

Taxing Carbon along the Value Chain. A WIOD CGE Application.

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Relevance

- Lessons from Durban et al.: Long way to go to reach a global climate agreement.
- Subglobal climate coalitions still want to proceed.
- But then: carbon leakage, competitiveness concerns.
 - Simulation studies: IPCC (2007): Carbon Leakage from Kyoto: 5 - 20%.
 - Econometric studies: Aichele and Felbermayr (2011) 8% increase of trade in embodied carbon from Non-Annex B to Annex B countries.
 - Peters et al. (2011): Net emissions transfer through international trade from developing to developed countries: 1990: 0.4 Gt CO₂, 2008: 1.6 Gt CO₂

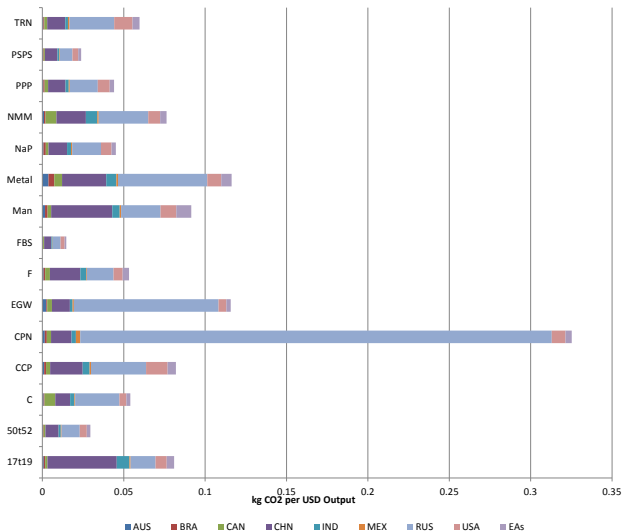
Border Measures

- Idea: Implement border measures (BTA) to address those issues.
- Add a border tax on foreign unregulated CO₂ emissions.
 - Markusen (1975), Copeland (1996): Border measures belong to the optimal policy portfolio in transboundary pollution problems.
 - Böhringer et al. (2011) analyse such tariff on embodied carbon by using a CGE model with GTAP 7.1 data.

Vertical Specialization

- Increasing vertical specialization since WWII.
- Hummels et al. (2001): International trade caused by VS increased by 30% (1970-1990)
- More complex trade networks may lead to double regulation of traded CO₂.

Non-EU Embodied Carbon in EU products



Outline

Motivation

WIOD CGE Model

- Calibration

- Scenarios

Simulation Results

- Carbon Leakage

- Sectoral Effects

- Welfare

- Vertical Specialization

Conclusion

WIOD CGE Model

Computable General Equilibrium (CGE) Model in the tradition of PACE, etc.

- Production through nested CES functions with CRS.
- International linkages: Armington (1969) trade, no factor mobility, no transport costs
- Substitution of energy by value added.
- BTA: Measuring embodied carbon and value it with coalition carbon price.
- Formulated as Mixed Complementarity Problem

Calibration

- IO data from the WIOD project: 40 countries, 35 sectors, 1995-**2005**-2009.
- Aggregated to 11 regions, 14 sectors
- Sectoral CO₂ data from WIOD environmental satellite accounts
- Behavioral parameters taken from Koesler and Schymura (2012).

Scenarios

1. Reduction only

- 20% CO₂ reduction relative to baseline in a coalition of EU, Australia, developed East Asian countries (Japan, South Korea, Taiwan)
- No border measures

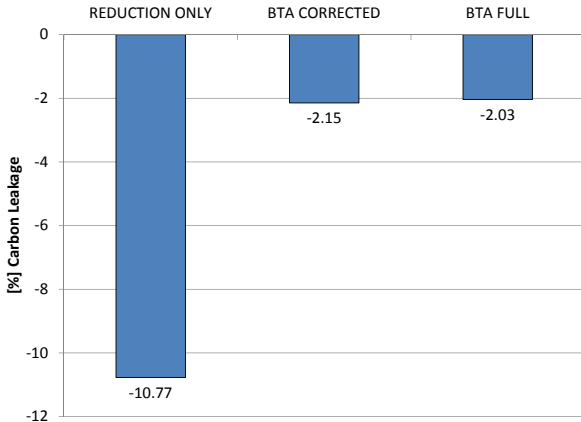
2. BTA full

- Same reduction as in *Reduction only*,
- but accompanied by a tariff on embodied carbon.
- if crosses border into coalition: embodied carbon priced with internal carbon price,
- no matters where the carbon comes from.

