“International Trade in Carbon-Based Products: What are the Rules and Consequences?”

Ian Sheldon
AED Economics, Ohio State University

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Climate Change

- Widely accepted climate change is occurring, is largely irreversible, and CO\textsubscript{2} emissions are connected to human activity (NRC, 2010)

- CO\textsubscript{2} concentrations have increased from pre-industrial levels of 280 ppm to 400 ppm (IPCC, 2014)

- In absence of mitigation, mean projected global warming will reach 3 to 4\textdegree{}C by 2100 (IPCC, 2014)

- Risks associated with climate change include changes in precipitation, sea-levels, and ocean circulation (Farid et al., 2016)
Climate Change

- Climate change is “...greatest and widest-ranging market failure ever seen...” Stern Report (2006)

- Despite logic of multilateralism (Paris Agreement), climate policy increasingly common at regional (EU), national (Australia), and sub-national (California) levels

- Necessarily “second-best” – problem of free-riding by those not in coalition

- Irrespective of policy-choice (tax vs. cap-and-trade), proposed unilateral climate legislation often includes border carbon measures
Why Border Carbon Measures?

- Industries accounting for large proportion of GHG emissions will face increased costs

- Typically, legislation targets border measures at carbon-intensive imports – predicated on two concerns about unilateral climate policy:
  - *Carbon leakage*
  - *Competitiveness*

- SB 775 (California) - importers required to purchase permits for CO$_2$ emissions, exporters exempt (Fowlie, 2017)
Economics of Border Carbon Measures

- Interdependence of leakage and competitiveness not a new idea – restatement of “pollution-haven” hypothesis (Copeland and Taylor, 2004)

- Policy options analyzed extensively:
  - *Environmental economists*: solve collective action problem via manipulation of terms of trade (Hoel, 1996; Böhringer *et al*., 2014)
  - *Trade economists*: restoring competitiveness vs. meeting WTO commitments (Bagwell and Staiger, 2001)
WTO Rules on Border Carbon Measures

- From standpoint of WTO, choice of border carbon measure will be critical – even if they have similar effects (Pauwelyn, 2013)
  - Import bans – would violate GATT Article XI
  - Punitive tariffs – would violate GATT Article II
  - Anti-dumping duties – cannnot include cost of carbon in importing country
  - Countervailing duties – failure to price carbon would not constitute an export subsidy
- Main challenge: to convince WTO that a border measure is an extension of domestic climate policy
Border Tax Adjustments (BTAs) and WTO

- Are BTAs trade-distorting?
- Imposition of domestic tax on “like” imported goods – allowed under GATT Article II: 2(a) if BTA is equivalent to internal tax
- Position of GATT/WTO established following implementation of VAT by EU, and based on economics of move to destination-based tax system
- Non-distorting due to price/wage/exchange rate adjustments (Lockwood *et al.*, 1994)
- BTAs should be *neutral* in terms of trade effects (WTO, 1997) – what does neutrality mean?
WTO/Climate Policy/BTAs

- BTAs come under GATT Article III: 2 – key issue is whether they are allowable on final goods that embody carbon or use carbon-intensive inputs

- Considerable legal analysis of how WTO Panel might rule (Goh, 2004; Pauwelyn, 2013)

- May be consistent with GATT Article III: 2 – Superfund case (GATT, 1987) cited in support

- Could justify under GATT Article XX – i.e., has necessary environmental objective, and is not discriminatory/trade-distorting
Case-Study: U.S. Aluminum Industry

- Energy-intensive industries such as steel, aluminum, chemicals, paper and cement most likely to be affected by unilateral climate policy (Houser et al., 2008)

- If market structure matters in these sectors, issues of carbon leakage and competitiveness best analyzed in tradition of, *inter alia*, Conrad (1993) and Barrett (1994)

- Trace out potential effects of US and Québec climate policies in U.S. aluminum industry where BTAs are assumed WTO-legal
Aluminum Production

- Primary aluminum produced in vertical process initially requiring bauxite and alumina
- Aluminum extracted from alumina by electrolytic reduction method using carbon anodes
- Production process energy-intensive, energy accounting for 25% of production costs (USITC, 2010)

Two key sources of GHG emissions (Carbon Trust, 2011):
  - Production process (2-3 tCO$_2$/t of aluminum)
  - Upstream electricity generation (3-20 tCO2/t aluminum)
## Aluminum Industry: Market Structure

