The Changing Global Market for Australian Coal

Michelle Cunningham, Luke Van Uffelen and Mark Chambers[*]

Photo: CUHRIG – Getty Images

Abstract

Coal is one of Australia's largest exports, and has accounted for around one-quarter of Australia's resource exports by value over the past decade. However, demand in the global market for coal has been evolving in recent years, which is creating some uncertainties for the longer-term outlook for coal exports. Looking forward, demand will be shaped by the speed of the transition towards renewable energy sources, changing steel production technologies, and the pace of global economic growth. Over the next few years, Australian coal production and exports are expected to grow fairly modestly.

Introduction

Australia is one of the world's largest producers and exporters of coal. Total domestic production has more than doubled since the early 1990s and export volumes have grown strongly. Australia produced around 510 million tonnes (Mt) of coal in 2017/18, of which around 75 per cent (380 Mt) was exported, up from 55 per cent in 1990/91 (Graph 1).

For most of the past decade, coal has been Australia's second largest resource export, after iron ore, and since 2015 has averaged around one-quarter of annual resource export values and 14 per cent of total export values (Graph 2). In 2018, the value of coal exports was $67 billion, equivalent to 3½ per cent of nominal GDP. Australia's coal exports consist of different grades of black coal: metallurgical coal, which has a relatively high energy content and is used for industrial purposes (primarily steel making); and lower-energy content thermal coal used for electricity generation.

Until the mid 2000s, growth in Australian coal exports was primarily driven by steadily expanding exports to Japan and other developed Asian economies. In the late 2000s there was a period of more rapid growth as exports to China and India in

particular expanded, and there was significant investment to expand capacity. Investment in the sector slowed from 2012 because falling prices led to a number of projects being delayed or cancelled (Saunders 2015). Investment has remained subdued since, as firms in Australia have focused on investments to sustain production rather than significantly expand output.

Unlike the strong growth in exports, domestic consumption of coal has been declining over the past 10 years or so. Domestic consumption is primarily for electricity generation – both black and brown coal are used.[1] Annual domestic coal consumption since 2015 has averaged around 122 Mt, but has declined by around 11 per cent since the mid 2000s. Although other forms of energy generation (mainly natural gas and renewables) have increased, coal still accounts for a relatively high share of energy generation in Australia – around 60 per cent in 2018.

Given the size of Australia's coal exports, changes in export volumes and prices can have a significant effect on Australia's GDP and terms of trade. The rest of this article discusses some of the international developments shaping the global market for Australian coal exports, and how these are informing the Bank's forecasts.

Global Coal Demand over Recent Decades

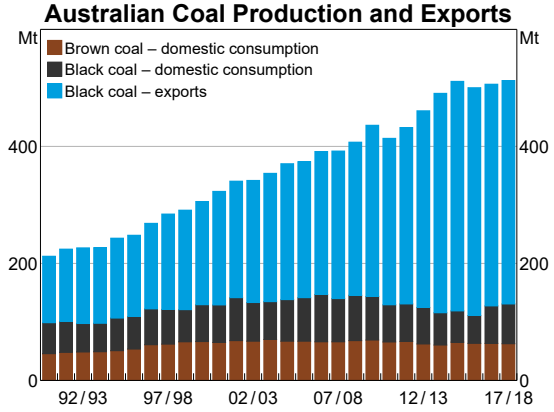
Coal has two main uses: electricity generation and steel production.[2] Thermal coal is primarily used for electricity generation and accounts for around three-quarters of global coal consumption. Metallurgical coal is typically used in the steelmaking process and accounts for 13 per cent of global coal consumption; metallurgical coal generally attracts a price premium over other coal types because of its higher energy content.[3]

Thermal coal and electricity generation

Globally, coal is the largest source of electricity generation, reflecting both its reliability as a base-load energy source and its relatively low cost. Of the estimated total global electricity generation of 26,600 terawatt hours (TWh) in 2018, around 10,000 TWh was generated using coal (Graph 3). Total coal-powered electricity generation has more than doubled since 1990, driven by sustained growth in developing economies and the related increase in energy demand.

