



# Some Economics of Carbon Leakage

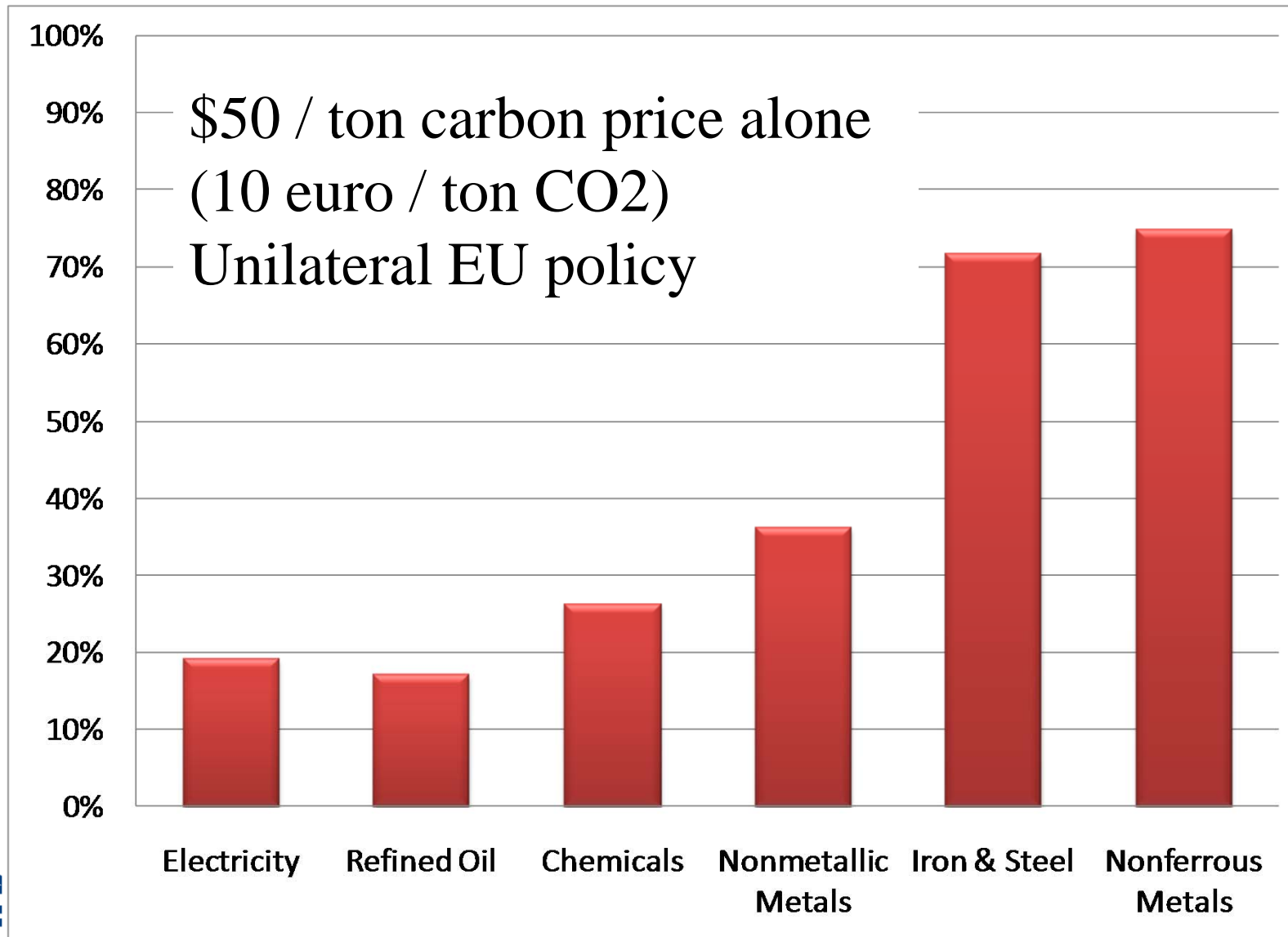
Carolyn Fischer  
*Resources for the Future*  
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# Carbon Leakage

- Increase in foreign emissions associated with a policy-induced decrease in domestic emissions
- 10-30% in most trade-oriented climate policy models
- Modest overall but can be large for certain individual sectors

# Leakage Rates for Europe



# Channels for Carbon Leakage

- Shifting economic activity and investment ("competitiveness")
- Global energy market response to demand shifts
- Intertemporal response of fossil resource owners ("green paradox")
  - Adjustments in scarcity rents and the path of fossil fuel extraction in response to changing demand expectations.

