

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

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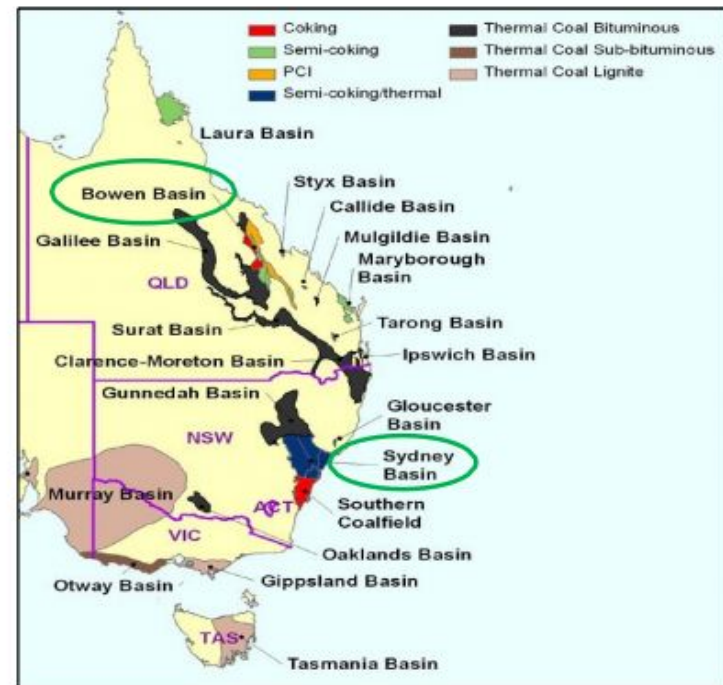
Research question

- 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.

95% of Australia's coal exports are from the Sydney & Bowen basins



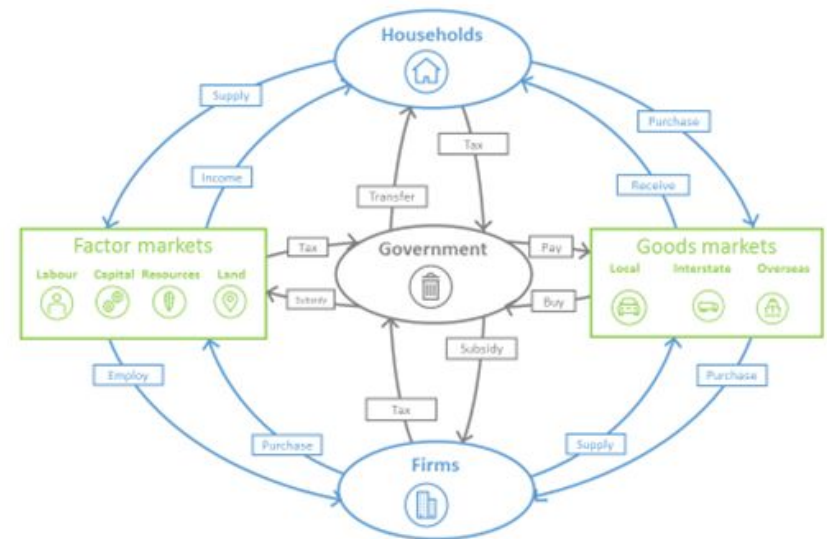
Context

- 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

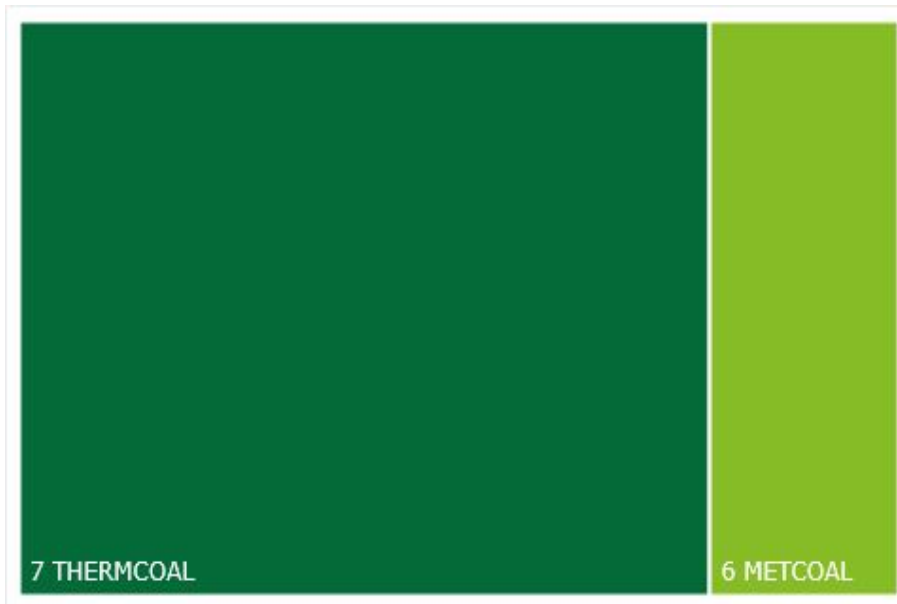
- DAE-RGEM = GTAP Dynamic + TERM
- DAE-RGEM = a multi-region, multi-industry, recursive dynamic CGE model.
- DAE-RGEM assumes:
 - Market clearing conditions, zero pure profits, a global and regional numeraire, a representative household, representative firms, sluggish mobility in factor markets, dynamic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