Graph 1

Australian Coal Production and Exports

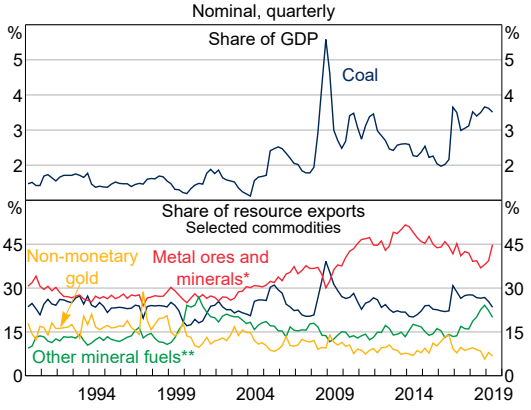


Sources: ABS; DOIIS; RBA

Graph 2

Australian Resource Exports

Nominal, quarterly

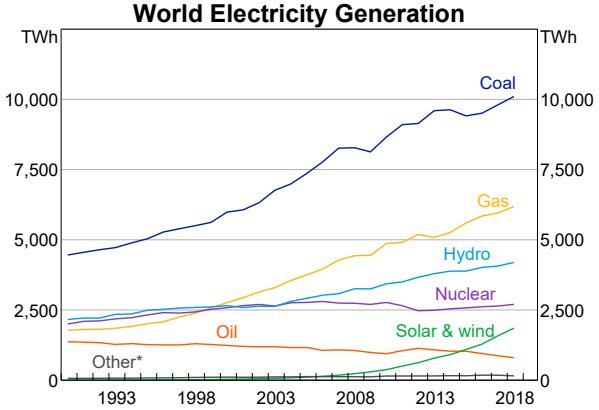


* Includes iron ore
** Includes liquefied natural gas

Sources: ABS; RBA

Graph 3

World Electricity Generation



* Includes pumped hydro, non-renewable waste and statistical discrepancies

Sources: BP (2019a); RBA

Global thermal coal demand increased sharply from the early 2000s, mainly due to rapid growth in the Chinese economy over that period. China is the largest global consumer of thermal coal, consuming around 3,200 Mt in 2018, a little over half of the global total, and around triple what it was consuming in 1990 (Graph 4). Sustained economic growth over recent decades in India and other Asian economies has also contributed to increased global thermal coal consumption.

In recent years, however, coal's share of global electricity generation has been declining – down from a peak in 2007 of a little over 41 per cent, to 38 per cent in 2018. A key driver of this decline has been increased global competition from less carbon-intensive energy sources, supported by lower gas prices and falling renewable energy costs. The investment in, and adoption of, these alternative energy sources has in part been because of changes to environmental and energy policies globally, as well as the private sector anticipating the transition to a lower carbon economy.

There have been some more pronounced trends for individual countries (Graph 5). Coal's share of electricity generation has declined more in advanced economies and China. This has been supported by government policies that have encouraged a shift away from coal, as well as an increase in gas-powered generation in the United States. Meanwhile, in India and other Asian countries, coal's share of electricity generation has increased alongside rising energy demand in these countries.

Steel production and metallurgical coal

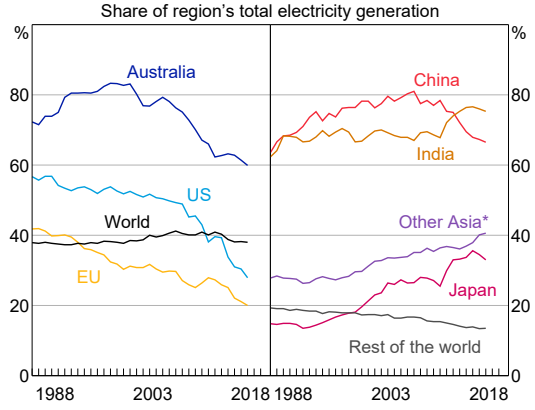
Demand for metallurgical coal has also increased strongly since the early 2000s, driven by the rapid increase in steel production in China, which became the world's largest steel producer in the early 2000s (Graph 6). China's demand for steel increased as rapid industrialisation and urbanisation drove high levels of investment in infrastructure and construction. Steel demand was also supported by rapid growth in Chinese manufacturing exports. Indian demand for metallurgical coal has also increased strongly since the mid 2000s alongside rapid growth in its domestic steel industry; because India has limited domestic reserves of metallurgical coal, demand has been met by imports.

Chinese steel production is more coal intensive than production in other economies, because it mostly uses blast furnace technology which

Graph 5

Coal-fired Electricity Generation

Share of region's total electricity generation

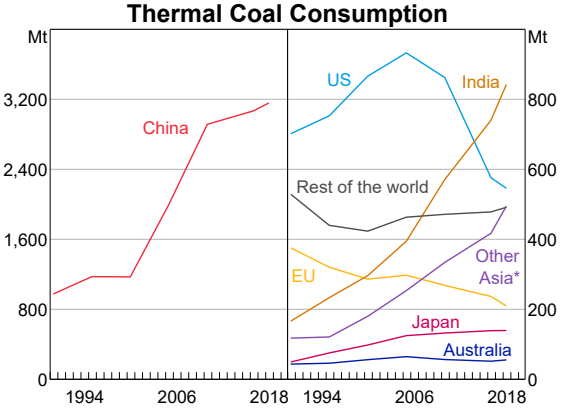


* Asia excluding China and India

Sources: BP (2019a); RBA

Graph 4

Thermal Coal Consumption

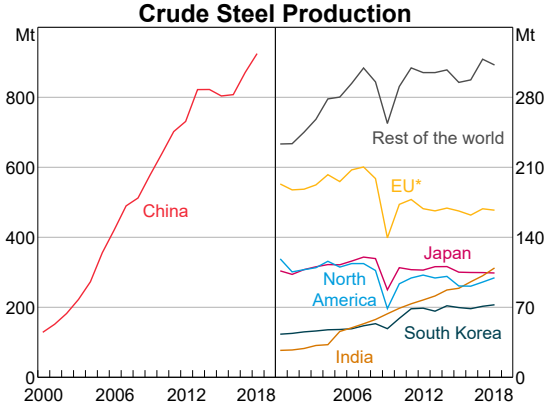


* Asia excluding China and India

Sources: IEA (2019); RBA

Graph 6

Crude Steel Production



* 2018 is an estimate

Sources: RBA; World Steel Association (worldsteel)

consumes metallurgical coal and iron ore as raw inputs. The main alternative mode of steel production – electric arc furnaces – allows steelmakers to melt down and reuse scrap steel, and hence does not directly rely on metallurgical coal as a raw input (although thermal coal may be used to generate the electricity). However, scrap utilisation rates are still relatively low in China because steel collection and recycling infrastructure remains undeveloped. Reflecting this, around 90 per cent of steel in China is manufactured using blast furnaces, compared to around 55 per cent in the rest of the world (Graph 7).

