2013, the mining boom had

- increased real per capita household disposable income for Australians by 13%
- raised real wages by 6%

- lowered the unemployment rate by about 1.25 percentage points

While much of the benefit of this expansion flowed to the mineral resource-rich states of Western Australia and Queensland, the mining boom contributed in an important way to maintaining the continuing growth of the entire Australian economy for a record period after the early 1990s. This was particularly important during the Global Financial Crisis (GFC) during 2008 and 2009. Commenting on this, the prominent Australian economist, Bob Gregory, observed that

The timing of this boom was very auspicious for us because just as the rest of the world was hit by the global financial crisis and their economies suffered and their unemployment rates went up, this boom in Australia was so powerful that it overrode that effect. So we escaped the GFC and we were one of the very few countries that managed to do that.⁷

The expansion of the Western Australian mineral economy

In 2005, the Australian iron ore miners (led overwhelmingly by BHP Billiton and RioTinto in the Pilbara) exported 117.5 million tonnes to China. This had increased to 498 million tonnes by 2015 and it rose further to 625 million tonnes in 2016. This spectacular rise, combined with high prices for iron ore during much of the decade, had a major impact on the Western Australian economy. Achieving this outcome involved major exploration activity, considerable investment in new mines and the expansion of key infrastructure.

Mineral exploration and mine investment

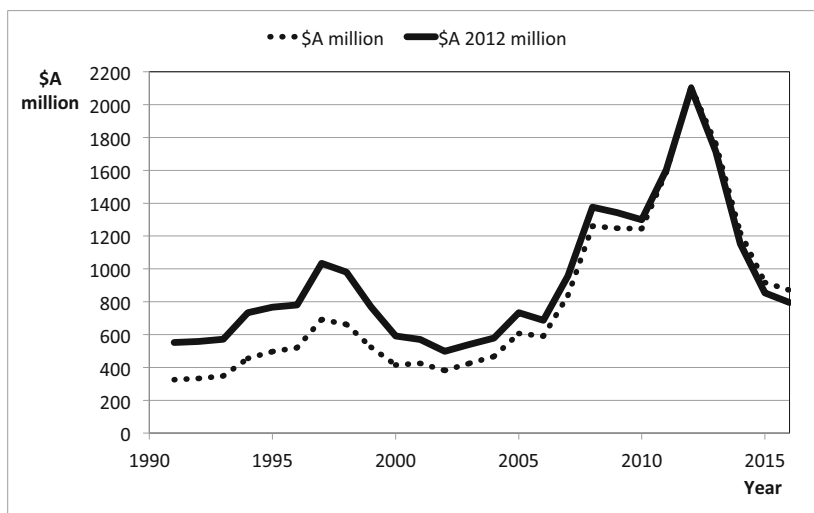
Mining companies typically invest in mineral exploration when they are making profits and are otherwise confident about the future. Successful exploration is necessary to build and replace depleting reserves.

As can be seen in Fig. 4, mineral exploration spending (in \$A at 2012 prices) rose from \$A 551 million in the year ended June 1991 to more than \$A 1034 million in 1997 just prior to the Asian economic crisis. It then dropped back to around \$A 500 million by 2002 before rising to almost \$A 2100 million by 2012. It decreased to \$A 795 million by 2016. While this is a significant decline, mineral exploration spending in WA still stands at a higher level than in 2001 and 2002.

The picture is a little different with mining and petroleum investment for the period from 1990–91 to 2015–16. As Fig. 5 shows, there was a gradual rise until 1997–1998 when annual

⁷ See Phillips (2016).

Fig. 4 Mineral exploration spending in Western Australia 1990–1991 to 2015–2016—in \$A 2012 and nominal \$A



investment in \$A 2012 exceeded \$A 8 billion, a falling back after the Asian economic crisis and a mild recovery between 2001 and 2005 when it rose to \$A 6.4 billion.

At that time, investment rose rapidly, reaching an annual peak of \$A 46.9 billion in 2012–2013. In the following 2 years, it fell back slightly to \$A 42.8 billion. With capital spending of this magnitude, it hardly seems that the mining boom is over, though clearly the most recent peak has passed.

The value of mineral production

Five minerals—gold, iron ore, bauxite/alumina, oil and gas and nickel—have been responsible for the overwhelming majority of the value of production of all WA minerals since 1960—see Table 6. While gold has historically been the state’s most important mineral, each of the other four key mineral sectors—iron ore, oil and gas, bauxite/alumina and nickel—at different times surpassed gold in monetary value after 1965.

The mining industry in Western Australia has faced only three difficult periods over the past half century. These were firstly in the late 1990s following the so-called Asian economic crisis in 1997, secondly in the period immediately after the Global Financial Crisis in 2009 and finally the “mining bust” period since 2014.

Despite these challenging episodes, the graphs in Fig. 1 above show that, even though there have been several occasions in which the estimated real value of mineral production have fallen from the one year to the next, its trend value at constant prices was consistently rising until 2013.

The industry’s competitiveness has been assisted by the floating Australian dollar since 1983, as well as by the Australian government’s effective management of inflationary forces, particularly from the 1980s onwards.

The value of iron ore produced and its percentage contribution to the value of WA’s mining output has varied quite widely since 1960. This shows up well in Table 1 (and Table 5).

Fig. 5 Mining and petroleum investment in Western Australia in \$A 2012 billions—1989–1990 to 2015–2016

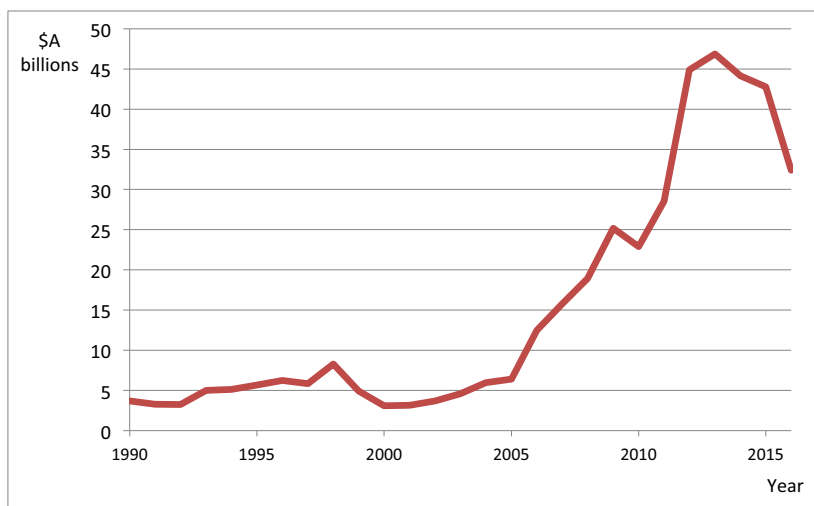


Table 1 Contribution of iron ore to the value of Western Australian mineral output—selected years

