# Assessing the costs of climate-change policy in New Zealand

Geoff Bertram

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# The wider context

- Economic instruments work because they set incentives in a direction that helps solve the problem
- Using direct command-and-control policy instruments without getting prices right leads to unnecessary economic costs and distortions in resource allocation
- That does not mean well-designed price instruments are sufficient (see the McKinsey abatement curve) but it does make them a necessary part of least-cost policy
- An important lesson of the past three centuries is that market economies appear to do better than non-market systems at calling forth the big behavioural and technological changes that are associated with human progress
- So it's strange to see so much scepticism from the business interests who are usually cheerleaders for the market system, when discussing the ability of carbon taxes to achieve cost-effective emission abatement and to contribute to a structural transition to a post-carbon economy

It's always a worry to see applied GE models, which are designed to trace the economy-wide response to price signals and other policy shocks under quite restrictive assumptions, being used as a substitute for proper policy analysis or appropriated to give "scientific" legitimacy to what otherwise would be transparently special pleading by vested interests

- Professionally, there are issues of scientific practice at stake - even if we recognise that economics is not a hard science, at least there is virtue in trying to follow the principles of good scientific practice and to resist capture

- Economic model development in New Zealand is far behind international best practice (not necessarily the modellers' fault – there's no longer any independent NZ modelling programme with arms-length funding)

- Economic models are, unfortunately, rather like fast cars, alcohol and tobacco: their consumption has significant external effects which makes them lethal to the public interest in the hands of addicts and children

- So we are entitled to expect to see put in place the usual regulatory safeguards to limit and, if possible, prevent abuse:
  - Models need to be clearly fit for purpose with any shortcomings clearly shown on the label (like AA checks on used cars)
  - Health warnings should be prominently displayed on each packet of model results to prevent abusers later claiming to have been unaware of the consequences of placing undue reliance on them
  - Some sort of ban on deliberately false and misleading advertising of model results is needed

# Regulatory impact studies are not reducible to applied GE modelling

- GE modelling has a valid and useful part to play but by itself it is not a regulatory impact assessment
- Perhaps the most famous regulatory impact assessment ever was J.M Keynes' *Economic Consequences of the Peace* (1919), which foreshadowed the Second World War as a possible consequence of the Versailles peace treaty
- The things that concerned Keynes were to do with political macroeconomic sustainability, rather than with the cashflows if war reparations were collected from Germany in a naive business-as-usual world – the point is that the policy changed the world and so produced consquences far bigger than the bean-counting analysis suggested
- At global level, with climate change the policy challenge is to transform the whole structure of the human economy to be consistent with climate stability
- At single-country level the temptation to free-ride on the efforts of others has to be set against the likely political-economy consequences of defecting from collective action

- If any country, or the world community as a whole, decides to act to cut GHG emissions, then price instruments must be part of the least-cost solution
- The *a priori* expectation is that the lowest-cost policy is the simplest – a universal, uniform price on carbon across all sectors
- If there are well-identified collateral problems that policymakers feel they have to address, then those should if possible be handled separately and explicitly without destroying the price signal on which the policy's effectiveness rests. (This is why border taxes are now high on the international policy agenda)
- If you observe policymakers ostensibly acting on carbon emissions but not adopting the least-cost approach to reducing them, then it is a reasonable inference that other goals are being pursued as well
- In that case the "costs" of the policy package need to be set against the full set of government objectives – not just against the emission reduction part
- Real-world climate change policy is dominated by wealth transfers and rent-seeking, with actual emission reduction generally down the priority list. Standard GE models are silent on the social costs of robbing the poor to pay the rich

"Cap and trade = Carbon tax plus corporate welfare"

# What applied GE models can and cannot do

- They can give a first-cut appraisal of the economy-wide effects of a policy shock, in terms of macro aggregates and sectoral trends
- But
  - The present generation of NZ models have few or no dynamic feedback loops by which changes in prices and quantities can drive endogenous technical change, investment behaviour, and consumer preference shifts, all of which can radically affect the economy-wide outcomes
  - In small trading economy their results depend heavily on what is assumed to be going on in the wider world
  - They inevitably have to make assumptions, often arbitrarily, which crucially affect the results
  - Because they are complex they are easily misconstrued, and run the risk of having their results taken out of context and “spun” by vested-interest lobbyists
  - They are silent on the politically-central issue of wealth transfers and income distribution

# What is “business-as-usual”?

- Back in 1993 it was simple: the NZ and world economies both proceeded along projected paths based on history
- The policy shock was then treated as a single exogenous event which shifted the economy’s equilibrium configuration
- Then the scenarios with and without policy could be compared
- Implicitly, the BaU scenario could play out for the period of the simulation without encountering any other shocks or any new constraint imposed by Nature

# Now things have changed because the world has moved on

- New Zealand has ratified the Kyoto Protocol and is therefore legally bound to meet a net emission target. Any cost of that policy shock is now a sunk cost, which means that the economy's business-as-usual path must be inclusive of the Kyoto commitment

- To retain the idea of BaU as a world in which New Zealand has no emission commitment is a basic analytical error unless the assumption is made that withdrawal from Kyoto is feasible and likely

- Yet model runs continue to be done as though the decision to ratify Kyoto still lies in the future rather than in the past

- The basic decision-making rule is that byegones are byegones and only future changes should be focused on

http://www.climatechange.govt.nz/documents/economic-modelling-of-new-zealand-climate-change-policy/

- Page 22: “The BAU represents a picture of the economy and emissions without any carbon charges or international emission obligations…. [I]t is a world without Kyoto or any successor agreements”

- As the May 2009 NZIER/Infometrics paper acknowledges (p.v and p.22) “New Zealand has signed up to Kyoto and therefore must meet its obligations. New Zealand does not have the BAU option of ignoring Kyoto. Thus the costs we report are the costs of having signed up to Kyoto **and *[emphasis added]*** the government paying or using an ETS or a tax to meet these obligations”

- The authors note that this makes their BAU “a rather artificial scenario **if viewed from the perspective that New Zealand has signed up to Kyoto *[emhasis added].***” But what other perspective can one take?