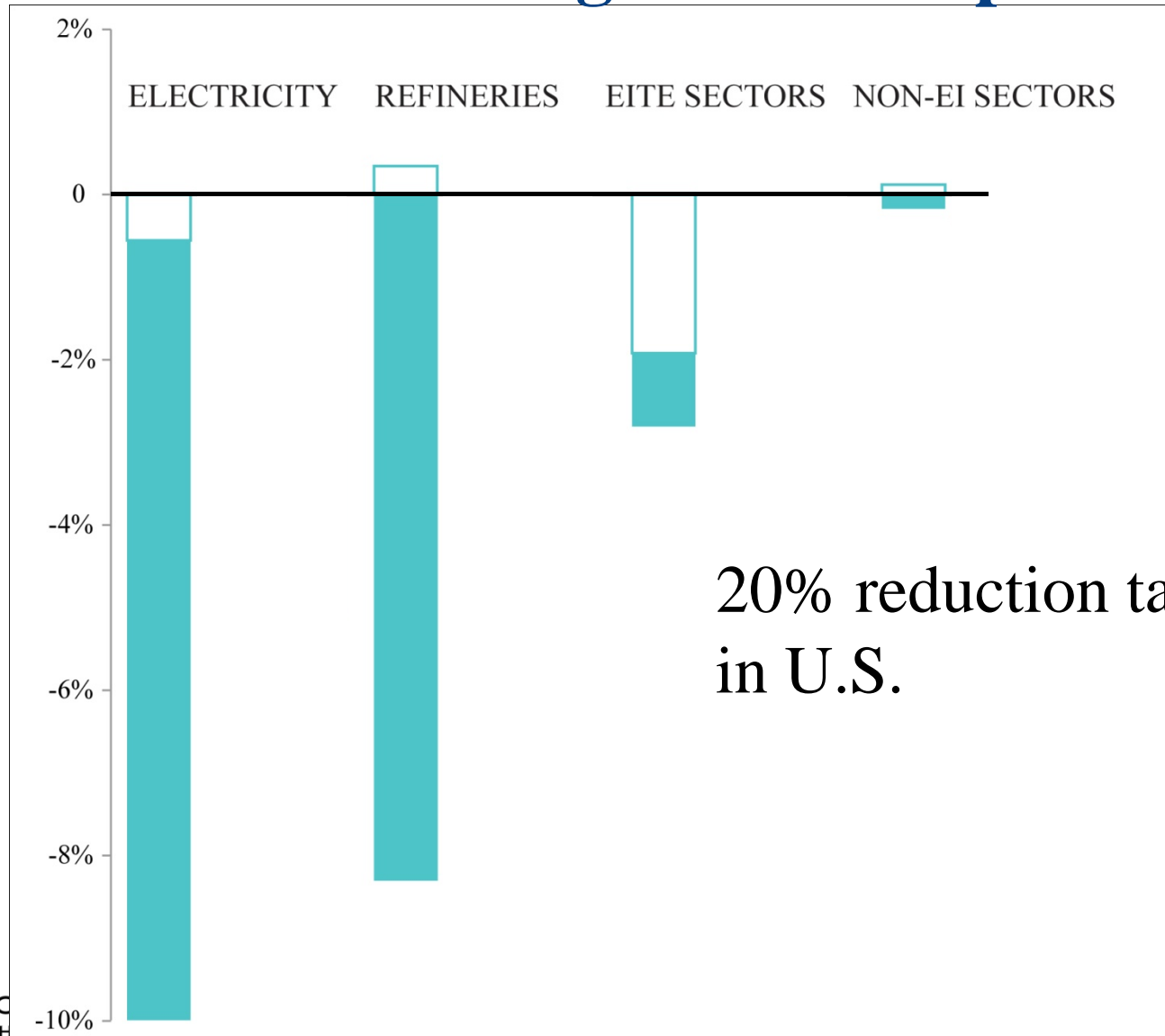
# Options for Coping with Leakage

- Global carbon pricing
  - Best option and only one to deal with energy market leakage
- Measures to address competitiveness-related leakage
  - Modest effects on overall leakage
  - But important for certain sectors and for political acceptability of stringent regulation
  - Larger effects if useful as leverage
- Weakening policies
  - Lower carbon prices, exempting exposed sectors

# Option (1): Output-based rebating

- Allocates allowances based on an industry average performance benchmark
  - Updated, not pure “grandfathering”
- Mitigates product price increase, which dampens leakage but also conservation incentives
  - Best applied narrowly to EITE sectors
  - Unable to distinguish among performance of trading partners; need to phase out as coalition expands

