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Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates

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Resources for the Future

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Motivation

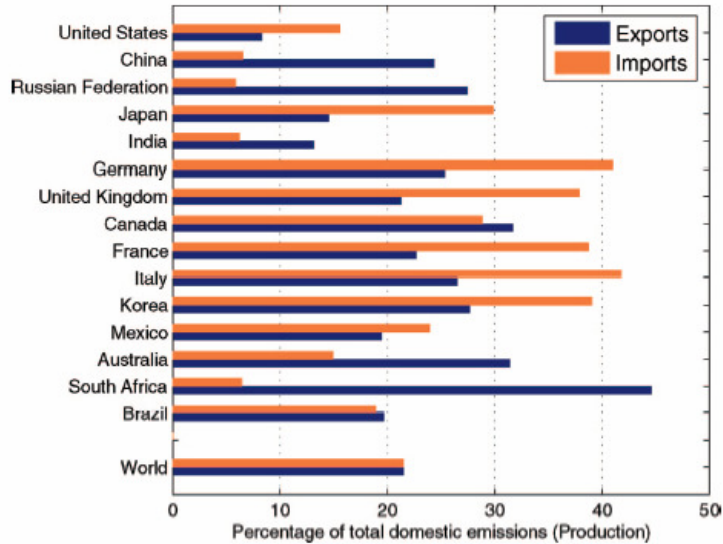
- Emissions regulation raises prices for domestic producers and raises concerns
 - loss of competitiveness
 - displacement of production
 - emissions leakage
- Lack of emissions pricing on the part of key trade partners is major stumbling block toward adopting significant policies for reducing GHG emissions
- Search for countervailing policies



"One day this will all be outsourced."

Carbon embodied in trade

(Peters & Hertwich, *Environ. Sci. Technol.*)



Leakage and the WTO

- Stiglitz (2006) argues that lack of GHG regulation is a de facto subsidy and should justify countervailing policies
- WTO law unlikely to agree, but some policies may be allowed with other justifications & disciplines



Counsel sensed that the panel might not be taking his argument as seriously as he had hoped.

Policy Options

- Border adjustment for imports (**Import Tax**)
 - Tax or permit requirement for products from countries w/o “sufficient” regulation
 - Bingaman/Specter, Lieberman/Warner bills
- Border relief for exports (**Export Rebate**)
 - Rebate of average emissions costs
- Both (**Full BTA**)
- Production-based rebates in domestic policy for regulated entities (**Home rebate**)

Home Rebate options

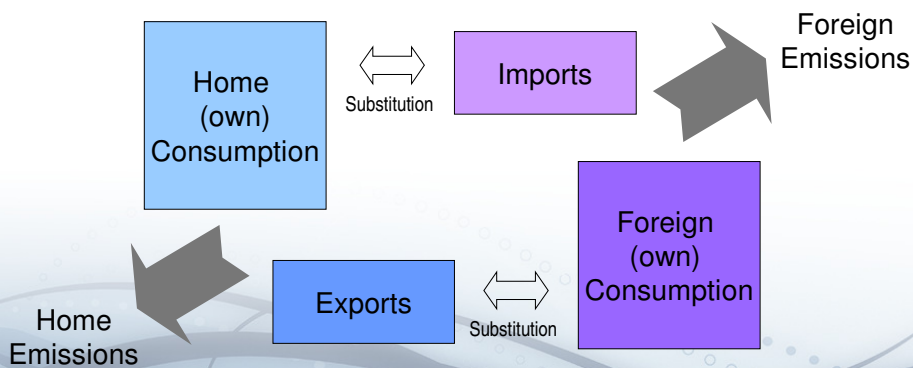
- Output-based allocation with updating
 - Distributes a sector’s share of the cap among firms in proportion to their production
 - Lieberman/Warner proposes to do this based on employment (or now electricity use)
- Allocation or rebate based on average or best-practice performance standard
- Additional output gives the firm additional allowances = production incentive
 - Mitigates price increase from carbon policy

$$\begin{aligned} \text{Product price} &= \text{marginal cost (emissions intensity)} \\ &+ \text{marginal emissions allowance cost} \\ &- \text{marginal allowance allocation value} \end{aligned}$$

