Montreal v. Kyoto

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One World
Many Countries
# Domestic v. International

<table>
<thead>
<tr>
<th></th>
<th>Title IV</th>
<th>Kyoto</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obligations</strong></td>
<td>Caps SO$_2$ by plant.</td>
<td>Caps GHG by states.</td>
</tr>
<tr>
<td><strong>Trading</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>Precise</td>
<td>Self-reporting</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>Mandatory</td>
<td>Voluntary</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>• Fine &gt; $3,000/ton 2005 &gt; price.</td>
<td>Article 18: “procedures and mechanisms…entailing binding consequences…be adopted by means of an amendment.”</td>
</tr>
<tr>
<td></td>
<td>• Excess subtracted from next year.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Non-compliance a felony</td>
<td></td>
</tr>
</tbody>
</table>
A Study in Contrast

<table>
<thead>
<tr>
<th></th>
<th>OZONE</th>
<th>CLIMATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricts emissions</td>
<td>All countries</td>
<td>Industrialized countries</td>
</tr>
<tr>
<td>Cuts emissions</td>
<td>Up to 100%</td>
<td>Around 5%</td>
</tr>
<tr>
<td>Duration</td>
<td>Permanent</td>
<td>2008-2012</td>
</tr>
<tr>
<td>Consequence</td>
<td>Ozone layer restored 2050</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Why the difference?
Two kinds of ozone

Bad ozone is in the troposphere. Good ozone is in the stratosphere.
Change over time
The underlying PD

Card game: $5 if keep red card; $1 for every red card handed in by anyone. Suppose $N = 100.$
To be effective, a treaty must

• Deter non-participation.
• Enforce compliance.
• Do both of these things even while requiring that parties do much more than they would were they to act independently (unilaterally).
Montreal Protocol

• Negotiated in 1987; amended 4 times and adjusted 6 times since then.
• Bans production and consumption of the ODSs.
• Achieves universal participation. (In 2008, the only non-parties were Andorra, Holy See, Iraq, San Marino, Timor Leste. Since then, they’ve all joined!)
• By around 2050-2070, the ozone layer is expected to be restored.
• How and why did the MP succeed?
## Cost-benefit analysis of the Montreal Protocol

<table>
<thead>
<tr>
<th>Ozone Depletion (%)</th>
<th>No Controls</th>
<th>Montreal Protocol</th>
<th>Unilateral Implementation of MP</th>
</tr>
</thead>
<tbody>
<tr>
<td>By 2000</td>
<td>1.0%</td>
<td>0.8%</td>
<td>0.9%</td>
</tr>
<tr>
<td>By 2050</td>
<td>15.7%</td>
<td>1.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>By 2100</td>
<td>50.0%</td>
<td>1.2%</td>
<td>49.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Payoffs to the US (Billions of 1985 $US)</th>
<th>No Controls</th>
<th>Montreal Protocol</th>
<th>Unilateral Implementation of MP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>$3,575</td>
<td></td>
<td>$1,373</td>
</tr>
<tr>
<td>Costs</td>
<td>$21</td>
<td></td>
<td>$21</td>
</tr>
<tr>
<td>Net Benefits</td>
<td>$3,554</td>
<td></td>
<td>$1,352</td>
</tr>
<tr>
<td>B-C Ratio</td>
<td>170</td>
<td></td>
<td>65</td>
</tr>
</tbody>
</table>

Implications

• Ozone depletion favored unilateral implementation of MP by at least some rich countries.
• Was MP a success? Or did it merely codify what states would have done anyway?
• Three major worries:
  – (1) production would relocate (leakage);
  – (2) poor countries would not cut back;
  – (3) it would be harder to sustain bigger cuts, involving a wider range of ODSs.
• MP addressed all three.
Carrot

• Developing countries had “common but differentiated responsibilities.”
• Rich countries to pay “incremental costs” for developing country implementation.
Stick

• The credible threat of a trade restriction sustained full participation and deterred non-compliance.
Cooperation & trade restrictions

- Minimum participation level set to 11 countries making up at least 2/3s of global consumption.

IEA Game with Trade Sanctions

\[ \Pi_n \]

\[ \Pi_s \]

Number of other signatories
The difference Montreal made
If the MP had not worked
Climate change
Framework Convention

• Aim should be to stabilize “greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.”