# % Change in Production, of which Change in Net Exports



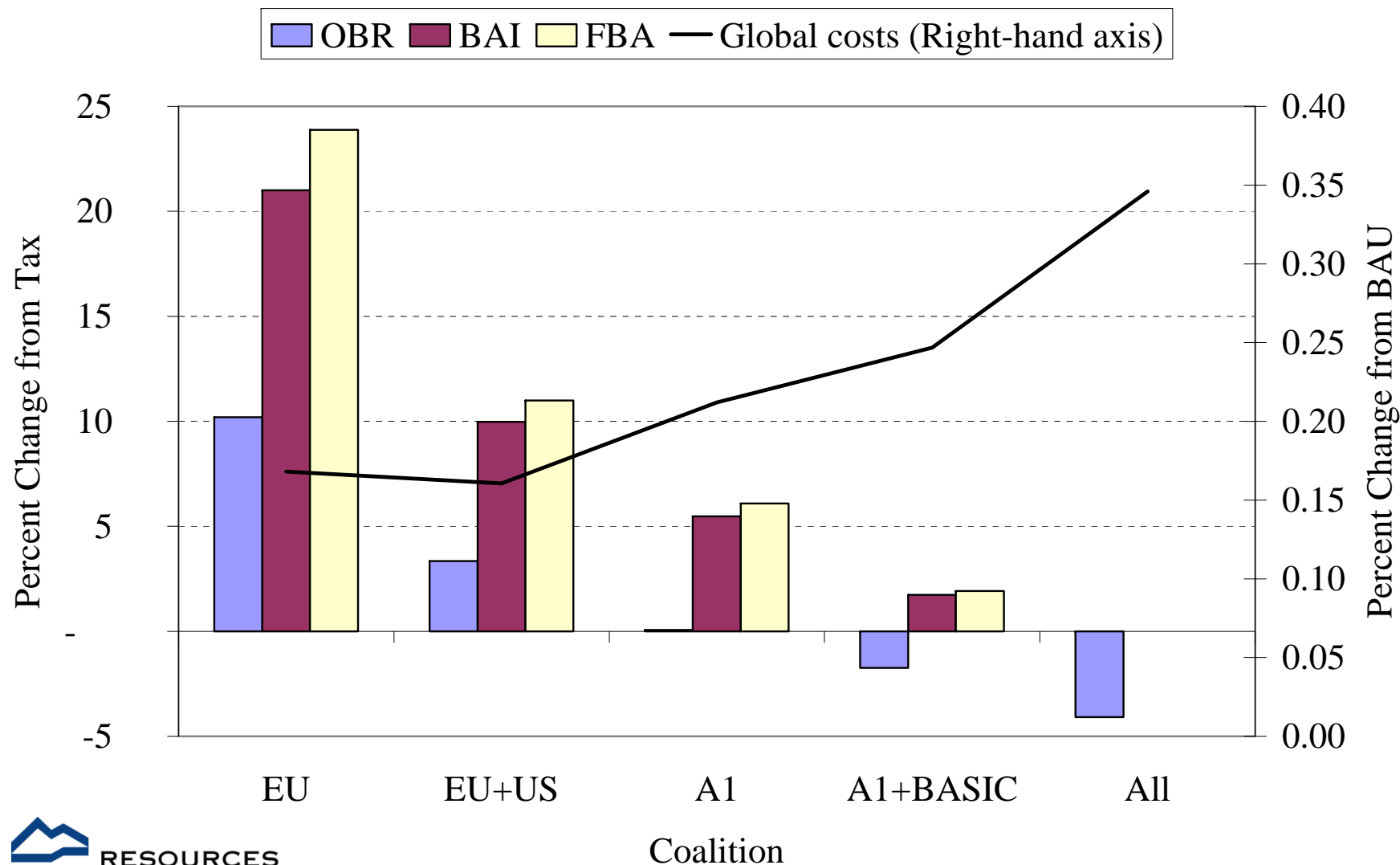
20% reduction target  
in U.S.