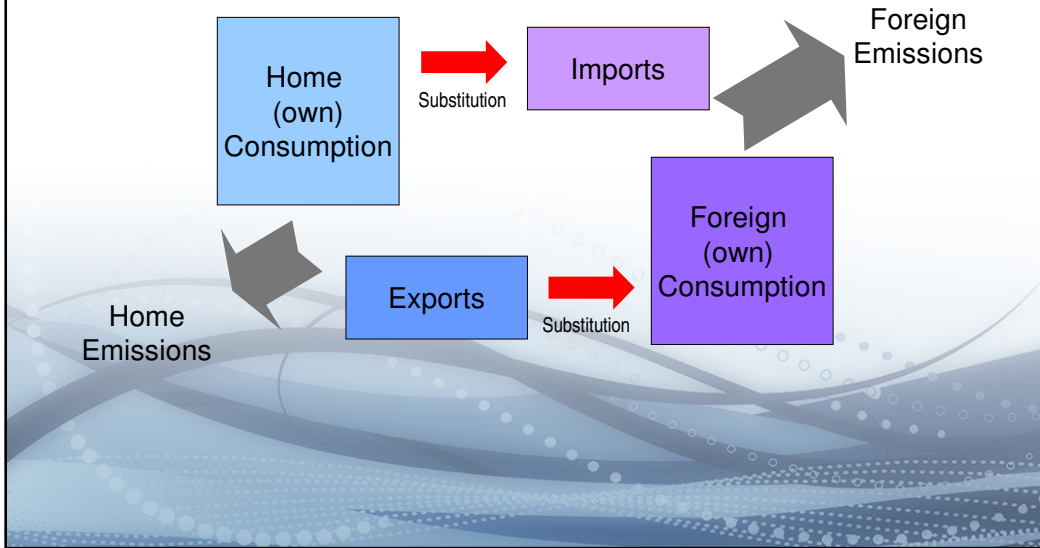
Policy Considerations

- Legal: Each option faces questions/hurdles in WTO
 - Import adjustments must not discriminate (Art. III, Most Favored Nation)
 - though economic rationale would like them based on individual country emissions
 - Export relief, rebates may be viewed as subsidies
 - Legal distinctions between taxes, rebates, and regulation
 - Environmental exception (Art. XX)
- Economic: Each option has tradeoffs

