Simone Pieralli, Ph.D.

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Dear Chris,

You have asked me to spell out the process I went through to review the documents you sent on potential emissions leakage. I understand you would be drawing on these documents to form part of the Commission's advice on Agricultural Assistance.

On 11th of May you provided me with draft text of Technical Annex I, alongside relevant extracts from the main report on the 16th of May. I provided written comments on this material on the 17th of May (attached in Annex 1).

You sent me an updated version of the relevant revised (but still draft) material (Technical annex revised including a preliminary version of modelling results but still to be changed before final which I did not see) on the 25th of May and asked me to verify whether the comments I had previously raised had been adequately addressed. My comments to your earlier draft were at least partly addressed. However, more new questions were raised in my brain when I reviewed the modelling boxes added on the 25th of May draft. I was not actually asked to review those modelling boxes, as they were additional material to the original draft Annex sent to me on the 11th). In any case, I provided some comments in response via email (attached in Annex 2).

Given the modelling, the unknown GHG pricing mechanism, macroeconomic uncertainty, I clearly believe a lot of uncertainties remain, as stated in my reply email on the same 25th of May. I am concerned by the potentially uncertain effects of a policy in some of the most uncertain years in a long time. This uncertainty and its effects on the policy results should be evaluated in the future before implementation (i.e. ex-ante).

Looking forward to hearing from you.

Best Regards,

Simo

[1] The views expressed in this correspondence are to be considered my own and can in no way be considered representative of any position by Massey University.

Annex 1: REVIEW of Main Report Section on "Managing the risk of emissions leakage" and "AA Report Technical Annex 1 DRAFT"

17th of May 2022

Introduction and general comments

The definitions of emission leakage in the legislation reported in the Technical Annex and paraphrased in the Main Report section are good definitions of emission leakage. One could define carbon emission leakage to be an increase in emissions abroad, originated from an increase in production abroad, induced by a decrease in production domestically, in turn caused by a domestic stringent climate policy.

The leakage rate, as defined in the Annex and in the literature, is the increase in emissions abroad divided by the decreased emissions domestically. If such defined rate is higher than 0, there is emission leakage. As a simple example, as a result of a stringent climate policy, one farmer in Aotearoa-New Zealand may stop producing one kg of a product and another farmer abroad may now find economic to produce that kg of product not produced in Aotearoa-New Zealand. If the two farmers have the same efficiency in emissions, the emissions in Aotearoa-New Zealand will be completely leaked abroad and the Aotearoa-New Zealand system would lose that kg of product (emission leakage would be 100% and no change in total emissions in the world from the domestic policy). Assuming same efficiency in emissions' intensity, the farmer abroad may instead only find economic to produce half a kg of that product (emission leakage would be 50% and there would still be a positive impact of the stringent domestic climate policy on world absolute levels of emissions). In both these cases, however, the cost to the NZ system would be high given the result obtained. The 50% leakage would still be a problem and impose a burden on NZ agriculture while other producers worldwide would benefit.

Even though it is partially true that Aotearoa-New Zealand agriculture is a high emission industry (in absolute terms) and dependent on exports for revenues, emission intensity per unit of agricultural product has gone down thanks to improvements in production and productivity (especially in sheep and beef and dairy). In the emission leakage example used above (NZ farmer dropping one kg of product domestically), what would more probably happen is that the farmer abroad deciding to increase production of one kg would have a lower efficiency in production in terms of emission intensity (given the relative efficiency of NZ producers) thus emitting more emissions in absolute than the emissions dropped domestically (emission leakage more than 100%). On the other hand, it may be as well that the farmer abroad (with now a higher emission intensity than the NZ farmer) only decides to produce half a kg more than before the domestic NZ policy. Depending on how much the emission intensity abroad were higher than the rather

efficient NZ producers, then leakage would be higher than 50%. The level of leakage is dependent in this case on the emission intensity. The lower is the emission intensity domestically, the higher is the probability of higher emission leakage abroad. The definition of leakage used in the Technical Annex and in the section of the Main Report on Leakage is similar to other modelling efforts such as, for example, from European Commission (2021).

An example of relatively stringent climate policy is the EU Emissions Trading System (EU ETS). Under the EU ETS, emissions have dropped in the EU by 24% between 1990 and 2019, while the economy has grown by 62%, thus effectively decoupling economic growth from domestic CO_2 emissions (as explained in the EU Farm to Fork strategy COM(2020)381). However, as long as other countries do not have the same level of climate ambition as the EU, there is a risk of carbon emission leakage. Preventing risks of emission leakage is one of the motivations for the introduction of the EU Carbon Border Adjustment Mechanism in 2023 on specific carbon-intensive EU imports covered by the EU ETS (REG(EU)2021/214).