Global Coal Supply and Australia's Exports

Reflecting the large structural increases in global coal demand, global coal production has increased significantly over recent decades. Global production has averaged around 8,000 Mt a year since 2010, nearly double the amount produced in the early 1990s. China is by far the largest producer of coal, accounting for nearly half of annual global production, and driving most of the growth in production in recent decades (Graph 8).

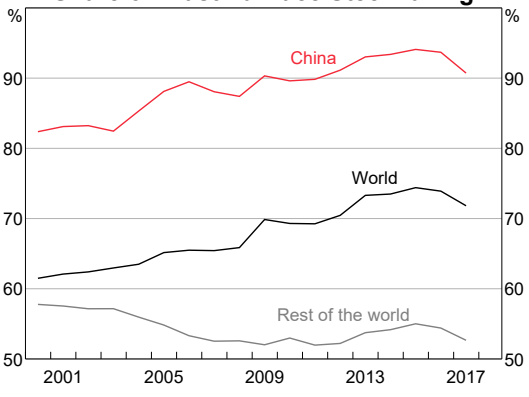
Other major producers include the United States and Europe. However, production in these economies has declined since the 2000s, as steel production has declined and other forms of electricity generation have displaced coal-powered generation. Other major producers that have grown over time include Indonesia, India, Russia and South Africa, as well as Australia. In most of these economies, apart from China and India, domestic consumption of coal is small relative to production, making them important players in the export market.

The two largest exporters of coal are Australia and Indonesia, each accounting for close to 30 per cent of total coal export volumes in 2018 (Graph 9). Australia exports slightly more thermal coal than metallurgical coal. But because the market for international trade in coal, known as the seaborne market, is smaller for metallurgical coal, Australian exports account for around half of this market, compared with around 20 per cent of global thermal coal exports.

Competition has increased in the seaborne market for both thermal and metallurgical coal, as lower-cost supply has entered the market and production

Graph 7

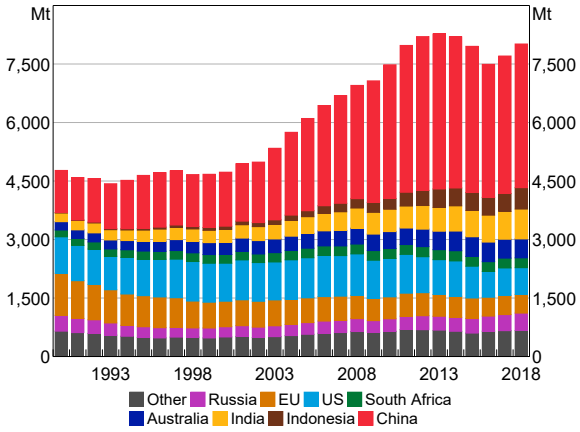
Share of Blast Furnace Steelmaking



Sources: RBA; World Steel Association (worldsteel)

Graph 8

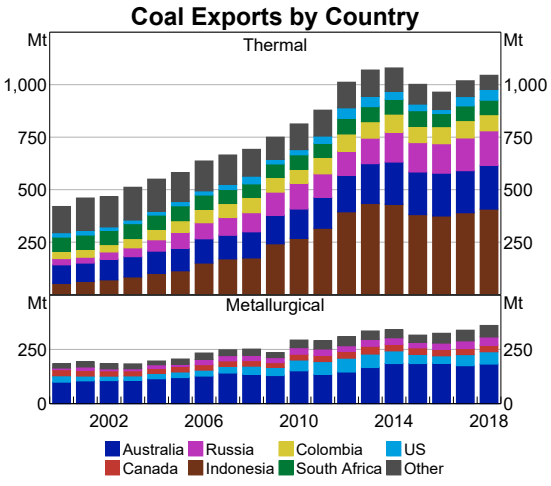
Global Coal Production



Sources: BP (2019a); RBA

Graph 9

Coal Exports by Country



Sources: AME; RBA

costs at existing mines have declined. Reflecting this, global production cost curves have moved outwards and become flatter over the past decade (Graph 10). At present, spot and contract prices exceed average variable production costs for most Australian thermal coal operations. However, Australian production costs span a fairly wide range, and some higher-cost operations may experience margin pressures if thermal coal prices were to move lower on a sustained basis. In the metallurgical coal market, in contrast, margins are currently strong, with average variable production costs for most Australian and other global operations below prevailing spot and contract prices.