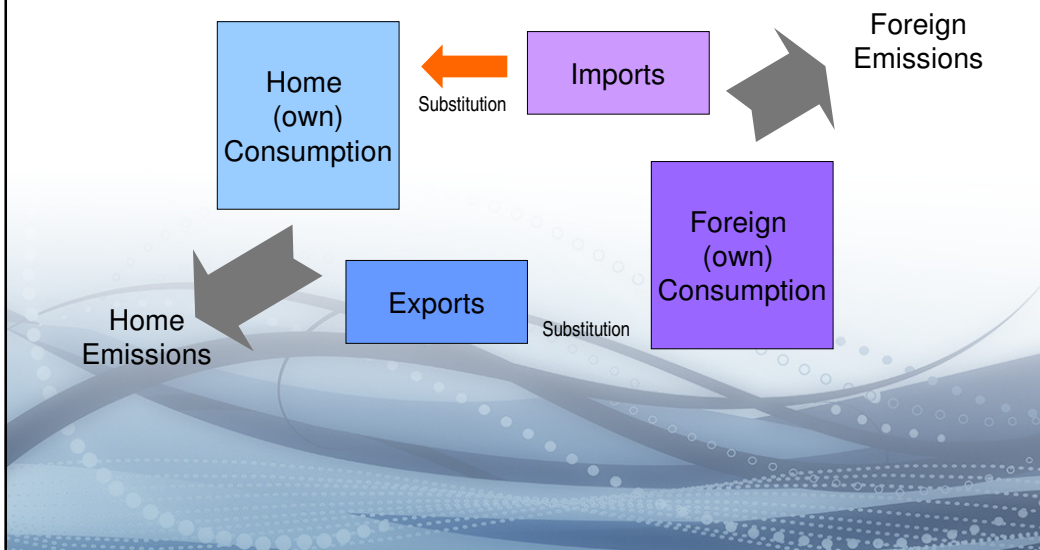
Economics: Components of Leakage



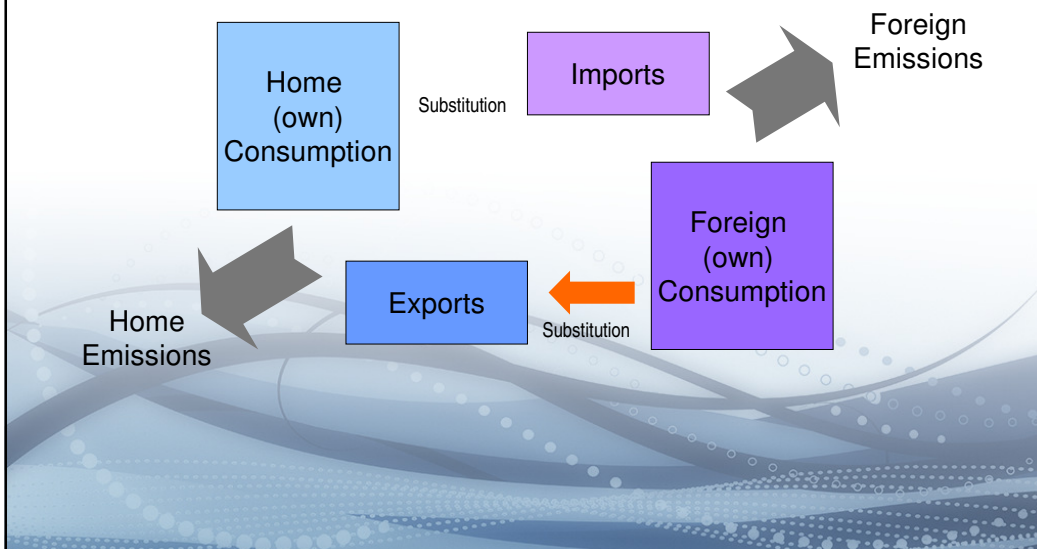
Components of Leakage: Emissions Price



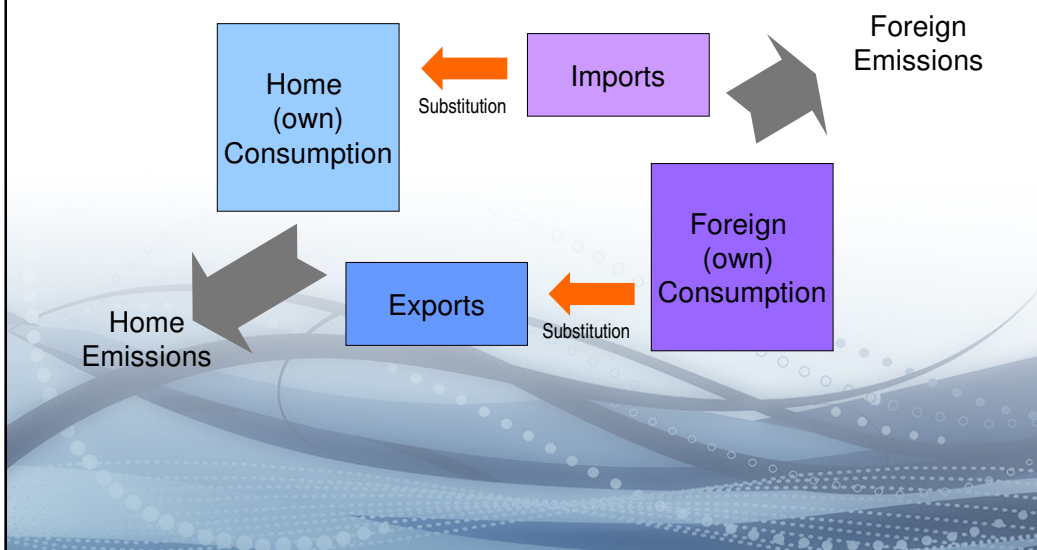
Components of Leakage: Import Tax



Components of Leakage: Export Rebate



Components of Leakage: Home Rebate



Primary Policy Effects

	Home good consumption	Imports	Exports	Foreign consumption
Import Tax	+	--	0	0
Export Rebate	0	0	++	-
Full BTA	+	--	++	-
Home Rebate	++	-	++	-

Evaluating Net Effects

- Each policy has “+” and “-” effects, and *none* necessarily reduces global emissions
- *All* promote domestic production to some extent
 - But shifting emissions between home and abroad doesn’t necessarily reduce total
- Cannot rank them without knowing
 - Relative responses of home and foreign goods to price changes (elasticities of substitution) and
 - Relative emissions rates