Data

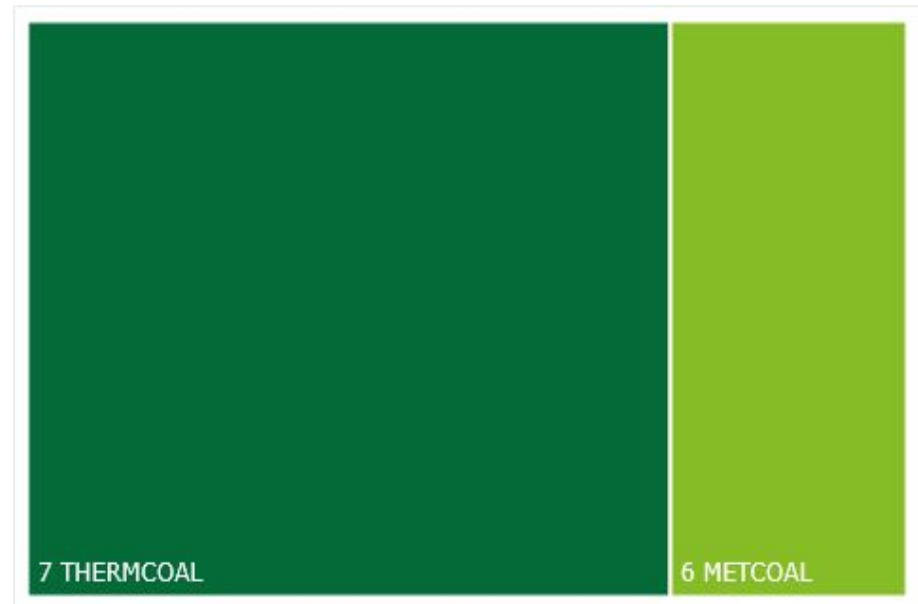
- Global and national data, including economic flows, base-year CO₂ and non-CO₂ emissions and power generation shares, comes from GTAP.
- National level data is then split down to a state and sub-state level based on census employment, income and value-add shares.
- The 'coal mining' sector is then split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

