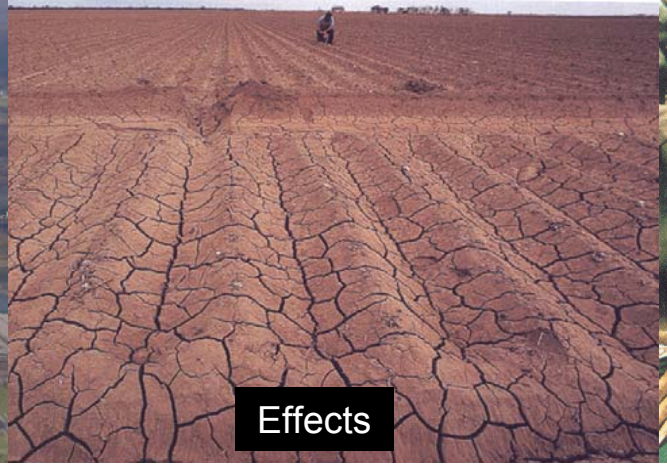

Economic Modelling of New Zealand Climate Change Policy

Presentation to

Institute of Policy Studies

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INFOMETRICS

Outline of presentation

1. Why?	The problem definition
2. How?	The modelling framework
3. How much?	The results
4. What does it all mean?	Policy implications
5. Eh?	Discussions and questions
6. What next?	2020 emissions targets

Problem definition

- We have an international climate change obligation due to Kyoto Protocol
- In 2012, requires us to account for any emissions over and above 1990 levels
- Two main options:
  1. Reduce domestic emissions
  2. Buy overseas permits
- Neither option is a free lunch
- What is the least-cost way of meeting this obligation?
- How does this differ in short run (2012) and long run (2025)?

The economy is a complex beast

- Industries don’t exist in isolation
- They rely on other industries
- They compete for a limited pool of resources (land, labour, capital, energy)
- And are affected by changes in govt policy and household behaviour, both in NZ and overseas

What is a General Equilibrium Model?

Economic behaviour described by mathematical equations

- household spending decisions
- world demand for NZ exports
- choice of fuels and factor inputs by industry

Wider ambit than traditional cost-benefit analysis

Economy divided into numerous industries

Track flow-on effects from one industry to another; eg

energy prices → industry costs → competitiveness → exports → labour demand → household spending → other industries