Simulation Model (and Caveats)

- Simulate model for covered sectors
 - Electricity (ELE); refined petroleum products (OIL); chemicals (CRP); nonmetallic minerals (NMM), which includes some ceramic production; pulp, paper and print (PPP); and iron and steel (I_S).
- Illustrative numerical parameters from GTAP-EG model with **baseline scenario of \$50/tonC** price
- Deliberately simple to elucidate primary effects
- Does not include general equilibrium impacts, which will include second-order effects via income, terms of trade, relative prices, etc.
 - Though they influence parameterization

Discussion: Baseline Leakage

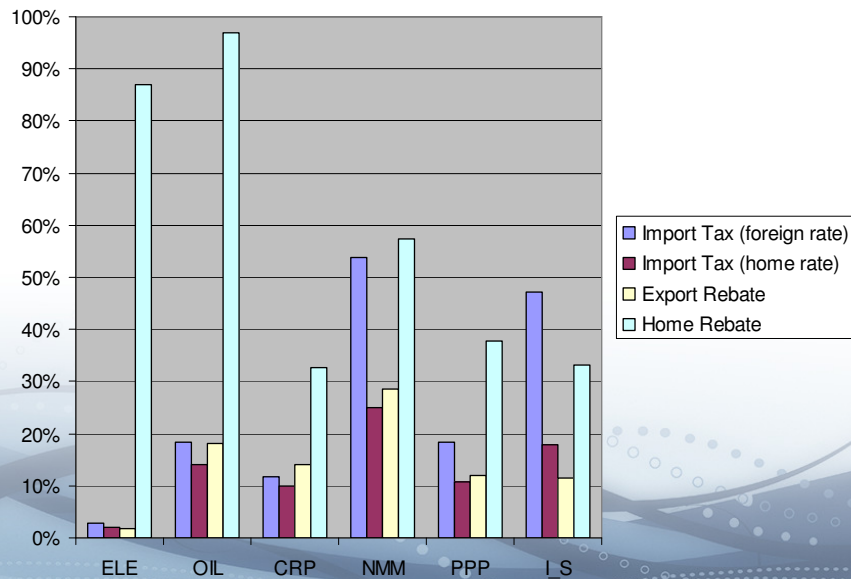
- Leakage = change in foreign emissions / domestic reductions in that sector
- Model generates significant baseline leakage, but much is attributed to global fuel price changes
- Border adjustment policies will only operate via product price changes