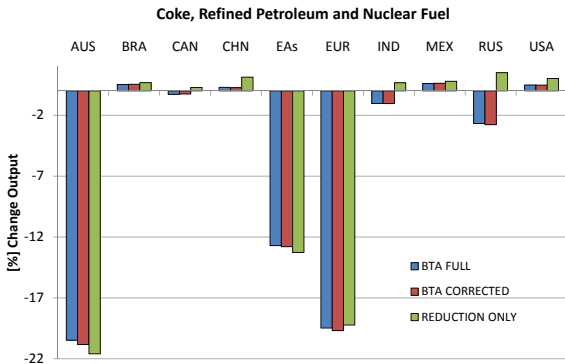
3. BTA corrected

- As *BTA full*,
- but only embodied carbon from non-regulated countries is taken into account.

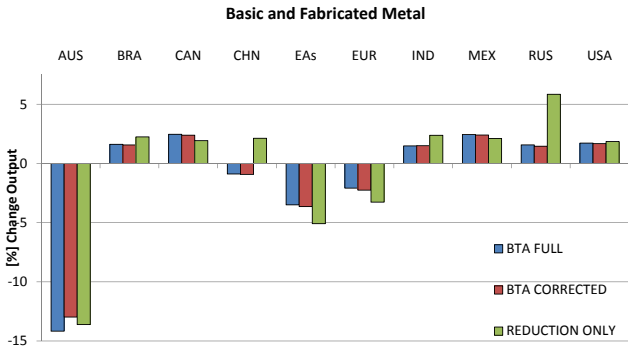
Effects on Carbon Leakage



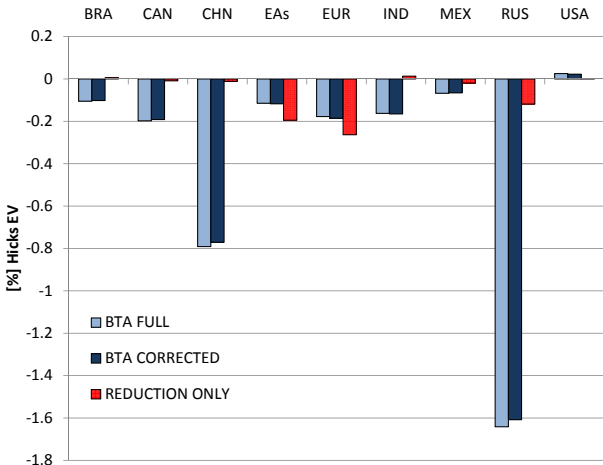
Sectoral effects: Coke



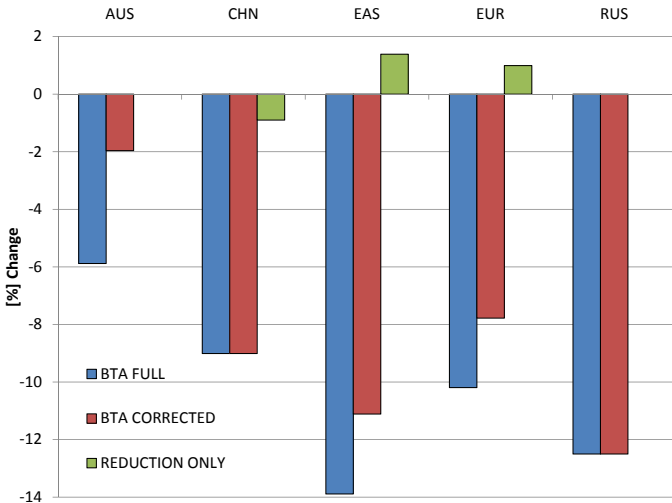
Sectoral effects: Metal



Welfare effects



Change in VS share of total exports



Concluding Remarks

- Using the WIOD CGE model:
- Tariff on embodied carbon is effective,
- but shifts burden to non-coalition regions.
- Differentiated carbon tariff has not much value added (but depends on assumed policy scenario)
- Effects of climate policy measures on vertical specialization need more attention.

Thank you for your attention!
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