Data

Global production



Australian Exports

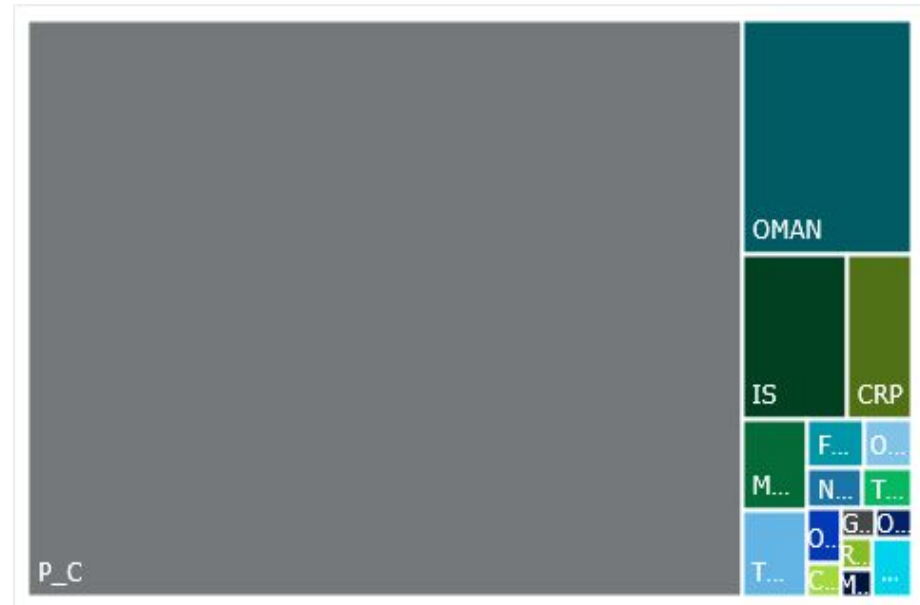


Data

Thermal coal

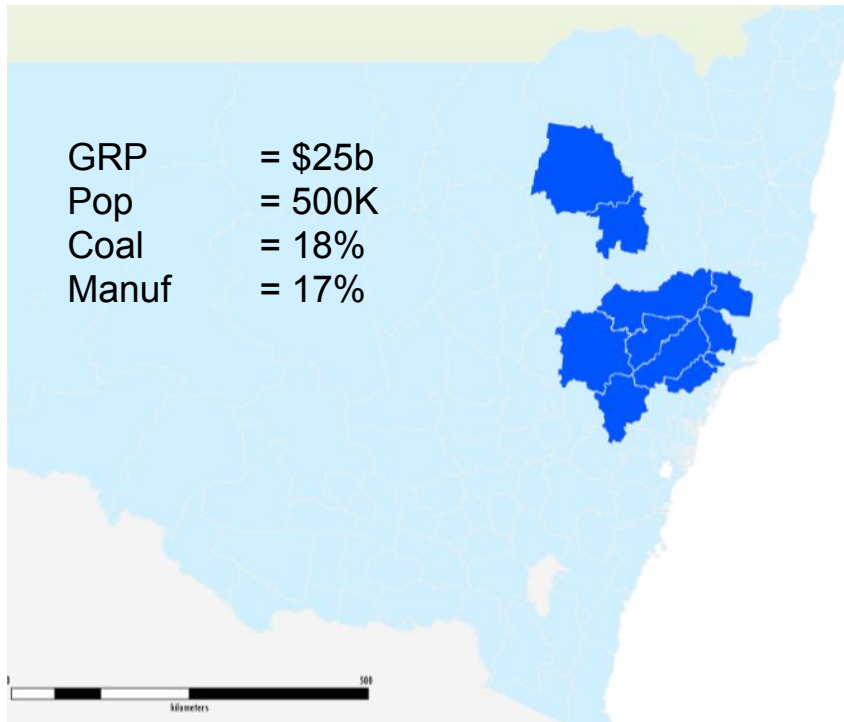


Met coal

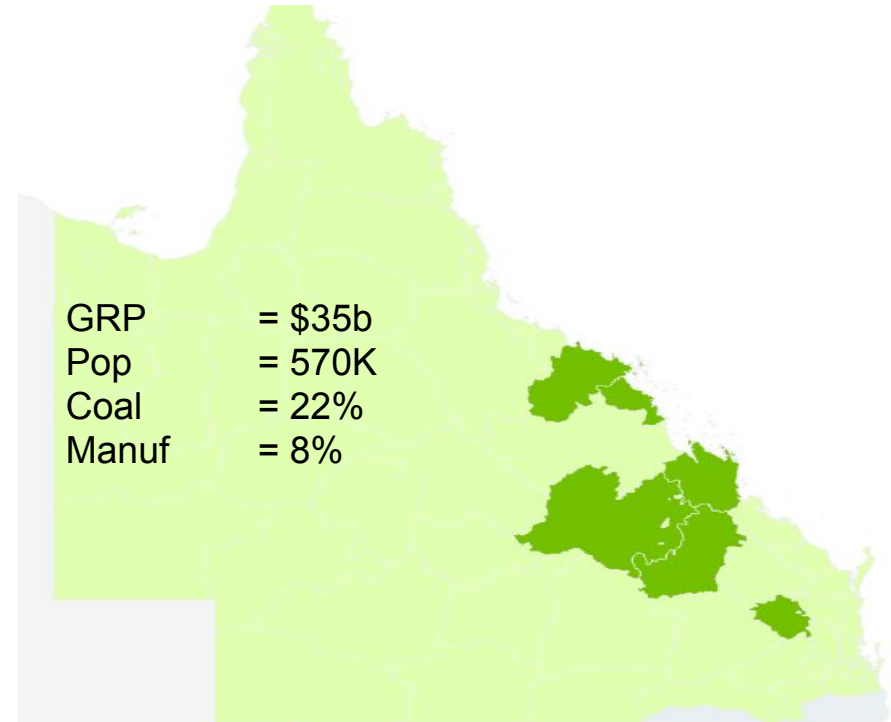


Data

Hunter



Bowen



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.