Australia's coal export destinations have evolved over the past decade as market demand has shifted. Japan remains Australia's largest destination for thermal coal exports, accounting for around 40 per cent in 2018, although its share has declined from around half of thermal coal exports a decade ago (Graph 11). Thermal coal exports to China have increased rapidly over the past decade, from less than 2 per cent of Australian thermal coal exports in 2008, to around one-quarter currently.[4] In recent years exports to economies in South-East Asia have been growing strongly, albeit from fairly low levels, reflecting the increase in thermal coal electricity generation in these countries.

Australia's major markets for metallurgical coal are India, China and Japan, which collectively account for around two-thirds of exports. Metallurgical coal exports to China and India have increased strongly over the past decade, in line with their expanding steel sectors, while the relative importance of Japan and Europe as export destinations has declined.

The Changing Global Landscape and Recent Coal Price Movements

The changing landscape for coal production and demand has driven some large movements in prices over recent years. Both thermal and metallurgical coal prices increased strongly over most of the 2000s as the increase in global demand outpaced additional supply coming on line. But by 2012, production capacity had increased globally, and a larger amount of coal was available through export markets – particularly from Australia, Indonesia and Russia. Prices subsequently declined, and reached a trough in early 2016 (Graph 12).

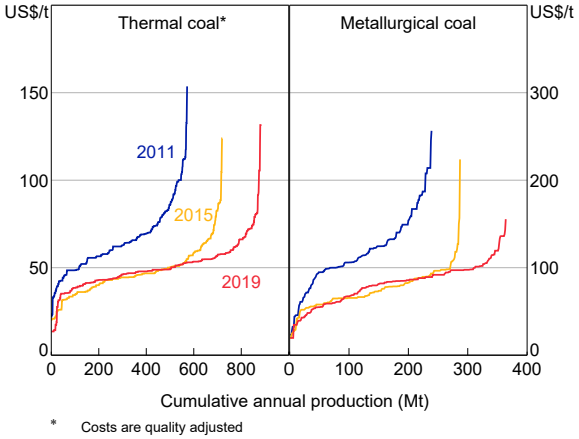
Prices for both thermal and metallurgical coal have increased since then, reflecting a range of factors including:

- changes in Chinese Government policies that have influenced global supply and demand dynamics
- limited supply growth in the seaborne market
- supply disruptions
- some changes in demand for coal with different quality characteristics.

Graph 10

Seaborne Coal Production Costs

Free on board basis

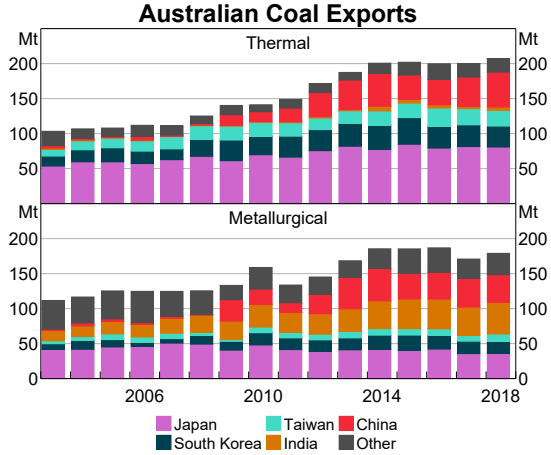


* Costs are quality adjusted

Sources: AME Group; RBA

Graph 11

Australian Coal Exports



Sources: ABS; RBA

Tightening of global supply–demand balance

One of the main drivers of stronger prices for seaborne coal since early 2016 was the rationalisation of domestic coal production in China around that time. Measures were implemented to reduce outdated capacity and to improve profitability in China's domestic coal industry, and working days in Chinese coal mines were reduced from 330 to 276 days per year (although this policy was reversed in late 2016).[5] The reduction in Chinese coal production occurred alongside a recovery in Chinese coal demand for use in both steel production and electricity generation. As a result, there was increased demand for seaborne coal, which had a large impact on coal prices (Graph 13). Thermal coal prices more than doubled from the start of 2016 to their peak in late 2016, while coking coal prices quadrupled over the same period (some supply disruptions also contributed to higher prices over this period).

Metallurgical coal prices have also been supported by continued growth in steel production in China and, to a lesser extent, India. Over the past few years, expansionary fiscal policies and accommodative financial conditions in China have supported property construction and infrastructure investment, which have boosted demand for steel production. Increased uncertainty over 2019 regarding the outlook for the Chinese economy has weighed on metallurgical coal prices in recent months, but prices are still well above the early 2016 trough. Indian steel production has also grown strongly, at an average annual rate of around 6 per cent over the past few years, although this is from a low base.

The increase in coal prices from their 2016 trough was also supported by fairly limited increases in supply, including from Australia. The earlier large declines in coal prices over 2011 to 2015 resulted in some global producers scaling back production to reduce costs, while some higher-cost mines were closed. Consequently, when demand picked up in 2016 and prices rebounded from their trough, there was reduced capacity for supply to respond.