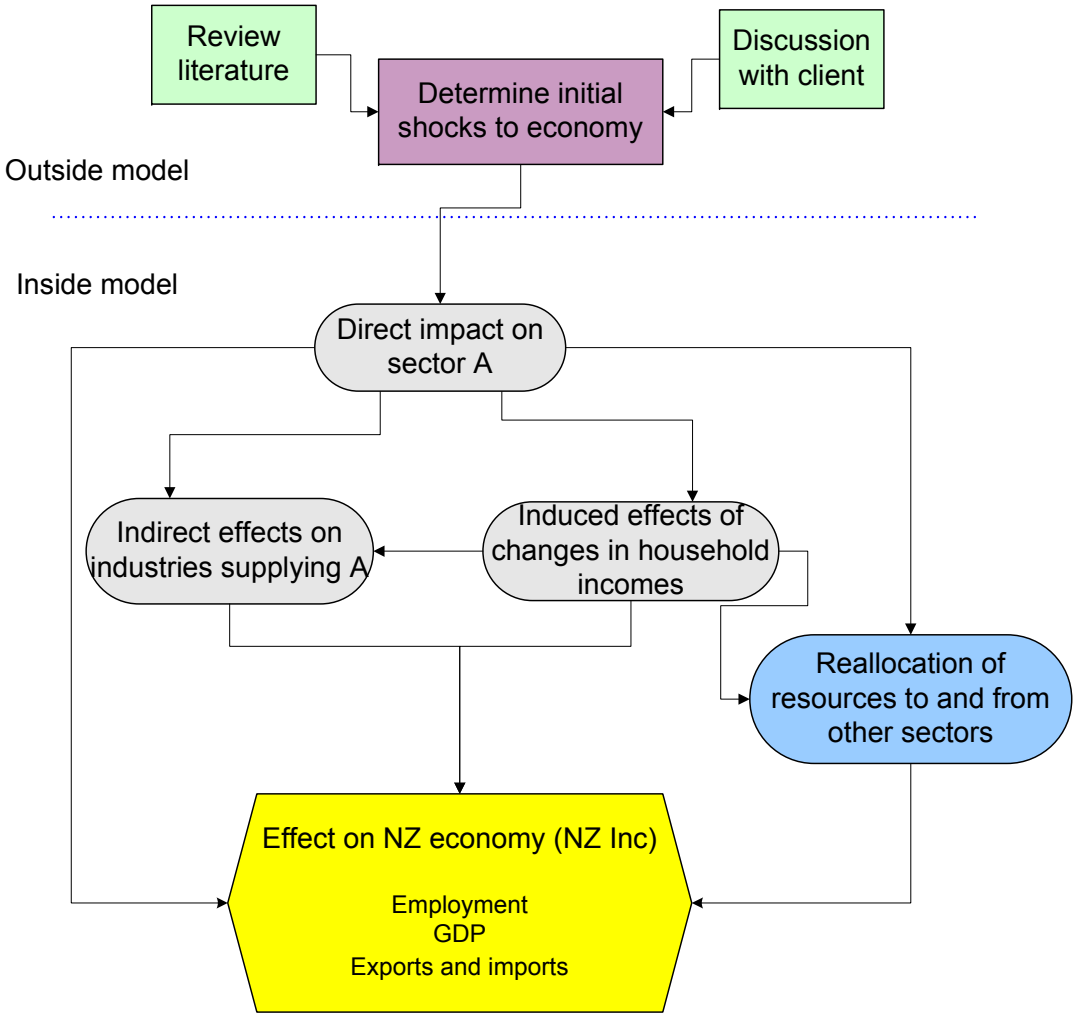
Designed for 'what if?' scenarios, not forecasting

Able to accommodate government policies

(tax, welfare, spending on infrastructure, user pays, subsidies)

…and external shocks (oil price rises, some aspects of global warming)