- By adopting a BAU lacking any Kyoto-related policy whatever, the authors are in effect imposing the BAU assumption of a New Zealand withdrawal plus the assumption such such a withdrawal is costless.

- All the numerical estimates of “cost” in their paper have to be read with this in mind

# Implications

- Suppose we specify “business as usual” as starting from where New Zealand currently is, with the Kyoto ratification a sunk cost so that the decisions to be modelled are various new policies undertaken in that setting.

- Then the baseline scenario relative to which costs or benefits would be estimated would be the one where government does nothing to abate emissions, but simply buys permits offshore to pay whatever penalty the economy incurs for breaching its Kyoto target.

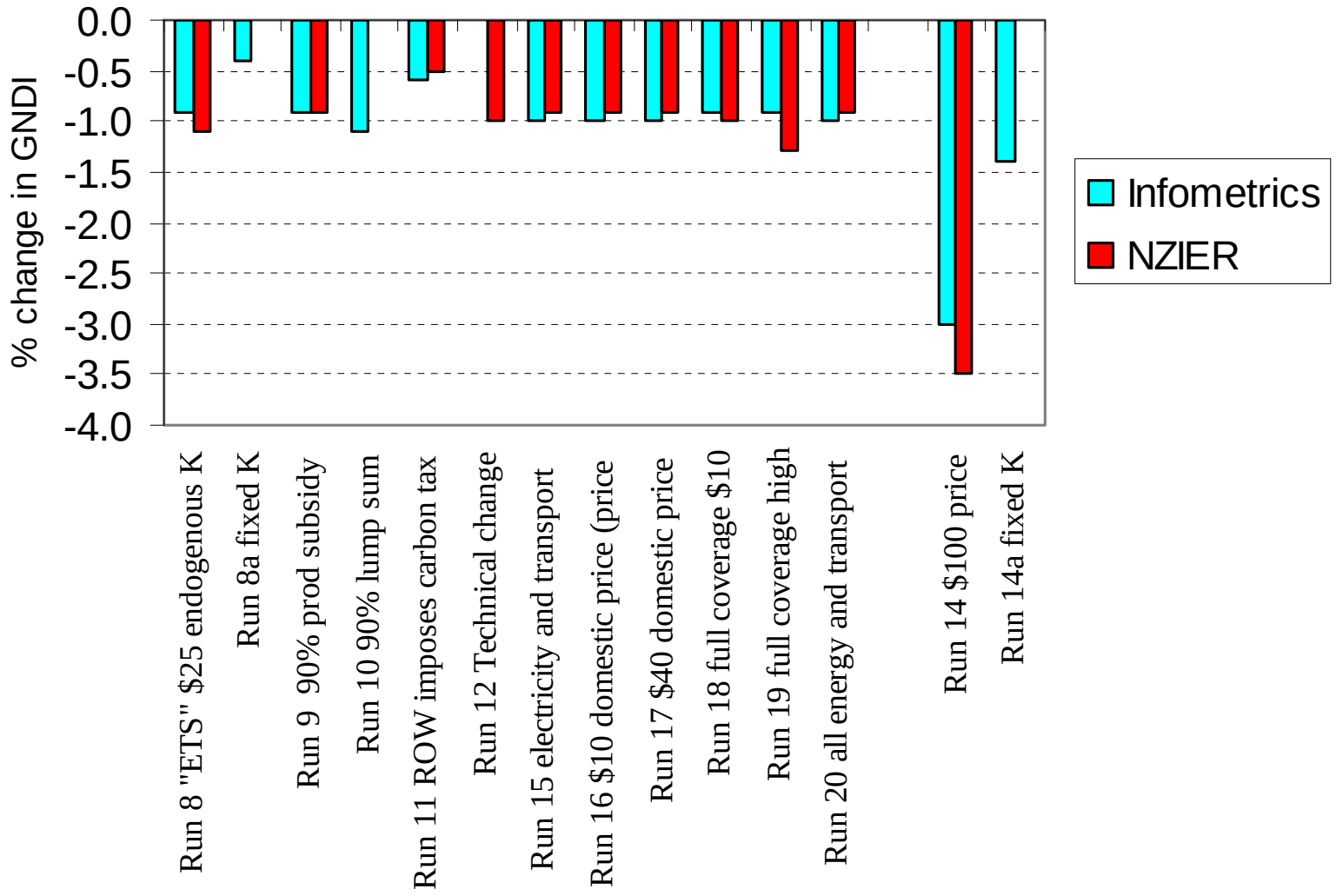
- This appears as “Run 21” in the NZIER/Infometrics exercise if a world carbon price of $25 is assumed, and “Run 22” for a world price of $100.

- Using this as the business-as-usual scenario we get quite different-looking results (same model outputs, just different presentation!)

