The Global Effects of Subglobal Climate Policies

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Introduction

- Individual OECD countries are in the process of legislating responses to the challenges posed by climate change.
- Prospect of rising carbon prices at home emerging economies lack comparable regulation raises concerns
  - competitiveness of energy intensive industries
  - carbon leakage
- As a response, controversial trade-related measures and allowance allocation designs are being proposed
Measures in Current Proposals

- American Clean Energy and Security Act of 2009 (ACESA) has provisions for “Ensuring Real Reductions in Industrial Emissions”

- Output-based rebates (OBR) of allowances for energy-intensive, trade exposed sectors (EITE)
  - Offsets domestic production cost increases (on average) from emissions liabilities
  - Different from grandfathering (as in EU), which is a windfall transfer to compensate losses

- Border carbon adjustment (BCA) for imports
  - Removes cost advantage for unregulated competitors
  - EU keeps this option on the table
  - Could also consider BCA for exports
Why are such measures necessary?

- Senators from key states
  - EITE sectors are small share of economy (<6%, and 10-20% of total emissions) but vocal, organized and unionized

- Hard to ask sectors to take on costs when significant shares of their reductions may be offset by increases abroad

- Alternatives (exemptions, weak climate legislation) worse
Why are trade-related measures controversial?

- Fears of disguised protectionism
- WTO obligations
  - Nondiscrimination
  - Can regulate products, not processes
  - Some exceptions for environmental purposes
  - Least-trade restrictive alternative
  - Restrictions on subsidies
- Common but differentiated responsibilities
- Negotiations in WTO and UNFCCC already difficult
What’s missing from the debate?

- Focus has been on targeted EITE sectors
- Need broader understanding about how climate policies implemented unilaterally (or sub-globally) affect all countries in the global trading system.
- Largest impacts are from the targeted carbon pricing itself, which generates
  - macroeconomic effects,
  - terms-of-trade changes, and
  - shifts in global energy demand and prices
  - changing the relative prices of energy-intensive and non-energy-intensive goods.
This Paper

- Effects of climate policies implemented in the EU and US on global distribution of economic and environmental outcomes
- How these outcomes may be altered by a variety of complementary policies aimed at addressing carbon leakage.
Numerical Model

- Global multi-sector, multi-region computable general equilibrium (CGE) model based on GTAP7 database
  - Detailed accounts of regional production, regional consumption, bilateral trade flows, energy flows and CO2 emissions
  - Static model with 2004 base year

- Assumptions:
  - No change in policies in other countries
  - No cap on emissions in Annex B
Energy and EITE Sectors

- **Energy Goods**
  - Coal (COL), crude oil (CRU), natural gas (GAS), refined oil products (OIL), and electricity (ELE).

- **EITE Goods**
  - Chemicals (CRP);
  - Non-metallic minerals, including cement and glass (NMM);
  - Pulp, paper, and print (PPP);
  - Iron and steel (I_S);
  - Nonferrous metals, including copper and aluminium (NFM).
Policy Scenarios

- US and/or EU reduce emissions by 20%
  - No international trading
- Different treatment of EITE sectors

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Results of Auctioned Caps

- Welfare costs substantially higher in the EU than in U.S.
  - U.S. has cheaper abatement options: carbon prices are $60/ton C for the U.S., and $125/ton for the EU. ($63 and $129 when jointly implemented)
  - Different trade intensities and terms-of-trade effects.
    - Natural gas prices are stimulated by the climate policies, whereas coal and crude oil prices are depressed.
    - EU is net importer of all three fossil fuels, whereas U.S. was a net exporter of coal in 2004.

- Welfare effects of unilateral policies can be quite different for different trade partners
  - larger for some than US or EU effects
Welfare effects of auctioned caps in U.S., the EU or both (Scenarios 1A, 2A and 3A)
Effects of additional policies

- Not valuing the additional benefits of avoided leakage
- Effects of other policies small but positive
  - beneficial terms of trade effects from protecting EITE sectors in these two large economies
  - Larger for EU, in which EITE larger share of emissions
- U.S. carbon price is not sensitive to the adjustment policies, while the EU carbon price rises 2% in the OUTPUT scenario and 4% with BTAX.
Welfare costs in the U.S. and the EU by policy scenario

- AUCTION
- OUTPUT
- REBATE
- TARIFF
- BTAX

For different policy scenarios, the diagram shows the welfare costs for the U.S. and the EU. The costs are represented as percentages and vary across different scenarios.
Welfare effects for other regions

- Moderate differences for most regions and negligible for the world as a whole.
- Losses for crude oil and coal exporting regions are generally highest when the U.S. and the EU also impose import tariffs
  - demand for fossil fuels outside these two regions are lower than in the other scenarios,
- Import tariffs also negatively affect exporters of energy-intensive goods, notably China, India and Canada.
  - Adjustments based on exporters’ emissions intensities
Welfare effects in different regions of joint caps in US and EU
Effects on Leakage

- Carbon leakage highest with unilateral EU cap
  - Up to 38%, compared to 19% for U.S.
  - EU is a more open economy than the U.S.
  - EU is a much bigger importer of fossil fuels
  - EU EITE industries less carbon-intensive
- When both regions reduce emissions, the leakage rates are closer to the U.S. policy scenarios.
  - U.S. has higher emissions than the EU
  - Joint caps eliminate EU-US leakage
- Policies limited in reducing leakage
  - Address production shifting, but not energy markets
  - Full border adjustment most effective
Global Leakage Effects

Scenario 1 (U.S. pol.) Scenario 2 (EU pol.) Scenario 3 (U.S. & EU pol.)