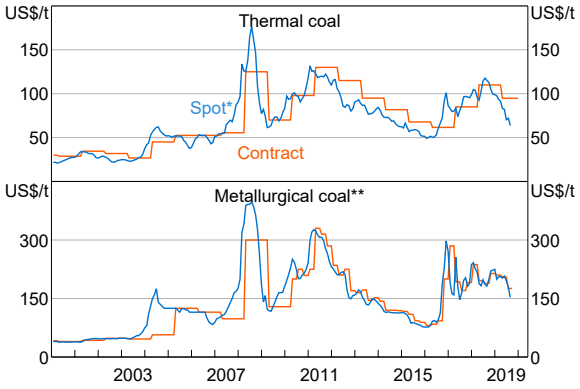
Supply disruptions

There have been a number of temporary disruptions to seaborne supply of coal over the past few years, particularly for metallurgical coal. Because Australia accounts for over half of the metallurgical coal seaborne market, and production is concentrated in the Bowen Basin region in Queensland, any disruptions to Australian coal supply tend to have a large impact on the seaborne market for metallurgical coal. In April 2017, Australian metallurgical coal exports declined by around 50 per cent, after Tropical Cyclone Debbie damaged key rail infrastructure servicing the Bowen Basin region (Graph 14). The reduction in Australian exports had a significant impact on global supply and prices rose sharply as a result. Prices continued to be supported over the rest of 2017 by ongoing operational issues and port delays in Australia which reduced metallurgical coal exports.

Graph 12

Australian Coal Prices

Free on board basis



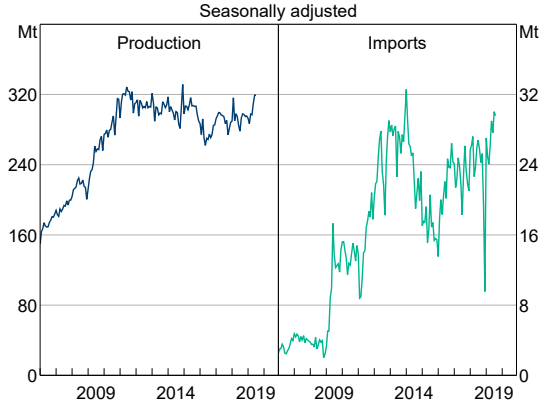
* Monthly average
** Price index is Premium Hard Coking Coal

Sources: DOIIS; IHS Markit; RBA

Graph 13

Chinese Coal Production and Imports

Seasonally adjusted



Sources: CEIC Data; RBA; WIND Information

There have also been temporary disruptions to supply from key thermal coal exporting countries. However, because the seaborne thermal coal market is larger and less geographically concentrated, any disruptions in one exporting country tend to have a smaller impact on global supply and prices.

Changing demand for different coal qualities

Demand for higher-quality metallurgical coal has increased following reforms in China's steel industry, including the closure of inefficient steel mills (that typically used lower-quality inputs) and stricter environmental standards. Improved steel margins have also supported demand for higher-quality inputs in recent years, which has contributed to a price premium for higher-grade coking coal (Graph 15).

In the case of thermal coal, the price premium for higher-quality coal widened over recent years, in part because of more countries pursuing more stringent environmental targets (DOIIS 2018). This contributed to the premium for Newcastle high-quality coal (6,000 kcal/kg) over lower-grade Newcastle coal (5,500 kcal/kg) widening to over US$50/t in mid 2018, compared with its long-run average of around US$17/t. Meanwhile, there had also been fairly limited growth in global supply of higher-quality coal, whereas supply of lower-quality coal had been increasing at a faster pace (IEA 2018a). Over the past year, however, the premium for higher-quality thermal coal has decreased. In part this is because some countries have substituted towards cheaper natural gas and because of an increase in renewable generation. Looking ahead, rising demand from South-East Asia is likely to be concentrated in mid-quality thermal coal.

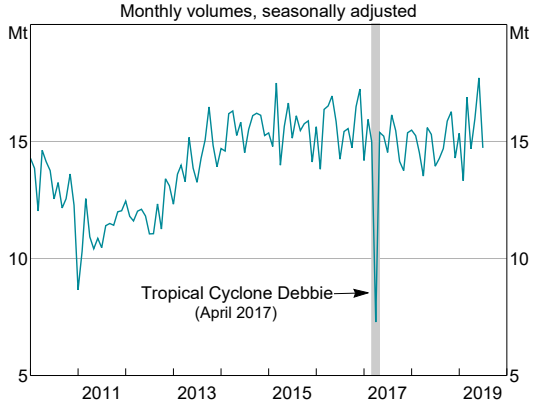
Information from the Bank's liaison program suggests that the changing outlook for prices for metallurgical and thermal coal has been a factor weighing on producers' investment decisions to expand capacity. There is a considerable lag between the decision to undertake new investment and the start of production, so investment decisions are based on long-run price expectations (which have been lower than prices observed over recent years).

A number of other factors have been cited by coal producers as weighing on coal investment. Coal producers have become more targeted with their investment decisions in recent years, due to their experience during declines in coal prices prior to 2016. The few large projects that are likely to go ahead have high-quality coal and low expected production costs. Other factors cited as weighing on investment decisions include lengthy planning and approval processes for coal projects. Funding availability has also been noted as a constraint on investment, as banks are increasingly reluctant to finance coal developments; most new finance is being secured from consortiums of lenders, which can be more complicated to arrange.