## Option (2) : Border Carbon Adjustment

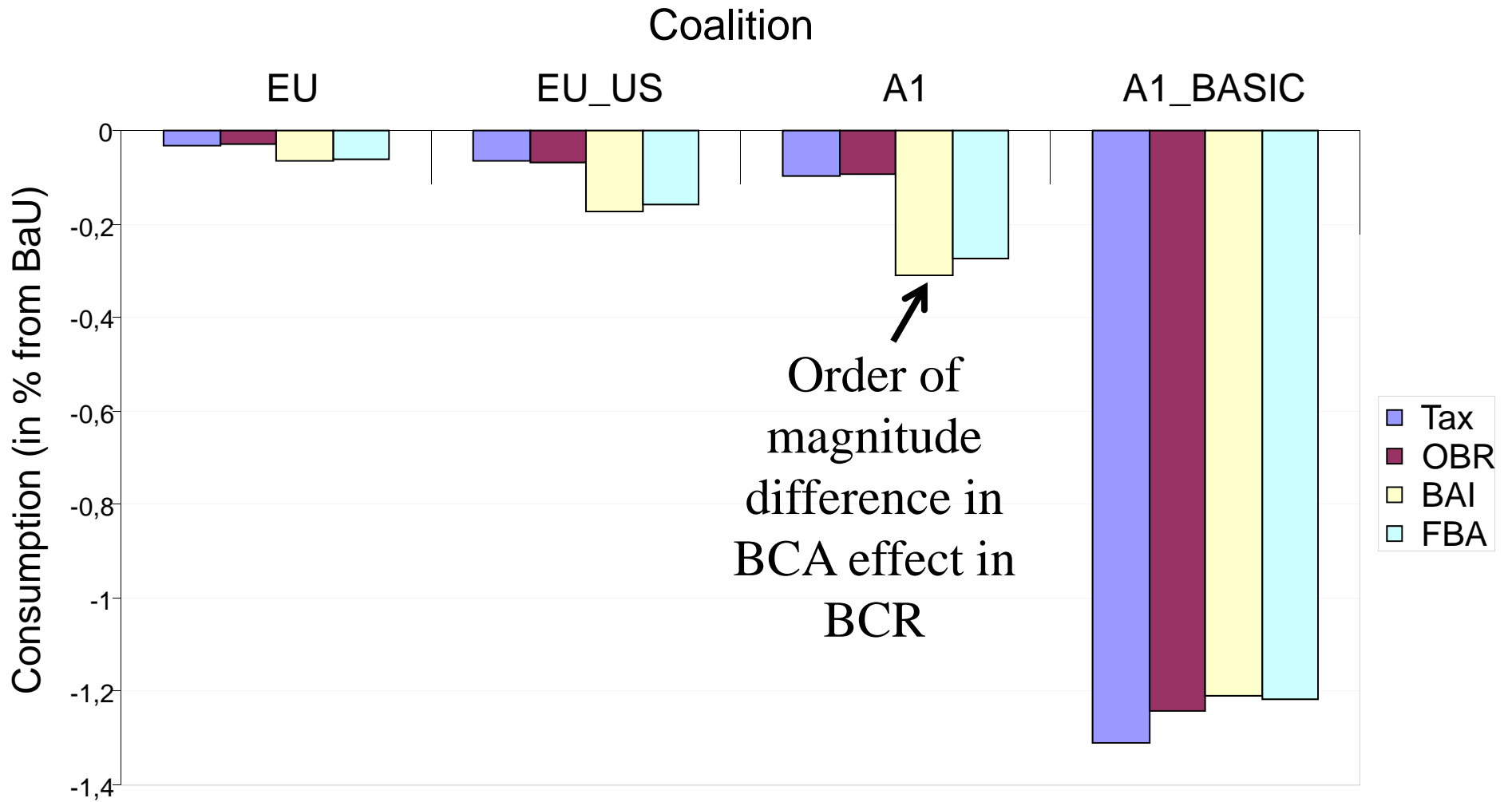
- Taxing imports based on a measure of their carbon content (and refunding for exports)
- Ensures consumers pay carbon-inclusive price, regardless of origin
  - Dampens leakage and maintains conservation incentives
- Also requires narrow scope of application
  - Can improve cost-effectiveness of carbon pricing if applied narrowly to sectors most vulnerable to leakage
    - E.g., cement, steel, aluminum
  - Costly if implemented too broadly