The Main Report section analysed is quite balanced in defining emission leakage and reporting the findings of the Interim Climate Change Committee on the potential for leakage in main export sectors for Aotearoa-New Zealand (dairy and sheep and beef). However, the section does not provide evidence from specific modelling done on the effects of pricing agricultural emissions per se. More on this later in this document. The rest of this document takes inspiration from Technical Annex to develop more specific comments on the potential impacts of pricing agricultural emissions on emission leakage.

Specific Comments

On the importance that other countries subsidise agriculture in the Technical Annex, it is true that in some of the main competitor countries in the globe the agriculture sector is "protected" through subsidies and non-tariff barriers. However, in most NZ export competitors' cases (EU and US), these subsidies usually respond to WTO rules and thus are either low or not distort agricultural commodity markets drastically because they are mostly decoupled from production. More importantly, Aotearoa-New Zealand would be one of the first countries to have such stringent regulation (an ad-valorem tax or fixed levy) on agricultural production. The problem, moreover, is not that is unilateral but that it would be more stringent than in other export competing countries, depending on the way it is implemented.

In Section 4 of the Technical Annex, the fact that there is potential for agricultural emissions pricing to make alternative land uses such as forestry more attractive would only be in part due to the new agricultural emissions pricing. The attractiveness of forest is true already now even without having agricultural emissions priced but just by including the forestry sector in the NZ Emission Trading Scheme (NZ ETS), coupled with low wool output prices.

The following statement in the Technical Annex: "In terms of agricultural leakage, the adoption of abatement technology is a more significant factor affecting emissions leakage than the level of the carbon price" is to be potentially slightly revised to say that the Henderson and Verma (2021) study finds that a carbon tax, with the Computable General Equilibrium (CGE) MAGNET model (under a variety of scenarios varying carbon tax level, number of implementing countries and abatement technologies availability) always decreases global net emissions as long as agricultural producers have access to abatement technologies. The study also finds that increasing the carbon tax from 100 USD/tCO2eq to 200 USD/tCO2eq or taking away the abatement technologies increases dramatically leakage. Depending on how pricing will be implemented in Aotearoa-New Zealand, this last statement may become very relevant for the effects on NZ farmers.

In the Technical Annex, the statement "One of the study limitations is that it over estimates New Zealand emissions intensities as it uses US EPA cost estimates." should be complemented to say that, in that study, the abatement technology costs are fixed in the future, not including any technological change, and, thus, future adaptation is not considered potentially to its fullest extent. Moreover, negative costs abatement options are set to zero thus biasing upwards abatement costs. Finally, emissions intensities adapted from Irfanoglu and van der Mensbrugghe (2015) and FAOSTAT (2021) for use in CGE models overestimate the intensities for countries such as Aotearoa-New Zealand.

In the last paragraph of Section 4.1 in the Technical Annex, the fact that global emissions do not rise is good but, strictly speaking, if there is an increase abroad it would still be problematic in terms of leakage, as shown by the Climate Change Response Act definition. Rigorous modelling of trade interactions is needed to understand the impacts of imposing an emission reduction legislation, also in conjunction with macroeconomic and production uncertainty (high oil prices, low yields, export bans).

In Section 4.3 of the Technical Annex, the report recognizes clearly that modelling of relationships with trade partners abroad is critical to understand the risk of emission leakage. The emissions leaked are the result of various factors. One of these factors is that Aotearoa-New Zealand would export less given lower internal production, which depends on the difference between internal product price and price prevailing on the international market (this is the NZ price elasticity of export demand). Another is the importance of Aotearoa-New Zealand in that trade market (proportion of export market supplied): being a price-maker in an internationally traded commodity or an exporter with a high share of world trade would make international price more sensitive to changes in exports from that country. The third factor is the capacity of NZ trade partners and competitors to export more given a change in either bilateral exports from Aotearoa-New Zealand or international prices (price elasticity of export demand and price elasticity of supply in those countries). All these parameters should be clearly modelled and considered to have a clearer understanding of the effects of pricing agricultural

emissions on greenhouse gas emission leakage abroad. At the time of writing this Review, the Boxes on modelling, both in the Main Report (Box 1) and in the Technical Annex (Box 2), are empty of any modelling results.