### Table 1: Market Structure of North American Aluminum Industry

<table>
<thead>
<tr>
<th>U.S. Producers</th>
<th>Market Share (%)</th>
<th>Canadian Producers</th>
<th>Market Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcoa</td>
<td>50.8</td>
<td>Rio Tinto Alcan</td>
<td>51</td>
</tr>
<tr>
<td>Century Aluminum</td>
<td>21.2</td>
<td>Alcoa</td>
<td>31</td>
</tr>
<tr>
<td>Rio Tinto Alcan</td>
<td>5.3</td>
<td>Alouette</td>
<td>18</td>
</tr>
<tr>
<td>Columbia Falls Aluminum</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>17.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/H</td>
<td>2.94</td>
<td></td>
<td>2.57</td>
</tr>
</tbody>
</table>

Source: Sheldon and McCorriston (2016)
North American Aluminum Industry

- Reasonable to treat U.S. and Canada as segmented markets where Canadian producers compete in US
- 50% of U.S. consumption via imports predominantly from Canada, and U.S. is most important export market for Canada
- Key difference between U.S. and Canadian aluminum production is that latter exclusively sources hydro-electric power
- Estimated GHG emissions: 2.5 tCO₂/t of aluminum in Canada (CIEEDAC, 2013) compared to 7.4 tCO₂/t of aluminum in U.S. (Carbon Trust, 2011)
## Simulation Results

### Table 2: Welfare Effects of U.S. and Québec Carbon Policies ($ billion)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-policy</th>
<th>U.S. carbon tax</th>
<th>Volume BTA</th>
<th>Share BTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producer profits</td>
<td>2.29</td>
<td>1.96</td>
<td>2.03</td>
<td>2.18</td>
</tr>
<tr>
<td>User surplus</td>
<td>11.72</td>
<td>11.15</td>
<td>10.92</td>
<td>10.40</td>
</tr>
<tr>
<td>Tax revenue</td>
<td>0.00</td>
<td>0.46</td>
<td>0.74</td>
<td>1.30</td>
</tr>
<tr>
<td>Social cost</td>
<td>0.52</td>
<td>0.49</td>
<td>0.49</td>
<td>0.50</td>
</tr>
<tr>
<td>Social welfare</td>
<td>13.49</td>
<td>13.08</td>
<td>13.20</td>
<td>13.40</td>
</tr>
<tr>
<td>Deadweight loss</td>
<td>-</td>
<td>-0.11</td>
<td>-0.06</td>
<td>-0.02</td>
</tr>
<tr>
<td>Effective carbon price ($/tCO₂)</td>
<td>-</td>
<td>282,84</td>
<td>282,84</td>
<td>282,84</td>
</tr>
<tr>
<td>BTA ($/t)</td>
<td>-</td>
<td>-</td>
<td>141</td>
<td>469</td>
</tr>
<tr>
<td>Market share (%)</td>
<td>57</td>
<td>55</td>
<td>56</td>
<td>58</td>
</tr>
<tr>
<td>Emissions (CO₂t - millions)</td>
<td>24.67</td>
<td>23.31</td>
<td>23.41</td>
<td>23.64</td>
</tr>
<tr>
<td>Leakage</td>
<td>-</td>
<td>0.12</td>
<td>0.00</td>
<td>-0.78</td>
</tr>
</tbody>
</table>

Source: Sheldon and McCorriston (2016)
Case Study - Conclusion

- Once market structure is allowed for in aluminum production, competitiveness can be defined in terms of profit-shifting
- Extent of both leakage and reduction in competitiveness dependent on interaction between U.S. and Canadian producers
- WTO-legal application of BTAs needs to account for way in which firms respond to changes in costs
- Deadweight losses due to second-best structure of problem
BTAs: Federal vs. State Regulation

- Debate over state-level BTAs being subject to federal legal challenge

- (Not) facially discriminatory under dormant Commerce Clause, and will (not) satisfy complementary tax doctrine (Ferrey, 2008 vs. Shanske, 2014; Gamage and Shanske, 2017)

- BTAs could also run up against dormant Foreign Commerce clause (Gamage and Shanske, 2017)

- However, in absence of WTO ruling on BTAs, not obvious there would be any federal ruling
Current Status of U.S. Climate Policy

- Federal climate policy unlikely to be enacted anytime soon, and U.S. backing away from international commitments to reduce emissions.

- Imposition of BTAs on U.S., given its withdrawal from Paris Agreement, may provoke retaliatory tariff response by U.S.

- U.S. may be able to negatively influence China’s terms of trade (Böhringer and Rutherford, 2017).

- Plays into President Trump’s view of China competing unfairly with the U.S.