- The next slides are identical sets of outputs from the NZIER/Infometrics modelling work, just evaluated against alternative BAU benchmarks. These are all runs in which the world carbon price is $25/t, and I’m focusing on the change in real GNDI, which the modellers chose as their measure of national economic welfare

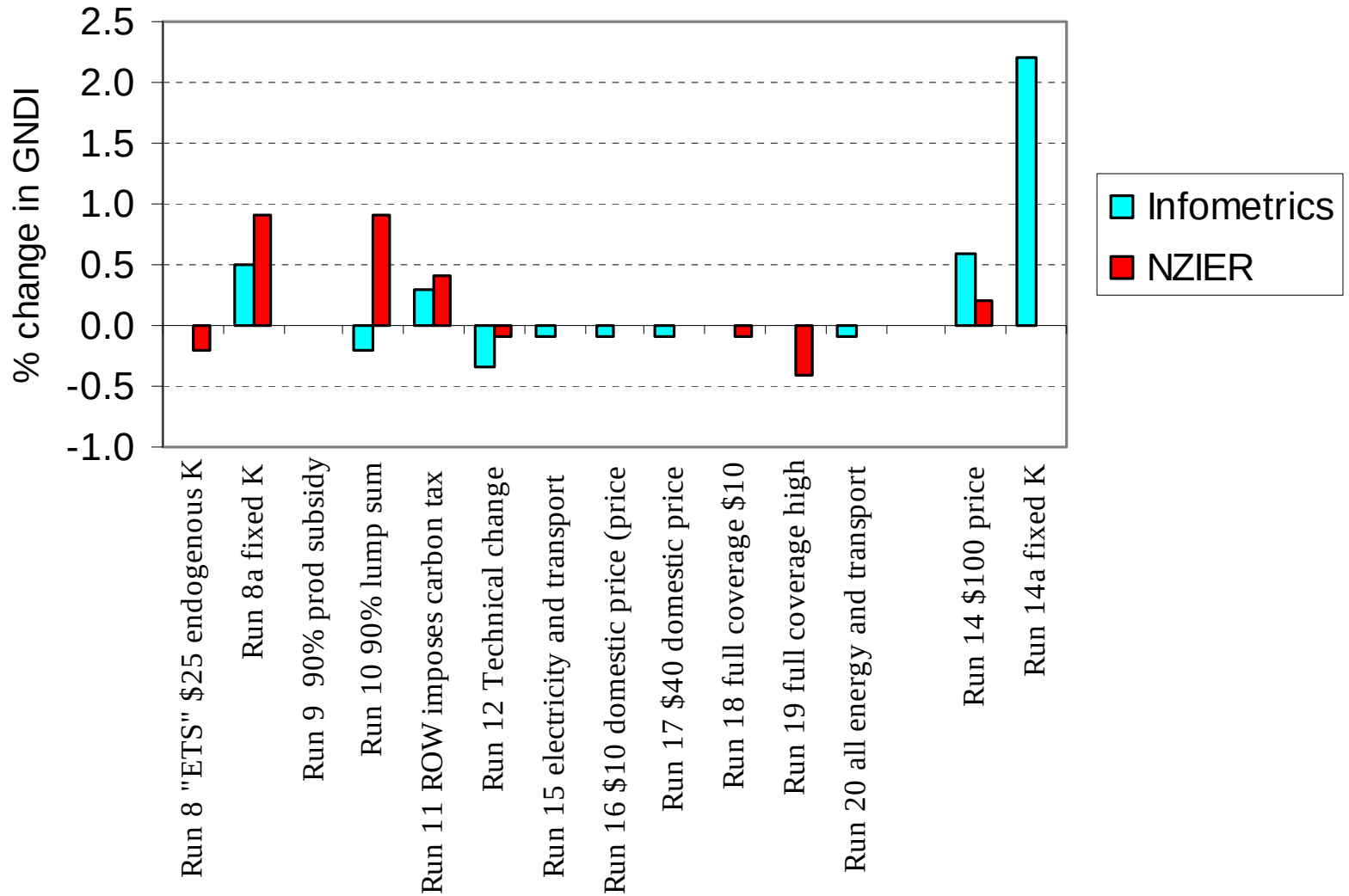
First, here’s how the results were presented in the NZIER/Infometrics report of May 2009

# BAU has no climate change, no Kyoto (or no consequences of NZ walking away from its obligations), nothing happening in rest of world



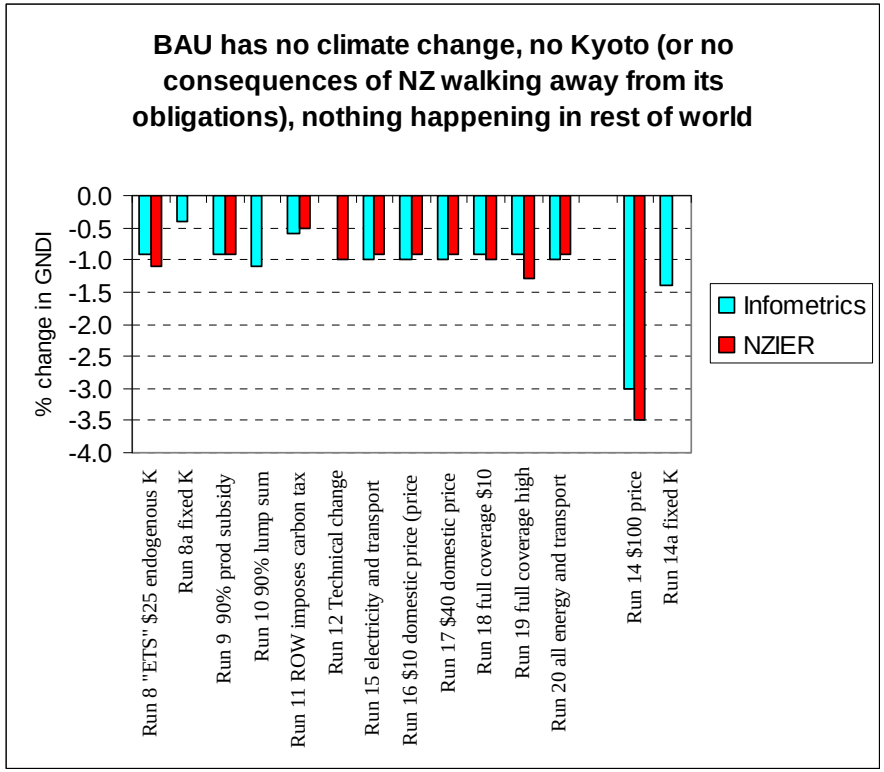
Now here's how the identical results look if we treat Kyoto ratification as a done deal (=sunk cost, = byegone)