	ELE	OIL	CRP	NMM	PPP	I_S
Baseline Leakage (1000 MtC)	10153	5969	801	791	138	489
Baseline Leakage Rate	8%	64%	20%	39%	11%	60%
Leakage due to Production Changes	1%	6%	6%	7%	2%	13%

Some Indicators for U.S. Covered Sectors (\$50/ton C emissions price)

	ELE	OIL	CRP	NMM	PPP	I_S
Export share of home production	0%	5%	13%	11%	5%	5%
Import share of home consumption	1%	11%	14%	15%	6%	11%
Emissions rate ratio	138%	131%	119%	216%	171%	264%
Emissions payments as % of cost increase	103%	101%	46%	78%	59%	46%

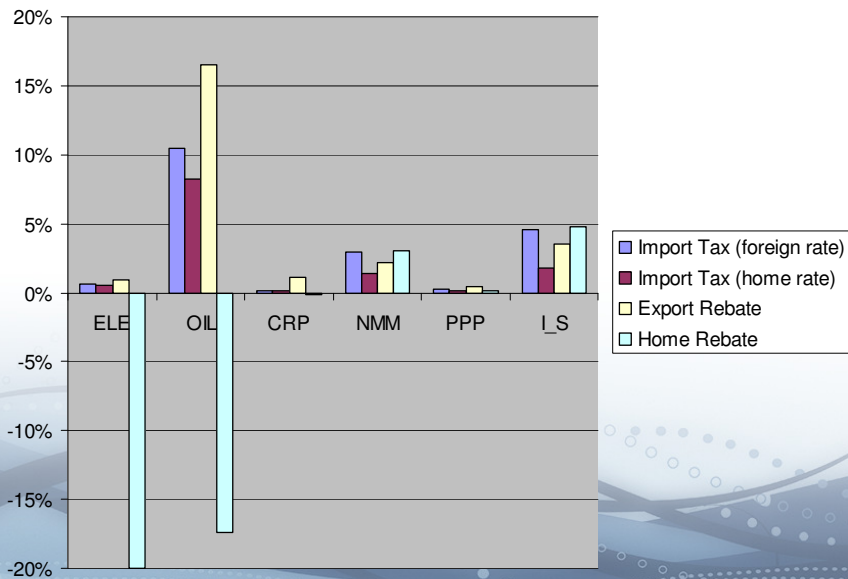
U.S. Production Loss Avoided



Results for U.S.: Production

	ELE	OIL	CRP	NMM	PPP	I_S
Baseline production change	-6.1%	-4.4%	-1.1%	-0.9%	-0.3%	-0.6%
<i>Production Loss Avoided (as % of Production Decrease with Emissions Tax Alone)</i>						
BTI (foreign rate)	3%	18%	12%	54%	18%	47%
BTI (home rate)	2%	14%	10%	25%	11%	18%
BRE	2%	18%	14%	29%	12%	12%
HR	87%	97%	33%	57%	38%	33%
FBA (foreign rate)	4%	37%	26%	82%	31%	59%
FBA (home rate)	4%	32%	24%	54%	23%	29%

Additional Net Reductions



Results for U.S.:

Reductions

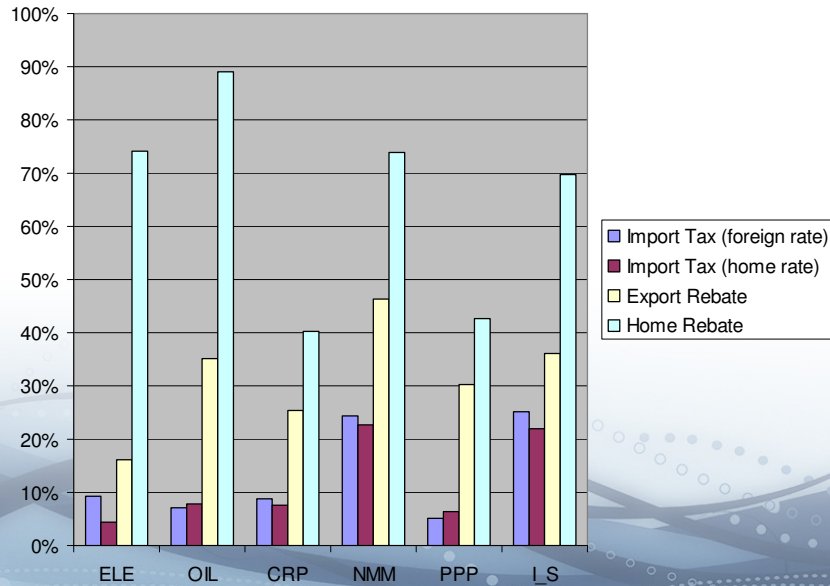
	ELE	OIL	CRP	NMM	PPP	I_S
<i>Leakage Avoided (as % of Domestic Reductions)</i>						
BTI (foreign rate)	1%	16%	1%	5%	1%	6%
BTI (home rate)	1%	12%	1%	2%	0%	2%
BRE	1%	23%	2%	3%	1%	4%
HR	1%	6%	3%	5%	1%	6%
FBA (foreign rate)	3%	44%	3%	8%	1%	10%
FBA (home rate)	2%	39%	3%	5%	1%	6%
<i>Additional Net Reductions (as % of Reductions with Emissions Tax Alone)</i>						
BTI (foreign rate)	1%	10%	0%	3%	0%	5%
BTI (home rate)	0%	8%	0%	1%	0%	2%
BRE	1%	17%	1%	2%	0%	3%
HR	-20%	-17%	0%	3%	0%	5%
FBA (foreign rate)	2%	27%	1%	5%	1%	8%
FBA (home rate)	1%	25%	1%	3%	1%	5%

Indicators of Leakage for Canada (\$50/ton C emissions price)

- Larger export/import shares
- Lower emissions rate ratios
- In some cases, foreign production less intensive

	ELE	OIL	CRP	NMM	PPP	I_S
Export share of home production	5%	15%	46%	33%	44%	21%
Import share of home consumption	3%	9%	51%	42%	22%	26%
Emissions rate ratio (foreign to domestic)	216%	89%	115%	107%	80%	115%
Emissions payments as % of cost increase	92%	89%	48%	78%	49%	58%