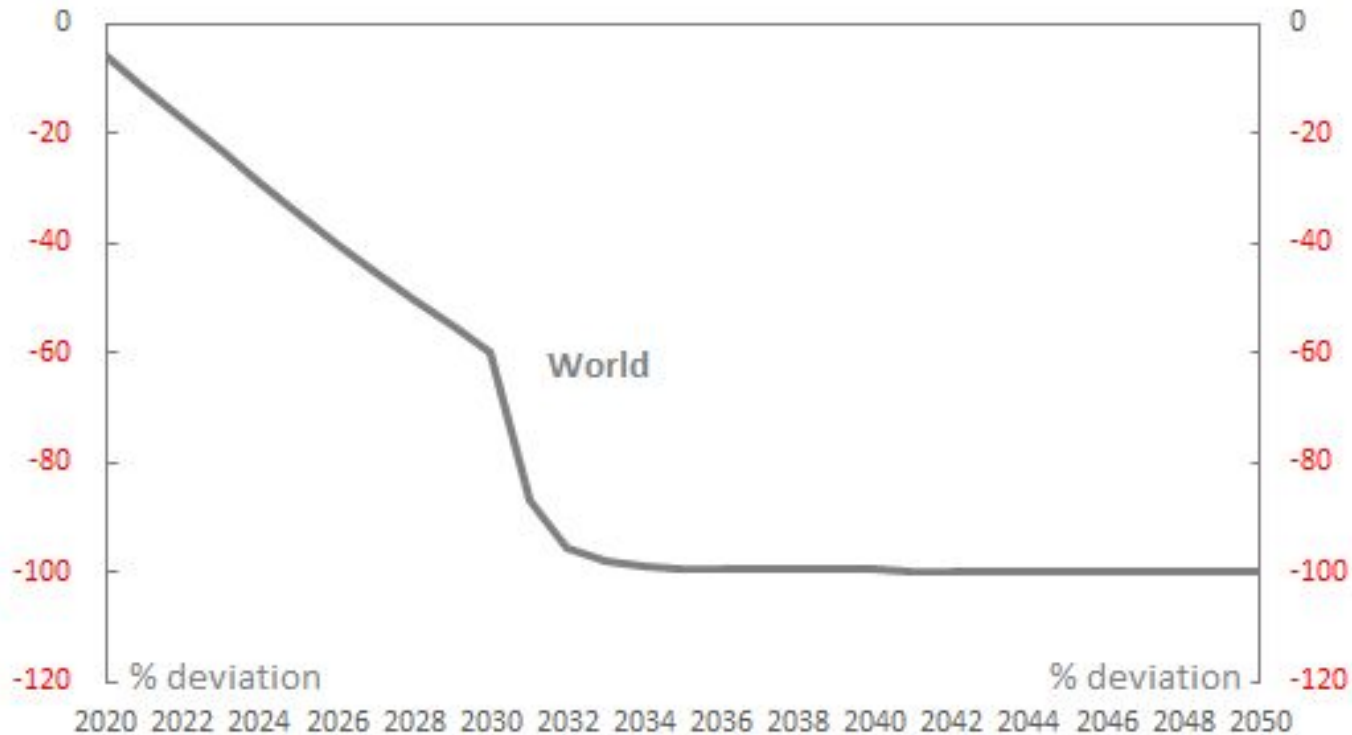
Policy

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.