Year	Value of all minerals (\$A bill)	Total value of iron ore (\$A bill)	% value of iron ore	Total value of other minerals (\$A bill)	% value of other minerals
1960	0.044	0.004	9.0	0.397	91.0
1980	2.621	1.162	44.3	1.459	55.7
2000	21.266	3.722	17.5	17.544	82.5
2005	33.406	8.302	24.9	25.104	75.1
2010	107.049	62.787	58.7	44.262	41.3
2015	99.513	53.765	54.0	45.749	46.0
2016	87.851	48.385	55.0	39.466	45.0

Source: Department of Mines and Petroleum (various years)

However, because of the dominance of iron ore in WA's economy after 2005, there has been an increasing risk for the state in depending too much on this mineral. As China moves into a more service sector-focused economy, with reduced iron ore demand, the market price of iron ore may fall, and this may have adverse consequences for Western Australia and for Australia more generally.

After accounting for only 9% of the value of WA's mineral production in 1960, it rose to 44.3% in 1980, fell back to 17.5% in 2000 and rose to 24.9% in 2005. Iron ore prices jumped from around \$A 30 per tonne in 2004 to \$A 125 per tonne in 2008. With the exception of a decline in 2009, they then stayed above \$A 100 per tonne until 2014. With this dramatic price increase and greatly increased volumes of production, iron ore accounted for almost 60% in the value of mineral output in 2010. As prices declined after 2010, iron ore's share fell back to 54% in 2015.

As Fig. 6 shows, by 2015–2016 Australian export prices of iron ore had fallen significantly from their 2013 levels. Also in 2015–2016, the real Gross State Product in WA increased by only 1.9%. This was 0.9% less than the corresponding national figure. In 2016–2017, the state government expects WA to grow at only 0.5% per annum, while the national growth rate is likely to be 2.5%.

An important indicator of the potential problem was the dramatic increase in the size of the mining sector as a percentage of total economic activity in the state. After hovering around 20% for most of the 1990s, it spiked suddenly at 25% in 2002, returned to 20% in 2005 and then rose strongly to hit 35% by 2011. By 2015, it had fallen back to 25%.

The effects on the Western Australian economy more generally

Economic growth

In the China-driven economic boom period between 2004 and 2014, Western Australia grew at on average 5.6% per annum,

which was 2.4% faster than the average annual growth rate for the entire Australian economy. This was also twice the difference of 1.2% in the annual rates of economic growth between WA and the nation during the 1960 to 2014 period.

Yet, as Table 2 shows, by 2015–2016 when mineral prices had fallen, real Gross State Product in WA increased by only 1.9%. This was 1.2% less than the corresponding national figure of 3.1%. In 2016–2017, the state government expects WA to grow at only 0.5% per annum, while the national growth rate is likely to be 2.5%. In 2017–2018, the Western Australian Treasury recently predicted the state to grow at 2.5% per annum, while the nation will grow at 3% per annum.

These observations beg the question of whether the slow economic growth experienced by Western Australia at the end of the mining boom reflects elements of the much discussed *resource* thesis initially associated with Gelb et al. (1988) and Auty (1993), empirically tested by Sachs and Warner (1995) and debated widely in the literature since that time.⁸

Per capita GDP

During its period of early European settlement, the incomes of Western Australians fell well behind those of people on the Eastern side of the continent. Using income data generated by Cashin (1993) at Australian Colonial Censuses prior to 1901, from national censuses for the period from 1901 to 1991⁹ and from Australian Bureau of Statistics annual estimates since that time, the graph in Fig. 7 shows that per capita GDP was less than 40% of the Australian colonial average in 1861. At that time, the Victorian and New South Wales gold rushes were taking place and the per capita GDP of Australians was the highest in the world.¹⁰

⁸ Venables (2016) provides an excellent recent review of the debate in this area.

⁹ Cashin uses Colonial Census data for the years of 1861, 1871, 1881 and 1891 and for the years 1901, 1911, 1921, 1933, 1947, 1954, 1961, 1971, 1981, 1986 and 1991.

¹⁰ For some relevant data based on the work of Maddison (1995), see Maxwell and Guj (2013).

Fig. 6 Australian export prices of iron ore 1969 to 2016—in nominal and real \$A prices

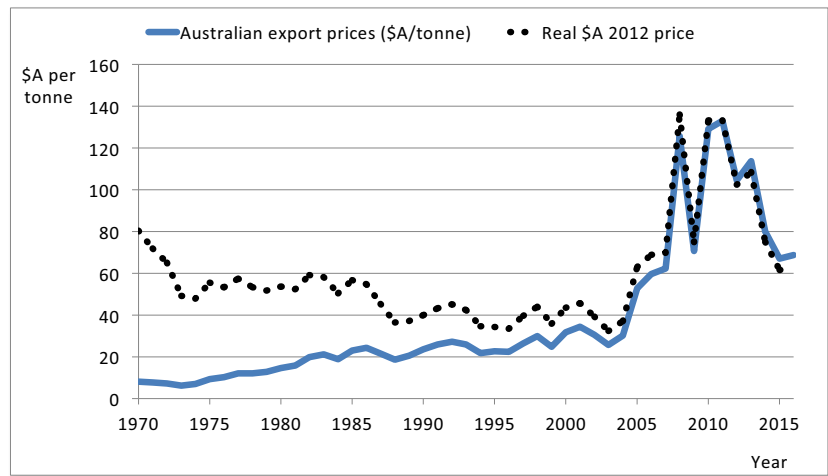


Table 2 Rates of actual and predicted economic growth in selected periods—Western Australia, Australia, high-income nations and the world

Area	Period	Average annual growth rate (%)
Western Australia	1960–2020 ^a	4.80
Long mining boom	1960–2003	4.95
China mining boom	2004–2014	5.60
Post-boom period	2015–2020	2.30
Post-boom financial years	2014/2015	3.60
	2015/2016	1.90
	2016/2017 ^a	0.50
	2017/2018 ^a	2.50
	2018/2019 ^a	2.50
	2019/2020 ^a	3.00
Australia	1960–2020 ^a	3.65
Long mining boom	1960–2003	3.85
China mining boom	2004–2014	3.20
Post-boom period	2015–2020 ^a	2.85
Post-boom financial years	2014/2015	2.3
	2015/2016	3.1
	2016/2017 ^a	2.5
	2017/2018 ^a	3.0
	2018/2019 ^a	3.0
	2019/2020 ^a	3.0
High-income nations	1960–2014	3.10
Long mining boom	1960–2003	3.70
China mining boom	2004–2014	1.20
World	1960–2014	3.50
Long mining boom	1960–2003	3.65
China mining boom	2004–2014	2.40