Graph 14

Australian Metallurgical Coal Exports

Monthly volumes, seasonally adjusted

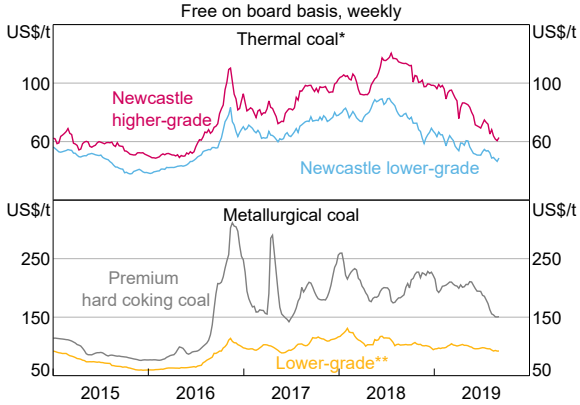


Sources: ABS; RBA

Graph 15

Australian Coal Prices

Free on board basis, weekly



* Newcastle premium energy content is 6,000 kcal/kg; Newcastle lower-grade energy content is 5,500 kcal/kg

** Australian low volatile pulverised coal injection

Sources: IHS Markit; RBA

More broadly, as discussed below, growing competition from alternative sources of energy generation, including natural gas and renewables, as well as policy measures to support less carbon-intensive energy generation, has added considerable uncertainty to investment decisions for thermal coal.

The Outlook for Global Coal Demand and Supply

To assess the outlook for coal, we consider the medium- to long-term forces shaping demand and supply for both thermal and metallurgical coal. The outlook for thermal coal demand will largely depend on how energy generation evolves and, in particular, how fast renewable and alternative electricity generation displaces coal-powered generation. Meanwhile, global metallurgical coal demand will largely be driven by global growth in steel production and changes in steelmaking technologies.

In the long run, there is considerable uncertainty around the outlook for coal consumption. Demand will depend on many factors that are difficult to forecast, including the pace of economic growth in developing economies, changes in the cost and capabilities of different technologies (particularly for renewable energy and steel production), and changes to government policies.

Changes in electricity generation

In the near term, demand for thermal coal is expected to remain supported by increases in coal-powered electricity generation in India and South-East Asia as well as continued growth in these economies. The longer-run outlook will strongly depend on the speed of transition to less carbon-intensive electricity generation relative to the pace at which aggregate electricity demand grows.

Over the next five years or so, some continued increase in coal demand, particularly from India and economies in South-East Asia, may partly offset a more general decline in demand as global electricity generation transitions away from coal to other energy sources. Over the longer term, however, the balance of risks for demand appear to be to the downside, as the transition from coal to other energy sources in advanced economies continues – including in Europe, the United States, South Korea and Japan. Over the next 20 years, the increase in global energy demand is expected to be largely met by renewable energy sources, and by 2040 renewables are expected to account for a larger share of electricity generation than coal (BP 2019b). The increasing uptake of renewables is expected to be supported by changes in technologies that make renewable electricity generation more viable, such as battery storage and upgraded electricity grid networks. Policies in many regions are also likely to be directed at reducing the carbon intensity of electricity generation, including through an increase in the share of renewables generation.[6]

The International Energy Agency's (IEA) *World Energy Outlook 2018* report presents long-term projections of thermal coal demand under different electricity generation scenarios (Graph 16). Under the IEA's scenario framed around government policies currently in place ('current policies'), global thermal coal demand is expected to increase moderately over the next 20 years, but still comprise a declining share of global electricity generation. An alternative IEA scenario ('new policies'), where a range of policies currently under consideration are implemented (which the IEA suggests moves countries towards meeting their Paris Agreement obligations), would see coal-powered generation broadly unchanged over coming decades.[7]

To date, the decline in renewable energy costs has been faster than expected. Should this trend continue, the substitution away from thermal coal and towards renewable energy sources would also be faster. In addition, if countries increase their commitments to reducing emissions, there would be an even faster transition. In the IEA's 'Sustainable Development' scenario (in which countries implement policies that the IEA suggests are comparatively more aligned with the Paris Agreement), coal's share in the electricity generation mix would decline from around 40 per cent currently to around 5 per cent in 2040.[8]

Developments in steel production

Chinese annual steel production appears to be broadly around its peak and production is expected to gradually decline, although there is considerable uncertainty around the outlook. Steel demand is expected to moderate largely because population growth and the rate of urbanisation are expected to slow. This would reduce the demand for residential housing and infrastructure, such as rail, highways and public buildings.[9] The ongoing transition towards a more services-orientated economy may also weigh on China's future steel demand.