GE framework



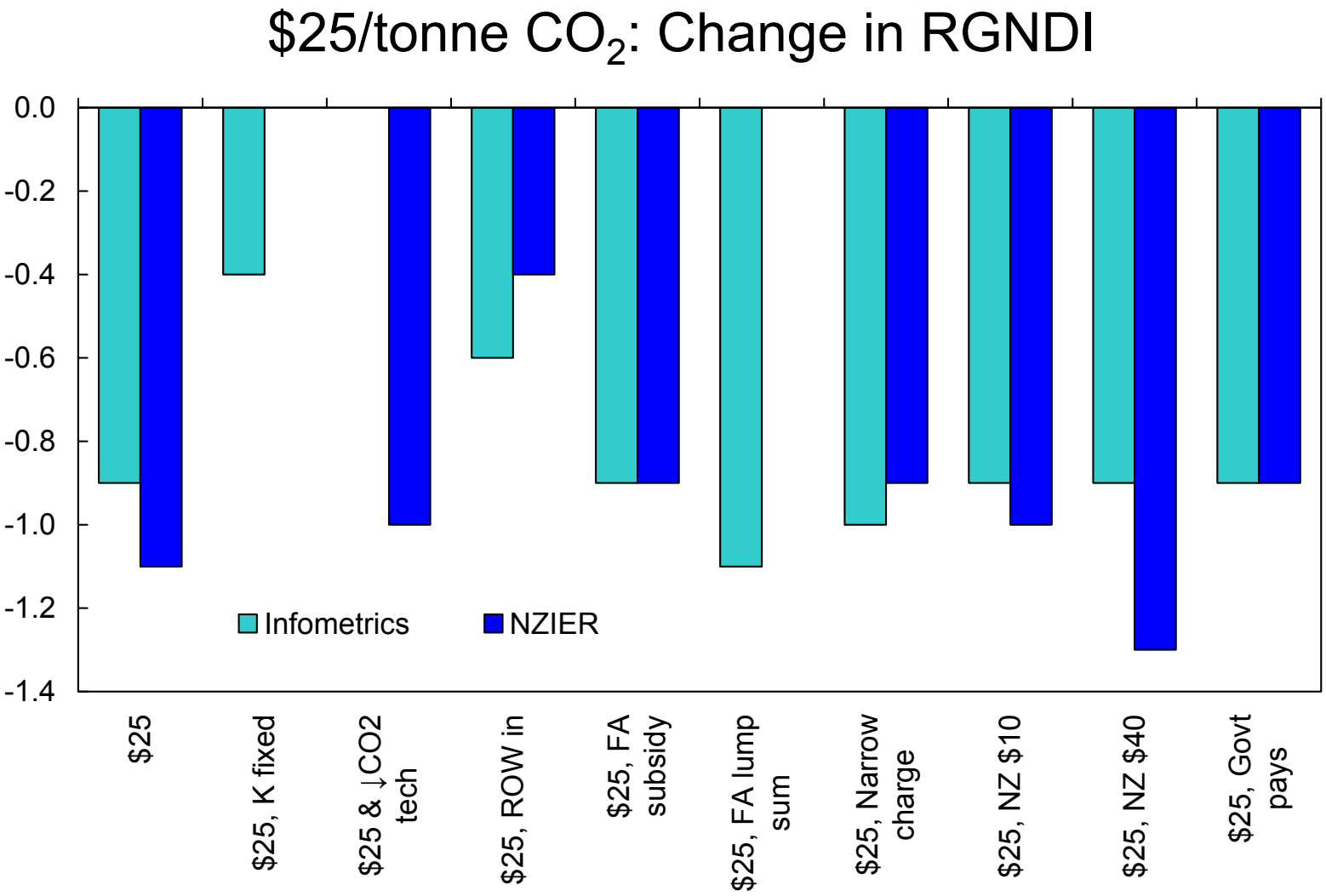
Policy Modelling: Procedure

- Prepare “Business as Usual” scenario – **not a forecast.**
- Compare alternative policies and shocks against the BAU.
- The following are usually held constant at BAU levels:
  - Total employment, wage rates endogenous.
  - Rates of return to capital, capital stock endogenous (but reverse in short run scenarios)
  - BoP, real exchange rate endogenous.
  - Fiscal surplus, personal income tax rates endogenous.
- NZ trade competes with non-Annex 1 countries in most scenarios.
- Forestry response not modelled.