Source: Australian Bureau of Statistics, WA Treasury Corporation, World Bank

^a Predicted

With a major recession on Australia’s East coast and a gold rush in WA in the 1890s, this situation changed. By 1901, per capita GDP in WA was at similar levels to that in the rest of the newly independent Australian nation. Per capita GDP fell back to around 80% in the inter-war period and remained in that position until 1960. The events associated with the second long mining boom led to increasing per capita GDP in Western Australia again, relative to the rest of the nation. The state’s per capita GDP reached national parity again in the late 1980s and rose to 119.5% by 1997. It then fell back to just over 111.5% in 2001.

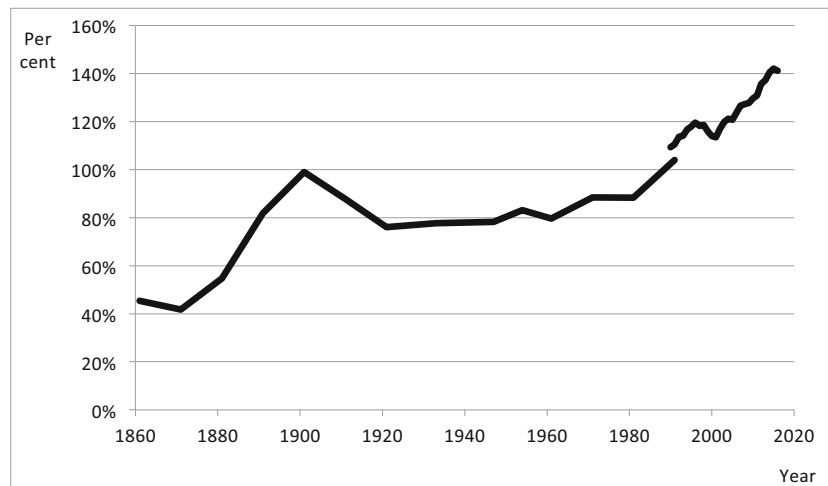
With the China-stimulated mineral boom continuing, Western Australian per capita GDP reached 140% of the national average by 2014. It has started a slow downward movement since that time. It is an interesting question whether, and by how much, WA per capita GDP will move back towards the national average and perhaps below it in the foreseeable future.

Unemployment and workforce participation

In Western Australia’s long mining boom period after 1960, the state’s average unemployment rates were marginally below average national rates—typically by 0.1 or 0.2%. Then in the period between 2004 and 2014, the rate of unemployment in Western Australia was consistently less than the Australian unemployment rate *by about one percentage point*—see Fig. 8. By the middle of 2015, however, it edged above the national rate for the first time in more than a decade. Standing at 6% in November 2015, it was 0.6% higher than the national percentage. This indicator is also consistent with the view that the China-driven mining boom period had ended in 2014.

In a corresponding manner, one might expect workforce participation rates to decline in an absolute and relative sense at the end of a period of high economic activity in a mining state such as Western Australia.

Fig. 7 Western Australian per capita GDP as a percentage of Australian per capita GDP—1861 to 2016

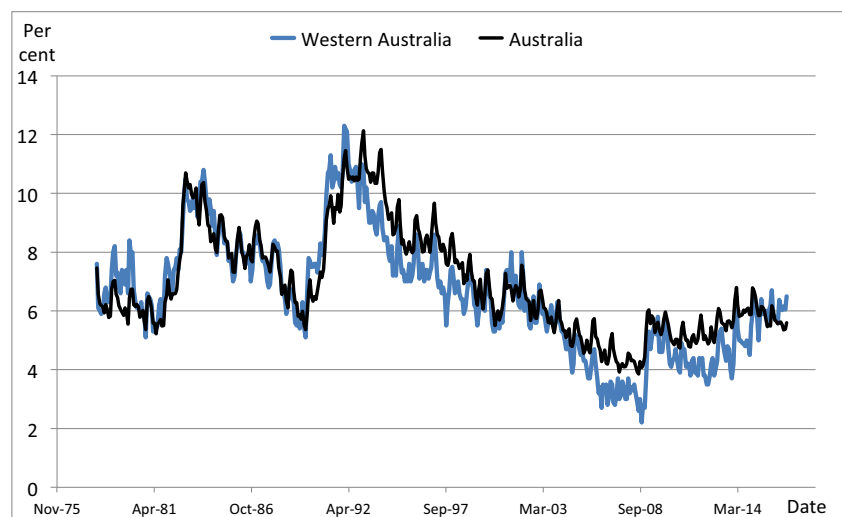


As can be seen from Fig. 9, this series has been volatile on a month-to-month basis since the late 1970s. Yet, there was an apparent widening gap between 1993 and mid-1995, a decline in the late 1990s, a narrowing in the early 2000s and a widening again between 2004 and 2014. There has not been any strongly discernible trend since 2014. Participation rates in WA were on average almost three percentage points higher than the corresponding Australian data between 1976 and 2016. This gap exceeded 4% in much of 2012 but had dropped to less than 3% by 2016.

Real estate prices

Another indicator of how a large mining boom affects a mineral-rich region is reflected in the level of its housing prices. During such a boom, housing demand increases strongly in major mining centres, as well as in the regional and state capital cities that service them. Housing supply typically struggles to keep up, and in these circumstances, housing prices and particularly housing rents rise dramatically.

