Extended Abstract
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Paper/Poster Title	National impacts of incorporating greenhouse gas efficiency and international competitiveness in trade

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Abstract	***200 words max***
Sensitivities around food production complicate efforts to reduce greenhouse gas emissions from agriculture and manage 'leakage' and 'backfire' *via* international trade. This paper considers a mechanism to internalise *relative* emission-efficiency within international agricultural trade on a commodity-by-commodity basis. At the global-scale, such a mechanism reduces global agricultural emissions by shifting production to countries that are relatively *more* emission-efficient (holding global consumption constant). Global emissions reduce *ceteris paribus* under such a mechanism, but the impact of meeting national targets is ambiguous without a numerical simulation. , Therefore, a partial equilibrium model of UK agriculture (FAPRI-UK) is used to illustrate the UK-level trade-offs of a hypothetical Relative Emission Border Adjustment (REBA). Regardless of whether the UK, or the trade partner, enjoys the emission-efficiency-advantage, global emissions fall under the REBA mechanism. When we assume the UK has the international emission-efficiency-advantage, national agricultural emissions increase because, the UK-produced commodities with the greatest *absolute* emission-efficiency-advantage (internationally), do not necessarily have a *comparative* emission-efficiency-advantage over other agricultural commodities (domestically). When we assume the trade-partner has the emission-efficiency-advantage, UK national agricultural emissions decrease but national consumption emissions increase, due to a higher share of (less emission-efficient) domestic produce being consumed nationally, instead of exported.	

Keywords	Agricultural sector greenhouse gas policy; Carbon-leakage; Carbon Border Adjustment; Food system decarbonisation
JEL Code	C63; Q11; Q17; Q56 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	***100 – 250 words***
This paper modifies the prevailing approach to address greenhouse gas emissions from energy (carbon) and trade intensive commodities for application to the main agricultural commodities produced in the UK. A price adjustment (tariff) based on the relative emission-intensity of the same agricultural commodity produced domestically, or by a trade partner, is implemented at the border. This directly disincentivises trade of that commodity by countries with relatively more polluting production systems (discouraging carbon-leakage), and indirectly encourages production of that commodity to shift towards countries with relatively less polluting production systems (improving global agricultural emission-efficiency).	

Methodology	***100 – 250 words***
Methane and nitrous oxide emissions linked to livestock and crop production are mapped from the UK national greenhouse gas inventory to agricultural sub-sectors in a partial equilibrium model (FAPRI-UK) to calculate an emission-intensity per unit of output for the main commodities produced and traded by the UK. Counter-factual scenario analysis is used to compare the implementation of a REBA-tariff on internationally traded commodities with a business-as-usual projection of production, prices, trade, emissions and nutrient balances forward to the year 2031. The UK model is solved with the FAPRI-GOLD model covering agriculture in the EU-27 to capture any feedback effects *via* the UK's main export and import markets.	

Results	***100 – 250 words***
Global emissions reduce regardless of whether the UK or the trade partner enjoys the emission-efficiency-advantage. The national emission impact is more sensitive to the UK's relative emission-efficiency position. In the case UK agriculture is better positioned, the contribution of agriculture to the national inventory (by source) increases, but taken from a consumption-side accounting approach (source emissions + emission embedded in imports – emissions embedded in exports) decreases. The opposite occurs in the case the RoW has an emission-efficiency advantage, with the by source inventory decreasing, but additional emissions being 'used' within the UK, largely due to a greater proportion of relatively in-efficient domestic produce displacing imports.	

Discussion and Conclusion	***100 – 250 words***
The analysis illustrates that the implementation of a relative emission border adjustment (REBA) has the potential to reduce global methane and nitrous oxide emissions within the food system without reducing the global supply of agricultural commodities. The mechanism directly reduces the global-average-emission-intensity of agricultural commodities by shifting production away from relatively more emission-intensive producers towards more efficient ones. The tariff on imports with a higher average emission-intensity helps to protect domestic producers in the case emission-reduction strategies impact on price competitiveness. However, in the case international competitiveness of UK commodities improve due to the REBA, production increases lead to additional emissions, working against (source-based)	

national emission targets, even though the UK's use-based emissions, and global emissions, are lower.