Overview of Carbon Pricing Instruments

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Modeling for Carbon Pricing Instruments
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Views are authors’ alone
Outline

Rationale for carbon pricing instruments

Modeling Issues
Carbon Taxes and ETS

Choice less important, but get the design details right

Comprehensively covering emissions

Exploiting the fiscal dividend

Establishing a significant, credible and rising price trajectory
Carbon pricing is the most effective policy...

<table>
<thead>
<tr>
<th>Behavioral response</th>
<th>Carbon pricing</th>
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</thead>
<tbody>
<tr>
<td>Fuel switching coal to natural gas</td>
<td>✓</td>
</tr>
<tr>
<td>Expanding renewables</td>
<td>✓</td>
</tr>
<tr>
<td>Expanding other zero-carbon fuels</td>
<td>✓</td>
</tr>
<tr>
<td>Reducing electricity demand</td>
<td>✓</td>
</tr>
<tr>
<td>Improving vehicle fuel economy</td>
<td>✓</td>
</tr>
<tr>
<td>Reducing driving</td>
<td>✓</td>
</tr>
<tr>
<td>Reducing heating fuels</td>
<td>✓</td>
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</tbody>
</table>

- But important to cover all sectors and to price emissions directly.
Other instruments are less effective...

- Energy taxes: e.g. taxes on electricity mitigate only indirectly (by reducing electricity demand)
- Regulatory approaches: e.g. incentives for power generation through renewables (does not encourage fuel switching, weak impact on electricity demand, does not reduce emissions outside of power sector)
Pricing instruments are cost effective

- Equate incremental costs of reducing emissions across firms, sectors, households

- BUT important to exploit fiscal dividend (1% of GDP in US, 2.5% of GDP in China)
  - use revenues to cut taxes on work effort and investment or for socially desirable spending
  - if revenues not used to increase economic efficiency, cost effectiveness seriously undermined
  - modeling analysis is important to enable better understand extent of potential fiscal dividend (i.e., revenues from C-tax or auctioning of emission permits)
Pricing instruments can raise revenue, but should not be a reason to set high prices.

- Carbon prices should be set to reflect environmental damages, with broader revenue needs from broader instruments (e.g., VAT, personal income taxes).
Stable price trajectory important to...

- Equate the costs of incremental abatement in different years
- Conducive to investment in clean technologies
- Stable revenues

How to limit price volatility in ETS?
  - e.g. allow to bank and borrow allowances
  - e.g. introduce a price collar
Modeling Issues
Value of Modeling

- Provides information about:
  - Emissions
  - Revenue
  - Energy prices
  - Distributional incidence—across households, firms
  - Evolution of energy sector (to guide investments)

- Trade offs between alternative policy designs
Useful Modeling Exercises (1)

- Coverage—compare policies with uniform price on all CO₂ with:
  - Policies with lower (or zero) prices for some emissions
  - Broader policies (e.g., non-CO₂ GHGs, forestry emissions, offsets)

- For carbon tax, alternative price levels, e.g.,
  - $25/ton CO₂ (US government, 2010)
  - $40/ton CO₂ (≈consistent with 3°C target)

- For ETS, price impacts of alternative emissions targets under different scenarios and price stability provisions

- Competitiveness and leakage impacts: compare international coordination with
  - Unilateral action + leakage/compet. mitigation measures
Useful Modeling Exercises (2)

- Analyze impacts of other policies, e.g. renewables/energy efficiency policies
  - Reduce emissions under carbon tax
  - Reduce emissions prices and revenue under ETS
  - Model needs to decompose responses (e.g., fuel economy vs. mileage components of gasoline elasticity)

- Role of complementary policies in addressing other market failures, e.g.:
  - Reluctance to make clean energy investments due to spillovers, uncertainty over payoffs
Use of Complementary Models

- Analytical (implemented in spreadsheets)
  - Explicit formulas to make transparent the contribution of underlying parameters to costs and impacts of policies
  - Helps interpret, and serves as check on, computational models

- Computational
  - More accurate predictions
  - Illustrate dynamics (low emission transition paths)
  - More detail at industry level

- Input/output
  - Impacts on different product prices
  - With CES data for household budget shares → distributional impacts

- Models of broader fiscal system
  - Impacts of alternative ways to recycle revenues
But Models Must

- Have realistic assumptions:
  - Future projections (e.g., energy prices, technology costs)
  - Response to policies (e.g., fuel price elasticities)

- Provide sensitivity analysis for different projections, parameter scenarios

- Trade off between transparency/sensitivity analysis and complexity
References