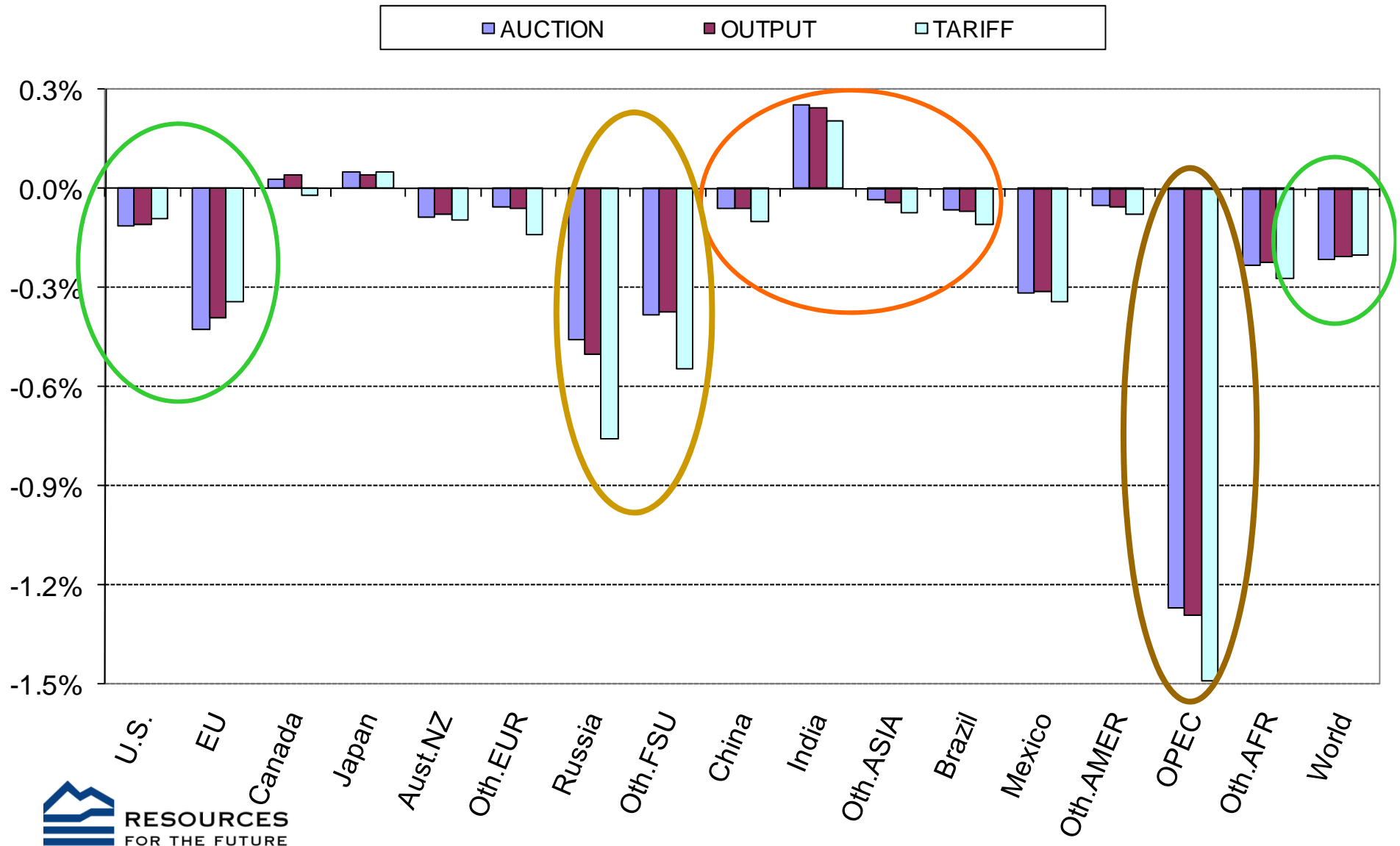
# Global Cost Savings of Antileakage Measures, and Global Costs of Carbon Price



