

Reforming Road Pricing

A CGE approach to modelling road user charges

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Motivation: road funding under road transport electrification

Roads are generally free to use, but costly to build and maintain.

Fuel excise has historically been an indirect proxy for road use, serving as a major source of road-related tax revenue

Energy transition weakens the link between fuel use and road use:

- Rapid uptake of EV

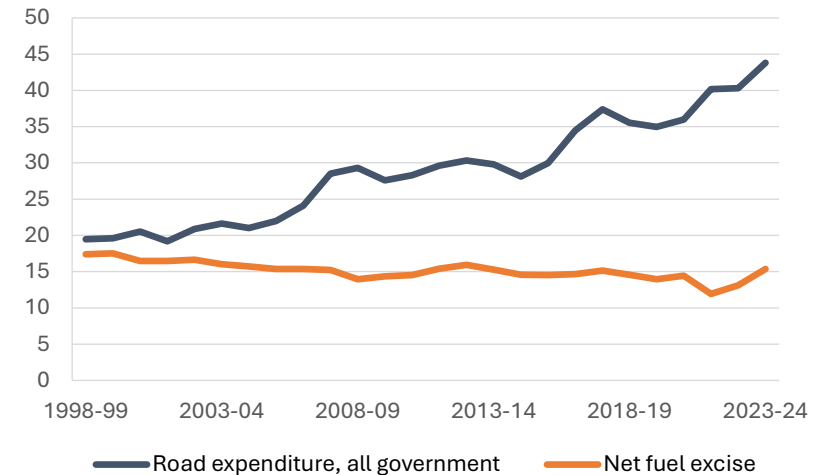
Calling for transport tax re-design: alternative road pricing mechanism

- Public finance perspective: fair and sustainable funding for road investment and maintenance
- Reforms to **Road User Charging (RUC)**

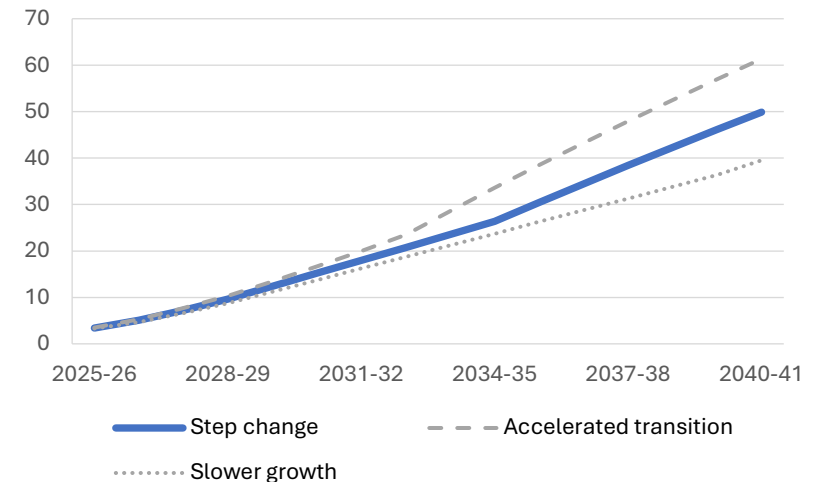
Current CGE models lack required representations for assessing road pricing reforms, e.g., vehicle type, propulsion technology, road use.

- How to develop a framework that explicitly represents road access and road users, so that alternative RUC options can be evaluated?