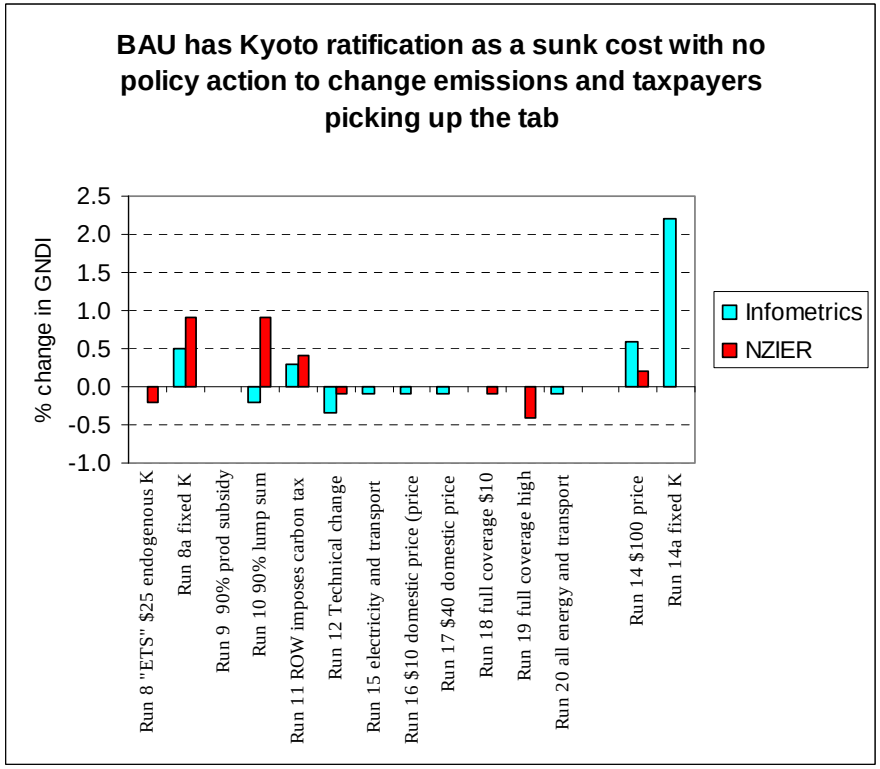
# BAU has Kyoto ratification as a sunk cost with no policy action to change emissions and taxpayers picking up the tab



Here it looks as though a 1-3% loss of GNDI is at stake in the current decision round

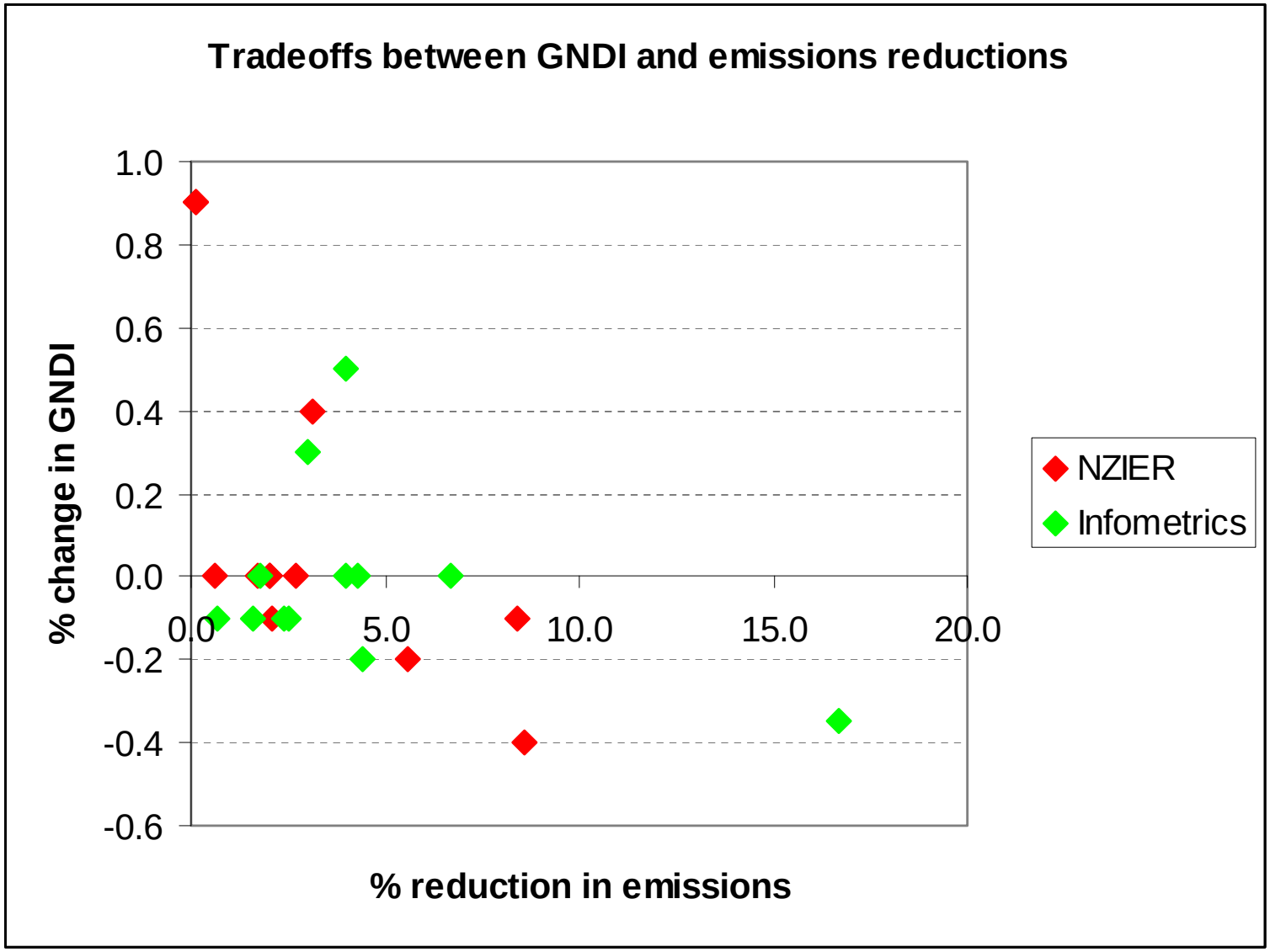
Here the biggest negative is 0.4% of GNDI and there are plenty of better policy options with payoffs between -0.2% and +2.0%



