Alternatives to Carbon Border Adjustment

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What is the question?

- Climate change is a global issue ⇒ global policies . . .
- . . . 2 main obstacles: free riding + special and differenciated treatment.
- Actually, several unilateral policies and big free-riders.
- 2 main issues: leakages (direct + indirect) + competitiveness.

⇒ **What is the best (second order) policy that could be unilaterally implemented by the EU?**

- Minimize leakages
- Minimize the negative impact on the competitiveness of domestic producers
- Incentive for free riders to join / for other countries to be more ambitious.

Main findings

In a world where a global policy to tackle climate change is not in place:

1. All unilateral policies fail to attract the US;
2. The social planner best solution (Club) is the most efficient
   $\rightarrow -40\%$ in leakages ...
3. ... but difficult to put in place (large redistribution within the Club);
4. Most efficient alternative for the EU27 alone: compensatory tariff at the border (difference in the carbon taxes).
   $\rightarrow -21\%$ in leakages, small damages on domestic producers.
   But what about WTO compatibility?
5. CBA: most popular among policy makers (and public opnions) but the less efficient (leakage & GDP).

Literature

Beyond mechanisms at stake, extensive CGE litterature on

- Impacts: environment, economic, redistributive...
- Different policies: CBA (Babiker and Rutherford, 2005), CCBA (Weitzel et al., 2012; Antimiani et al., 2013), compensatory tariffs (Böhringer et al., 2012), coalitions (Manders and Veenendaal, 2008)
- Under different instutionnal environments: Kyoto Protocol, EU ETS, Paris Agreement – with or w/o the US...

It provides guidelines for the optimal designs of policies, in particular CBA:

- The base for compensation
- The tax rate
- Compensation mechanisms for domestic producers

Contribution

1. Unified framework to compare different policy options:
   - several CBA modalities + Nordhaus Club;
   - in terms of multiple outcomes: global GHG emissions, incentive for free-riders to join, impact on the imposing economy.
2. Reference scenario: Paris Agreement, without the US.
3. Considered GHGs: CO_2, non CO_2, emissions from energy use and from production processes.

The model – Main features

One of the main issues at stake: leakages

- Direct: displacement of activities;
- Indirect: lower global energy prices.

⇒ CGE model: MIRAGE-e, with GVCs + GHGs

- GHGs: GTAP-E and GTAP NCO_2 + model structure for GHGs from production + energy in VA (Fontagné et al., 2013)
- Recursive dynamic: GDP, current account, saving rates, energy efficiency consistently projected by a macro-model then imposed to MIRAGE (Fouré et al., 2013);
- Modelling of a GHG cap: endogenous GHG tax to meet an imposed GHG target (eq. to cap and trade).

Detailed scenarios I

MIRAGE-e 2, GTAP9 (splitted with the ImpactECON package, Walmsley and Minor, 2016)

1. **Baseline:** dynamic, in 2 steps
   → BAU + update in tariffs (Guimbard et al., 2012) and FTAs + **Paris Agreement**
2. **Scenario 1:** Carbon Border Adjustment mechanism in the EU27
   - The EU GHG tax is applied on **all** imported goods;
   - Based on the emission intensity of **European** producers;
   - At this stage, **no rebate** for European exporters (incomplete CBA).

Detailed scenarios II

3. **Scenario 2:** The EU27 imposes a (positive) tariff at its borders
   - To compensate for the differences in the level of the taxes on GHG emissions (EU27 – exporting country);
   - Based on the emission intensity of **European** producers.

4. **Scenario 3:** the EU27, the UK, China and Japan build a Club
   - Common target in emission reduction (equal to the sum of individual NDCs);
   - A (relatively) small tariff (2 p.p.) on **all** goods imported from outside the club.

Results – Emission leakage

Scenario	Leakage (Mt CO_2eq)
Paris Agreement	1719
Club & tax	−701
Club w/o tax	−603
Scenario 2	−358
Scenario 1	−113

- Club: −40% in leakage with tax, −35% without;
- Scenario 2: half of the impact of the Club, sizeable changes in some sectors;
- CBA misses the target.