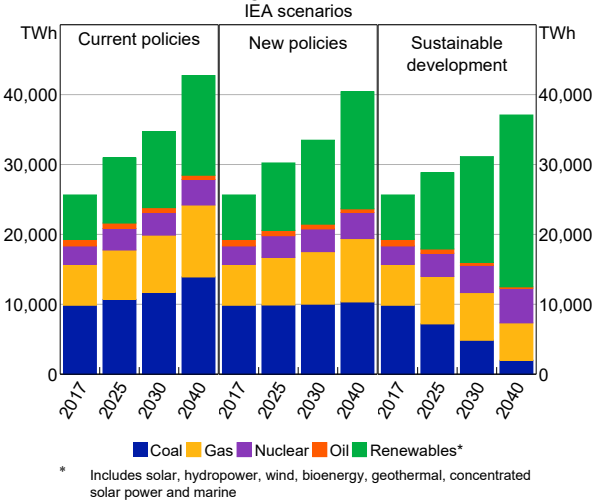
Further weighing on the outlook for Chinese metallurgical coal demand is an expected increase in the use of electric arc furnace technology. As more infrastructure assets, machinery and vehicles enter the replacement phase of their cycle, and scrap metal collection and recycling mechanisms become more widespread, scrap availability is expected to increase.[10] The Chinese Government has a target of increasing the share of scrap steel used in steel production to 30 per cent by 2025 (RBA 2017). Nonetheless, there is considerable uncertainty around how fast and how much Chinese steel production might shift towards more electric arc furnace technology.

In contrast to an expected moderation in Chinese steel production, Indian steel production has been growing strongly, and this is expected to continue over the next decade. Growth in Indian steel production is supported by an ambitious government target to triple output capacity to around 300 million tonnes by 2030, as well as plans to expand its manufacturing sector (DOIIS 2019b). The increase in India's steelmaking capacity will be primarily driven by an increase in blast furnace capacity. Rising demand for metallurgical coal will continue to be met by imports because of limited domestic availability, and India is forecast to become the world's largest importer of metallurgical coal by 2020 (DOIIS 2019a). In addition, growing steel production capacity in Vietnam, Malaysia and Indonesia is also expected to support demand for seaborne metallurgical coal.

Graph 16

Electricity Generation Mix

IEA scenarios



* Includes solar, hydropower, wind, bioenergy, geothermal, concentrated solar power and marine

Sources: IEA (2018b); RBA

Global supply[11]

Global supply of thermal coal is not expected to increase significantly in the next few years. Although there may be some scope for incremental increases in production at existing operations, there is relatively little additional capacity likely to be added to the seaborne market, given current indications of global investment plans and the long lead times for expanding capacity. In the absence of much additional global supply, it is possible that there may be episodes of tightness in the global supply–demand balance, which could support prices. This would particularly be the case if some exporting countries, such as Indonesia, were to direct more supply to their domestic market, or if global demand was stronger than expected for a period.

In contrast, the global metallurgical coal seaborne market is expected to expand over the medium term, as Australia and some other major exporting countries are expected to increase production, partly in response to recently higher prices as well as a more positive medium-term outlook for demand (DOIIS 2019b).

The Outlook for Australian Coal Exports

Over the next few years, Australian coal production and exports are expected to grow fairly slowly, driven by productivity improvements, the restart of some existing mines and completion of investment projects. However, mining companies generally maintain a cautious approach to any expansionary

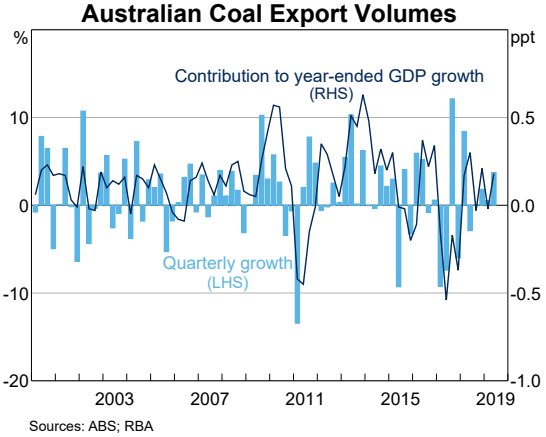
investment. In part, this is related to longer and more challenging approval processes and tighter financing conditions. The uncertain outlook for longer-term demand is also a key challenge for investment decisions. Low exploration expenditure is likely to limit future supply growth, particularly for thermal coal, despite a long pipeline of potential projects in Australia (DOIIS 2019b). The Bank's outlook therefore assumes there will be only moderate growth in coal export volumes and investment over coming years, particularly compared to the growth rates seen over the past 15 years.

Within this central outlook, it is possible that forecasts will need to be adjusted if there are any temporary supply or demand shocks. These can have large short-run volume and price effects, which, in turn, can materially affect economic aggregates. The effect of Tropical Cyclone Debbie in 2017, discussed above, is an example of this. The sharp decline in coal export volumes in April caused by this event subtracted around ½ a percentage point from GDP growth in the year to June quarter 2017 (Graph 17). As coal production and exports resumed over the latter half of 2017, there was then a period in which coal exports were making a relatively large positive contribution to GDP growth. Similarly, weather-related disruptions caused large declines in coal exports in early 2011 and mid 2015.