Road spending vs net fuel excise
(*\$b, constant 2023-24 prices*)



Projection of EV share of the passenger fleet
(*%, by CSIRO and AEMO*)



Research question

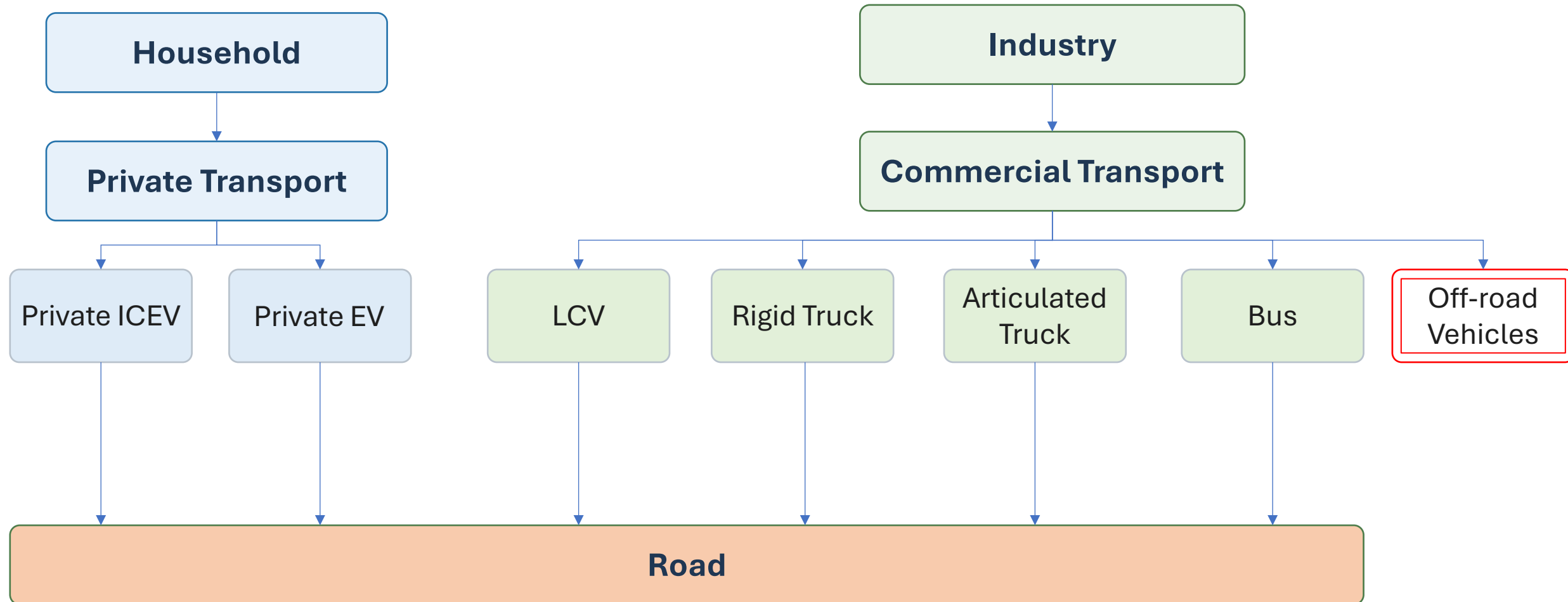
How to model road user charges in a CGE framework and assess policy impact?

- How can road use be represented explicitly in a CGE database?
- How can the use of vehicles be distinguished by household/commercial use, vehicle type and technology?
- How can publicly supplied road access be represented while preserving benchmark accounting identity of the database?
- How to model the pricing of road use while the road is now effectively “cost-free”?