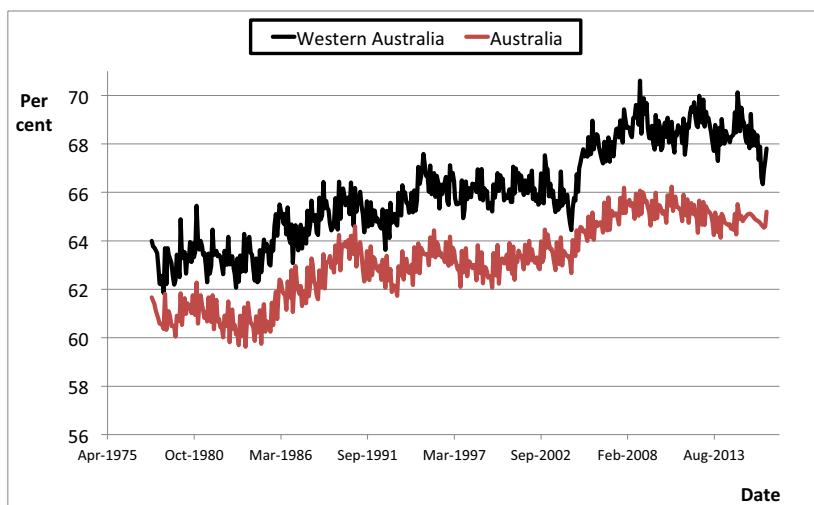
Fig. 8 Unemployment rates in Western Australia and Australia—2004 to 2016



The real estate market situation in Western Australia reflects this. At the peak of the mining boom, De Poloni (2013) observed that the average cost of renting a single-family house in the Pilbara regional centre of Karratha was \$A 1800 per week. This is compared with rental prices of \$A 450 to \$A 500 per week for similar properties in the Perth metropolitan area, some 1500 km south. There were correspondingly high rental prices in the other major Pilbara centres of Port Hedland and Newman.

At the same time, the average price of a new house in Karratha was more than \$A 800,000. In this situation, mining companies often found it more cost effective to use “fly-in, fly-out” strategies for their workforces. Workers would fly either to remote mine sites or to these mining centres for working rosters such as 14 days on and 7 days off, or 8 days on and 6 days off, while their families continued to live in Perth or in other cities and towns. While on the job, they would often work 12-hour shifts, and sleep in single rooms in accommodation camps close to the mines.

Fig. 9 Monthly participation rates in the workforce—Australia and Western Australia—1978 to 2016



In addition to the highly distorted housing market in some key regional mining centres, the property market was also strong in the Perth metropolitan area. In the period between the March quarter of 2002 and the March quarter of 2007, median house prices rose from \$A 190,000 to \$A 475,000. Over the same period, median house prices in Australia’s biggest city, Sydney, rose from \$A 365,000 to \$A 480,000. So, as can be seen in Fig. 10, for a brief interlude Perth prices almost equalled those in Sydney.

Because of Queensland’s strong resource sector, the housing market in Brisbane, Australia’s third largest city, has some similarities with Perth. Though housing prices fell behind Perth after 2005 and stayed at about \$A 60,000 less for most of the period until 2014, there were signs of catching up in 2015.

Consistent data at regional and smaller area levels are available from Australia’s 5-yearly national census. Information is available presently up until the 2011 Census, but there is considerable delay in its publication. Real estate databases

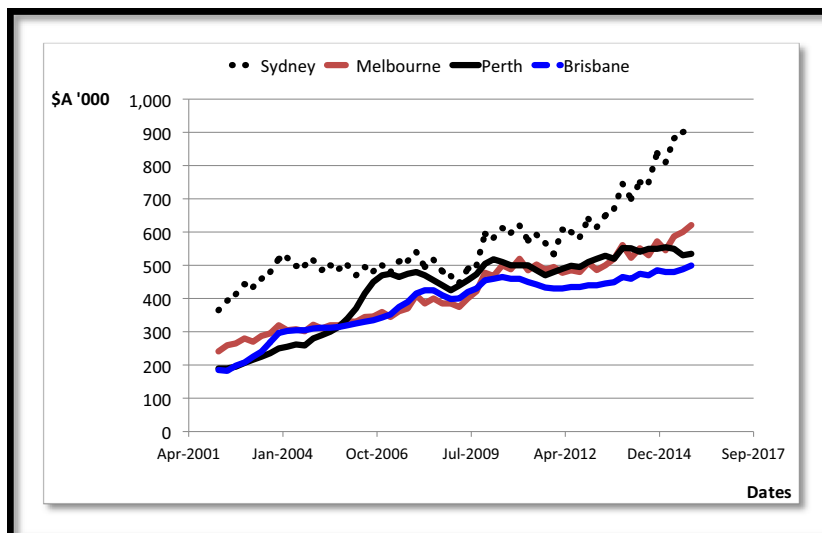
provide an interim view of most recent developments. Hence in early 2017, median housing prices in Karratha had dropped to around \$A 250,000 and rentals were around \$A 350 per week.

Infrastructure development

State governments drive much infrastructure spending in Australia. They are largely responsible for the provision of roads, railways, bridges, most harbours, hospitals and other health facilities, schools and universities and a range of other public buildings and facilities.

In a mining boom period, there is usually greater public pressure to commit expected increasing taxation collections and royalty payments to finance an ambitious range of new public projects. One danger in this situation is that the government of the day may be too optimistic about the expected income flows it will receive from the mines and oil and gas

Fig. 10 Quarterly median house prices in Sydney, Melbourne, Perth and Brisbane (in \$A ‘000)—March 2002 to December 2016. Source: Australian Bureau of Statistics (2016)



wells. If it borrows to finance new projects and the demand and the prices for the minerals produced by its miners do not increase as quickly as forecast, there may not be enough money available to repay loans.

During the China-driven mineral boom, successive Western Australian state governments committed funding to a broad array of new projects. These included the following:

- the Perth metropolitan area's rail system, which, among other things, saw the opening of the southern line to Mandurah but has also included unfinished or aborted projects such as the Perth Airport Link, the Ellenbrook railway line and the Mirrabooka to Perth City light rail project
- the state's main roads, with new highways completed from Perth to Bunbury, from the Perth airport to its Central Business District and several sections of the Great Northern Highway. It also included the controversial Roe 8 and Roe 9 projects to enhance truck access to the Fremantle port
- a major new tourism precinct at Elizabeth Quay in the Perth Central Business District on the Swan River
- several new hospitals (e.g. Fiona Stanley, Perth Children's Joondalup and Midland health campuses) and new schools
- new high-quality sporting arenas including a basketball arena, a major cricket and Australian football stadium and a rectangular stadium for rugby and soccer (association football)

In addition to this, in 2008 the WA State government instigated its Royalties for Regions programme. An initiative of the rurally based junior Government coalition party—the Nationals—the programme involved investing more than \$A 6 billion in the next 8 years in more than 3600 projects and programmes outside of the Perth metropolitan area. The aims of this programme were to build capacity, retain benefits and improve service provision in regional communities as well as attain sustainability, expand opportunities and increase the prosperity of these regions.

As the economy slowed, it became necessary to delay or discontinue several of these projects.