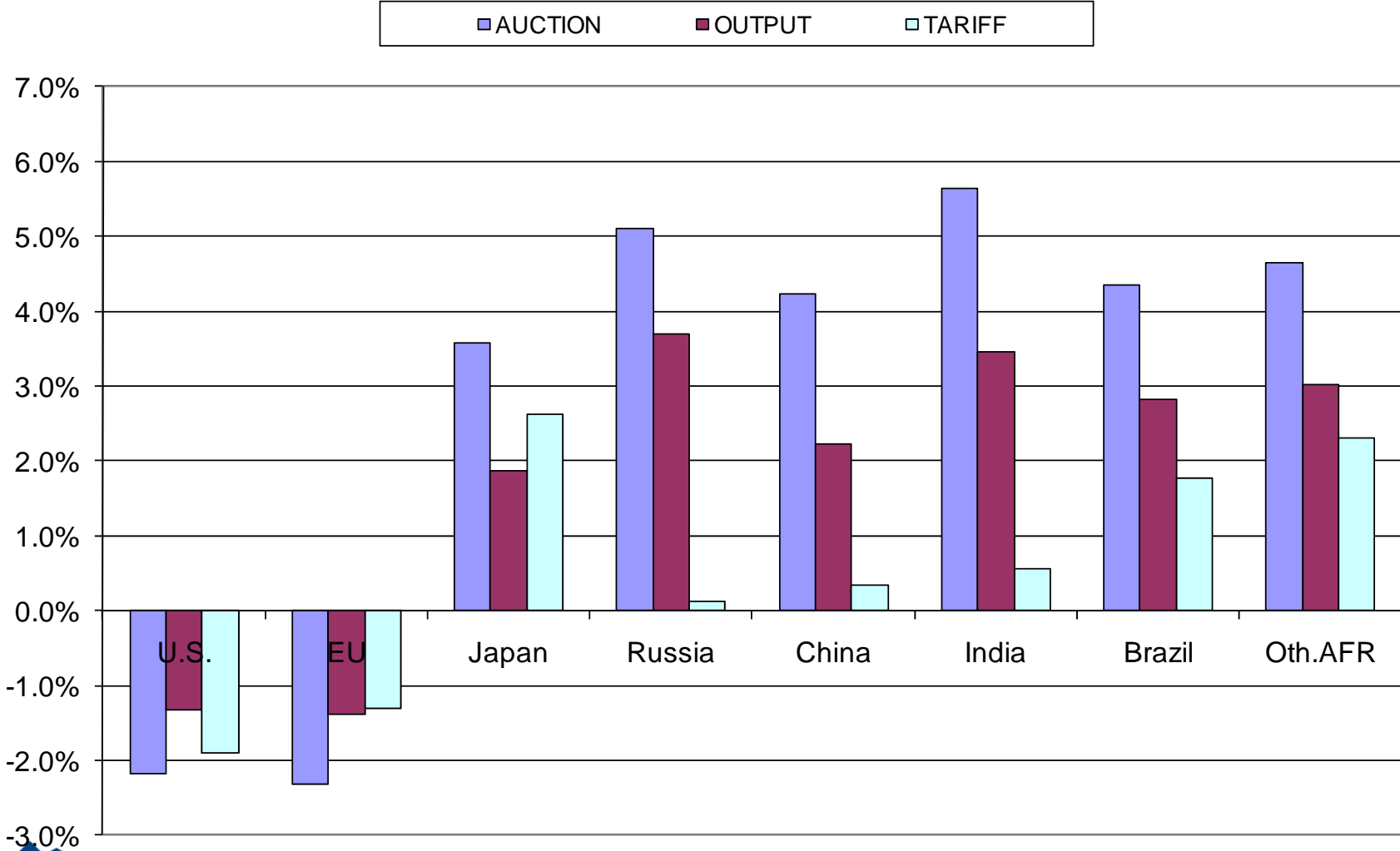
# Economic Adjustment Cost for China



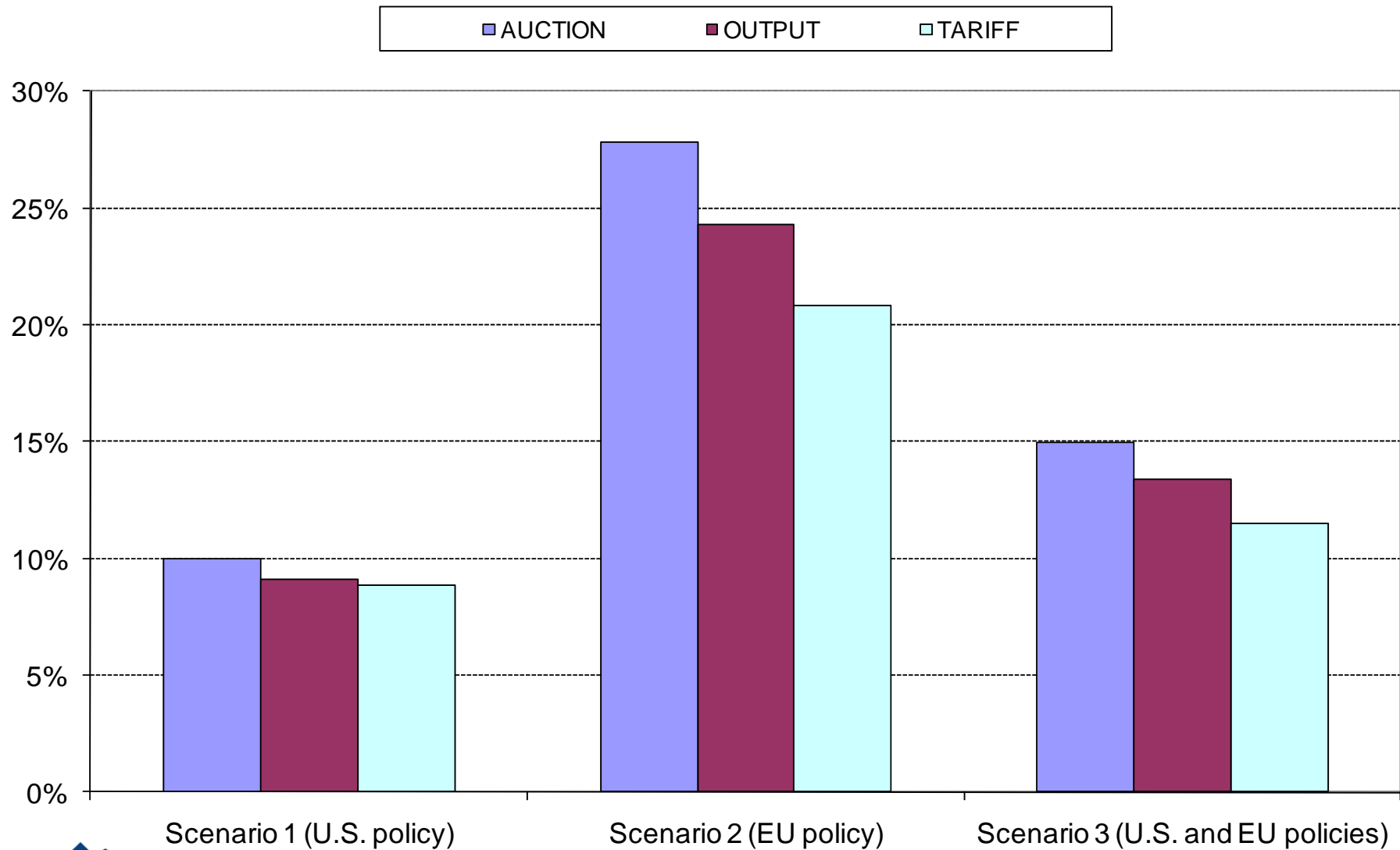
# Consumption Effects of Joint U.S. and EU Action by Policy Option