• Reasonable? Only non-participants are Andorra and Holy See (Iraq, and Somalia joined 2009).
Kyoto Protocol
Kyoto Protocol

• Sets emission limits 2008-2012 for Annex I countries only.
• Applies to CO$_2$, CH$_4$, N$_2$O, HFCs, PFCs, SF$_6$.
• Allows trading.
• Clean development mechanism.
• Enters into force after being ratified by at least 55 countries making up at least 55% of Annex I CO$_2$ emissions.
Problems

• No enforcement
  – Non-participation of the U.S.
  – Non-compliance by Canada and...
• Trading may not reduce emissions (“hot air”).
• Much too short term.
  – In a recent report, the government of Canada says, “While Canada remains committed to meeting its reporting requirements under the UNFCCC and Kyoto Protocol, the focus of Canadian action on climate change is not on the remaining years of the Kyoto Protocol. The world is now turning the page on Kyoto and is focused on reaching a new agreement in Copenhagen in December 2009.”
• Very modest; can it be made more ambitious?
• What is to follow?
Reasons for Kyoto’s Failure

• The economics are not as favorable as for ozone.
# Ozone v. Climate Economics

## TABLE 1
Comparative Economics of
Ozone Protection and Climate Change Mitigation

<table>
<thead>
<tr>
<th></th>
<th>Benefit</th>
<th>Cost</th>
<th>Net Benefit</th>
<th>Benefit-Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of U.S. Dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montreal Protocol</td>
<td>$2,775</td>
<td>$250</td>
<td>$2,525</td>
<td>11</td>
</tr>
<tr>
<td>Stabilizing at $2 \times \text{CO}_2$</td>
<td>$6,570</td>
<td>$3,900</td>
<td>$2,670</td>
<td>1.7</td>
</tr>
<tr>
<td>Limit to 2°C</td>
<td>$9,450</td>
<td>$11,250</td>
<td>-$1,800</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Source: the estimates for Montreal are from Barrett (2007), Table 3.3, and derive in turn from Velders et al. (2000). The estimates for climate change goals are from Nordhaus (2008), Table 5-3. Note that the estimates for Montreal and climate change are not directly comparable. The Montreal figures are in 1997 dollars and reflect estimates only through 2050; the climate estimates are in 2005 dollars and reflect estimates at least through 2200. Note also that the estimates for Montreal assume a 5 percent rate of discount. Stern (2007) has criticized Nordhaus for using a “high” rate of discount, but so long as a consistent approach were used to evaluate Montreal and these climate scenarios, the impression given in this table would be preserved.
Reasons for Kyoto’s Failure

• Economics not as favorable as for ozone.
• In contrast to the MP, few countries have an incentive to do much unilaterally.
  – Trade leakage; global energy markets: MCs steep.
  – Gradual climate change winners & losers.
  – Abrupt/catastrophic climate change uncertain.
• Kyoto difficult to enforce (trade restrictions problematic).
Reasons for Kyoto’s Failure

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• In contrast to the MP, few countries have an incentive to do much unilaterally.
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• Kyoto difficult to enforce
  – Carrots: Will rich countries pay for abatement?
  – Sticks: Trade restrictions problematic.
Why did the U.S. not ratify?

• Senate Resolution August 1997.
  – the United States should not be a signatory to any protocol …which would
    • (A) mandate new commitments to limit or reduce greenhouse gas emissions for the Annex I Parties, unless [it] also limit[s] or reduce[s] greenhouse gas emissions for Developing Country Parties within the same compliance period, or
    • (B) would result in serious harm to the economy of the United States…. 
U.S. Strategy

• Under Clinton
  – Negotiate and then seek ratification.

• Under Obama
  – Secure domestic legislation and then agree to do this as part of an international agreement.
Congress

• Still wants issues raised in 1997 Senate resolution to be addressed.

• House bill says:
  – The Administrator, in consultation with the Department of State and the United States Trade Representative, shall annually prepare and certify a report to the Congress regarding whether China and India have adopted greenhouse gas emissions standards at least as strict as those standards required under this Act. If the Administrator determines that China and India have not adopted greenhouse gas emissions standards at least as stringent as those set forth in this Act, the Administrator shall notify each Member of Congress of his determination, and shall release his determination to the media.

• This may create new tensions.
Latest developments

• Most recent negotiating text reveals huge differences.
• U.S. Congress dragging heels.
• Give up on idea of negotiating “legally binding commitments” in Copenhagen.
• Aim for a “political agreement.”
• Obama offers to cut U.S. emissions 17% from 2005 level by 2020, but this pledge is contingent on Congress passing legislation.
• China offers to cut its “carbon intensity” 40-45% from 2005 level by 2020. This is a “voluntary action.”
Silver lining in Kyoto’s cloud

• Effect of MP on concentrations.
• Montreal adjustment of December 2007.
  – HCFCs controlled under MP.
  – HFCs controlled under Kyoto.
• Why not control HFCs in a separate agreement?