

# Oil supply shocks and fuel tax policy in Australia: insights from a dynamic CGE framework

Xianglong (Locky) Liu,  
Jason Nassios,  
James Giesecke

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Centre of Policy Studies  
Victoria University

## Background

- Recent surges in global oil prices
  - July 2021→March 2022, more than 50% increase
  - Higher intermediate input costs for businesses, higher price of transport, and an overall increase in the cost of living for households
- Policy response: fuel excise cut by 50% (44c/L→22c/L) for six months

## This paper explores

- The impact of the **oil supply shock** on the **Australian economy**
  - Different responses to oil supply shocks across countries (Peersman and Robays, 2012)
  - Australia: net oil-importing, non-oil energy exporting
- The role of oil-gas price linkage in Australian LNG export
  - Oil-indexed LNG pricing mechanism in the Asia-pacific gas market
- The economic implications of the fed gov's **fuel excise** policy response
  - Fuel excises: specific taxes levied at a fixed cost per litre of fuel
  - Higher fuel prices could partly mitigate the policy effectiveness on consumer prices

## Empirical framework

- Single-country dynamic Computable General Equilibrium (CGE) model
  - Victoria University Regional model with Taxation detail (VURMTAX) (Nassios et al. 2019)

**Counter-factual analysis:** a hypothetical persistent oil price shock based upon observed market responses

- 52.6% increase in global oil prices in 2022
- Duration: 3 years
- Unwind from 2026 onwards, back to the baseline

## Main findings

- 1 Such an oil supply shock leads to a fall in real GDP by 0.38% on impact, mainly driven by a weakened labour market. The damage is damped by a rise in net exports, particularly energy-intensive commodities
- 2 Import-competing and export-oriented industries are the winners
- 3 The oil-gas price linkage has a limited capacity to mitigate the economic damage caused by higher oil prices
  - LNG sector: low labour intensity, high foreign ownership
  - Higher gas prices hurt domestic gas users
- 4 A 50% reduction in fuel excise can help damp the fall in real GDP by 0.064pp, equivalent to an improvement of 17.3%

- 1 Quantify the economic impact of an oil price shock not only at the aggregate macroeconomic level but also at the disaggregated sectoral level within a consistent analytical framework
- 2 Contribute to the energy market literature by evaluating the offsetting effect of the linkage between oil import and LNG export prices to an oil price rise  
→ highlight the importance of the country-specific energy industry structure
- 3 Model development to incorporate the real-world policy response to an oil price shock  
→ Introduce new theory to VURMTAX to model fuel excise as a specific tax

## Brief overview of the VURMTAX model

- A 91-industry, eight-region computable general equilibrium model of Australia
- Based on the Victoria University Regional Model (VURM) developed by Adams et al. (2015)
- Rich tax-specific features which facilitate modelling of the Australian tax system  
→ See Nassios et al. (2019) for a full account
- Data from a variety of sources to parameterise VURMTAX  
→ ABS, Agricultural Census data, state accounts data, international trade, etc...
- Base year 2017/18

# Key assumptions

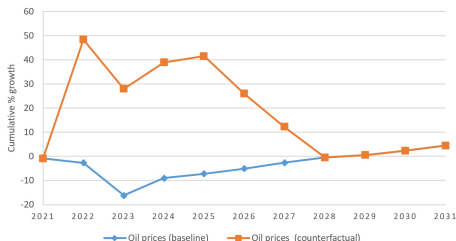
- Sticky real wage in the short run
- Regional migration driven by real wage disparity
- Fixed public consumption
- Fixed mining investment

# Oil price shock

A simulation in VURMTAX involves two parallel model runs:

- Baseline forecast:

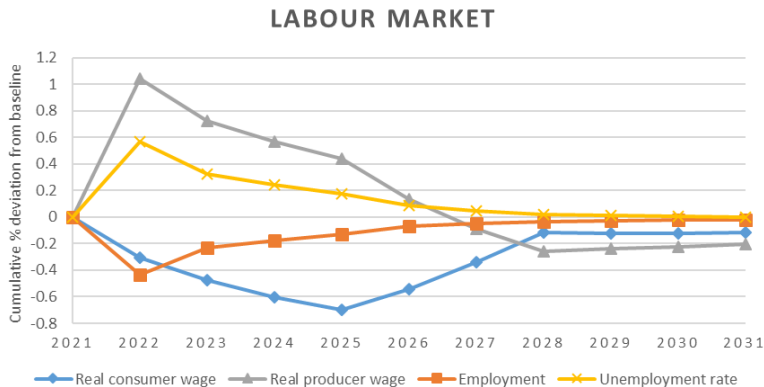
- The "would-be" of global oil prices if the recent oil price shock had not happened
- Oil price growth aligned to the reference oil price projection (European Brent spot price) from US Energy Information Administration (EIA)



