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Royalty flush

Risks to NSW coal royalties from Adani and Galilee Basin development

Development of large coal mines in Queensland's Galilee Basin will reduce thermal coal prices. This also reduces royalty revenue received by NSW. The Adani project alone is likely to reduce NSW revenue by nearly $50 million per year. The NSW government should oppose subsidies to Adani.

Discussion paper

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Summary

If Adani's Carmichael mine and other Galilee Basin projects are developed, they will expand supply on the traded thermal coal market. Adani's project alone would increase supply by 6%, GVK's mines would add a further 6% and all Galilee Basin projects could increase it by 30%.

Increases in supply push down coal prices and therefore affect the coal industry in other parts of Australia and the world. New South Wales, as another major exporter of thermal coal, is at risk of losing coal volume and coal royalties if Queensland expands supply.

Estimates of the impacts of developing the Galilee Basin can be made based on market data and published estimates of price elasticity of demand and supply. Based on these estimates:

- The Adani project alone would reduce world traded coal prices by between 1.1% and 5.5%, with central estimates around 3.8%.
- The Adani and GVK projects proceeding would reduce world traded coal prices by between 2.1% and 10.9%, with central estimates around 7.5%.
- All Galilee Basin projects proceeding would reduce world traded coal prices by between 5.3% and 27.3%, with central estimates around 18.8%.

Based on these estimates, NSW coal royalties would be reduced:

- The Adani project would reduce NSW coal royalties by between $AUD14 million and $AUD70 million per year, with central estimates around $AUD49 million.
- Adani and GVK mines would reduce NSW royalties by between $AUD27 million and $AUD140 million per year, with central estimates around $AUD96 million.
- The full development of Galilee Basin mines would reduce NSW coal royalties by between $AUD68 million and $AUD349 million per year, with central estimates around $AUD240 million.

Based on these estimates, the NSW government should strongly oppose taxpayer subsidy of Adani's infrastructure. Given the potential impacts of lower prices, it is surprising that no state or federal government body has published more detailed analysis of how Adani and Galilee Basin development would affect NSW and other parts of Australia's coal industry.

Introduction

Economic theory says that an expansion in supply should reduce prices. The development of Adani's Carmichael mine and others in the Galilee Basin would expand supply in the traded thermal coal market. Despite the attention given to the Adani mine and potential subsidy by the federal government, no analysis has been published regarding its effect on the coal price and how this lower price might affect other stakeholders such as the New South Wales coal industry and the New South Wales (NSW) Government which receives royalties from it.

NSW is a large producer of thermal coal and some low quality metallurgical coal. Most NSW coal is exported and international prices also affect the price of coal used in NSW. NSW produces around 200 million tonnes of coal per year, of which around 160 million is exported through the Port of Newcastle.[1] This production generates annual royalties of $1.1 to $1.5 billion for the state, around 2 percent of the state's revenue.

The effect of Adani's expansion of supply could be offset by an increase in demand. However, the size of the internationally traded thermal coal market is not likely to increase significantly. Australia's Department of Industry forecasts little growth in the next few years and the International Energy Agency (IEA) expects trade to be smaller in 2021 than 2014.[2] In the longer term, the IEA central scenario (New Policies) projects that the traded coal market in 2040 will be just 37 million tonnes larger than it was in 2014, an increase of less than half of one percent. Alternatively, if the world implements policies in line with the Paris Agreement (roughly equivalent to the IEA's 450 scenario), the IEA expects global coal trade to halve to around 500 Mtpa by 2040.[3]

In short, Carmichael and the Galilee Basin would be a significant expansion of supply to a market that is not getting bigger and, if we do anything about climate change, could get a lot smaller. In this paper, we assume that demand remains consistent at current levels.

[1] Department of Industry (2017) *Resource and Energy Quarterly*, https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Resources-and-energy-quarterly.aspx; Bevan (2017) *Record coal exports for Newcastle Port*, http://www.theherald.com.au/story/4409305/coal-comeback-drives-port-to-trade-record/

[2] Ibid, see page 43, and IEA (2016) *Medium Term Coal Outlook*, see Table A8, https://www.iea.org/newsroom/news/2016/december/medium-term-coal-market-report-2016.html

[3] IEA (2016) *World Energy Outlook*, see Table 5.5 and Figure 5.2, https://www.iea.org/bookshop/720-World_Energy_Outlook_2016