Caveats

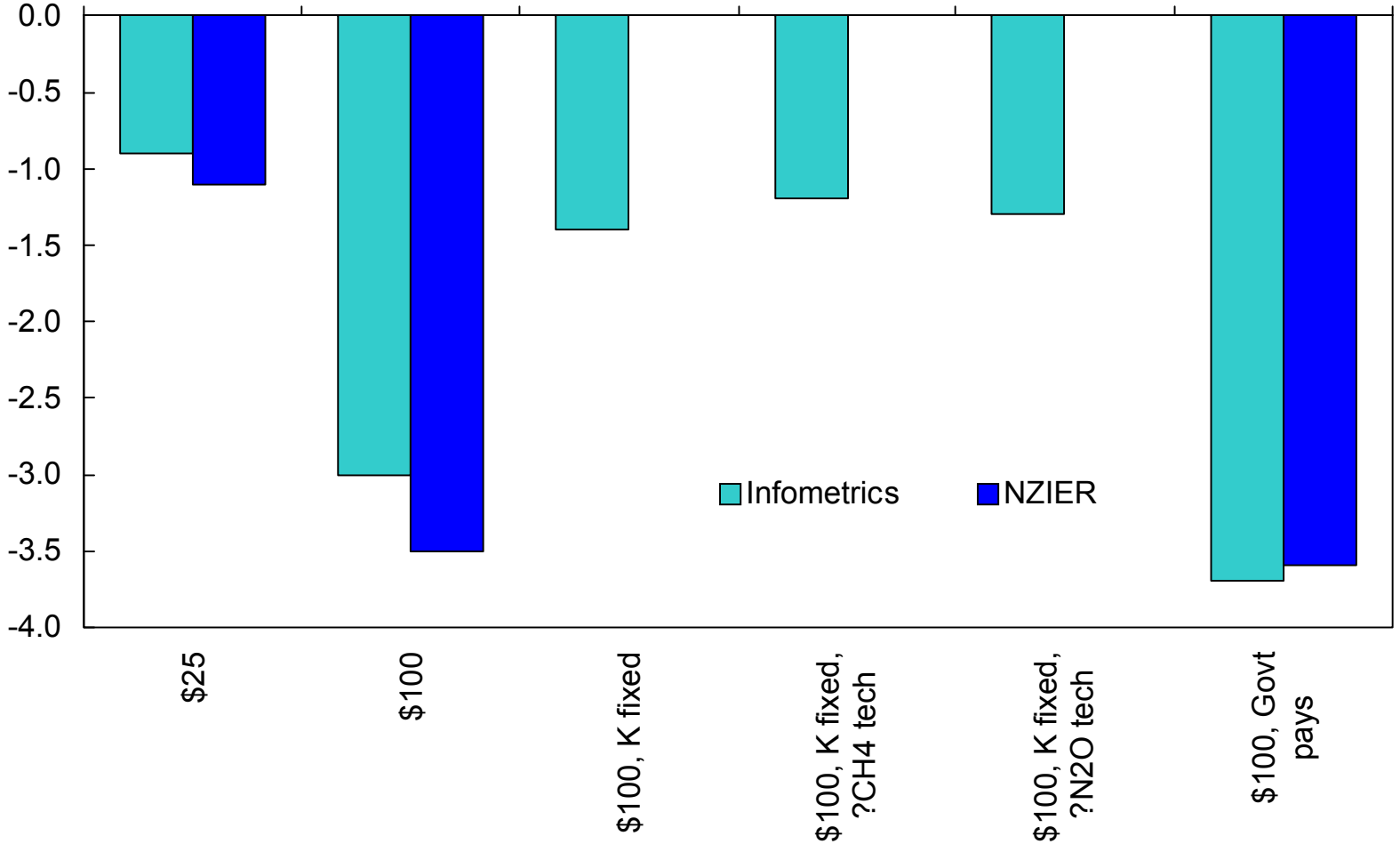
- No endogenous technological change.
- Silent on transition costs.
- Ignore possible international consequences of NZ doing nothing to reduce GHG emissions
- Lumpiness in production.
- CH_4 and N_2O modelled as 'process' emissions.
- Aggregation bias.
- Pricing (competitive model, P=AC=MC).
- Income tax only average rates for household income quintiles.

Long Run Modelling Results (1)



Long Run Modelling Results (2)

$100/tonne CO_2: Change in RGNDI



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Long Run Modelling Results (3)

1. **The NZ economy will continue to grow, but there is a cost:**

   2009: $38,500 per capita

   2025: $56,000 per capita

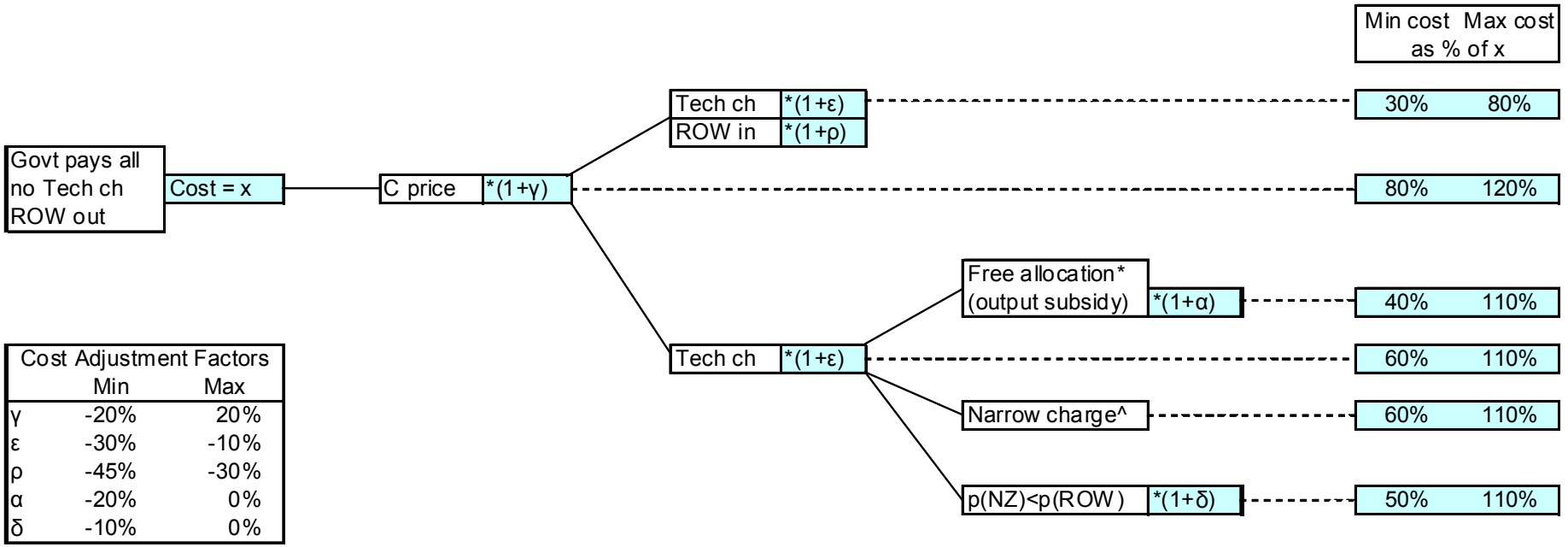
   2025: ≈$54,000 per capita with $100/tonne CO_2