# Changes in Exports of EITE Products (Joint Policies)



# Global Leakage Effects

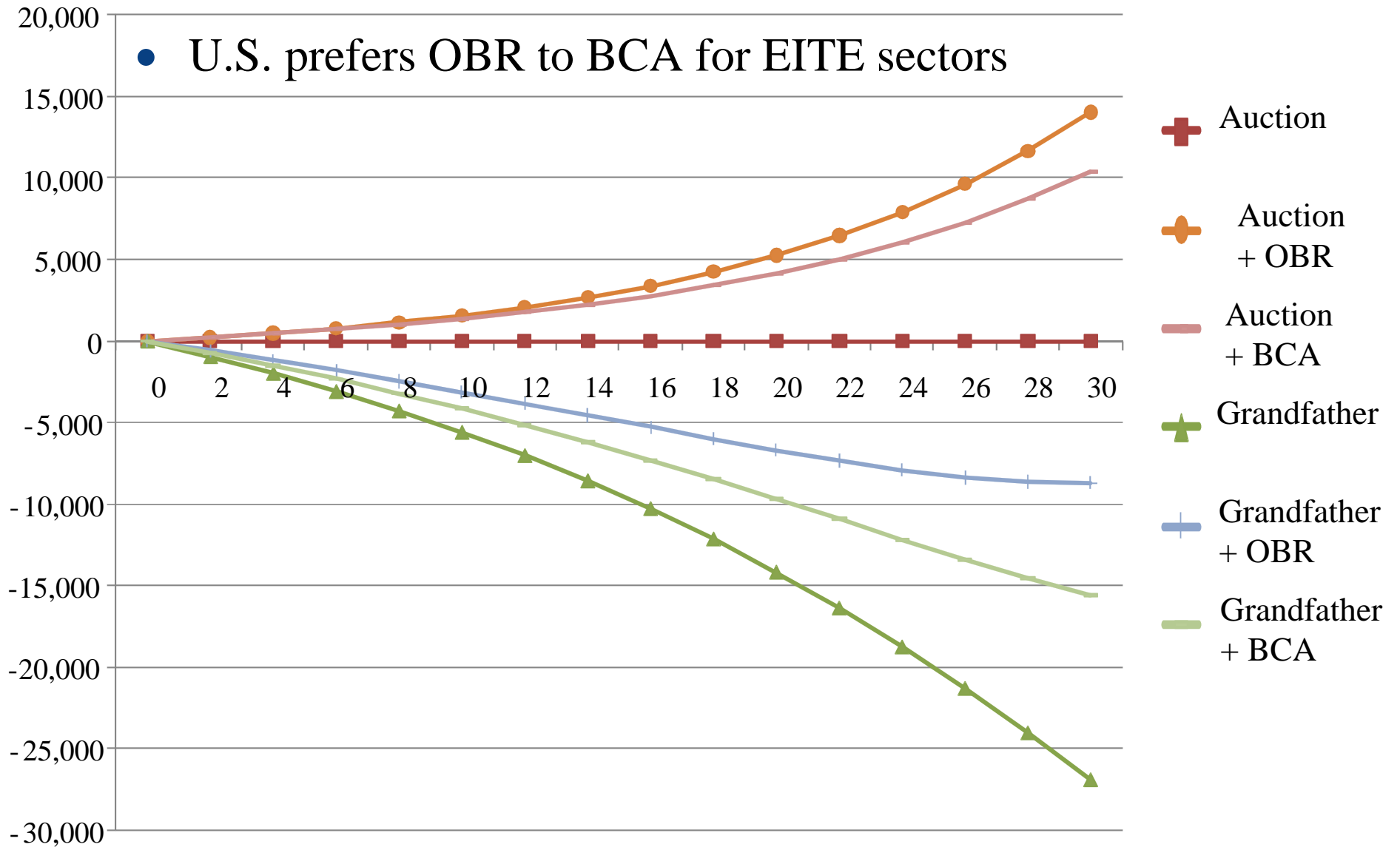


# Role of Revenue Recycling

- Pre-existing taxes distort labor (and capital) markets
  - Higher prices from regulation lower real wage, reducing labor supply and tax revenue: **“Tax Interaction”**
  - *It matters how we use the revenues*