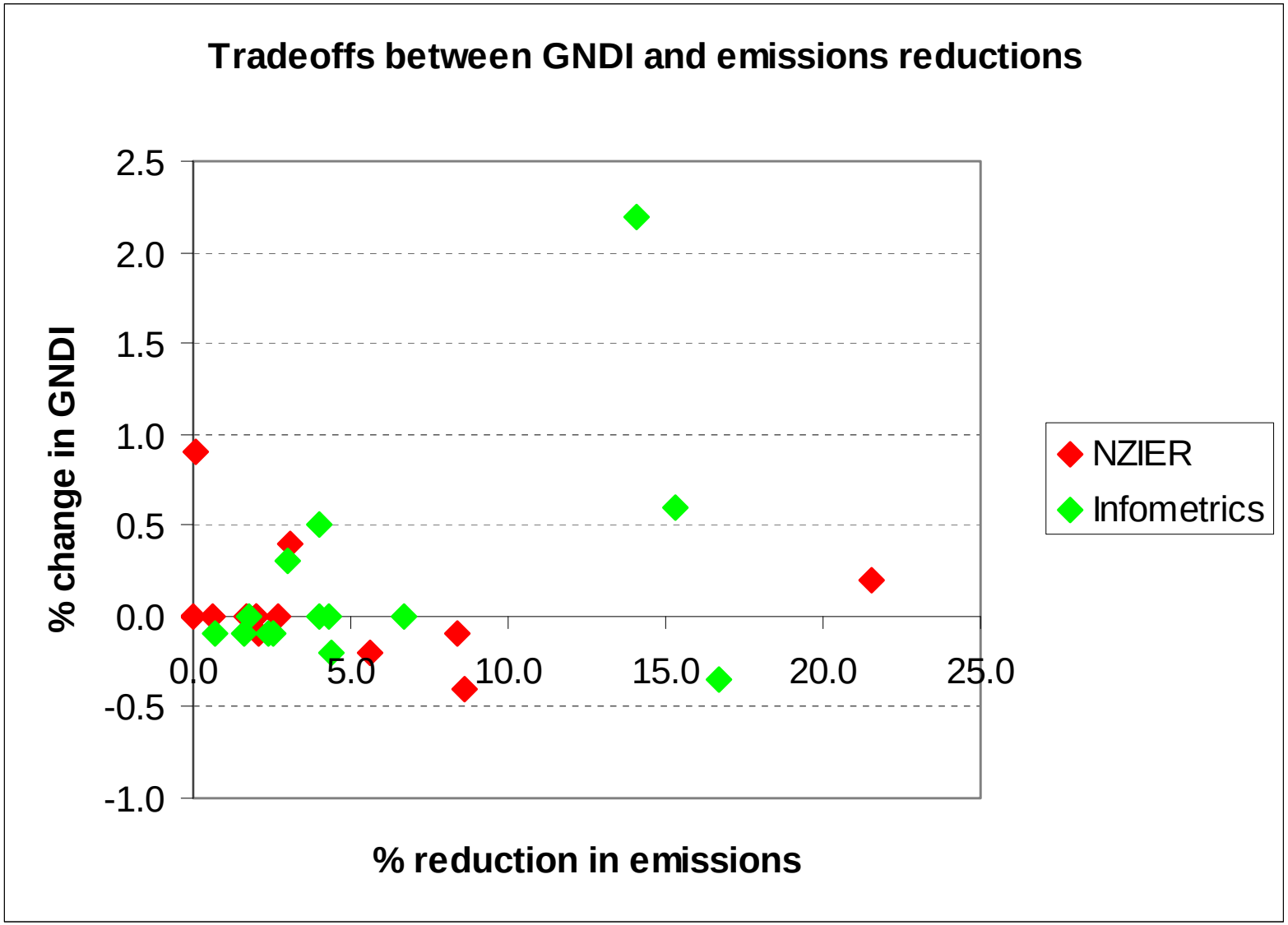




**Which of these better captures the decisions policymakers face today?**

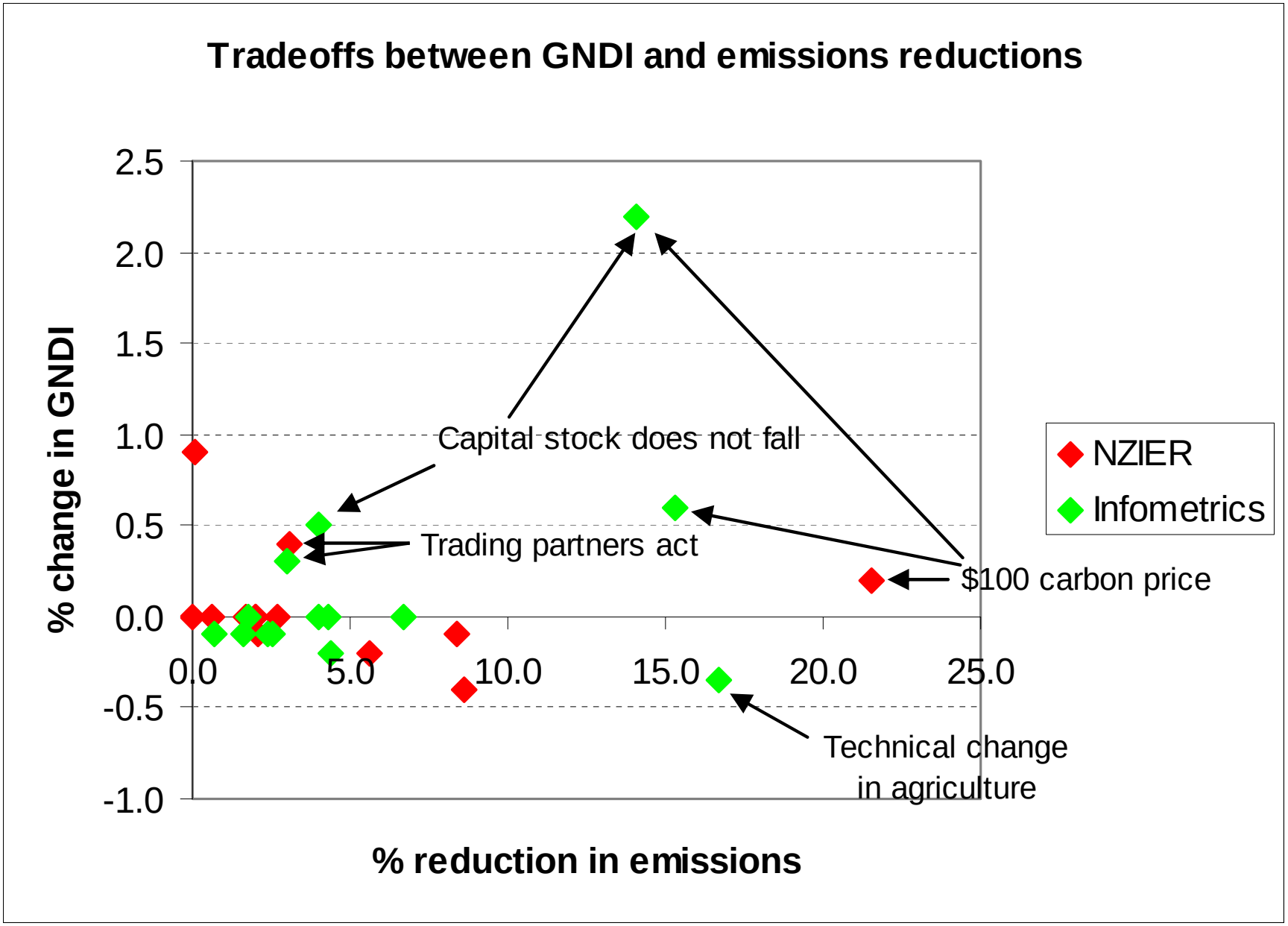
Now consider what tradeoffs might show up within the constraints of the specified model runs, first with the world carbon price restricted to $25/t….



# … and now adding in the results with world carbon price of $100/t (with BAU from Run 22)



# Here we see some things that make pretty important differences to the modelled outcomes



# Conclusions that could have been drawn in the May report

- The treatment of investment and the capital stock makes a big difference to the GNDI results so it's important to think carefully about that
- In a world where other countries (NZ's trading partners) put a price on carbon, according to these model runs NZ gains GNDI from doing so too. Why exactly? (Remember the 1991 Tasman Institute model's finding that unilateral action looked better than worldwide action, because NZ's export markets shrank under a global carbon tax!)
- In the May 2009 runs, a higher world carbon price increases the payoffs to unilateral New Zealand policy actions even if our trading partners don't act to impose carbon prices on their own producers
- Pushing technical change in agriculture would really yield a big gain in emission reduction at low cost to the economy, according to these model runs

- Obviously, those were not the conclusions actually drawn by the authors or reported in the media
- But let's think about some of them a bit further

# Take first the capital stock question

- NZIER and Infometrics started with different views, and NZIER's view prevailed except for the two special Infometrics runs (8a and 14a).

- Switching from the NZIER to the Infometrics model radically improves the simulated level of GDP and GNDI at 2025. With the $25 carbon price there's half a percent of GDP and GNDI in it; with the $100 carbon price the difference is 2.9% on GDP and 1.6% on GNDI (compare Tables 5.2.1 and 5.2.2 in the report)

