

MEMORANDUM

TO: Environmental Defence Society (EDS)

FROM: Professor Tim Hazledine

DATE: 18 December 2019

DAIRY NZ ECONOMIC MODELLING

1. DairyNZ commissioned economic modelling reports from two independent economic consultants (Sense Partners and Infometrics). The economists used the same 'computable general equilibrium' (CGE) model with the same result: New Zealand's economic well-being would be slightly improved by the imposition of freshwater quality standards.
2. The modelling reports predicted the impacts over thirty years (to 2050) of four policy 'scenarios', which are a sequence of progressively more demanding regulatory policies as they will apply to the dairy sector. Scenarios 1 – 3 are driven by the 'Essential Freshwater Package', with its goal of achieving ecologically healthy waterways through reductions in various pollutants (E-coli, suspended and deposited sediment, nitrogen, phosphorus). Scenario 4 adds methane emission targets, motivated by the Climate Change Response (Zero Carbon) Amendment Act 2019.
3. The big jump in sector impacts comes when going from Scenarios 1 and 2 to Scenario 3, with some further upheavals forecast from adding the methane targets.
4. In press releases, DairyNZ has focussed on the Scenario 3 impacts, choosing to summarise these as:
 - Costing New Zealand \$6billion/year, by 2050
 - A 24% decline in milk production, representing a 'serious threat to the international competitiveness of New Zealand's dairy sector'
 - Exports in total dropping by \$8.1billion/year in 2050
 - Loss of 15-20% of jobs in dairying
5. Below, I will first tie the DairyNZ claims in to the modelling results. Then I will give my own views on the matter.

Costing New Zealand \$6 billion/year by 2050

6. This is an unsurprising, though misleading, interpretation of the modelling prediction that real GDP would be this amount lower in 2050 under Scenario 3 than in the "Business as Usual" (BAU) counterfactual with no freshwater etc policies. In the larger overall economy of 2050 (predicted to grow about 88% overall in the thirty

years) \$6 billion is about 1.1% of GDP, and indeed this is what the modellers predict GDP will be reduced by under the Scenario.

7. I believe that -1.1% is too large an effect, for reasons I will give later. But even if I am wrong about this, there isn't a \$6 billion 'cost' to New Zealand generated here. We, or our descendants, will not be \$6 billion/year worse off as a result of implementing Scenario 3. In fact, New Zealand overall is forecast in the modelling to be slightly better off in economic terms as a result of the freshwater policies, even without adding in benefits from better water quality and lower carbon emissions.
8. This is seen on, for example, Table 1 of the Infometrics report, in which it is forecast that Real Gross National Disposable Income will be about \$1 billion/year (0.2% of GDP) *higher* under Scenario 3: 'A higher level of RGNDI is generally consistent with a better standard of living' (page 9).
9. The \$1billion/year increase seems to be due to reduced need to buy international emission units that would otherwise be needed if Scenario 3 was not enacted (Sense Partners, page ii).
10. But it is still striking that cutting back on milk production, which means cutting back on dairy product exports, is on balance not harmful to economic well-being in New Zealand. The reason, according to the economic modellers, is that NZ is producing too much milk, and thus having to take a lower price to move it all on the export market. If we cut back the quantity supplied, we could move up the demand curve, getting a better price from fewer resources committed to the dairy sector – called 'improved terms of trade' (Infometrics, pp 4, 9; Sense Partners, page ii).

24% decline in milk production, representing a 'serious threat to the international competitiveness of New Zealand's dairy sector'

11. Contrary to the above assertion, then, our 'international competitiveness' as a dairy exporter will actually be *improved* by cutting back production, in the worthwhile sense of NZ being in a more favourable market position, able to charge a higher price for our dairy products.

Exports dropping by \$8.1 billion/year in 2050

12. Most of this drop is from fewer dairy exports, but this is on a constant-price basis. That is, the *volume* of our dairy exports will fall, but, as noted above, the price we get will go up, and in the model this just about exactly matches the volume drop, such that the actual earnings from exports stays about the same. Note that one of the 'closure rules' imposed on General Equilibrium models is that the current account balance must be maintained – we cannot open up trade deficits or surpluses. Basically, what the modellers predict will happen is that NZ Inc. will get a 'free lunch' from our overseas customers: they will be willing to pay about the same total amount of money for fewer total dairy product exports, which is money we can use to pay for about the same value of imports as before, with the bonus of being able to divert the resources saved by not producing the milk to other useful productive activities in the wider economy.