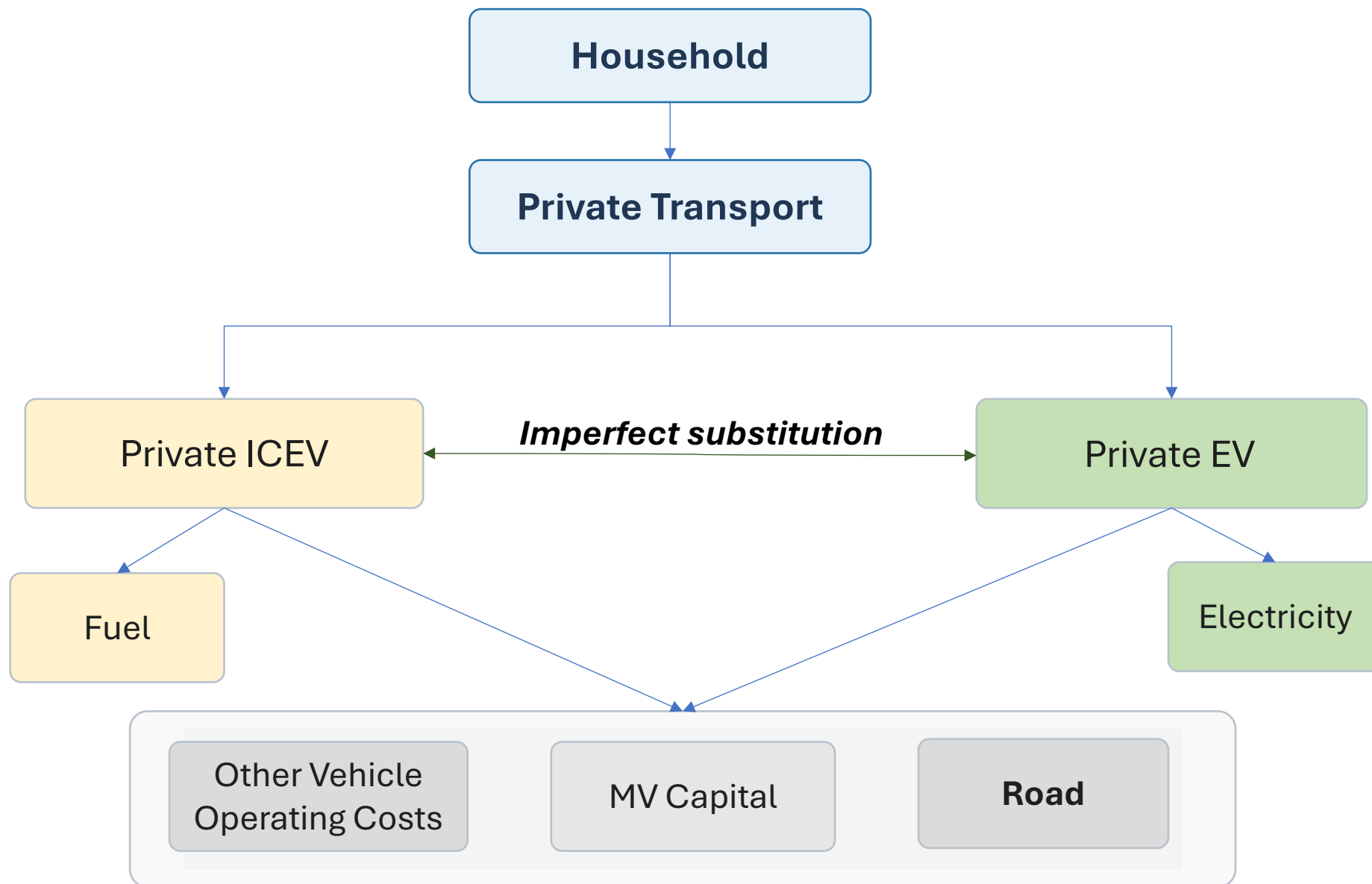
Ultimate objective

- Develop a CGE modelling framework for broader transport policy assessments in the context of road transport electrification.