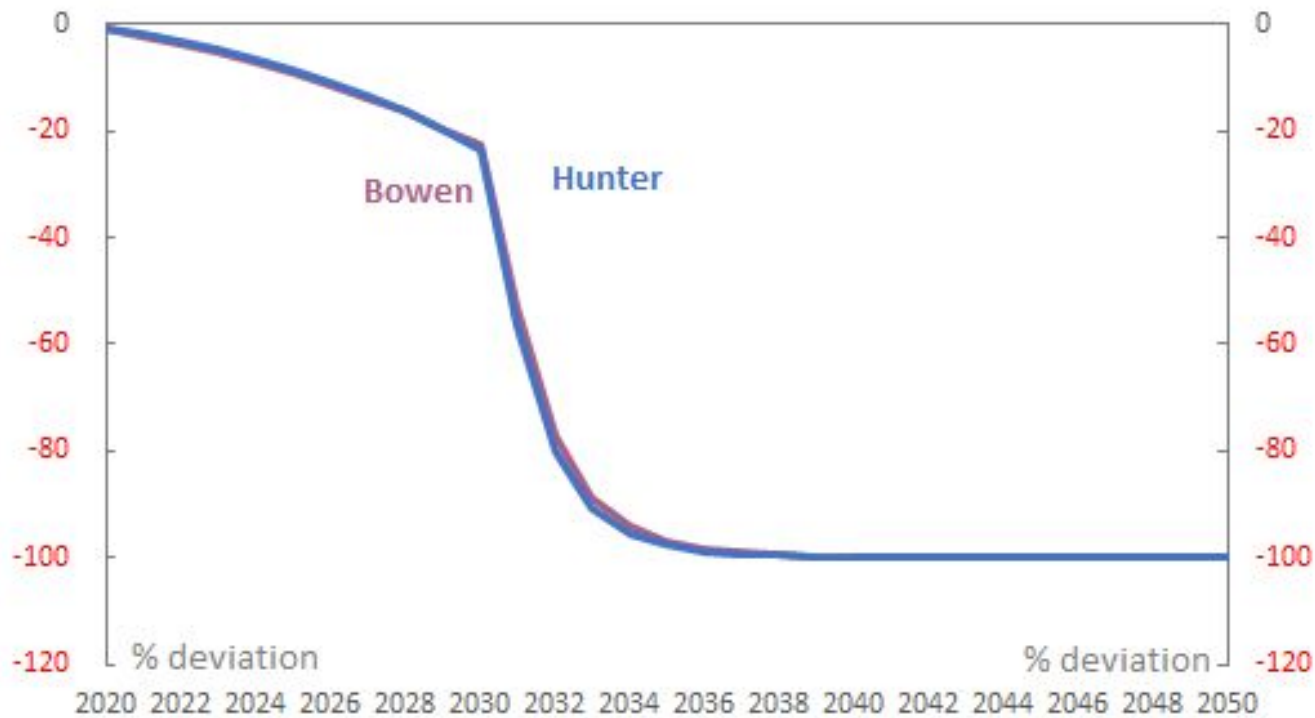
Results

Chart 1 - Deviations in global thermal coal production



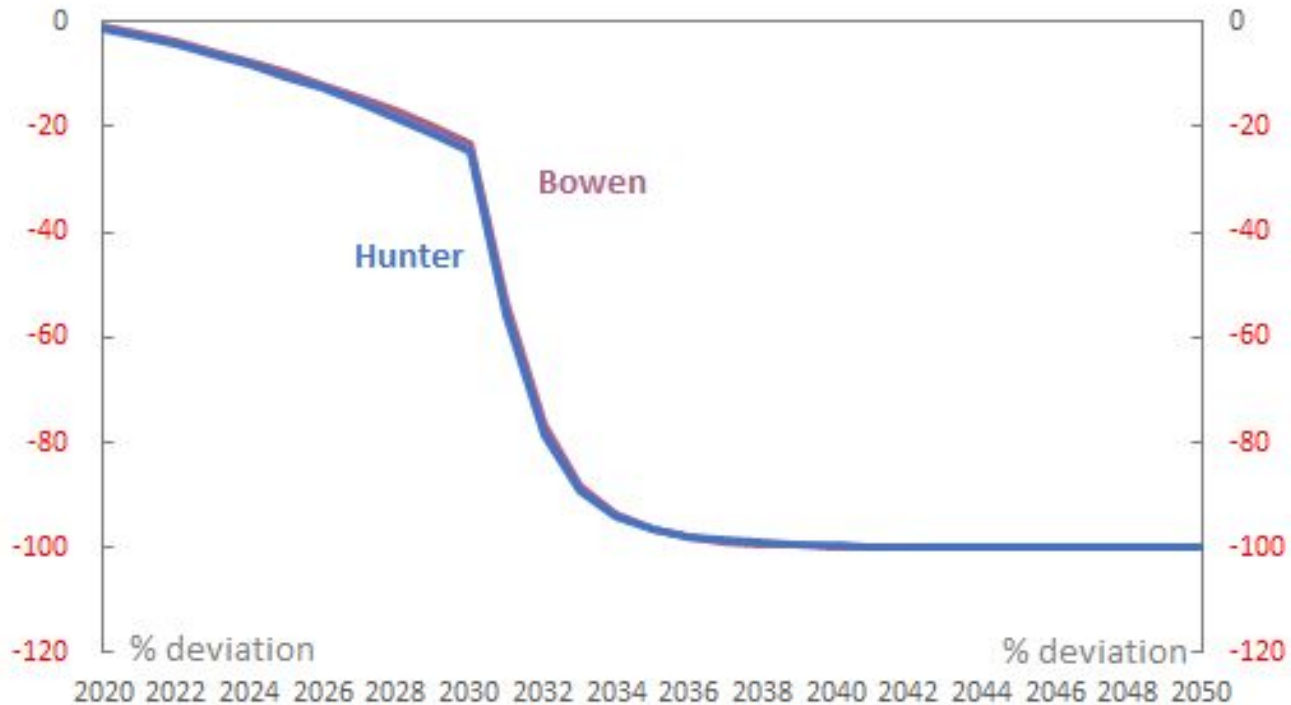
Results

Chart 2 - Deviations in Australian exports of thermal coal