Loss of 15-20% of jobs in dairying

13. Another closure rule obeyed by responsible CGE modellers is that total employment is fixed. In this case, we have policies which will release workers from, in particular, four of the sector groups in the model: dairying, dairy product manufacturing, part of services to agriculture, part of cropping (for feed). The CGE model reallocates these workers through the other 51 industry sectors, not allowing – it should be noted – for relocation, retraining, and other adjustment costs.
14. However, there can be no doubt that these adjustments will be painful in dairy-intensive regions, even though spread out over twenty years from 2030 to 2050. For comparison, the size of the adjustment is about the same size but in the other direction to that experienced over the twenty years from 2000 to 2020, when New Zealand's milking cow numbers increased by more than 20%, with the movement to dairy conversions of land previously in drystock grazing or forestry.

My assessment of the situation

15. *It is my prediction that New Zealand will be significantly better off economically from the implementation of the policy scenarios – even before factoring in the environmental benefits that these policies are primarily purposed to achieve.*
16. This is a surprising and unusual prediction that follows from unique features of the New Zealand dairy industry. We have an 'elephant in the room' here, and the name of the elephant is Fonterra. Fonterra truly is a strange beast: it has near-monopoly access to NZ's milk production, but, unlike a conventional monopoly, it is statutorily unable to choose how much milk it will process. This almost inevitably results in over-production and too-low prices, the benefits of which are overwhelmingly captured by our export customers, given that 95% of New Zealand's milk ends up being sold outside the country (in processed form, of course).
17. In this situation, imposing environmental compliance costs on the industry acts as what economists call a '2nd Best' policy. First best would be if Fonterra could control its own output: the compliance costs approximately achieve this end result by incentivising the farmers who do make the production decisions to produce less milk.
18. But if this is the case, why, in the CGE model, isn't the predicted increase in economic well-being (real gross national disposable income) even greater than the \$1 billion which is accounted for by fewer international emission units purchased? I believe this is because the CGE model is unduly pessimistic about the change in real GDP that will be the equilibrium result of Scenarios 3 and, especially, Scenario 4 – predicted to be a little more than 1% of GDP, as noted above.
19. Part of the undue pessimism no doubt stems from the assumption that land taken out of dairying will not be reallocated to other productive, but less environmentally demanding, farming activities, such as drystock farming. This is not a good assumption, and is noted as such in DairyNZ's own Report (Doole, 2019, pp14-5). Apparently, ex-dairy farmland gets switched by the CGE model into forestry, an

activity which, however environmentally desirable it may be, does not contribute much to current GDP.

20. However, there still seems to be too much GDP lost. I worry that Infometrics are here making the same microeconomic error that I criticised in my Commentary added to the Environmental Defence Society's October 31 Submission on the Essential Freshwater Reform proposals. On average, NZ dairy farms are more productive users of farm land than drystock farmers or forests. But the average conceals a wide range of productivity at the farm level, as I documented, and as Graeme Doole's current modelling fully recognises (2019, pp8-12). If the Infometrics CGE model is typical of its type then it assumes equal productivity of all farms or farms within each industry sector. Such an assumption, apart from being factually wrong, exaggerates the GDP loss from losing dairy farms, because it does not recognise that the most likely farms to be forced to retrench or even exit dairying by the costs of achieving freshwater targets will be the most economically vulnerable operators, whose demise will thereby release relatively large amounts of resources for useful redeployment elsewhere in the economy.
21. Similar considerations apply to the likely consequences of reallocation, over a very long time frame, of labour, capital and other resources released from supplying inputs to dairy farms, and from processing their milk. As a concrete example, a milk processing factory that has reached the end of its productive life would be simply shut down – not refurbished or replaced. The capital and labour thereby released would find their way to some other sector, perhaps a sector far away from farming.

What if Business-as-Usual isn't?

22. The CGE models have to grind out forecasts for economic variables all the way to 2050, the date of the long-term goal of the climate legislation. However, no-one really has a clue what the world and our piece of it will be like in thirty years' time. So the modellers do not publish their 'business as usual' (BAU) forecasts, asking and showing instead how much *difference* specific events, such as the policy Scenarios would make to the BAU numbers, whatever they are.
23. This is a sensible strategy, but only if it can be safely assumed that nothing in BAU would have direct implications for the freshwater and GHG targets.
24. But I can think of at least four possible disturbances to business-as-usual which would have such implications:
 - A major climate change catastrophe (effects unknown but likely substantial)
 - Improvements in various technologies and techniques affecting water pollution and GHG emissions
 - Major shifts in agricultural land use
 - Useful reforms in the processing sector

25. Farmers and agricultural scientists are great problem-solvers. If the problems change, then so does the direction of their efforts to solve them. As Sense Partners put it:

“We would expect additional innovation in response to tighter environmental policy settings to partially offset the long-term impacts of these policies on profits and production” (page 3)

If so, then the cuts in cow numbers required under Scenarios 3 and 4 will be less than forecast with the current BAU as built in to the CGE model. Even without tighter freshwater quality targets, it seems that there is in the agricultural research sector a general shift in emphasis towards achieving ‘cleaner’ farming in New Zealand, with results that are likely to bear fruit over the next decades

26. It seems that pressure of population growth as well as environmental considerations may result in a switch away from using arable land for producing crops to feed animals, to producing crops that feed humans directly. Talk on this seems to be focused on reducing meat production, and I don’t know if similar considerations apply to feeding dairy cattle – perhaps they are the most ecologically efficient way of getting milk. If not, then the BAU will naturally involve smaller dairy herds.
27. How long will Fonterra’s farmer owners wish to hold out before yielding to competitive pressures to improve their Co-Op’s performance, in particular with respect to the self-defeating requirement to process and sell – somehow – all milk offered to it, and perhaps also to do something about Fonterra’s famously bulky and high-paid bureaucratic management structure?