- Counterfactual scenario 1:

- Hypothetical world oil prices rise by 52.6% in 2022 relative to the EIA baseline forecast, remaining elevated for three years, easing back afterwards
- Global inflation of commodities: infer from domestic cost-structure (exc. key resource exports) and align with literature (Choi et al., 2018)
- Lower foreign demand: an increase in world oil price by 50% from the baseline would cause about 1% loss of global GDP (Timilsina, G.R., 2015)

# Scenario 1: macro results - relative to baseline

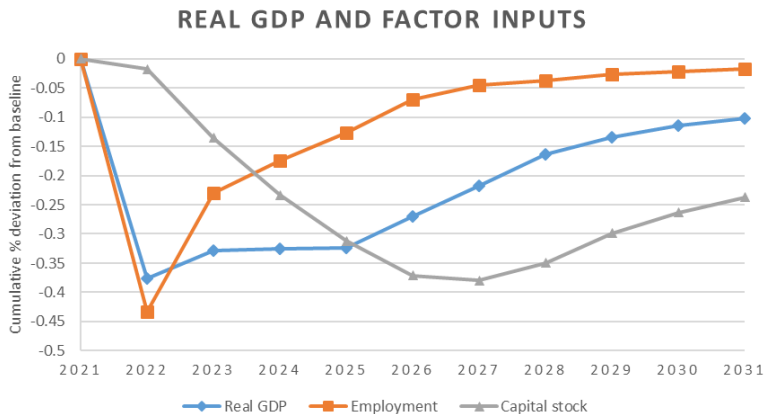


Labour market:

- Real sticky wage in the short run
- Labour costs influenced by CPI, rise relative to output prices
- Lower employment in the short run.
- Unemployment rate rises by 0.57pp

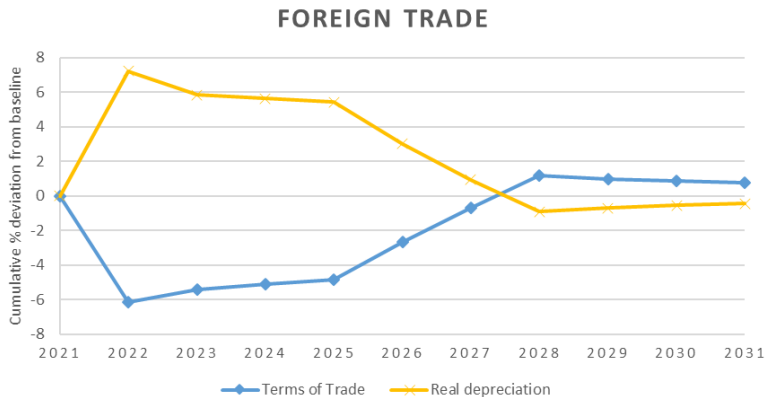


# Scenario 1 - oil price rise: macro impact



Real GDP falls by 0.38% on impact

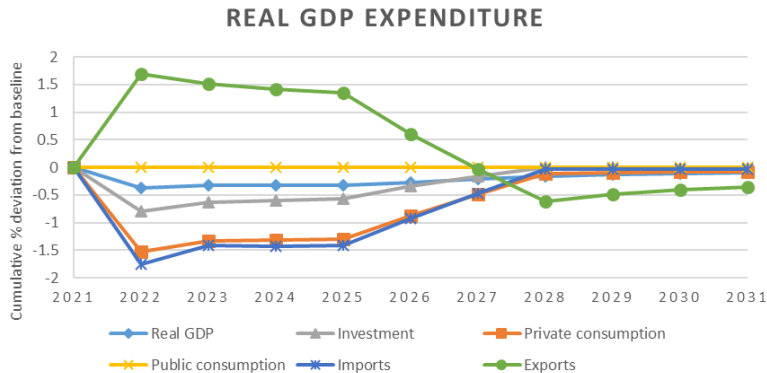
# Scenario 1 - oil price rise: macro impact