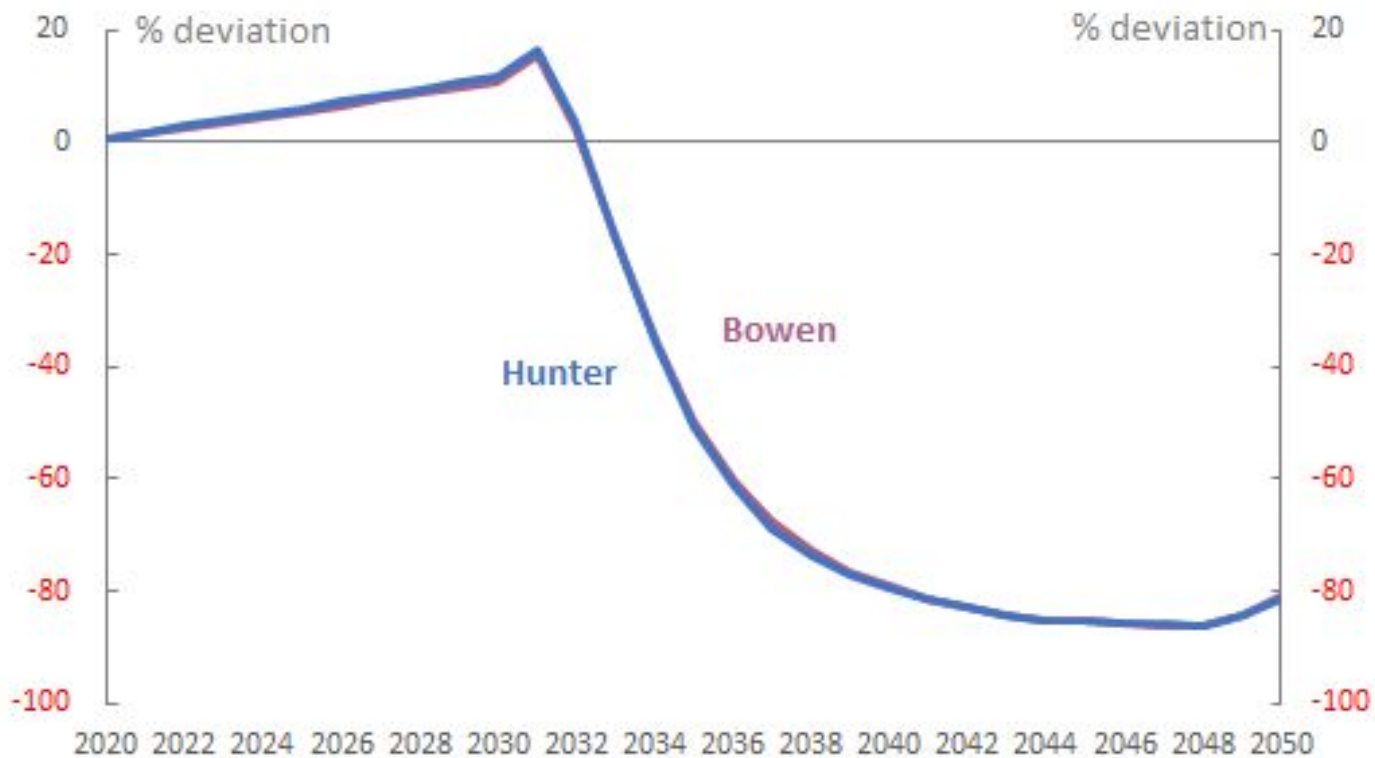
Results

Chart 3 - Deviations in Australian thermal coal production



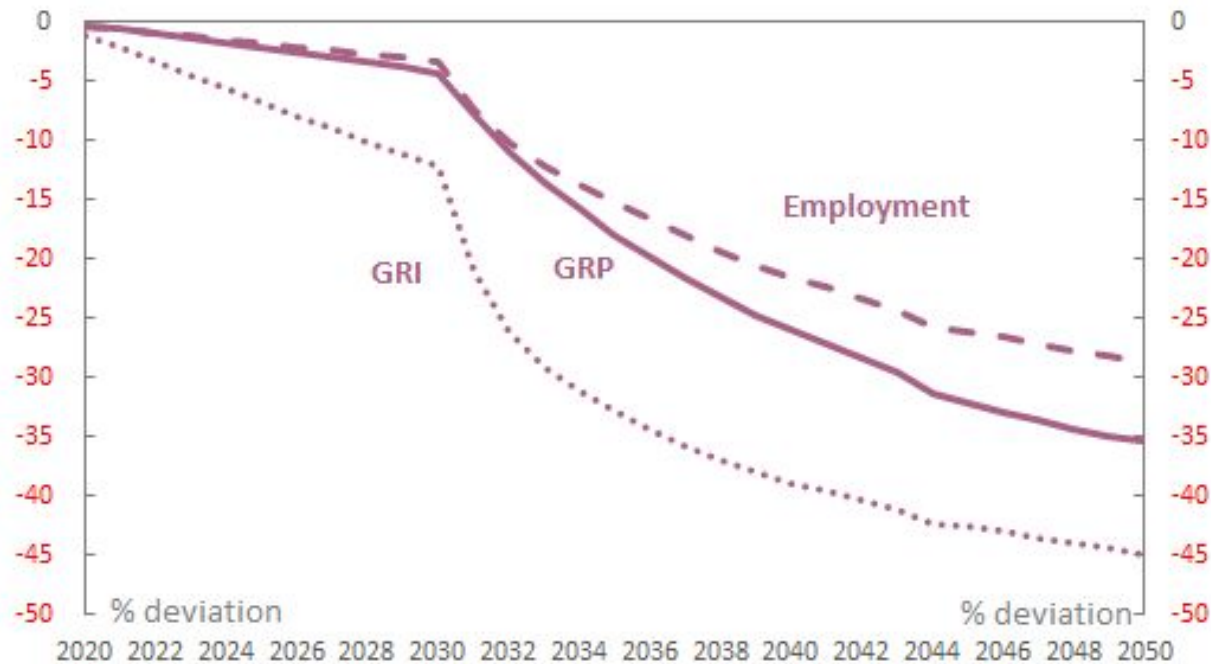
Results

Chart 4 - Deviations in Australian metallurgical coal production