AUCTION OUTPUT REBATE TARIFF BTAX
Distribution of Leakage

- 40% of leakage to Annex B countries
  - Large share to Russia
  - More for US unilateral policy
- Effects of adjustment policies
  - hardly reduce leakage to other OECD countries, and also to Latin American and African countries.
  - The largest impacts on leakage are in Asian countries, former Soviet Union, and OPEC.
Leakage Rates by Region

- Canada
- Japan
- Aust.NZ
- Oth.EUR
- Russia
- Oth.FSU
- China
- India
- Oth.ASIA
- Brazil
- Mexico
- Oth.AMER
- OPEC
- Oth.AFR

Categories: AUCTION, OUTPUT, REBATE, TARIFF, BTAX
Effects on EITE competitiveness (production)

- Both output-based allocation and border adjustment policies dampen the production decrease.
  - Largest impacts in the EU
  - Full border adjustment usually most effective
  - Output-based allocation has about the same effect as import tariffs alone.
  - Small effects on electricity-intensive sectors (not adjusting for indirect emissions)
  - If the import tariffs also take into account indirect emissions (i.e., from electricity production) embodied in the products, production of non-ferrous metals in the EU will actually increase.
Effects on U.S. production of different U.S. climate policies

-4.0 %
-3.5 %
-3.0 %
-2.5 %
-2.0 %
-1.5 %
-1.0 %
-0.5 %
0.0 %
0.5 %

OtherManuf&Serv
PaperPulpPrint
Chemical
Minerals
IronSteel
NonFerrousMetal

AUCTION OUTPUT REBATE TARIFF BTAX
Effects on EU production of different EU climate policies

![Graph showing percentage changes in EU production across different sectors due to climate policies.]

- Other Manuf & Serv: -3.5%
- Paper & Print: -3.0%
- Chemicals: -2.5%
- Minerals: -2.0%
- Iron & Steel: -1.5%
- Non-Ferrous Metals: -1.0%
- AUCTION: 0.0%

Legend:
- AUCTION
- OUTPUT
- REBATE
- TARIFF
- BTAX

For the future.
Percentage Change in Total Production, by Region (Joint Caps)

![Percentage Change in Total Production, by Region (Joint Caps)](chart.png)
Competitiveness in Nonimplementing Regions

- Production in EITE sectors increases across the board
- Non-EITE sectors experience production decreases in all countries except OPEC.
- Adjustment policies in part shift production in the other regions back toward non-EITE from EITE.
- Aggregate production remains higher across the board with adjustment policies than with no climate policy action
  - Similar effects on EITE exports
- Welfare is determined by consumption rather than production, so while other regions reap competitiveness benefits, most remain worse off.
Effects on Chinese EITE exports of different U.S. and EU climate policies

![Bar chart showing the effects of different climate policies on Chinese EITE exports. The x-axis represents different industries: PaperPulpPrint, Chemical, Minerals, IronSteel, NonFerrousMetal. The y-axis represents the percentage change in exports. The chart uses different colors for auction, output, rebate, tariff, and BTAX.]
Effects on Indian EITE exports of different U.S. and EU climate policies
Effects on Brazilian EITE exports of different U.S. and EU climate policies
Summary: Welfare

- Welfare effects of subglobal climate policies are significant not only for the countries undertaking them but also for their trade partners
  - Mostly negative, but some winners
- Policies intended to avoid leakage have little affect on welfare overall—even in the countries implementing them
  - mostly just shift global production in certain energy intensive goods.
- However, import adjustments can have significant effects, especially for fossil energy producing nations.
Summary: Leakage

- Significant share occurs via changes in global energy prices.
- None of the countervailing policies are able to reduce leakage rates very much—at most by 15%, in the case of full border adjustments.
- 30-50% of leakage from U.S. and EU climate policies can be attributed to other Annex B nations.
- Adjustment policies do have significant effects on the energy-intensive sectors to which they are applied.
- Still, for the most part, domestic production is lower and foreign exports are higher than without any climate policy intervention.
  - Exception for cement and glass.
A Tempest in a Teapot (in a really big Tempest)?

- Main effects on global welfare, emissions, and leakage arise from the primary climate policies themselves.
- Developing nations do not actually gain economically from developed country efforts to reduce GHGs.
- Nor do their sectors targeted specifically by anti-leakage policies necessarily lose, compared to a world without any climate policies.
- Ultimately, it is in all countries’ interest to mitigate climate change as comprehensively and cost-effectively as possible, and the larger question is whether or not unilateral anti-leakage policies can help in that transition.
Thanks!

- Norwegian Research Council
- ENTWINED
Emission Allowance Rebate Program

- Gives rebates in the form of allowance allocations to eligible EITE sectors
  - 5% energy (or CO2) intensive and 15% trade intensive, or 20% energy intensive
  - Excludes refining
- Rebates based on production, benchmarked to 100% of sector average emissions
  - Direct and indirect
- Max 15% of cap
- Phaseout begins 2025 over 10 years unless adjustments determined necessary