Applying economic theory to Adani and Galilee Basin mines

Part of the difficulty in using economic concepts in the real world is that information like the position, shape and slope of supply and demand curves are unknown and difficult to estimate. Current equilibrium quantity on the international traded coal market is around 1,000 million tonnes per year and is forecast to stay at around this level.[4] Equilibrium price has been around $AUD80 per tonne for most of 2014-16 and this is the long term forecast of Australian Treasury.[5]

The development of Adani's project alone would introduce 60 million tonnes of new supply into the world traded coal market, an expansion of 6%. If other proposals go ahead, the expansion of supply would be greater. GVK's Alpha and Kevin's Corner projects have most approvals for 30 million tonnes per year each, another 60 million tonnes per year, with Adani an expansion of 12% of market supply. All Galilee Basin proposals represent capacity of around 300 million tonnes per year, or around a 30% expansion of supply. These percentages are conservative, as the 1,000 million tonne estimate of total market quantity includes all international traded coal, rather than the Asia Pacific basin that Australian thermal coal exports focus on.

The most recent estimate of the long run price elasticity of demand of thermal coal – is a 1991 paper by the Australian Bureau of Agricultural and Resource Economics (ABARE), which made an estimates of -0.2 over the short term (1 year) and -0.3 for longer term.[6] A later modelling exercise by the Productivity Commission noted that there were "few studies" that have directly estimated the elasticity of demand for thermal coal over the short and long run and used the ABARE 1991 study to derive estimates of between -0.95 and -1.4 for the average elasticity of demand in thermal coal markets.[7]

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[4] Department of Industry (2017) *Resource and Energy Quarterly* and IEA (2016) *Medium Term Coal Outlook*, see Table A8, https://www.iea.org/newsroom/news/2016/december/medium-term-coal-market-report-2016.html

[5] Bullen, Kouparitsas & Krolikowski (2014) *Long-run forecasts of Australia's terms of trade*, www.treasury.gov.au/~/media/Treasury/Publications and Media/Publications/2014/Long run forecasts of Australias terms of trade/Documents/PDF/long_run_tot.ashx

[6] Ball and Loncar (1991) *Factors influencing the demand for Australian coal*, Australian Bureau of Agriculture and Resource Economics

[7] Productivity Commission (1998) The Australian Black Coal Industry: Inquiry Report Volume 2: Appendicies, http://www.pc.gov.au/inquiries/completed/black-coal/report/coal2.pdf , See notes on Table L5.4, page 320, and page 318. Most of the Commission's analysis is focused on the elasticity of demand for Australian exports, as opposed to market demand as a whole. As thermal coal is relatively homogenous, the price elasticity of demand for specifically Australian coal is very high, with the

Price elasticity of supply is also rarely quantified in published analysis by economists. One study from the US cites a range of estimates from 0.3 to 2.0 and concludes that the best estimate is around 0.5.[8] These estimates are broadly reflected in international market cost curves, that show the quantity of supply available to the market at different operating cost estimates.[9]

From these numbers we can estimate the impact of a change in supply. The proportional change in price from the expansion in supply is given by:

$\Delta(\varepsilon/(\varepsilon+\eta))$ where

Δ is the initial change in supply

ε is the elasticity of supply

η is the absolute value of the elasticity of demand

Applying this formula to change from the Adani project alone and central elasticity estimates gives:

$6\% \times (0.5/(0.5+0.3)) = 3.8\%$

The following tables show the same calculation for the different possible expansions of supply at the different estimated elasticities:

Commission estimating long run elasticities of between -5.9 and -94.2. The commission's modelling is based on elasticity of -20 due to model constraints. These highly elastic results reflect that Australian coal is not very different to other counties' thermal coal and is quickly substituted for them in this model.

[8] Light, Kolstad and Rutherford (1999) *Coal Markets, Carbon Leakage and the Kyoto Protocol*, http://www.colorado.edu/economics/papers/papers99/wp99-23.pdf

[9] See for example 2016 Seaborne thermal cost curve by Wood Mackenzie reproduced in Queensland Resource Council (2015) *State of the sector*, https://www.qrc.org.au/_dbase_upl/State%20of%20the%20Sector_DecQtr15.pdf

Table 1: Percentage change in coal price with Adani project

Percentage change in coal supply	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Price elasticity of supply	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	2	2	2	2
Price elasticity of demand	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4
Percentage change in coal price	4.3%	3.8%	2.1%	1.6%	3.6%	3.0%	1.4%	1.1%	5.5%	5.2%	4.1%	3.5%

Table 1 shows that based on published estimates of coal market elasticities the Adani project alone would reduce world traded coal prices by between 1.1% and 5.5%, with central estimates around 3.8%.