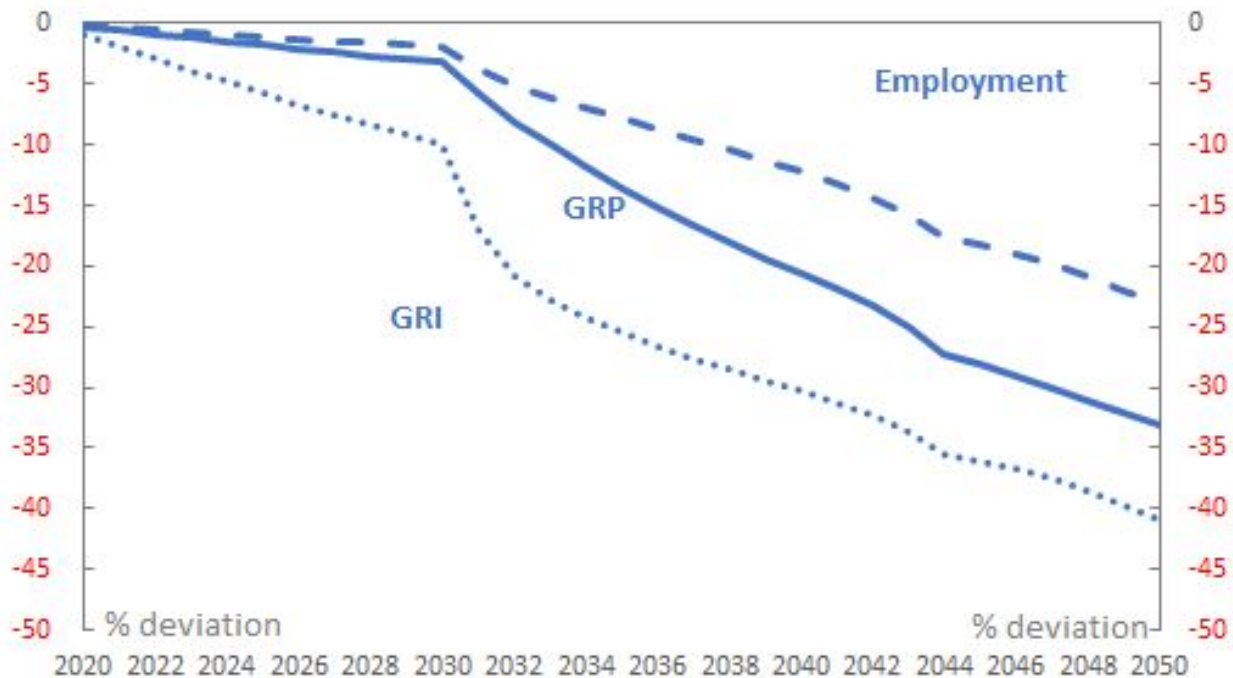
Results

Chart 5 - Macroeconomic impacts in the Bowen basin



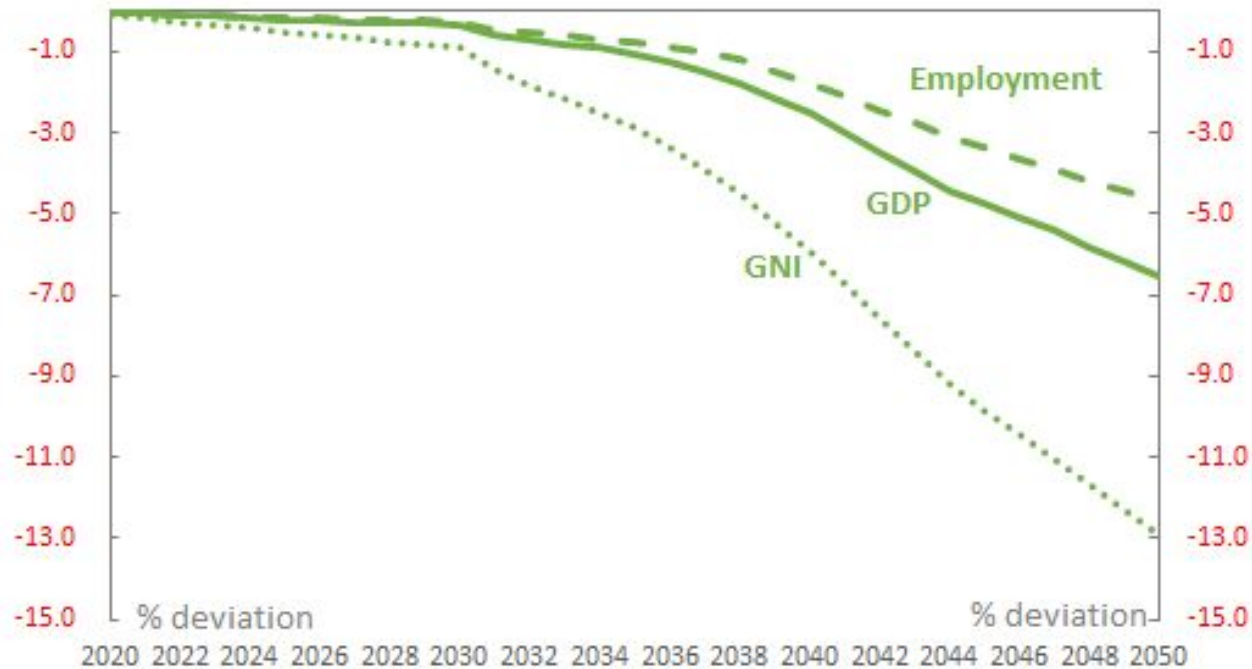
Results

Chart 6 - Macroeconomic impacts in the Hunter basin