- The NZIER story says that imposing a carbon tax drives down the rate of return on any given stock of capital relative to the rest of the world and this reduces investment in New Zealand. So to hold the rate of return constant, the capital stock ends up smaller than it would have been under BAU, so GDP and GNDI are both reduced.

- The Infometrics story said that the determinants of investment can't be reduced to a simple rate-of-return story, and the safest assumption is that capital stock ends up the same under the various policies. (This seems especially important here given the models' assumption of no new technologies that could create investment opportunities in renewables.)

- The different stories matter a lot because all the negative GNDI outcomes in those charts I showed are attributable entirely to the capital stock assumption – where you see a 0.4% modelled fall in GNDI, that is equal to the sensitivity of GNDI to the capital assumption

# The acid test is what happens in the NZIER story when NZ's trading partners put carbon taxes on their producers too

- That's Run 11 in the May report
- My understanding is that NZIER assumes that the rate of return on a given stock of capital in our trading partners stays unchanged under a carbon tax, while the rate of return in NZ falls unless investment and capital are cut back.
- That means at a minimum that the modelling work is incomplete without a re-specified Run 11 using symmetric investment assumptions for all countries
- It certainly means the model results were biased down for the one scenario in which New Zealand was not assumed to be acting alone (with its trading partners doing nothing)

# The capital-stock problem in summary

Why does the capital stock fall in the NZIER model?