The recent mining bust

As Table 2 shows, the Western Australian economy has experienced a major decline in its economic growth, both absolutely and relative to the Australian nation, since the end of 2014. The WA Treasury Corporation (Government of Western Australia 2017) has recently predicted that this situation will continue in 2016/2017, 2017/2018 and 2018/2019. If its

assessment is correct, the “mining bust” period in WA will last for at least 4 years.

This recent and predicted growth experience of WA between 2014/2015 and 2018/2019 is an average of 2.3% per annum. This compares with national estimates of 2.8% per annum economic growth over the same period. It contrasts notably with that of the state's long post-World War II mining boom period—where WA grew on average

- 1.1% per annum *faster* than the Australian economy between 1960 and 2003
- 2.4% per annum *faster* than the national average during the 2004–2014 China mining boom period

It is instructive briefly to reflect on some of the variables, which have influenced recent developments.

Resource curse factors

This change in WA's economic fortunes since 2014 has arguably been influenced by some of the key factors associated with the so-called *resource curse* thesis. This is the argument that resource-rich nations grow more slowly than resource-poor nations—see Gelb (1988), Auty (1993) and Sachs and Warner (1995).

Following the approach used by the authors of Mining Minerals and Sustainable Development (2002), slower growth in mineral-rich nations may be attributable to

- falling and volatile mineral prices (external market forces)
- Dutch disease effects (internal economic stresses) associated particularly with movements in exchange rates
- some of the forces of political economy including rent-seeking and corruption

Let us consider each of these areas briefly. Consider again the annual export Australian dollar prices of iron ore plotted in Fig. 6. Between 2004 and 2008, these prices rose consistently—from less than \$A 40 per tonne to around \$A 140 per tonne. After a major fall in 2008 at the time of the Global Financial Crisis, they recovered again to around \$A 120 per tonne from 2009 until 2011. But by 2015, they had fallen back to just over \$A 60 per tonne. Iron ore prices rose marginally in 2016. World mineral production is not now in a boom phase, but there are positive signs that the “bust” may be ending. Fortunately for iron ore-producing nations, recent market prices have not fallen back to their pre-2005 levels.

Postulating that Dutch disease “...simply denotes the co-existence of booming and lagging sectors in an economy due to a temporary or sustained increase in export earnings”, Davis (1995, p. 1768) argues that “...there is nothing inherently growth-inhibiting in mineral booms and resulting Dutch disease phenomena”. A mineral boom tends, however, to

drive up a country's exchange rates and place economic pressure on the fortunes of its lagging tradable goods sectors.¹¹

This occurred during the China-driven economic boom in Australia with the Australian dollar rising in terms of the Trade-Weighted Index with Australia's major trading partners from 50 in 2002 to 60 in 2005, 70 in 2007 and going past 80 in 2011 before dropping back down into the 60s in 2014—see Fig. 11. These higher exchange rates undermined the competitiveness of the lagging sectors such as agriculture, tourism and manufacturing in Western Australia, and in Australia more generally, during this period.

In some situations, this may lead to government intervention to assist workers in lagging industries particularly when the impact of a resource boom places great pressure on a regional economy.¹² This may be the case when local workers find it difficult to move into jobs in the booming industry.

One other disappointing area after a major mining boom often relates to the failure of several key investments proposed and even initiated during a boom period to come fully into operation. With an overheated economy, where there is rent seeking, there are often budget pressures and unexpected delays to complete new projects. In some cases, bureaucratic inefficiency or corruption may also be an underlying problem.

Budgetary issues

Australia operates with three levels of government. The national government is headquartered in Canberra, some 300 km south of Sydney, and 600 km north-east of Melbourne. Six states (New South Wales, Victoria, Queensland, Western Australia, South Australia and two internal territories (the Australian Capital Territory and the Northern Territory)) make up the second tier, and there are about 700 local government areas in the third tier. While the national government often uses debt to finance its activities, it is more usual for State governments and local governments to run balanced budgets.

As noted, during the China mining boom, the Western Australian State Government made numerous commitments to build up the infrastructure of the state. Several of these initiatives are listed in the previous section. The financial commitment to provide them raised debt levels as the mining sector slowed. Commentators such as O'Connor (2017) argue, also, that

Lucrative pay rises offered to teachers, nurses and police during the height of the mining construction boom which made WA public servants among the nation's best paid—placed a huge and lasting fiscal drain on the budget.

¹¹ In their key articles, Corden and Neary (1982) and Corden (1984) have discussed and explained the Dutch disease phenomenon in considerable detail.

¹² For further discussion on this issue, see Corden (1984, 2012) and Rolfe et al. (2007).



Fig. 11 Australian dollar Trade Weighted Index—1985 to 2017

As a result, the State Treasury has recently predicted that the public debt of Western Australia will reach \$A 41 billion by 2020. This will be the highest level of public debt per resident of any Australian state or territory. With significant interest repayments, there are major budgetary challenges ahead for the newly elected Western Australian State government.

According to the Western Australian Treasury Corporation (2017), Moody's Investment Service assessed the state's long-term credit rating in early May 2017 as Aa2 with a "stable" outlook. Standard and Poor's assessment was AA+ with a "negative" outlook. These assessments are less favourable than they had been in 2014. Recently, the larger states of New South Wales and Victoria have had "Aaa" from Moody's and "AAA" from Standard and Poor's.

Australia's GST redistribution debate

Under the Australian federal system, the national Government has the major revenue raising (taxing) powers while the states and territories have greater expenditure responsibilities in areas such as the provision of health services, education, policing, railways and roads. The national government is responsible for levying and collecting personal and company income taxation, while states collect stamp duty on property sales and they often tax business payrolls. States also collect mining royalties.¹³ Local government areas require property owners to pay Council rates (property taxes) to finance their services.

Australia's national Government also introduced a Goods and Services (GST) tax regime in July 2000. The tax has been set at 10% since that time, and it is collected by the national government. It applies to most transactions, but notable exceptions are education and health services and some fresh food. In line with a formal agreement with the States and

¹³ Mining royalties are taxes on a company's mine production measured in monetary units per unit of output (e.g. \$5 per tonne) or as a percentage of the monetary value of a mine's output (e.g. 5% of mine revenue)

Territories, the Commonwealth Grants Commission (CGC) recommends how the GST revenue should be shared between them to achieve *horizontal fiscal equalisation*, in response to requests from the Commonwealth Treasurer.