2. **The actions of the rest of the world are important**: no action raises NZ welfare loss by 50%-100%.
3. **Free allocation can reduce welfare losses,** particularly under limited action by the rest of the world and if few abatement technology options.
4. **Free allocation for stranded assets is more costly than production-linked free allocation**.
5. **The higher the world carbon price, the greater the cost to the New Zealand economy**.

Long Run Modelling Results (4)

6. **New abatement technologies improve the relative welfare impact of price instruments**.
7. **Changes in the size of the capital stock have significant economic effects -** the modelling assumption regarding whether the capital stock is able to vary in the long run has a significant effect on the results.
8. **Differential pricing has minimal impacts -** NZ meets most of its emission obligation by purchasing permits offshore.

Scenarios relative to 'Government Pays'



* Free allocation via lump sums is inefficient and so not considered, but may have an equity justification.

^ In the limit this is the same as govt pays with no protection, so no extra cost factor is applicable.

Short Run Modelling Results (1)

In the short run, there is relatively little difference, at the macroeconomic level, between:

- the government funding our Kyoto liability through general taxation,
- an ETS with free allocation, and
- a narrow pricing scheme that covers just the energy and transport sectors – omitting agriculture.

But government pays scenario two key drawbacks.

1. No price signal for carbon.
2. Untenable political economy approach to emissions reduction in the longer term (NZ credibility).

Recommendations

1. Introduce a carbon price.
2. In short run, a narrow based carbon pricing scheme at a low domestic price can provide this signal at a slightly lower economy wide cost than a comprehensive ETS.
3. However, if RoW takes action and technological improvements occur, a broad based ETS with no free allocation or exemptions is the least-cost way of meeting our post-2012 obligations.

4. Minimum regret (?): ETS with free allocation to CAR industries (linked to output) in the meantime.
5. *Consider agriculture exemption in short term if accurate price signals cannot be imposed at farm level at low cost.*