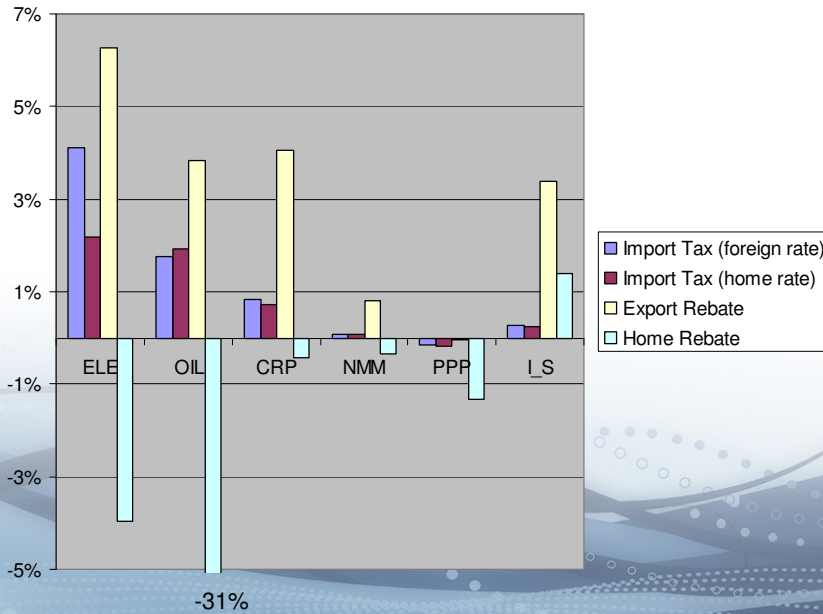
Canadian Production Loss Avoided



Results for Canada: Production

	ELE	OIL	CRP	NMM	PPP	I_S
Baseline production change	-5.6%	-8.2%	-2.5%	-2.7%	-1.5%	-1.6%
<i>Production Loss Avoided (as % of Production Decrease with Emissions Tax Alone)</i>						
BTI (foreign rate)	9%	7%	9%	24%	5%	25%
BTI (home rate)	4%	8%	8%	23%	6%	22%
BRE	16%	35%	25%	46%	30%	36%
HR	74%	89%	40%	74%	43%	70%
FBA (foreign rate)	25%	42%	34%	71%	35%	61%
FBA (home rate)	20%	43%	33%	69%	36%	58%

Additional Net Reductions



Results for Canada: Reductions

	ELE	OIL	CRP	NMM	PPP	I_S
<i>Leakage Avoided (as % of Domestic Reductions)</i>						
BTI (foreign rate)	5%	4%	2%	2%	0%	2%
BTI (home rate)	3%	5%	2%	2%	1%	2%
BRE	9%	21%	8%	4%	4%	7%
HR	7%	-4%	5%	5%	4%	8%
FBA (foreign rate)	15%	28%	10%	6%	4%	9%
FBA (home rate)	12%	29%	10%	6%	4%	9%
<i>Additional Net Reductions (as % of Reductions with Emissions Tax Alone)</i>						
BTI (foreign rate)	4%	2%	1%	0%	0%	0%
BTI (home rate)	2%	2%	1%	0%	0%	0%
BRE	6%	4%	4%	1%	0%	3%
HR	-4%	-31%	0%	0%	-1%	1%
FBA (foreign rate)	10%	6%	5%	1%	0%	4%
FBA (home rate)	8%	6%	5%	1%	0%	4%

Discussion: Policy Options

- For most sectors, full border adjustment is most effective at reducing leakage
- But when border adjustment is limited to the home emissions rate or lower (e.g. best practice), the home rebate tends to be more effective
 - Bad idea for energy sectors (electricity, refining)
- Home rebate usually better at encouraging production
- All policies limited in improving net reductions

Caveats and Further Research

- Results are sensitive to the relative emissions intensities of foreign goods and elasticities
 - May be different for more narrowly defined subsectors
 - Does not include rebate for upstream energy cost increases (electricity)
- With an emissions cap (rather than tax), home emissions cannot increase among covered sectors
 - Result of adjustment policy is then to raise the market allowance price and shift costs among sectors
- Does not address changes in emissions among uncovered sectors
- Future research may use full CGE model and others to explore these results

Thanks

- Alan K. Fox (coauthor)
U.S. International Trade Commission
- Mistra Foundation



Results for U.S.: Full Cost Adjustment

	ELE	OIL	CRP	NMM	PPP	I_S
<i>Production Loss Avoided (as % of Production Decrease with Emissions Tax Alone)</i>						
BTI (home rate)	2%	14%	22%	32%	18%	39%
BRE	2%	18%	30%	37%	20%	26%
HR	85%	96%	71%	74%	64%	73%
FBA (home rate)	4%	32%	52%	69%	39%	65%
<i>Leakage Avoided (as % of Domestic Reductions)</i>						
BTI (home rate)	1%	12%	2%	3%	1%	5%
BRE	1%	22%	5%	4%	1%	9%
HR	1%	6%	6%	7%	2%	13%
FBA (home rate)	2%	38%	7%	7%	2%	14%
<i>Additional Net Reductions (as % of Reductions with Emissions Tax Alone)</i>						
BTI (home rate)	0%	8%	0%	2%	0%	4%
BRE	1%	16%	2%	3%	1%	8%
HR	-19%	-17%	0%	4%	0%	10%
FBA (home rate)	1%	24%	3%	4%	1%	11%

U.S. Avoided Production Loss (Full Cost Adjustment)