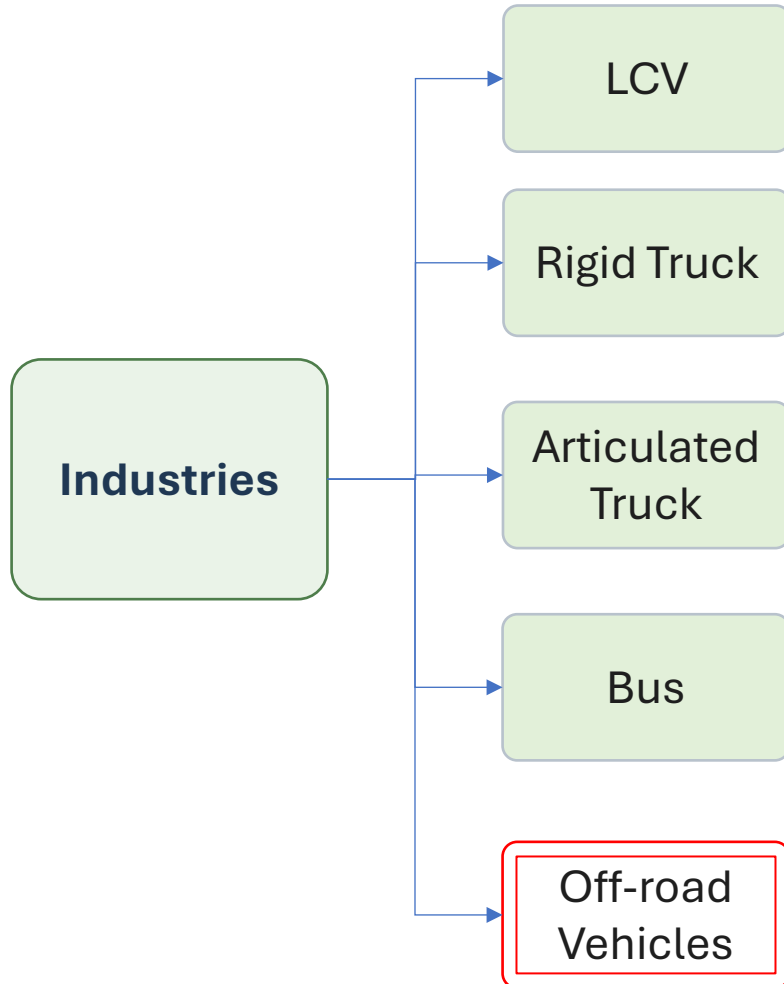
Representing road use in VURMTAX



Private Transport



Commercial Transport



- **Cost structure:** similar to Private Transport
 - Vehicle-class-specific
 - Intermediate inputs
 - Fuel, electricity and repairing costs
 - Road
 - MV Capital
- **Sales** to industries
- industry-specific (to some degree)
 - E.g., Mining, Road Freight, Road Passenger
- Off-road vehicles stripped off
- ICEV/EV Variation breakdown (WIP)

Road and Modelling a RUC

A government-owned dummy road sector

- Road investment stripped out from public investment in civil engineering and construction
- Cost structure:
 - **Capital** component: infrastructure
 - **Land** component: physical access of road corridor
 - **Almost free to use**
 - Imputed rental incomes (almost fully) returned to road users through implicit subsidies
 - Small but positive: cost to use toll roads, make it to exist