Partly because the model captures the falling profitability of the existing carbon-intensive industries which are in the database, but doesn't allow for the profitable appearance of renewable technologies to provide the substitute products and processes. The model assumes no technology response to price

Obviously, if putting a price on carbon fails to incentivise profitable technical change, the investment outlook will weaken.

Also because the carbon tax is simply assumed to crowd out investment, without addressing the possible recycling of the tax revenue - for example, back to investment subsidies for renewables

# A couple of other small quibbles about the NZIER/Infometrics report

- P.37 “a price on carbon has the same negative effects on economic efficiency as any other distortionary tax”

- P.45 “under a carbon pricing scheme with a world price of $100, per capita income could fall by up to $2000 by 2025”

# My responses

- A tax to correct a negative externality is an undistorting tax, not a distorting one. It has positive, not negative, effects on economic efficiency.

- The statement that in the model runs per capita income “falls $2000 by 2025” is simply incorrect, and is directly and explicitly refuted several times elsewhere in the report. Its appearance in the ‘summary and conclusions’ is either a careless mistake, or a deliberate attempt to give the casual reader the wrong impression about the costs of policy

# Induced technical change

- The New Zealand GE models have no endogenous technological response to price changes
- This becomes most obvious when, e.g., the carbon price is pushed up to several hundred dollars per tonne without triggering entry by any backstop technologies
- Inclusion of backstops in GE models overseas was standard practice by the early 1990s
- It's done in the Electricity Commission and MED's modelling of electricity generation scenarios
- But neither NZIER nor Infometrics have sector-specific backstops that trip in automatically when the carbon price rises past key thresholds
- There's a big overseas literature around this, and a whole new generation of models which integrate technological response into their GE frameworks

Consider the June 2009 Infometrics report for GPC
(http://www.gpcnz.co.nz/Site/Papers_and_Submissions/Default.aspx )


# General Equilibrium Analysis of a 40% Reduction in Emissions by 2020

**for Greenhouse Policy Coalition**

**Prepared by Infometrics Ltd**

July 2009

**Table 1**
**Summary of Model Results**

| | BAU | (i) | (ii) | (iii) | (iv) |
|---|---|---|---|---|---|
| | | $100 | $200 | $500 | $500+ forestry |
| | % pa on 2005/06 | % change on BAU | | | |
| Private Consumption | 2.4 | -4.6 | -7.6 | -8.9 | -4.9 |
| Exports | 2.5 | -2.0 | -4.2 | -12.1 | -15.3 |
| Imports | 3.0 | -4.2 | -6.8 | -7.8 | -4.3 |
| GDP | 2.0 | -2.7 | -4.8 | -7.9 | -6.9 |
| RGNDI | 2.4 | -3.5 | -5.7 | -6.6 | -3.5 |
| **RGNDI per capita ($'000, 05/06 prices)** | **49.0** | **47.4** | **46.2** | **45.8** | **47.3** |
| $CO_2e$ emissions (Mt) | 86.4 | 73.8 | 65.4 | 45.6 | 45.8 |
| AAU allocation (Mt) | | 36.8 | 36.8 | 36.8 | 36.8 |
| New forestry (Mt) | | 0.0 | 0.0 | 0.0 | 9.0 |
| AAU to purchase (Mt) | | 37.0 | 28.6 | 8.7 | 0.0 |

- The headline number the funder wanted was the change in per capita RGNDI as a result of running the Infometrics model under very particular assumptions (more on those in a moment), using a simple carbon tax to drive emissions down towards a 40% reduction relative to 1990, which Infometrics estimated would mean bringing annual emissions down to 36.8 metric tonnes of CO2 equivalent.

- Under the assumptions initially specified, the target emissions reduction could not be achieved. Even with the carbon tax driven up to $500 per tonne, emissions would not come down below 45.6 Mt per year, 8.7 Mt above target.

- The modellers then assumed 9.0 Mt per year of sequestration by forestry, which meant that the target was hit by claiming credit for “LULUCF”.

A professional economist looking at these results would immediately ask three relevant questions:

- What exactly were the assumptions and how do they stack up against standard ideas from mainstream economic theory?

- Where are the health warning posted, and what do they say exactly?

- When the results of the study were released for public consumption by the lobby group that funded the work (and which presumably specified the assumptions), were the limitations clearly enough spelt out to protect the public and policymakers from drawing unwarranted implications from the numbers?

# Here's how the results were released to the media

## NEW EMISSION REDUCTION TARGET COULD BE VERY COSTLY.

**6 July 2009**

New economic analysis done for the Greenhouse Policy Coalition shows that the emission reduction targets being called for by Greenpeace of a 40% reduction by 2020, **would** come at a very high cost for every New Zealander, **potentially reducing every person's income by $3,200 by 2020 and doubling the price of energy**.

# Here's the health warning from the modeller

Adolf Stroombergen, chief economist at Infometrics concluded that the price of carbon would need to be extremely high, possibly up to $800-900/tonne, for New Zealand to reduce emissions 40% below 1990 levels **if no step-change technologies were available for widespread adoption. However at high carbon prices he expected there would be changes that the model did not readily capture.**

"At high carbon prices one would expect that some industries would close completely (rather than substantially reducing output), **there would be step changes in consumer behavior, such as how they travel to work, farming would change, and more trees would be planted.**"

# What was obviously absurd in the economics of putting a $500/tonne carbon tax on while assuming no technological or consumer response?

- The modeller was compelled to suppress the key mechanisms by which market economies respond to shocks and thereby solve economic problems

- For example, forestry planting was not allowed to encroach onto agricultural land. Simple economic intuition suffices to rule that out given that a carbon tax, applied symmetrically to sources and sinks, is a relative price swing against pastoral farming in favour of forestry. The elasticity may be uncertain but it's not zero. At $500/tonne, sheep surely give way to trees as the more profitable land use

# What conclusion should be drawn?

- First and foremost, that even “taking the model into the basement and beating it with a rubber hose” (Buiter’s description of how central banks built their risk-management models) can’t produce big economy-wide costs of climate-change policy.