Table 2: Percentage change in coal price with Adani and GVK projects

Percentage change in coal supply	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Price elasticity of supply	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	2	2	2	2
Price elasticity of demand	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4
Percentage change in coal price	8.6%	7.5%	4.1%	3.2%	7.2%	6.0%	2.9%	2.1%	10.9%	10.4%	8.1%	7.1%

Table 2 shows that based on published estimates of coal market elasticities that the Adani and GVK projects proceeding would reduce world traded coal prices by between 2.1% and 10.9%, with central estimates around 7.5%.

Table 3: Percentage change in coal price with all Galilee Basin projects

Percentage change in coal supply	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Price elasticity of supply	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	2	2	2	2
Price elasticity of demand	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4	0.2	0.3	0.95	1.4
Percentage change in coal price	21.4%	18.8%	10.3%	7.9%	18.0%	15.0%	7.2%	5.3%	27.3%	26.1%	20.3%	17.6%

Table 3 shows that based on published estimates of coal market elasticities that all Galilee Basin projects proceeding would reduce world traded coal prices by between 5.3% and 27.3%, with central estimates around 18.8%.

Implications for New South Wales

A reduction in price caused by Adani's project would have an impact on the NSW coal industry and coal royalties received by the NSW government. The impact on industry is difficult to forecast – some mines would likely close, others may respond to lower prices by trying to reduce costs and increase production volumes. Assuming that production volume remains broadly as forecast by NSW Treasury, we can estimate the impact of Adani's project on NSW royalty collection, based on the price change estimates calculated above.

The table below is the royalty estimates from the last NSW budget papers:

Table 4: Coal royalties in the NSW 2016-2017 budget

Table A4.5: Royalties revenue

	2014-15 Actual	2015-16 Budget	2015-16 Revised	2016-17 Budget	2017-18 Forward Estimates	2018-19 Forward Estimates	2019-20 Forward Estimates
	$m	$m	$m	$m	$m	$m	$m
Royalties	1,254	1,431	1,161	1,257	1,339	1,407	1,475

Source: NSW Government (2016) Budget papers: Supplementary revenue and expense analysis[10]

NSW budget papers do not provide exact assumptions for prices, exchange rates, quality, volumes, etc, but by taking production quantity data and forecasts from Department of Industry, we calculate Treasury's estimated future AUD prices for NSW coal:

Table 5: Deriving NSW Treasury average AUD coal price assumptions

		2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Production	Million tonnes	199	190	200	200	200	200	200
Royalties	$AUD millions	1,254	1,161	1,257	1,339	1,407	1,475	1,475
Royalty rate	%	8%	8%	8%	8%	8%	8%	8%
Av royalty per tonne	AUD	6.3	6.1	6.3	6.7	7.0	7.4	7.4
Av price	AUD/t	78.8	76.4	78.6	83.7	87.9	92.2	92.2

[10] Note that these figures may include some other mineral royalties from the handful of gold, mineral sands and other mines that operate in NSW. The vast majority of NSW royalties come from thermal coal, however, so much so that non-coal royalties are not broken out in budget papers.

Assumptions and notes:

- 2020-21 is assumed as being the same as 2019-20, the last year of the budget papers. This is conservative as budget papers usually assume some increase in production and are usually optimistic on price.
- Assumed overall royalty rate of 8%. In NSW royalty rates vary depending on the type of mine. Open cut mines attract an 8.2% rate, while underground is 7.2% and "deep underground" is 6.2%. As the bulk of NSW production is from open cut mines, with deep underground mines producing very little, the average rate is likely to be closer to 8.2% than 7.2%.
- Note that the average price per tonne can be different to benchmark prices per tonne, reflecting that not all coal is of benchmark quality.
- Some NSW coal is semi-soft coking coal. While a slightly different product, semi-soft coal is often blended into and traded on either thermal or metallurgical coal markets, and its price is strongly linked to thermal coal prices.