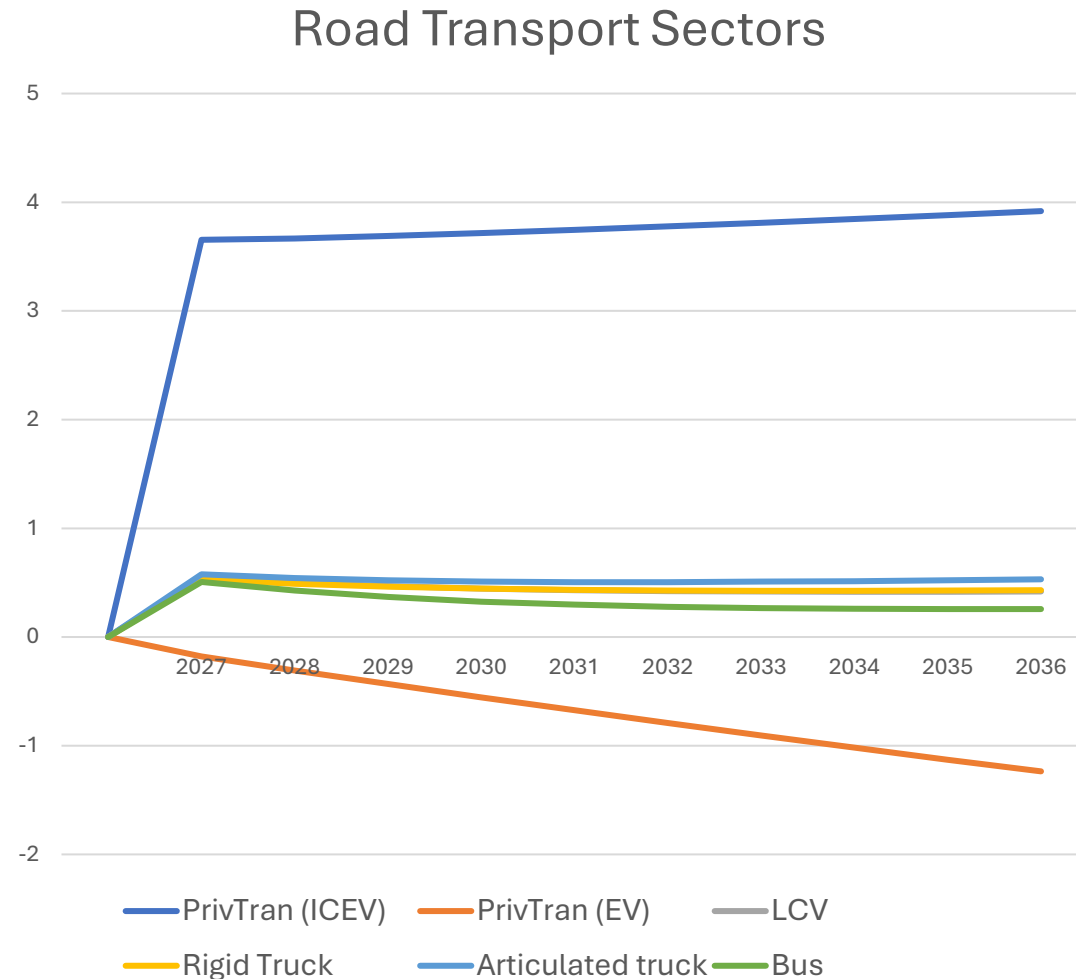
Modelling RUC

- Reduction in the implicit subsidy on road access (i.e., land component of road sector)
- Revenue collected by the federal government
- Revenue distribution MATTERS

