The transition of Australia’s thermal coal industry – scenario analysis

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Research question

• What does the global and national transition to a low-carbon environment mean for Australia’s thermal coal industry and those regional economies where it is located.

• There is a sector-specific dimension, a short-run dimension and a long-run dimension to this issue.
  – The long-run dimension is what will be explored here through the use of CGE modelling.
  – The short-run dimension will be explored in subsequent work drawing on VAR modelling.
  – The sector-specific aspect will be analysed using a partial equilibrium model that has significant detail on Australia’s thermal coal industry and how it links into global markets.
Issue

• The world is moving away from the production of electricity using fossil fuels including thermal coal.
  – The latest IEA 2°C scenario has coal trade down 38% from its 2014 level by 2030.

• Thermal coal is a major export for Australia and still a major input to our electricity generation.
  – In 2018 it was our second largest source of export revenue.

• Thermal coal mining is concentrated in a few key areas of Australia and employs a specific set of workers.
Context

• How resource-dependant economies react to demand shocks (Corden and Neary 1982).
• Australia’s economic transition to low carbon environment (Adams, Parmenter & Verikios 2016).
• Impact of carbon tax on black/brown thermal coal miners (Waschik 2015).
• There is no specific literature on the potential reaction of those areas in Australia which are dependent on coal mining to a change in demand consistent with a global move toward decarbonisation.
CGE analysis

• CGE analysis is good for showing the possible long-run evolution of these economies to slowly declining demand.

• The Deloitte Access Economics General Equilibrium Model (DAE-RGEM) is the model I am using.
DAE-RGEM

• DAE-RGEM = GTAP Dynamic + TERM
• DAE-RGEM = a multi-region, multi-industry, recursive dynamic CGE model.
• DAE-RGEM assumes:
  – Market clearing conditions, zero pure profits, a global and regional numeraire, a representative household, representative firms, sluggish mobility in factor markets, dynamic labour and capital market closures, a stylised government sector.
Data

- Global and national data, including economic flows, base-year CO2 and non-CO2 emissions and power generation shares, comes from GTAP.
- National level data is then split down to a state and sub-state level based on census employment, income and value-add shares.
- The ‘coal mining’ sector is then split into metallurgical coal and thermal coal mining.
Data

Global production

Australian Exports
Data

Thermal coal

Met coal
Data

Hunter

GRP = $25b  
Pop = 500K  
Coal = 18%  
Manuf = 17%

Bowen

GRP = $35b  
Pop = 570K  
Coal = 22%  
Manuf = 8%
Baseline

The baseline simulation assumes the following:

- IMF/World Bank projected growth rates for GDP, population and labour force.
- WEO projected rates of energy efficiency improvement.
- Learning rates for solar and wind from CSIRO.
- Australia’s emissions track the Department’s projections.
Policy

The policy simulation assumes the following:

- Australia hits the 28% end of its Paris target.
- Global emissions follow the same trajectory to 2030.
- In both cases, the reductions are met via an emissions constraint and shadow price on carbon which allows the economy to pick the most efficient reductions.
- From 2030 onwards, Australia and global emissions are reduced toward net-zero by 2050.
Results

Chart 1 - Deviations in global thermal coal production
Results

Chart 2 - Deviations in Australian exports of thermal coal
Results

Chart 3 - Deviations in Australian thermal coal production
Results

Chart 4 - Deviations in Australian metallurgical coal production
Results

Chart 5 - Macroeconomic impacts in the Bowen basin
Results

Chart 6 - Macroeconomic impacts in the Hunter basin
Results

Chart 7 - Macroeconomic impacts in the Australia
Next steps

This work can be refined and expanded:

- Migration and fly-in/fly-out workers.
- Baseline calibration (i.e. industry growth forecasts).
- Policy recommendations (i.e. industry policy).
- Technology assumptions/sensitivity (i.e. CCS).

2017
Begun PhD coursework

TPR/first paper (draft)
Early 2020

Late 2020
Second paper (VAR)

Third paper (PE model)
2021
Submit

2022
References