Measuring (or not) the benefits

28. Just about everyone – including DairyNZ – agrees that improving freshwater quality and reducing methane emissions are Good Things in themselves. There are doubts, however, about whether the benefits match the costs.
29. Sense Partners note that, because NZ accounts for just 0.17% of global greenhouse gas emissions, ‘even significant domestic reductions are...unlikely to deliver material benefits to New Zealand’ (page 16). I know what they mean – if the gases spread themselves evenly around the globe, reductions in any country’s point emissions will mostly benefit everybody else.
30. However, some people and politicians use this number (0.17%) to supposedly justify doing nothing at all about reducing our emissions – what’s the point? This is an immoral and inconsistent position. Emissions are not, on the whole, made by ‘countries’ but by individual households, farms and businesses. The aggregation to the country level is only meaningful from a policy response point of view – governments of countries are the only institutions with the sovereign power both to act locally and to sign treaties internationally. And as Sense Partners go on to say: ‘However, if such actions [to reduce our emissions] can support or even catalyse wider global emissions reduction efforts, there will be benefits from limiting global temperature increases.’

31. My own view, in any case, is – as I set out in my October 31 commentary in EDS’s submission – that emission targets and freshwater quality targets are really best based on ethical considerations – beyond the numerical calculus of cost-benefit trade-offs. However, due to the unusual institutional situation of New Zealand’s dairy industry, here there doesn’t even seem to be a trade-off needed: along with the environmental improvements we will get simple economic benefits from pulling back on dairying.

Modelling issues

32. It may often seem, in resource management affairs, that the technical discussion degenerates to disagreements between experts cancelling each other out, to the confusion and perhaps cynical despair of commissioners and other policymakers. In general, this does appear to be quite common in New Zealand RMA and related processes.
33. However, in the specific case at hand, the economists, at any rate, could probably find much more common ground if all competent experts had access to all the relevant information. This is not so with respect to the Computable General Equilibrium Model deployed on Dairy NZ’s behalf by the (highly competent) economic consultants, Infometrics, and used to generate the rather lurid predictions on which I have focussed above. The model is not in the public domain.
34. Dr Adolf Stroombergen – chief economist and model-builder at Infometrics – has been prompt and helpful at responding to the many questions I have posed to him, and I appreciate that. However, in going through my queries, I have come to rather feel like (to maintain the metaphor) the blind person prodding parts of the elephant to thereby try to form an idea of what an elephant looks like. If they could just open their eyes, they would understand in an instant what an elephant looks like!
35. However, to my request for a full operating manual of the CGE model, Dr Stroombergen replied (by email): “There’s no manual – the model is not in the public domain as that’s our IP”, and he referred me to the three and a half page “Overview of CGE Model”, which is Appendix A of the Sense Partners report. This is useful as far as it goes, which is not nearly far enough. The devil, here, is in the detail.
36. DairyNZ have, I recall, claimed that the modelling has been “independently peer-reviewed”, but in my professional opinion it is simply not possible to satisfactorily peer-review a ‘black box’ of which the crucial contents are concealed as private property. It is like this: a developer finishes a new building, and calls in the building inspector to certify that it is safe, etc, but then refuses to let the inspector enter the building!
37. I do not believe that the interests of public policymaking in New Zealand, and even the private interests of Infometrics, are well served by not having this model in the public domain, where it can be replicated and tested (and thereby improved) by other experts. And in the absence of such properly informed scrutiny, I do not believe that DairyNZ, nor any other interested party, are justified in taking seriously the specific forecasts that are the output of the model.

38. It is my current view – which might well be altered had I and everyone else full access to the model – that CGE models are over-used and often inappropriate in specific policy situations. To (finally) switch the metaphor, the proprietor of such a model tends to be like the small boy with a hammer, to whom everything looks like a nail. In fact, actual policy situations nearly always have crucial specific characteristics which most CGE models – being brutally simple in their theoretical underpinnings – simply can't cope with. In the present case, I expect that the model does not well mimic the unusual structure of the NZ dairy industry, with its near-monopolistic major player, Fonterra, nor the remarkable diversity of efficiency in land use at the farmer level.