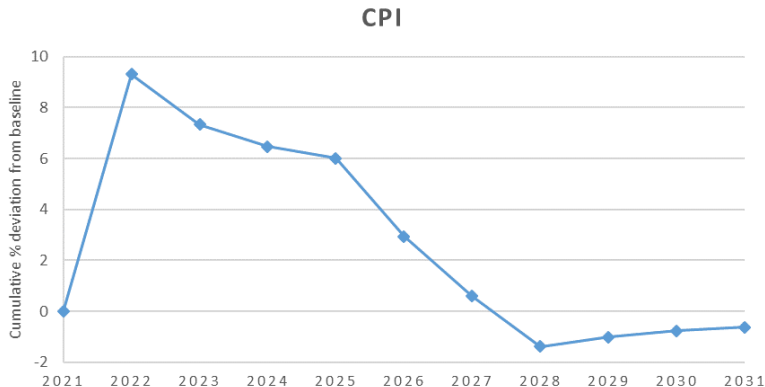
## Foreign trade

- Fall in terms of trade
- Increased international competitiveness

# Scenario 1 - oil price rise: macro impact



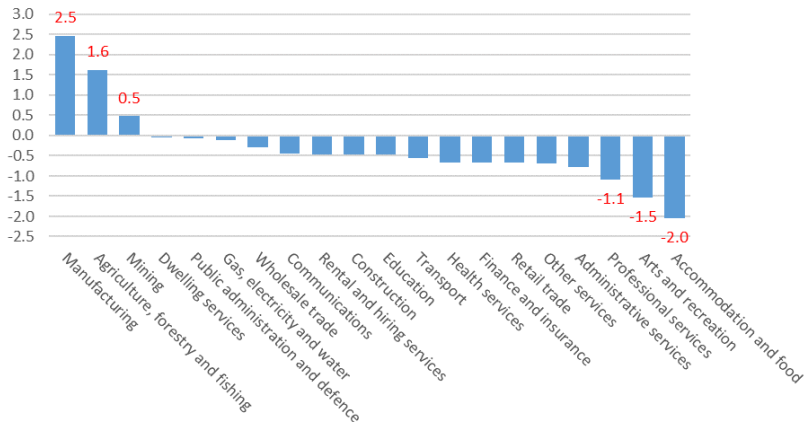
# Scenario 1 - oil price rise: macro impact



- The CPI increases by 9.7%
- Close to the estimated inflation impact of oil supply shock by Hoang and Nguyen (2018)

# Oil price shock: industry impact

ANZSIC Level 1 industry output  
% deviation from baseline in the short run



- Winners: import-competing and export-oriented industries  
→ trade-exposed, benefit from real depreciation

# Counterfactual Scenario 2: linked LNG and oil prices

## Australia:

- Australia is one of the largest **LNG exporters** in the world
- About 80% of Australia's LNG is sold under long-term contracts in the Asian market that carry terms linking LNG prices to oil prices with a lag of around three to six months, depending on specific contractual arrangements.
- **Oil-gas price linkage:** co-movement in oil import and LNG export prices
- **Offsetting effect:** favourably influence the terms of trade and the purchasing power of domestic income

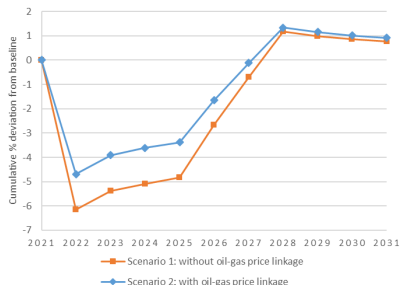
→ **But to what extent?**

## Scenario 2

- Activate the oil-gas price linkage and examine its potential to dampen the damage of the oil price rise
- Augment Scenario 1 with one additional shock: Australian LNG export prices rise by an amount equal to 50% of the oil price rise (Zhang et al, 2018)

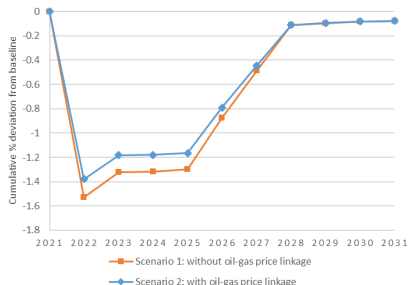
# Scenario 2

## TERMS OF TRADE



Improvement of 24% (1.5pp)