Table 5 shows that NSW Treasury is basing its royalty forecasts on a price of between $AUD76 and $AUD93 per tonne out to 2020. Allowing for some inflation, this is consistent with the $AUD80 per tonne price that is near the recent equilibrium price and Commonwealth Treasury's long term forecast. Taking Treasury's forecast as a base case, where NSW produces 200 million tonnes of coal per year, which sells at an average real (inflation adjusted) price of $AUD80 per tonne, the impact of Adani and Galilee Basin development on NSW coal royalties can be estimated. Table 6 below shows these estimates for each elasticity of demand-derived price estimate discussed above:

Table 6: NSW coal royalties with only Adani development

Reduction in coal price	Equilibrium coal price (real AUD/t)	Royalty payments based on NSW 200 million tonnes production (real AUD millions)	Difference in royalty payments due to Adani development (real AUD millions)
Baseline	80	1280	NA
3.8%	$76.96	1231.36	-48.64
1.1%	$79.12	1265.92	-14.08
5.5%	$75.60	1209.6	-70.4

Table 6 shows that based on the above estimates, the development of the Adani coal project would reduce NSW coal royalties by between $AUD14 million and $AUD70 million per year, with central estimates around $AUD49 million.

Table 7: NSW coal royalties with Adani and GVK developments

Reduction in coal price	Equilibrium coal price (real AUD/t)	Royalty payments based on 200 million tonnes production (real AUD millions)	Difference in royalty payments due to Adani and GVK development (real AUD millions)
Baseline	80	1280	NA
7.5%	$74.00	1184	-96
2.1%	$78.32	1253.12	-26.88
10.9%	$71.28	1140.48	-139.52

Table 7 shows that based on the above estimates, the development of the Adani and GVK mines would reduce NSW coal royalties by between $AUD27 million and $AUD140 million per year, with central estimates around $AUD96 million.

Table 8: NSW coal royalties with all Galilee Basin development

Reduction in coal price	Equilibrium coal price (real AUD/t)	Royalty payments based on 200 million tonnes production (real AUD millions)	Difference in royalty payments with full Galilee Basin development (real AUD millions)
Baseline	80	1280	NA
18.8%	$64.96	1039.36	-240.64
5.3%	$75.76	1212.16	-67.84
27.3%	$58.16	930.56	-349.44

Table 8 shows that based on the above estimates, the full development of Galilee Basin mines would reduce NSW coal royalties by between $AUD68 million and $AUD349 million per year, with central estimates around $AUD240 million.

A key assumption in these estimates is that NSW continues to produce 200 million tonnes of coal each year, regardless of the change in price. In reality, some NSW mines will respond to lower prices by reducing production, going into ‘care and maintenance’ or closing permanently. This reduction in production would further reduce NSW coal royalty revenue.

This possibility has been emphasised by other parts of the coal industry. The head of Glencore’s coal division has said:

> Bringing on additional tonnes with the aid of taxpayer money would materially increase the risk to existing coal operations.[11]

Similarly, Ian MacFarlane, former minister and head of the Queensland Resource Council has stated:

> It's a competitive world and some of our members see [subsidised finance for Adani] as giving an advantage to one of their competitors and that's part of commerce.[12]

Many of Mr MacFarlane's members produce metallurgical coal or thermal coal of much higher grade than Adani would. NSW mines, such as Glencore's, are much closer competitors for Galilee Basin mines and should be advocating against taxpayer subsidy of their competitor. Surprisingly the NSW Minerals Council is silent on this issue.[13]

[11] Robbins (2015) *Glencore warns on taxpayer support for new coal projects*, http://www.smh.com.au/business/mining-and-resources/glencore-warns-on-taxpayer-support-for-new-coal-projects-20151007-gk3h5y.html

[12] Proybn (2017) *Bill Shorten in bind over Adani coal mine*, http://www.abc.net.au/7.30/content/2017/s4652955.htm

[13] McCarthy (2017) *Stephen Galilee's anti-coal protest comments on a Queensland mine raise questions about silence over Hunter impacts, say critics*, http://www.theherald.com.au/story/4407729/nsw-minerals-council-criticised-over-selective-mine-comments/?cs=12

Comparison with change in Chinese coal production

In March 2016, the Chinese government reduced domestic coal production by requiring Chinese mines to operate for only 276 days a year (down from 330). This reduced Chinese coal production by 10% and increased imports by 4.7% in the year to October.[14] That is the change in all Chinese coal imports, both thermal and metallurgical coal of all grades. The Australian Department of Industry calculates that Chinese thermal coal imports increased by 29% last year, which works out to an extra 35 million tonnes.[15]

This 35 million tonne increase in Chinese imports represented a 3.5% increase in demand. This was the main reason for a subsequent increase in the seaborne traded thermal coal price, as the Department of Industry noted:

> Increases in thermal coal prices can largely be attributed to increased Chinese demand for imports, driven by the government-mandated closure of coal mine capacity and a spike in electricity demand over China's hot summer.[16]

Of course there are other factors, – the Chinese summer, bad weather in Indonesia – but increased Chinese imports was the main one.