- Adolf managed in his most extreme scenarios to crank out only a 5-6% one-off downward shift in the level of GDP, leaving the underlying growth rate unchanged

- The general international consensus from better models with more sensible assumptions is that a couple of percentage points of GDP is the highest one-off effect that can be counted as a cost of climate change policy. The economy can continue to grow over the long run with the global-commons externality internalised by a carbon price, and good policy design can bring the costs down to negligible levels <u>for the economy as a whole</u>

# But

- The politically-relevant costs of pricing carbon are not the economy-wide ones. They are the private losses imposed on particular groups of rich and powerful industrial interests within the advanced economies, including New Zealand

- Those vested interests won't countenance any wealth transfer from themselves to the rest of the community as a collateral effect of economically efficient policy.

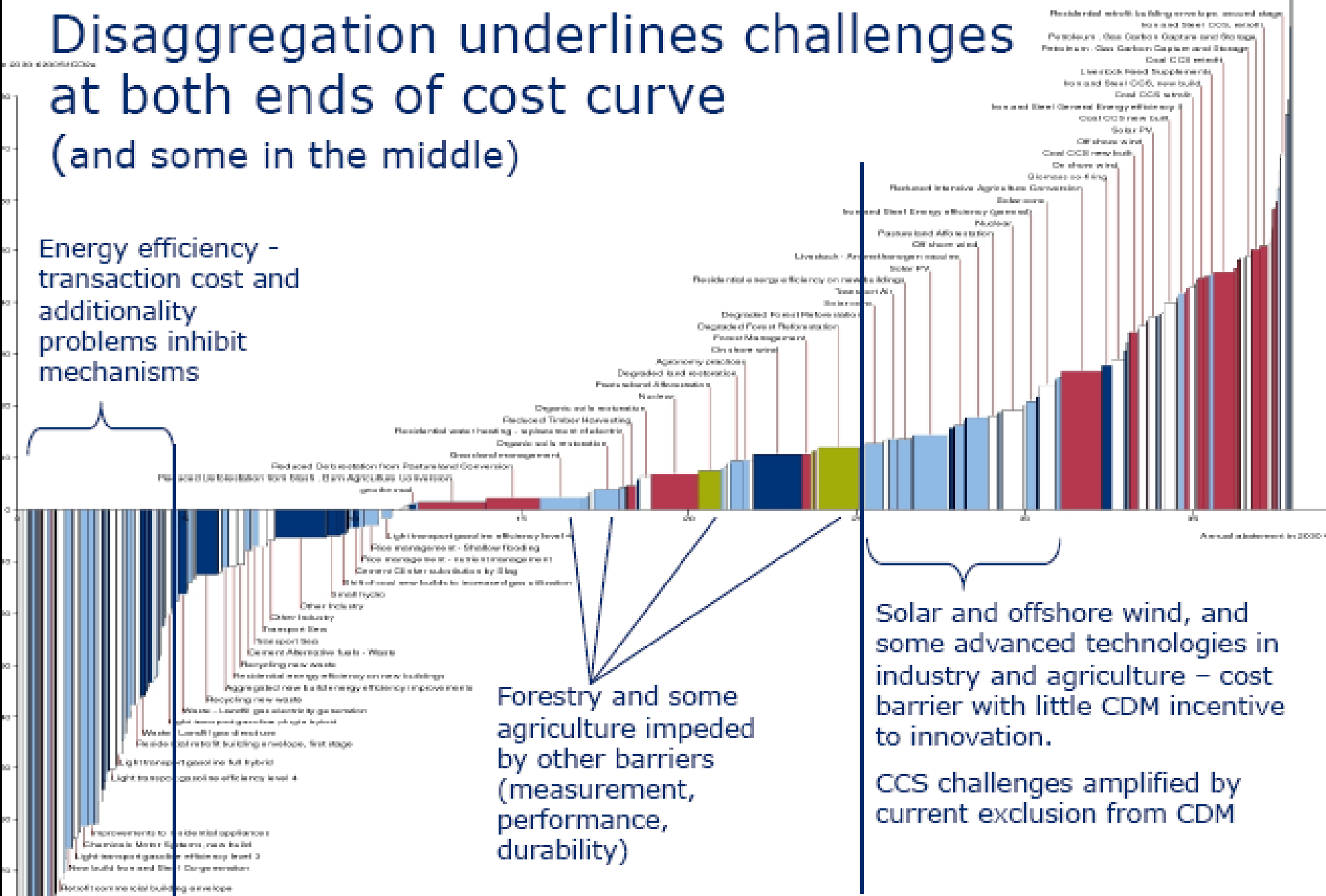
- In New Zealand they have blocked policy advance for two decades now. The ETS has been designed more to pander to their interests by corporate welfare than to change emissions.

- The economics say that a uniform, universal price on carbon is the efficient way to go. The collateral need for society to pay ransom to its hold-up operators is best addressed separately through the usual welfare-state mechanisms.

- The difficulty is that doing corporate welfare transparently in full public view is much harder to sustain politically

# Disaggregation underlines challenges at both ends of cost curve

## (and some in the middle)



Energy efficiency - transaction cost and additional problems inhibit mechanisms

Forestry and some agriculture impeded by other barriers (measurement, performance, durability)

Solar and offshore wind, and some advanced technologies in industry and agriculture – cost barrier with little CDM incentive to innovation.

CCS challenges amplified by current exclusion from CDM

Source: McKinsey Cost Curve v2.0 data, as applied Carbon Trust (2009) *'Global carbon mechanisms: evidence and emerging implicatio*