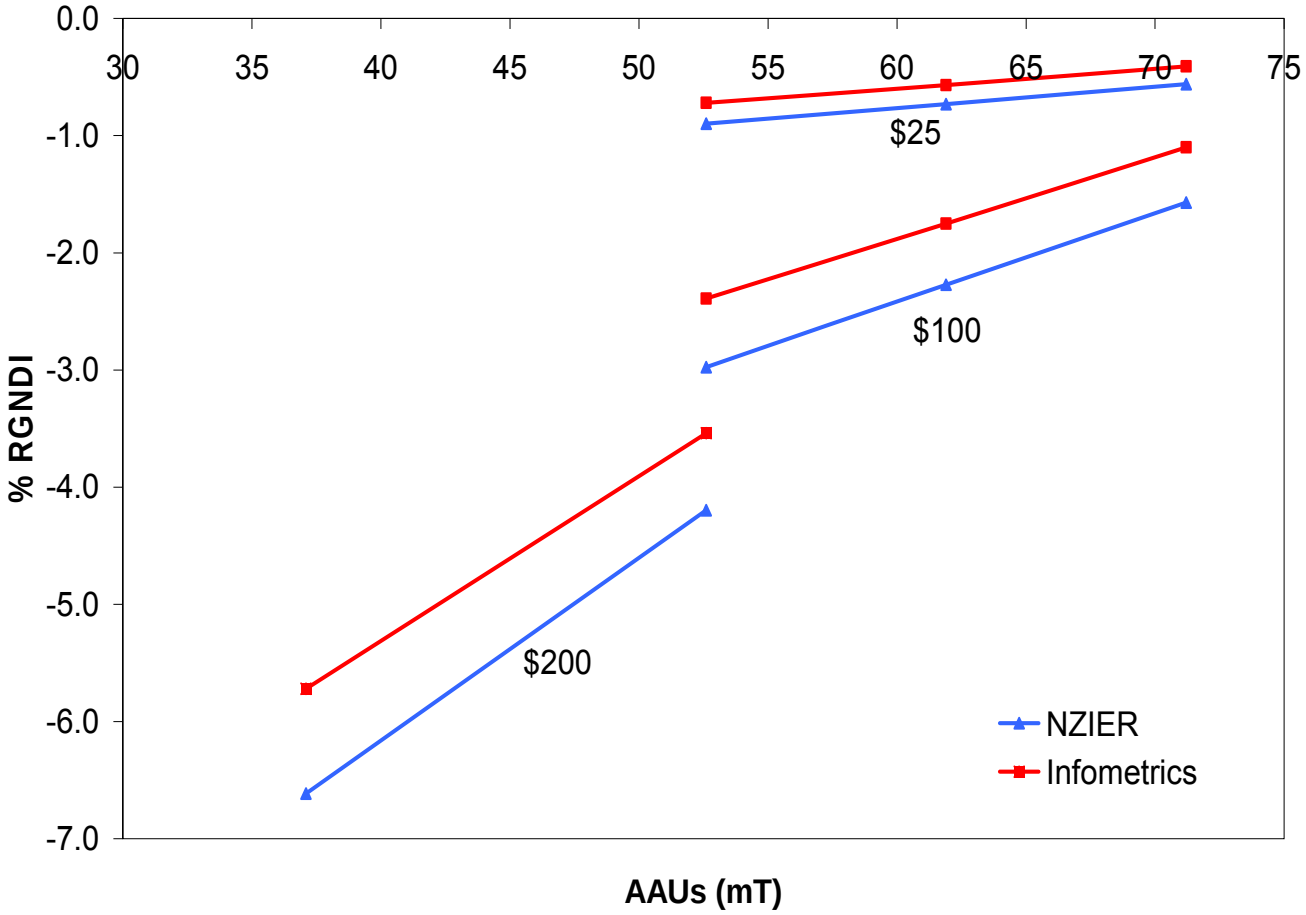
2020 Targets: Background

- Let's be clear what a "target" is

  An emissions target is a stated intention to meet a particular emissions level by 2020. It can be met by reducing emissions to that level but can also be met by storing carbon in forests ***or by purchasing emission units offshore****. (emphasis added) (MfE 2009)*
- 2020 emissions target is NOT a domestic emissions reduction target
- It is analogous to New Zealand's AAU allocations
- Fewer AAUs or a more stringent target does not impact New Zealand's domestic emissions → domestic emissions are a function of the carbon price
- The target or level of AAUs simply determines the amount of emissions permits that must be purchased from other countries → wealth transfer

2020 Targets: Impact on Welfare

- Level of GDP not directly impacted, but significant cost to New Zealand's welfare (RGNDI)
- Marginal impact of extra AAU is about 1.7 times its value



2020 Targets: International Issues

- If no international trading, all emissions reductions must take place domestically
- To meet 1990 levels in 2020, this would require a carbon price of ~$200 at large cost to New Zealand
- An international agreement does NOT prevent competitive-at-risk issues