Illustrative simulation

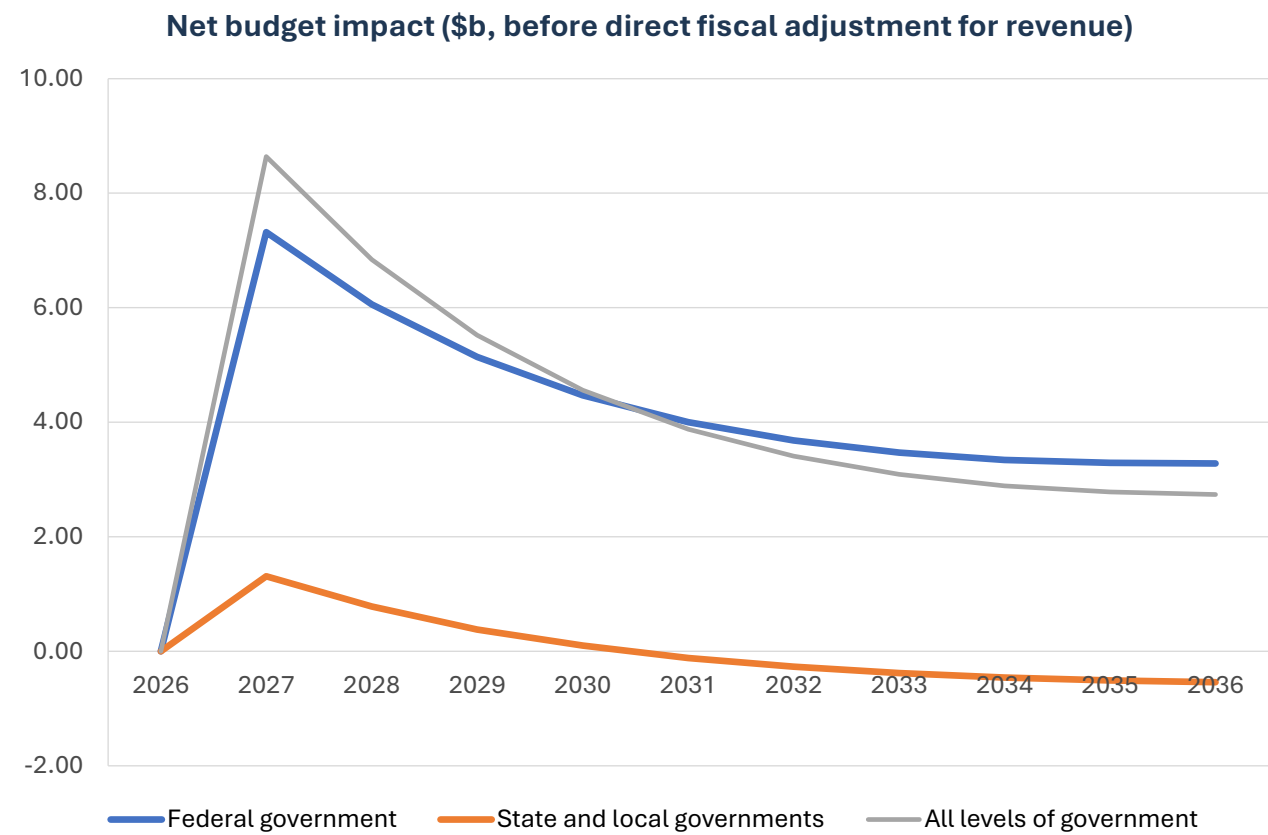
- Revenue-neutral replacement of net fuel tax with RUC, with a plain baseline

Illustrative simulation



- Direct benefit to ICEV from fuel tax removal
- Declined Private EV
 - No benefit from fuel tax removal
 - Exposed to RUC
 - Suffer from demand substitution in the Private Transport nest
- RUC reform challenge
 - “Reforms should be designed to not deter the continued take-up of electric vehicles” --- Treasurer

Illustrative simulation: other results



Fiscal outcomes between levels of government depend on who collects the RUC revenue

	% deviation from baseline	
	2027	2036
Macroeconomy		
Real GDP	0.35	0.21
Household consumption	0.44	0.32
Employment	0.60	0.24
Real exports	0.70	0.52
Industry output		
Transport	1.15	1.10
Agriculture	0.96	0.41
Manufacturing	0.77	0.46
Mining	0.24	0.50
Public administration and defence	0.07	0.04
Other services	-0.03	-0.07

Key Takeaway and Future Work

Australia needs alternative road funding mechanisms amid rapid road transport electrification

This study develops a CGE framework for analysing road user charging options and assessing their economic impacts by explicitly representing road transport sectors (road users) and a road sector.

The simple fuel tax replacement simulation

- An **illustrative application** of this framework, not an assessment of an optimal RUC design
- It demonstrates how the framework can trace the macroeconomic, sectoral, vehicle-class, vehicle-technology, and fiscal consequences of shifting from fuel-based taxation to alternative RUC options.

Policy design matters

- Revenue collection and distribution
- Interactions with vehicle electrification need to be considered as part of the reform

Future Work

- Expand capacity of the framework for examining regional impacts for Australia state and territories
- Exploring and evaluate alternative RUC designs and revenue recycling assumptions
- Add a CO₂ account to assess the implications of road transport policies for emissions.