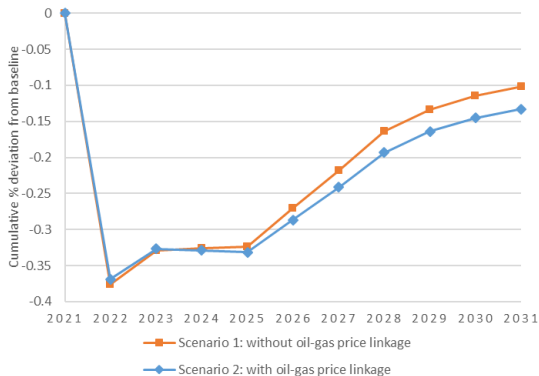
## PRIVATE CONSUMPTION



Improvement of 9.7% (0.15pp)

# Scenario 2

## REAL GDP



Improvement of 1.9% (0.07pp)



# Main results: Scenario 2

## Results:

- Help counter the negative effect of increased oil prices
  - Moderate the fall in the terms of trade and private consumption
- Limited offsetting capability to counter the harm

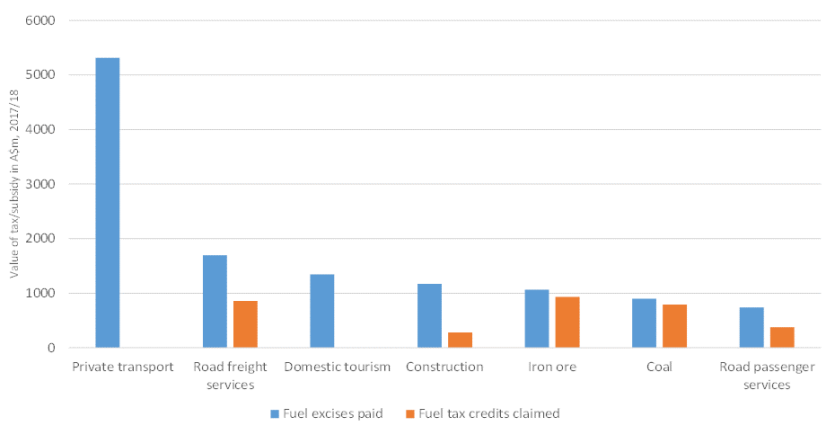
## Why?

- High capital intensity of the Australian LNG industry
  - limited impact to labour market and household income
- Substantial foreign ownership
  - dilute the contribution of the boosted industry output to the national income
  - only a small portion of profits stay in Australia (Cassidy and Kosev, 2015)
- Higher domestic gas prices
  - Less affordable gas for domestic users
  - Reduce household purchasing power

# Counterfactual Scenario 3: fuel excise cut

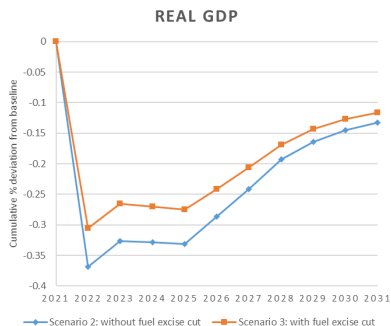
## Setup:

- A temporary 50% reduction in the fuel excise rate, that remains in place for three years and unwinds as the oil price rise unwinds
- Oil-LNG price linkage activated



Fuel excise and fuel tax credits claimed across a selection of VURMTAX industries, 2017/18

# Scenario 3: results



Improvement of 17.3% (0.06pp)



Reduction of 0.1pp (17.2%)

- Fuel excise tax cut is compromised by higher oil prices, mitigating its effectiveness

This paper

- 1 Investigate the effects of a persistent global oil supply shock on the Australian economy
  - Size of the shock (52.6%) based upon observed market response
  - Damage the real GDP by 0.38% on impact
  - Stimulate output in export-oriented and import-competing domestic industries: agriculture, mining and manufacturing industries
- 2 Investigate the capacity of the oil-linked LNG export prices to cushion the harm
  - Modest offsetting effect
  - Low labour intensity, high foreign ownership and higher domestic gas prices
- 3 The damping effect of a 50% fuel excise cut as policy response
  - Mitigate the damage to the labour market and the real GDP by around 17%