Paraphrasing the CGC web definition,

“**horizontal fiscal equalisation** refers to the funding of state governments from the GST revenue pool so that ... each has the fiscal capacity to provide services and associated infrastructure at the same standard, if each makes the same effort to raise revenue from its own sources and operates at the same level of efficiency”.

With its mineral wealth, Western Australia has considerable capacity to raise revenue from mining royalties. With the rise of mineral production between 1983–84 and 2015–16, as well as strong mineral prices, royalty payments by companies to the Western Australian government increased from \$A 118 million in 1983–1984 to almost \$A 7 billion in 2013–2014 before dropping back to \$4.6 billion in 2015–2016.

Because WA generates considerable revenue from the mining royalties that it collects and keeps, while other states (apart from Queensland) do not, the Commonwealth Grants Commission has judged that it should redistribute most of the GST tax proceeds generated in WA to other states, in facilitating horizontal fiscal equalisation. Hence, as Table 3 shows, WA lost nearly \$A 4.5 billion of its GST payments to the other states in 2015–2016. It received only 30 cents in every dollar of GST proceeds from the Commonwealth.

The unfortunate outcome of the present redistribution process is, however, that this GST movement is taking place in an economic environment where a major mining downturn has now been in evidence for 3 years.

With the WA economy struggling, the current national policy of horizontal fiscal integration is undermining its

recovery. This casts doubt on the validity of the estimates obtained and the model used by the Commonwealth Grants Commission to implement the process of horizontal fiscal equalisation. The essence of the problem is that the GST redistribution for the coming year is based on royalties collected in the 3 years preceding the year of calculation. While this may be reasonable when there are stable royalty flows, there are problems for a state budget when royalty payments vary dramatically. It is hardly surprising that the Western Australian government has consistently advocated the return to it of a much higher percentage of its GST taxes.

The Western Australian state government faces major challenges in seeking to balance its budget within the next few years. In his May 2015 state budget presentation, the then Western Australian Treasurer, Dr. Mike Nahan, projected a deficit of \$A 2.7 billion for the 2015/2016 financial year—see Government of Western Australia (2015a). This was subsequently updated to \$A 3.1 billion—see Government of Western Australia (2015b). With an annual revenue of around \$A 45 billion, this outcome is very different from the state’s budget positions, 5 years earlier, which had usually been in small surplus.

In early February 2016, Moody’s further reduced the Western Australian government’s credit rating to AA2 because of its concerns about containing expenditure on health care and other social services. After the Council of Australian Governments meeting in late March 2016, the Federal government allocated only 30.4% of WA’s GST payments for the preceding year to be returned to Western Australia. In a trip to WA in early April, the Prime Minister announced a significant additional roads grant of \$A 266 million to the state for the 2016–2017 financial year. While this was a positive gesture, it was not enough to compensate for the almost \$A 4.5 billion lost to other states in the GST redistribution.

Table 3 Recommended GST payments per dollar of revenue raised to Australian states and territories to achieve horizontal fiscal equalisation—2015/2016

State or territory	GSP entitlement (\$)	Population (mill)	Population percentage	CGC allocation (\$ bill)	Population-based allocation	Redistribution
New South Wales	0.947	7.682	31.89%	17.295	18.192	– 0.897
Victoria	0.892	6.002	24.91%	12.730	14.213	– 1.483
Queensland	1.128	4.848	20.12%	12.990	11.481	1.509
Western Australia	0.300	2.686	11.15%	1.915	6.361	– 4.446
South Australia	1.359	1.709	7.09%	5.518	4.047	1.471
Tasmania	1.819	0.517	2.15%	2.236	1.224	1.012
ACT	1.100	0.395	1.64%	1.032	0.935	0.097
Northern Territory	5.570	0.252	1.05%	3.335	0.597	2.738
Australia		24.091	100.00%	57.051	57.051	

Source: Commonwealth Grants Commission

The WA government and its economy have been working with a fiscal redistribution system that penalises it when mineral prices suddenly decline. Over the past 3 years, this has caused Western Australians to suffer economically while their fellow citizens in Australia's Eastern States have prospered.

In March 2017, there was a change in the WA state government as the electors "discarded" the conservatively focused Liberal and National Party coalition for the more left-leaning Australian Labor Party government. As well as fiscal redistribution issues, this result was also influenced by the Liberal Party's decision to swap preferences with the right wing One Nation party of Pauline Hanson. Yet, the policy position of the new government seems unlikely to differ substantively from that of its predecessor in the area of GST redistribution.

When will the bust be over?

Encouraged by an upward movement in *mineral prices*, some commentators have recently argued that Western Australia's mining downturn may have ended. As noted above, the bust had begun in the early months of 2014. The RBA's Index of Commodity Prices, set at 100 in 2015, and stated in \$A, fell from 144.5 in January 2014 to 114.5 in November 2014 and then to 93.3 by December 2015. Beginning a tentative rise back to 110.5 in October 2016, the index then jumped to 139.7 in January 2017 before declining to 128.5 by May 2017. The price of iron ore increased from \$US 50 per tonne in November 2016 to almost \$US 90 per tonne in March 2017. Yet, it had fallen back to around \$US 55 per tonne by mid-June 2017. In the light of these price movements, it seems premature to argue that the mining bust period is over.

Another way to consider the situation is in terms of the recent and projected *economic growth* of Western Australia. Recall the relevant data in Table 2. While it still grew more quickly than the rest of Australia, the WA economy was slowing in 2014–2015. In 2015–2016 and 2016–2017, it has lagged noticeably behind the rest of the country. Furthermore, the Western Australian Treasury Corporation (2017) has recently predicted that there will be two more years—2017–2018 and 2018–2019—of slower than average national growth in the state. If this occurs, the effects of the mining bust will have lasted for 5 years.

It is also interesting to see whether the continuation of the mining "bust" is supported by the movement of some other relevant economic indicators. These include *housing prices*, *unemployment rates* and the assessment of the "State of the States" report.

Between the March quarter of 2014, when the mining downturn began, and the December quarter of 2016, the gap between the median house price in Sydney and that in Perth increased consistently from \$A 149,000 to \$A 447,000. While this growing difference reflected the importance of an

overheated real estate market in Sydney, the median price of housing in Perth also fell during this period. It would seem necessary for it at least to rise again (probably in real terms), to sustain any argument that the "mining bust" is over.

The rate of unemployment is usually considered to be a lagging indicator of economic activity. As we have seen previously, Western Australian unemployment was less than the national percentage by around one percentage point during the China mining boom. During 2015, this gap disappeared, and in 2016 and the early part of 2017, it has been 0.3 or 0.4% above the national figure. This suggests that there is still some time until the mining bust will be over. It would seem likely to be at least 4 or 5 years from the start of the "bust" until a fully fledged economy recovery arrives.