Beyond the next few years, the outlook for coal prices and demand is increasingly uncertain, particularly for thermal coal. The global seaborne market for thermal coal has grown significantly over the past 15 years, and Australian thermal coal exports are competing with plentiful supply from a number of other large low-cost producers. Many of Australia's key thermal coal export destinations, including China, Japan and South Korea, are transitioning away from coal-powered electricity generation. A continuation of this trend would be likely to weigh on coal export volumes and prices. On the other hand, demand is expected to grow in other economies in the Asian region, at least for a period. In particular, India and South-East Asia are likely to become increasingly important destinations for Australian coal exports over the next few decades as demand for energy grows and new coal-powered projects are added in these economies. It is difficult to forecast whether continued growth in exports to these markets might for a period outpace the global transition to less carbon-intensive electricity generation.

Graph 17

Australian Coal Export Volumes



Sources: ABS; RBA

For metallurgical coal exports, the moderation in Chinese steel production, as well as a rising share of scrap in production, may weigh on demand over the next few years. More generally, Chinese policies could have a large impact on Australian coal demand, given that China accounts for close to a quarter of Australian metallurgical coal exports. These policies might include fiscal stimulus aimed at boosting infrastructure spending, environmental measures or changes to coal import policies. However, even if Chinese demand were to slow, this is likely to be somewhat offset by stronger demand from other destinations. India, which is already Australia's largest destination for metallurgical coal exports, should remain a key source of demand given expected growth in its steel sector. Reflecting this, Australian metallurgical coal exports are likely to remain a large part of the global seaborne market.

Overall, Australia is expected to remain a key global supplier of coal exports over coming years. This outlook is supported by Australia's proximity to key export markets, as well as the relatively more favourable characteristics of Australian coal.

Footnotes

[*] Michelle Cunningham, Luke Van Uffelen and Mark Chambers are from Economic Analysis Department. Trent Saunders also contributed to this work while in Economic Analysis Department.

[1] Although brown coal is used for some domestic electricity generation in Australia, brown coal is typically not exported. Globally the use of brown coal is less common due to its lower energy content and higher levels of carbon emissions.

[2] A small share of coal is also used for cement production and other industrial uses.

[3] Metallurgical coal includes both coking coal and pulverised coal injection (PCI) coal.

[4] Around 44 per cent of Chinese metallurgical coal imports in 2018 were sourced from Australia, compared with 24 per cent for thermal coal (DOIIS 2019a).

[5] For more information on these policies, see Boulter (2018).

[6] For example, the shift towards renewable energy sources in Europe will be supported by policies to end coal-based generation by 2030 (or earlier) in a number of countries, including Denmark, France, Ireland, Italy, Netherlands, Portugal and Spain. See, also, Debelle (2019).

[7] The 'New Policies Scenario' is based on energy policies that have been announced as at August 2018, and incorporated the commitments made in the Nationally Determined Contributions under the Paris Agreement. Where commitments are aspirational, the IEA makes a judgement as to the likelihood of those commitments being met in full. Under the New Policies Scenario, the IEA forecasts that coal's share of electricity generation will fall from 37 per cent in 2017, to around 30 per cent by 2030 and 26 per cent by 2040.

[8] The IEA's 'Sustainable Development Scenario' is based on achieving the main energy-related components of the United Nations Sustainable Development Goals, agreed in 2015. See United Nations (2015) for more information.

[9] See RBA (2017) for more information on the Chinese steel market and demand for bulk commodities.

[10] Worldsteel estimates that scrap availability in China will increase by around 50 per cent by 2030 from current levels (Çiftçi, 2018), supported by policies aimed at improving scrap metal collection and recycling, as well as higher scrap prices (DOIIS 2019b).

[11] For more discussion of the near term outlook for global coal exports, see DOIIS (2019a) and DOIIS (2019b).

References

Boulter, J (2018), 'China's Supply-side Structural Reform', RBA *Bulletin*, December, viewed 10 September 2019. Available at <https://www.rba.gov.au/publications/bulletin/2018/dec/chinas-supply-side-structural-reform.html>.

BP (2019a), BP Statistical Review of World Energy, June 2019, BP plc, London.

BP (2019b), BP Energy Outlook, June 2019, BP plc, London.

Çiftçi, BB (2018), 'Blog: The future of global scrap availability', worldsteel Association.

Debelle G (2019), 'Climate Change and the Economy', Public Forum hosted by the Centre for Policy Development, Sydney, 12 March.

DOIIS (Department of Industry, Innovation and Science) (2018), Resources and Energy Quarterly, December.

DOIIS (Department of Industry, Innovation and Science) (2019a), Resources and Energy Quarterly, March.

DOIIS (Department of Industry, Innovation and Science) (2019b), Resources and Energy Quarterly, June.

IEA (International Energy Agency) (2018a), *Coal 2018 – Analysis and Forecasts to 2023,* OECD/IEA, Paris.

IEA (International Energy Agency) (2018b), *World Energy Outlook 2018*, OECD/IEA, Paris.

IEA (International Energy Agency) (2019), *Coal Information 2019*, OECD/IEA, Paris.

RBA (2017), 'Box A: The Chinese Steel Market and Demand for Bulk Commodities', *Statement on Monetary Policy,* November.

Saunders T (2015), 'Developments in Thermal Coal Markets' RBA *Bulletin*, June, pp. 19-27.

United Nations (2015), 'Sustainable Development Goals', available at <https://sustainabledevelopment.un.org/?menu=1300>