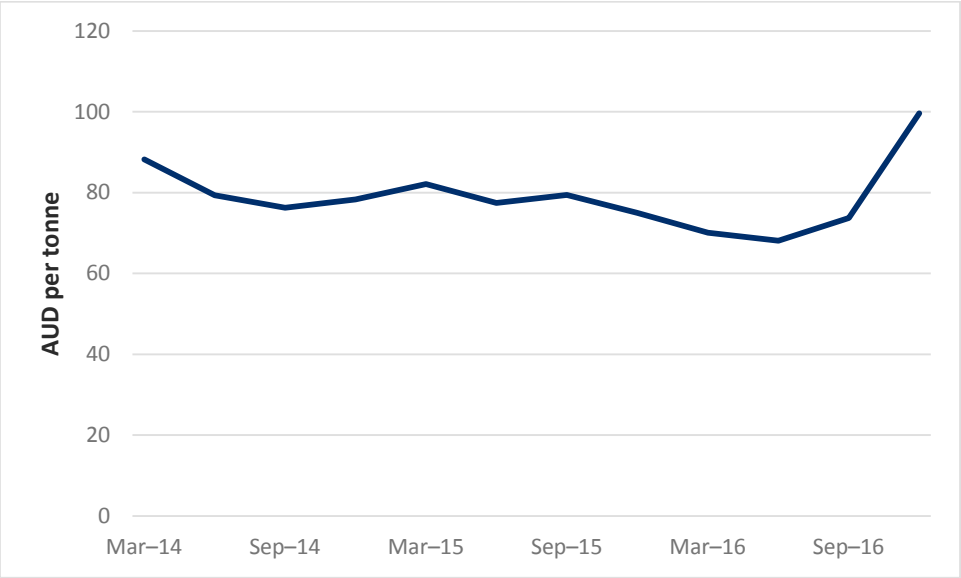
The increase was substantial. According to the Department of Industry, Australian thermal coal export prices increased from around $68-70AUD/t in March-June to $100/t in December, as shown in Figure 1 below:

[14] Duck (2017) *The Chinese coal industry: How to solve the problem of oversupply,* https://www.crugroup.com/knowledge-and-insights/insights/the-chinese-coal-industry-how-to-solve-the-problem-of-oversupply/

[15] Department of Industry (2016) *Resource and Energy Quarterly December 2016*, p 43, https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Resources-and-energy-quarterly.aspx. Calculation based on 121 million tonnes of imports in 2015, IEA (2016) *Medium Term Coal outlook*, Table A9.

[16] Department of Industry (2016) *Resource and Energy Quarterly December 2016*, p 45, https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/req/REQ-September-2016.pdf

Figure 1: Benchmark Australia thermal coal export price



Source: Department of Industry (2017) *Resource and Energy Quarterly*, Historic Data Mar 2017, Table 24(2)

The key point to note from Figure 1 is that a 35 million tonne increase in Chinese thermal import demand for the year to October led to a AUD$32/tonne increase in price for Australian thermal coal exports, a change of 46%. These higher prices have persisted into March 2017, with benchmark thermal coal price at $AUD114/t at time of writing.[17] This suggests that in the short term at least the above estimates on the potential impacts of Adani and other Galilee Basin projects are conservative.

[17] Index Mundi (2017) *Coal, Australian thermal coal monthly price*, http://www.indexmundi.com/commodities/?commodity=coal-australian&months=60

Conclusion

Prices and volumes in world coal markets will change for many reasons. International producers could withdraw from the market, pushing prices up. Carbon prices could be adopted widely, reducing demand for coal and pushing prices down. The outlook for thermal coal is very uncertain.

What is certain is that putting new supply into the traded thermal coal market will reduce prices. Using taxpayer loans to reduce prices and subsidise the development of the Galilee Basin is not in the interests of NSW. In many ways this also works against the interests of the wider Australian and global populations given the implications for climate change.

The Galilee Basin represents a threat to NSW coal royalties, potentially costing the state hundreds of millions per year through reduced royalty revenue. These risks should be fully and transparently assessed by NSW Treasury and Department of Industry to enable NSW representatives to protect the interests of their state.