The Impact of U.S. Climate Legislation on Trade with China

CLIENT: ENERGY INFORMATION ADMINISTRATION; DEPARTMENT OF ENERGY

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Introduction

- Climate change is a growing concern for U.S. policymakers
  - American Clean Energy and Security Act (2009)
    - Waxman-Markey
  - Emissions Leakage
Goals

- To model impact of carbon tax on imports from China
  - Computable General Equilibrium (CGE) Modeling
  - Results: Impact on trade, emissions, and output

- To assess international policy implications
  - How China responds
    - Domestic Tax?
    - Files complaint with WTO?
Methods

• CGE Model
  - Simulates policy changes in a large number of inter-related markets
  - e.g. Heckscher-Ohlin
    - H-O: 2-regions; 2-goods; 2-factors
    - Our model: 4-regions; 5-goods; many factors

• Main focus
  - Policy change: imposition of carbon taxes
  - How do we calculate carbon taxes?
Cap and trade adds a cost to CO$_2$, while the market mechanism directs remaining emissions.

In our model, the cap and trade price is the tax on CO$_2$ emissions.

CO$_2$ prices of $20/ton and $31.70/ton are used.
## Emission Coefficients: Ton CO₂ / Ton Output

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<th>EITE Sectors</th>
<th>U.S.</th>
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### Ad Valorem Tax (Emissions Price: $20/ton CO$_2$)

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<th>China (%)</th>
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Literature Review

- **Background Literature**
  - **Top-Down**
    - Focus: Macro-perspective, breakdown of regions into sectors
  - **Bottom-Up**
    - Focus: Micro-perspective, input/output coefficients
  - **Static**
  - **Dynamic**

- **Our model is a top-down approach with static and dynamic simulations**
Literature Review

- **Top-Down: Dynamic**
  - Bernstein, Paul M; Montgomery W. David and Thomas F. Rutherford (1999); EPA (2009); EIA (2009); Winchester, Niven; Paltsev, Sergey and John, Reilly (2010)

- **Top-Down: Static**
  - Al-Amin, Chamhuri Siwar and Abdul, Hamid (2009); Mattoo Aaditya, Subramanian Arvind; van der Mensbrugghe Dominique, and Jianwu, He (2009)

- **Bottom-Up: Dynamic**
  - Ping-Cheng Li; Chang-Huang, Huang and Shih-Hsun, Hsu (2001)

- **Bottom-Up: Static**
  - Fatai, Koli; Oxley, Les and F.G. Scrimgeour (2003); Fischer, Carolyn and Alan, K. Fox (2009); Laitner, A. John and Donald A. Hanson (2006); Lloyd, P.J. and X.G. Zhang (2006); Qiao-Mei, Liang; Ying, Fan, and Yi-Ming, Wei (2009); Zhang, Xiao-guang and George, Verikios (2006)
A Similar Study

- Example:
  - Mattoo et al (2009), World Bank Study

- Trade tax (collected at the border) has serious consequences for China, Brazil, and India
  - Exports decline
  - Real income decline

WTO implications
Our Results

- **Scenario 1 (using emission price of $20/ton)**
  - Domestic Production Tax in the US
  - Import Taxes on goods from China, EU and ROW

- **Scenario 2 (using emission price of $20/ton)**
  - Domestic Production Tax in **US, EU and ROW**
  - Import Taxes in all regions on goods from China

- **Dynamic Simulation of above scenarios ($31.70)**
  - Simulation 1 & 2 over a ten year period
Scenario 1
Scenario 2
Dynamic 1 – China Output & Emissions

- Percent Change in Exports
- Percent Change in Domestic Production
### Dynamic 1 – US Output and Emissions

#### Percent Change in Exports

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<th>Paper</th>
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<th>NonMetals</th>
<th>I&amp;S</th>
<th>Non-Ferrous</th>
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#### Percent Change in Domestic Production

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Dynamic 1 – US Exports

Percent Change in Exports

Percent Change in Domestic Production

US

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

Paper Chem NonMetals I&S Non-Ferrous

-3 -2 -1 0 1

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

Paper Chem NonMetals I&S Non-Ferrous

-26 -21 -16 -11 -6 -1 4
Dynamic 2 – China Output & Emissions

Percent Change in Exports

Percent Change in Domestic Production
Dynamic 2 – China Exports

Percent Change in Exports

Percent Change in Domestic Production

China Exports

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<th>Year</th>
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Dynamic 2 – US Exports

Percent Change in Exports

Percent Change in Domestic Production

US Exports

Year 1  Year 2  Year 3  Year 4  Year 5  Year 6  Year 7  Year 8  Year 9  Year 10

Paper  Chem  NonMetals  I&S  Non-Ferrous
Dynamic Simulation-2 Results

Percent Change in Domestic Emissions

China

-2 -1.5 -1 -0.5 0 0.5 1
Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

-3 -2.5 -2 -1.5 -1 -0.5 0 0.5 1
Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

Paper Chem NonMetals I&S Non-Ferrous
Dynamic Simulation-2 Results

Percent Change in Domestic Emissions

China

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

Paper Chem NonMetals I&S Non-Ferrous

Percent Change in Domestic Emissions

China

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10

Paper Chem NonMetals I&S Non-Ferrous
Dynamic Simulation - 2 Results

Percent Change in Domestic Emissions
Dynamic Simulation-2 Results

Percent Change in Domestic Emissions

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6 Year 7 Year 8 Year 9 Year 10
Policy: China’s Response – I

- **Internalize the tax**: China implements its own domestic carbon tax
  - America cannot impose trade tariff (No double taxation)
  - Tax revenue welcomed by government
  - Tax revenue can subsidize technology change in China

- **Tax structure**
  - Will be incorporated into energy tax category in first few years
  - Begin with $2 in 2012 and increase to $30 by 2030
China brings complaint to WTO

WTO Case-by-Case System

- Burden of proof falls on defendant government
  - Article I - MFN
  - Article III – National Treatment
- Retaliatory measures allowed if legislation is not justified
  - Article XX – General Exceptions
Policy: China’s Response – II

• Concerns
  o MFN violation
    ▪ Waxman-Markey exceptions
  o National treatment violation
    ▪ Controversy over determination of baselines
  o Article XX exception is a way around these two BUT must argue:
    ▪ Protect human plant or animal life, or
    ▪ Conserve exhaustible natural resources
Conclusions

- Waxman-Markey hurts output and exports of U.S.

- W-M will not prevent leakages unless China implements its own production tax

- W-M will not achieve its goals of reducing emissions worldwide

- Technological change is necessary to reduce emissions in the long run