Emissions leakage in the context of Irish climate action in agriculture

Alan Matthews

alan.matthews@tcd.ie

Comments and reactions welcome

Emissions leakage

- Claim is that Irish agriculture should not be asked to reduce animal numbers because it would lead to increase in global emissions
- For any traded commodity, there will be emissions leakage assuming demand (the curve, not the quantity demanded!) remains unchanged, it will be high for Irish beef and dairy
- Its almost an article of faith that Irish (dairy) production has lowest global emissions intensity per kg output and thus herd reduction must increase global emissions through simple substitution
- But impact of more stringent climate policy on global emissions is more complex and is mediated through a number of channels.
- Demand effect – lower production will lead to higher prices, thus fall in consumption
  - Reduction in emissions likely to be small due to low price elasticities of demand for ASFs
- Production switching effect – Irish beef and dairy production is relatively GHG efficient but so are many competitors that might replace Irish production
  - Differences in emissions intensity within countries as important as differences with competitor countries. Less productive (higher emissions) animals would be taken out of production first. Expansion in third countries would involve more efficient (lower emissions) animals, so working with national averages can be misleading.
  - There will be instances where emissions intensity of substitute production are higher than in Ireland (think expansion of Nigerian local production if reduced Irish powder exports)
  - No specific Irish studies address this issue and because of data issues, different assumptions on mitigation technologies, etc. one would expect results to vary widely. A study by Commission JRC looks at leakage in EU context as a result of EU-wide agricultural mitigation (Pérez Domínguez et al., 2016). (next slide)
- Climate policy design
  - Emissions are the product of activity levels and emission factors, where emissions factors are a function of technology and management. Alternative technologies can be available but imply higher cost. Setting an emissions reduction target will always imply a reduction in activity. However, the production impacts are significantly reduced when subsidies are paid for mitigation technologies. Farmers then prefer to adopt the more expensive technologies rather than reduce activity. Significant subsidy support will be available in Ireland.

Insights from EU level modelling

JRC EcAMPA 2 study (Perez-Dominquez et al, 2016)

- JRC study modelled mitigation targets of 15%, 20% and 25% reductions for agriculture in 2030 using CAPRI model
  - Uses the same database as the oft-quoted JRC study comparing emissions intensity of farm systems across EU
- Distributed across MSs on cost-effective basis (modelled by applying uniform tax on methane and N2O emissions) so Irish abatement for 20% scenario was -15.2%.
- Most leakage occurred due to increase in beef cattle production in Rest of World.
- Subsidising mitigation technologies reduces the impact on EU production and reduces leakage rates (by around 10 percentage points).
- At EU level, a 20% abatement target for agriculture was estimated to reduce
  - EU cattle numbers by 16% (production by 9%) on cost-effective basis, and EU dairy herd by -3.4% (production -2.0%).
  - Corresponding Irish figures are reduction in beef herd size of -8.8% (production -7.5%) and dairy herd -3.3% (production +0.4%).
- Emission leakage is a function of the stringency of the mitigation target. The higher you go, the more the reduction occurs through reduced activity levels and the less through technology and management changes.
  - EU study found leakage rate of 23% for 15% target, 29% for 20% target and 35% for 25% target.

EU modelling insights (continued)

- The EcAMPA study finds significant potential to reduce emissions at EU level through mitigation technologies. For 20% abatement, around 56% comes from technology and around 44% from changes in production (the latter includes the mitigation effects of measures related to genetic improvement). This reflects high share of crop production where technologies are more readily available.
- EcAMPA study does not present leakage rates by commodity or by country. Ireland with higher dependence on beef and dairy might be expected to experience a higher leakage rate if there are fewer/less effective mitigation technologies for livestock production.
- The mitigation technologies included in the EcAMPA model may also be less relevant to Irish grass-based and small farm structure. The technologies included relevant to livestock production are feed additives, low nitrogen feed, nitrification inhibitors, genetic improvements, anaerobic digestion and better timing of fertiliser.
- Most of the EU leakage rate is driven by the reductions in livestock numbers especially beef as crop production is much less affected by mitigation efforts (Figure 22 in the study).
- We can derive a crude estimate of the leakage rate for beef/dairy production in the 20% abatement scenario by (a) assuming all the increase in emissions outside EU (23.3 Mt CO_2e) arises from lower beef/dairy production, and (b) the emissions reduction from beef/dairy in the EU can be equated to the emissions reduction from reduced EU production (35.2 Mt CO_2e). This gives a leakage rate of 66%. This underestimates the leakage rate to the extent that some of the emissions reduction from reduced production arises in non-ruminant agriculture but overestimates the leakage rate to the extent that some of the emissions reduction in beef/dairy can be achieved through mitigation technologies.
- **Takeaway message:** Scaling down these EU-level results to Ireland must be done with caution. Reduction in beef herd of 16% and dairy herd by 3% (in context of other reductions at EU level) may be associated with leakage factor of 66%. Higher mitigation ambition would raise leakage factor while, to the extent that mitigation technologies are available, subsidising mitigation technologies will reduce the leakage rate. Leakage rates in the range of ambition being asked of Irish agriculture unlikely to be above 100% based on assumptions of this model

Additional emissions leakage arguments

- The policy incentive effect – impact of Ireland's behaviour on the climate policies of other countries
  - Paris Agreement strategy is based on countries agreeing to ramp up their levels of climate ambition at five-yearly intervals
  - If Ireland, as one of the world's richest countries but with an emissions profile similar to many developing countries, fails to meet the PA climate goals, this sends a signal to other countries that they need not make an effort
  - Conversely, if Ireland succeeds in meeting its climate goals, this can encourage other countries to make more ambitious reduction pledges, which is a further offset to the potential leakage in emissions
  - This ramping-up mechanism is fragile, it is not mandatory, but experience since 2015 suggests that it does work (see, e.g., pledges made by countries at Leaders' Summit on Climate) and will be an important mechanism in mitigating emissions leakage
- Technology development and transfer effect
  - Increased technology transfer to improve production efficiency and lower emissions intensities in third countries will reduce emissions leakage (Perez-Dominquez et al, 2016)
  - The heavy lifting on this will be done by climate finance, but there is a link with climate action in Ireland
  - More stringent climate action will incentivise farmers, researchers, processors and input suppliers to innovate on technologies that can reduce emissions, increasing the stock of emissions-reducing technologies available for transfer
  - Ireland alone is obviously a small player but very specialised in grassland/animal research so could have potential longer-term significance
- Summary
  - Evidence is lacking to support the claim that ambitious efforts to reduce Irish agricultural emissions would increase global emissions

Reference

- Pérez Domínguez, I., T. Fellmann, F. Weiss, P. Witzke, J. Barreiro-Hurlé, M. Himics, T. Jansson, G. Salputra, and A. Leip. 2016. *An Economic Assessment of GHG Mitigation Policy Options for EU Agriculture (EcAMPA 2)*. Joint Research Centre Institute for Prospective Technological Studies. Luxembourg: Publications Office of the European Union.