Club – Detailed results I

Table: Impact on GHG emissions

	Paris Ag.	Scen. 3	
	(Mt CO_2eq)	Club w/o tax (%)	Club & tax (%)
Club	24041	0.04	0.01
EU27	3097	64.17	63.35
China	19709	−14.17	−14.04
Japan	809	67.71	67.09
UK	426	62.94	62.14
USA	10452	−1.49	−1.62
Dev. No commit.	7567	−2.32	−2.80
World	72923	−0.85	−1.03

Notes: Variations, in volume, with respect to the reference scenario (i.e. Paris Agreement without club), in 2035.

Club – Detailed results II

Table: Long term changes in GDP

	Paris Ag.	Scen. 3	
	(USD bn)	Club w/o tax (%)	Club & tax (%)
Club	64365	1.63	1.56
EU27	22324	3.50	3.43
China	29838	−0.90	−0.92
Japan	7994	5.50	5.35
UK	4209	2.23	2.06
USA	25135	0.07	0.01
Dev. No commit.	7141	0.25	−0.19

Notes: Variations, in volume, with respect to the reference scenario (i.e. Paris Agreement without club), based on a Fisher index.

EU unilateral policies – Results I

Table: Impact on GHG emissions

	Paris Ag. (Mt CO_2eq)	Scen. 2 (%)	Scen. 1 (%)
EU27	3097	−0.86	0.01
China	19709	−0.01	0.01
Japan	809	−0.01	−0.00
UK	426	4.25	−0.44
USA	10452	−0.71	−0.30
Dev. No commit.	7567	−0.77	−0.25
World	72923	−0.50	−0.14

Notes: Variations, in volume, with respect to the reference scenario (i.e. Paris Agreement without club), in 2035.

EU unilateral policies – Results II

Table: Long term changes in GDP, selected countries

	Paris Ag. (USD bn)	Scen. 2 (%)	Scen. 1 (%)
EU27	22324	−0.09	−0.23
China	29838	−0.00	0.01
Japan	7994	0.03	0.01
UK	4209	0.12	−0.05
USA	25135	0.00	−0.01
Dev. No commit.	7141	0.01	−0.05

Notes: Variations, in volume, with respect to the reference scenario (i.e. Paris Agreement without club), based on a Fisher index.

Conclusion – Take home

In the absence of a global climate policy, how to tackle leakages and competitiveness distortions?

- Club: the best solution $\rightarrow$ minimal leakages + resources to redirect towards poorest countries.
- Club has 2 main drawbacks: fails to attract the US + massive redistribution of gains within the Club.
- A good alternative: unilateral EU compensatory tariff. But WTO compatibility?
- CBA: lowest benefits for the environment, costs beard by the EU only.

Next steps

- What is the cost for the US to join the Club?
- What is the outcome of a CCBA (CBA + rebate for domestic exporters)?
- Illustrate the differences when the CBA is designed on importers *vs* exporters emissions.

References I

Antimiani, A., Costantini, V., Martini, C., Salvatici, L., and Tommasino, M. C. (2013). Assessing alternative solutions to carbon leakage. *Energy Economics*, 36:299–311.

Babiker, M. H. and Rutherford, T. F. (2005). The economic effects of border measures in subglobal climate agreements. *The Energy Journal*, 26(4).

Böhringer, C., Bye, B., Fæhn, T., and Rosendahl, K. E. (2012). Alternative designs for tariffs on embodied carbon: A global cost-effectiveness analysis. *Energy Economics*, 34:S143–S153.

Fontagné, L., Fouré, J., and Ramos, M. P. (2013). MIRAGE-e: A general equilibrium long-term path of the world economy. Working Paper 2013-39, CEPII.

Fouré, J., Bénassy-Quéré, A., and Fontagné, L. (2013). Modelling the world economy at the 2050 horizon. *Economics of Transition*, 21(4):617–654.

Guimbard, H., Jean, S., Mimouni, M., and Pichot, X. (2012). MAcMap-HS6 2007, An exhaustive and consistent measure of applied protection in 2007. *International Economics*, 130:99–121.

Manders, T. and Veenendaal, P. J. (2008). Border tax adjustments and the eu-ets-a quantitative assessment. Technical report, CPB Doc. 171.

Walmsley, T. and Minor, P. (2016). ImpactECON 002 rev. 2 Supply chain database, data and model documentation. Technical report, ImpactECON.

Weitzel, M., Hübler, M., and Peterson, S. (2012). Fair, optimal or detrimental? environmental vs. strategic use of border carbon adjustment. *Energy Economics*, 34:S198–S207.