One recent assessment that has attracted considerable recent interest within Australia is the Commsec *State of the States* report - Commsec (2017). It is based on eight key indicators, to which its authors give equal weight. These are economic growth, retail spending, equipment investment, unemployment, construction work, population growth, housing finance and dwelling commencements. The report ranks states and territories in relation to their average performance in each area during the previous decade.

When Commsec published its 2010 report during the middle of the mining boom, WA easily outperformed the other seven Australian states and territories. Since that time, WA's position has deteriorated. By January 2017, it ranked eighth out of the eight states and territories assessed. It retained that position in April 2017.

In its *Executive Summary* to their April 2017 report, the Commsec authors noted that

The economic performance of Western Australia continues to reflect the ending of the mining construction boom. But the recent strong recovery in metal and mining prices and record mining export volumes are encouraging developments. Housing affordability also continues to improve with the consolidation in home prices.

These are some encouraging signs, but any recovery is still in its very early stages. It seems realistic to assume that the next strong upward movement in the mining cycle may not take place until 2020 or beyond.

A final assessment

The preceding discussion suggests that Western Australia has been slow to emerge from the major mining downturn, which began in 2014. Despite this production of iron ore, alumina and bauxite, and liquefied natural gas have all increased strongly in the past 3 years. Gold and nickel production has been relatively stable.

Table 4 US Geological Survey estimates of reserves of some key minerals—2000 and 2016

Minerals	Australia	World	Australian percentage
2000			
Iron ore (mill tonnes Fe)	11,000	71,000	15.5%
Bauxite (mill tonnes)	3800	25,000	15.2%
Gold (t)	4000	48,000	8.3%
Nickel (mill tonnes)	11	49	22.4%
2016			
Iron ore (mill tonnes Fe)	23,000	82,000	28.0%
Bauxite (mill tonnes)	6200	28,000	22.1%
Gold (t)	9500	57,000	16.7%
Nickel (mill tonnes)	19	78	24.4%

Source: United States Geological Survey

Furthermore, there is continuing support for the profitability and competitiveness of mining in WA in the Fraser Institute annual survey of mining and exploration companies—see Fraser Institute (2016). Western Australia has retained its position as the Australian mining jurisdiction with the greatest investment appeal during the past two decades in their assessment. Furthermore, during this period, estimated reserves of Australian iron ore, bauxite, gold and nickel (all largely based in Western Australia) have remained at high levels—see Table 4—suggesting that exploration success is keeping pace with mining activity and that these sectors will continue to operate profitably in the foreseeable future.

Yet, there remains a continuing threat to the prospects of the WA economy because of the nature of the current annual redistribution of Goods and Services Tax collections by the Australian national government among the Australian states and internal territories.

As discussed above, there has been a very low return of GST revenue collected for transactions in WA by the national government back to WA in recent years. This has occurred to facilitate the policy of horizontal fiscal integration.

In this regard, it is encouraging to note the following statement in the national Federal budget papers—Commonwealth of Australia (2017).

.... Western Australia will continue to receive the lowest share of GST per person in 2017-18. Whilst the Commission's calculations recognise that Western Australia also faces high costs in delivering services across a very large State, this is more than offset by the very high level of revenue it can collect, particularly from mining royalties.

In response to ongoing suggestions that the current approach to HFE does not sufficiently recognise differences between States' individual circumstances, the Government has tasked the Productivity Commission with conducting an inquiry on the impacts of the current methodology used to determine GST relativities on national productivity, efficiency and economic growth. The Productivity Commission will report by 31 January 2018.

The Government has also said it will consider a GST relativity floor to provide more certainty on the minimum share of GST that a State can receive in any year. The Government will explore a floor once relativities return to more normal levels—this is not expected for several years.

One would expect any favourable findings with respect to Western Australia to be part of the Australian Government's policy agenda in 2018–2019. There is, however, a strong argument for action to occur more quickly.

Appendix

Table 5 Level of production of major minerals in Western Australia—selected years

Mineral	1960	1970	1980	1990	2000	2005	2010	2015	2016
Gold (t)	27.3	10.9	10.8	148.0	204.0	167.3	163.8	195.9	195.5
Iron ore (mill t)	0.2	40.6	85.0	106.0	151.2	233.2	385.0	718.9	762.6
Bauxite/alumina (mill t)	0.03	1.0	3.7	6.7	9.4	11.2	12.7	13.7	13.9
Crude oil (kl)		na	na	1530.0	12,054.0	12,768.0	11,840.0	8343.4	5813.9
Nickel (kt)		30.0	74.3	67.8	143.0	180.4	180.1	183.1	165.5
Coal (mill t)	0.9	1.2	3.2	4.2	6.5	6.3	6.7	6.6	6.7
Diamonds (mill cts)				33.9	51.0	22.8	16.3	10.4	10.0
Ilmenite (kt)	114.6	550.6	83.0	1071.0	1168.0	707.2	510.0	188.3	133.3
Copper (kt)	3.6	2.1	4.8	24.0	29.4	61.9	149.8	188.8	177.7
Lead (kt)	2.2	0.5	13.2	8.0	64.5	2.3	26.1	59.8	20.3
Zinc (t)			45.9	60.0	232.6	48.4	87.6	77.2	75.7
Manganese ore (kt)	53.8	202.3	1.6	0.3	212.4	606.9	730.3	543.4	358.8
Salt (kt)		910.0	3681.0	5924.0	8809.0	11,580.0	10,970.0	11,390.1	11,390.1

Table 6 Value of mineral production in Western Australia (\$A million)—selected years 1960 to 2016