Results

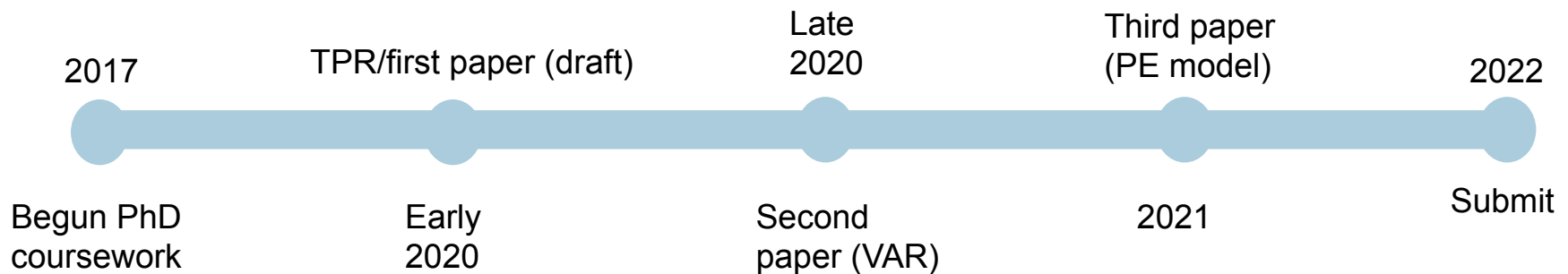
Chart 7 - Macroeconomic impacts in the Australia



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).



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