In Box 1 in the Technical Annex, on the reduction of fertilisers, in the EU Farm to Fork strategy COM(2020)381 as part of the EU Green Deal targets, reduction of fertilisers of 20% up to 2030 is estimated to be required to reduce nutrient losses by 50% in the same timeframe. However, the actual national EU Member States targets, potentially more stringent than that, will be decided in the Member States National Common Agricultural Policy (CAP) Strategic Plans as established in REG(EU)2021/2115. These National CAP plans constitute the core of the Common Agricultural Policy from 2023 to 2027 and are being decided at the moment (until the September/October 2022). They will be entering into force in 2023, if no further application delay is agreed due to the Ukraine situation. Some of the EU Member States (together with the United States) are competitors for Aotearoa-New Zealand exports. The future shape that policies (softer or tighter constraints) will take in those European Union countries will have an impact on Aotearoa-New Zealand exports. In addition, the potential reductions in trade from having the EU Carbon Border Adjustment Mechanism applied to agricultural emissions (which is not the case now, but it could be in the future) and the potential benefit from signing a free trade agreement between Aotearoa-New Zealand and the European Union should be factored in the assessment.

Conclusions

More modelling is needed to understand the effects on emission leakage from different scenarios of agricultural emissions pricing. Large-scale partial equilibrium agricultural models, such as Aglink-Cosimo (routinely used by OECD, FAO, and European Commission), modified with an explicit representation of important NZ bilateral trade relationships, could be a key tool to understand the effects on emission leakage from the proposed agricultural emissions pricing. Uncertainty analysis, around the scenarios envisaged, should be also performed to understand the effects of very large macroeconomic uncertainties and potential harvest failures or unavailability (e.g. from value chain blockages). An uncertainty analysis provides somehow "confidence bounds" on predicted effects of main trade variables and can provide a probabilistic statement of these effects.

As shown in Denne (2022), emission reductions from dropping production are more prone to lead to emissions leakage. Thus, reductions in emissions should come, as much as possible, from efficiency improvements and mitigation technologies, rather than from diminishing production.

Results on leakage from pricing agricultural emissions in Aotearoa-New Zealand will clearly depend on many factors and there is still uncertainty on how the agricultural emissions pricing will be implemented exactly: who will be imposed the payment (farmer or processor), price level of reference for gases, the way this price will be pegged to payments requested from the primary sector, free

allowances, future profitability of farming sectors given uncertain macroeconomic world scenarios, and the reliance of NZ exports on some key trade partners.

Potentially and depending on the results of previously mentioned modelling and uncertainties and on the exact design of the agricultural emissions pricing policy, a valid tool to minimise production reduction in Aotearoa-New Zealand (when NZ farmers are imposed a price on agricultural emissions but farmers in trade competitor countries are not) could be providing agricultural assistance to farmers. However, the exact way this assistance would be provided is critical for the achievement of the final goal and for WTO compliance. Its effects should be specifically modelled ex-ante, monitored during implementation, and evaluated ex-post. Differences in implementation of agricultural emissions pricing and of agricultural assistance could make a big difference in results and potentially defeat the purpose of the emission reduction policy.

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Annex 2: Email to Climate Change Commission Staff

25th of May 2022

From: Simone Pieralli […]
Sent: Wednesday, 25 May 2022 2:05 pm
To: […]
Cc: [...]
Subject: RE: Risk of leakage _ Main report_For review

Kia ora […],

Thank you for sending these documents through!

My comments are mostly general and in a sense I respect the way you have decided to reply to part of my comments and include some caveats. This text in a sense remains yours fully.

The first comment is that the texts have improved quite a lot. I send the two texts with some comments and very tiny changes.

The reliance on the ICCC report in the main text is understandable given the extra modelling done since then but things change rapidly in the world. That was a pre-Covid, pre-Ukraine aggression type of analysis, pre-rise in NZU prices and so on. So their results should be taken with caution.

The other comment I would like to raise is about the modelling done. I appreciate the complexity of the modelling.

In general, it is really interesting. However, I am not sure I would believe the results fully, especially the fact that not all livestock emissions from NZ would be offset globally. There is also a contradiction between the two texts I think that I pointed out on who are the countries producing more or not. This relates also to whether we believe the emissions can be offset globally or not. If the countries offsetting are mainly the non-constrained ones, then there is no reason why they should not offset the whole emissions. If instead the emissions are mostly offset by constrained countries, then it would be more reasonable.

The other point is carbon pricing and equivalent methane prices, how they have been set in the modelling and how is any discounting applied.

I would also point out that, from the modelling, the agricultural assistance would almost reduce to zero the reduction in emissions. That probably says something about how the pricing was done and assistance has been modelled but it is hardly a desirable outcome (no leakage but also no reduction).

In conclusion, I think you have clarified that all final results depend on a lot of uncertainties.

I hope this helps.

Thank you for letting me know your opinions and if you have doubts on the points raised.

Best Regards,

Simo