Mineral	1960	1970	1980	1990	2000	2005	2010	2015	2016
Gold	26.7	11.7	180.2	2372.0	2936.0	3016.0	8794.9	9021.0	10,569.6
Iron ore	3.9	332.5	1162.0	2246.0	3722.0	8302.3	62,786.4	53,764.5	48,385.2
Bauxite/alumina	0	60.8	436.0	2336.0	2658.0	3461.0	4127.3	5043.0	4590.0
Oil and gas	na	na	332.0	1530.0	7650.0	12,403.0	22,861.9	24,053.4	19,807.9
Nickel	0	87.3	322.2	593.0	1844.0	3503.0	4471.4	3467.8	2372.5
Coal	4.9	5.9	60.7	184.0	271.5	271.7	283.5	301.0	329.4
Diamonds	0	0	0	414.0	703.7	467.8	292.9	337.2	276.7
Heavy mineral sands	1.2	12.6	83.0	473.0	731.8	800.9	602.4	443.7	538.7
Copper	0.0	2.0	4.8	24.0	61.1	243.7	1191.7	1333.0	1160.2
Lead	0.1	0.1	0	8.0	20.2	42.0	19.5	138.5	14.6
Zinc	0	0	0	60.0	251.0	42.2	146.6	197.3	189.6
Salt	0	6.5	37.5	124.0	185.0	221.3	386.7	384.6	336.2
Other	6.8	60.0	85.1	74.0	232.1	631.0	1083.5	1028.4	820.3
Total	43.6	579.4	2620.5	10,438.0	21,266.4	33,405.9	107,048.7	99,513.4	87,850.6
CPI	7.6	9.7	26.2	57.1	70.2	82.6	95.8	107.5	108.6
Total output (\$2012 mill)	573.7	5973.2	10,001.9	18,280.2	30,294.0	40,443.0	111,741.9	92,570.6	80,893.7
Big 5	30.6	492.3	2432.4	9077.0	18,810.0	30,685.3	103,041.9	95,349.7	84,100.8
% of “Big five”	70.2%	85.0%	92.8%	87.0%	88.4%	91.9%	96.3%	95.8%	96.7%
Employment	na	na	na	36,554	40,335	58,745	85,163	107,033	105,653

References

- Appleyard RT (1991) Western Australia into the twenty-first century: economic perspectives. St George Books, Perth
- Australian Bureau of Statistics (2015) *Australian National Accounts: State Accounts*, Cat no. 5220.0. Canberra
- Australian Bureau of Statistics (2016) Residential property price indexes: eight capital cities, Dec 2015, Cat no. 6416.0, Canberra
- Australian Bureau of Statistics (b) various years, *Yearbook of Western Australia*, Perth: Australian Government
- Australian Bureau of Statistics (c) various years, *Mineral and petroleum exploration: Australia*, Cat no. 8412.0, Canberra
- Australian Bureau of Statistics (d) various years, *Private New Capital Expenditure and Expected Expenditure: Australia*, Cat no. 5625.0, Canberra
- Auty RM (1993) Sustaining development in mineral economies: the resource curse thesis. London: Routledge
- Battellino R (2010) Mining Booms and the Australian Economy. Reserve Bank of Australia Bulletin. March quarter, 63–69
- Cashin PA (1993) Using data on money stocks to estimate real colonial GDP in the seven colonies of Australasia: 1861–1991, Center Discussion Paper No 687, Economic Growth Center, Yale University, May, 40p
- Commonwealth of Australia (2017) Budget 2017–18: Federal Financial Relations Budget Paper No. 3, Canberra
- Commsec (2017) various years, State of the States, (Downloaded from www.commsec.com.au/homepage.html)
- Corden WM (1984) Booming sector and Dutch disease economics: survey and consolidation. *Oxf Econ Pap* 36:359–380
- Corden WM (2012) Dutch disease in Australia: policy options for a three-speed economy. *Aust Econ Rev* 45(3):290–304
- Corden WM, Neary JP (1982) Booming sector and de-industrialisation in a small open economy. *Econ J* 92(368):825–848
- Davis GA (1995) Learning to love the Dutch disease: evidence from the mineral economies. *World Dev* 23(10):1765–1779
- De Poloni, Glen (2013) Rents are up and down in the Pilbara. ABC News, (Downloaded from www.abc.net.au)
- Department of Mines and Petroleum Western Australia, various years, Western Australian Minerals and Petroleum Statistics Digest, Perth. (Downloaded from www.dmp.wa.gov.au)
- Downes P, Hanslow K, Tulip P (2014) The effect of the mining boom on the Australian economy. research discussion paper 2014–08. Reserve Bank of Australia, Sydney 44p
- Gelb, Alan, Associates (1988) Oil windfalls: blessing or curse. World Bank, Washington
- Government of Western Australia (2015a) 2015–16 Budget Paper No. 3 Economic and Fiscal Outlook, Perth. (Downloaded from www.ourstatebudget.wa.gov.au)
- Government of Western Australia (2015b) 2015–16 Government Mid-year Financial Projections Statement (or Mid-year Review), Perth. (Downloaded from www.treasury.wa.gov.au)
- Government of Western Australia (2017) various years, Western Australia Economic Profile, Department of State Development, Perth
- Jackson T, Green K P, (2016) Fraser Institute Survey of Mining Companies, Vancouver

- Maddison A (1995) *Monitoring the World Economy*, Organisation for European Co-operation and Development, Paris
- Maxwell P (1999) *The Importance of Mining Services to the Western Australian Economy*. CEDA Information Paper No 63, December, 23p
- Maxwell P, Guj P (eds) (2013) *Mineral economics*, Second edn. Australasian Institute of Mining and Metallurgy, Melbourne
- Menzie D, Pui-Kwan T, Fenton M, Jorgenson J, van Oss H (2004) *China's growing appetite for minerals*. United States Geological Survey, Open-File Report 2004–1374
- Mining Minerals and Sustainable Development (2002) *Final Report*, International Institute for Environment and Development, London
- O'Connor A (2017) *WA Government grapples with budget crisis as it seeks return to surplus—but what can it do?* ABC News, Australian Broadcasting Commission, 6 April 2017. Downloaded from www.abc.net.au on 7 May, 2017
- Phillips K (2016) *The mining boom that changed Australia*. Downloaded from Radio National, Australian Broadcasting Corporation, 13 April
- Radetzki M (2006) *The anatomy of three commodity booms*. *Res Policy* 31:56–64
- Radetzki M (2008) *A Handbook of Primary Commodities in the Global Economy*, Cambridge University Press
- Rolfe J, Miles B, Lockie S, Ivanova G (2007) *Lessons from the social and economic impacts of mining of the mining boom in the Bowen Basin 2004–2006*. *Australas J Reg Stud* 13(2): 134–153
- Sachs JD, Warner AM (1995) *Natural resource abundance and economic growth*. NBER Working Paper No. 5398, December
- Venables AJ (2016) *using natural resources for development: why has it proved so difficult?* *J Econ Perspect* 30(1):161–184
- Western Australian Treasury Corporation (2017). <http://www.watc.wa.gov.au/>. Accessed 5 May
- Wiggins C (1993) *Mining Services in Western Australia*. CEDA Mining Program, Perth