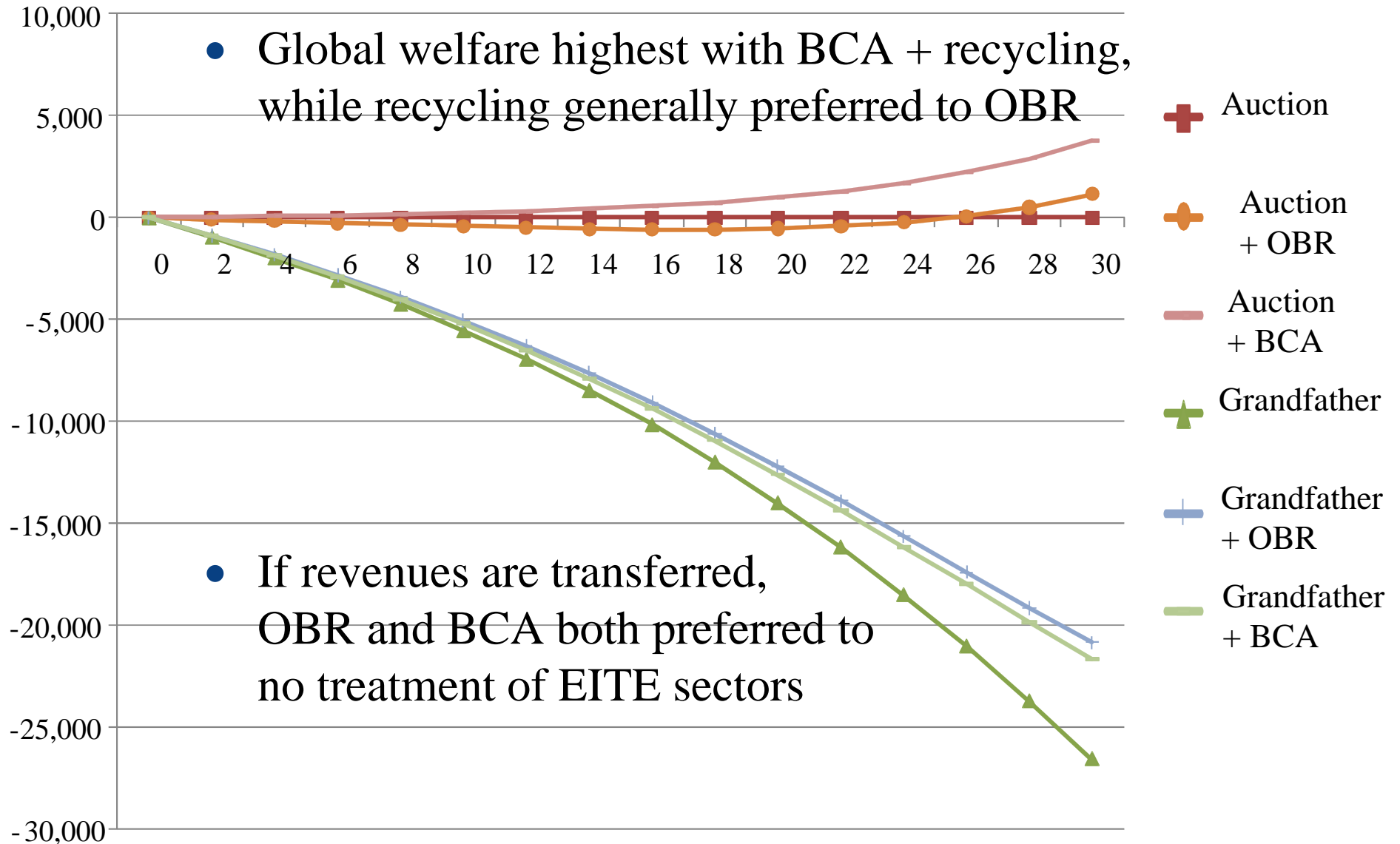
# Sensitivity of U.S. Welfare Changes

to Stringency of Emissions Reduction Target (Millions of 2004 USD)  
Compared to 100% recycling



# Sensitivity of Global Net Welfare Changes

to Stringency of Emissions Reduction Target (Millions of 2004 USD)  
Compared to 100% recycling



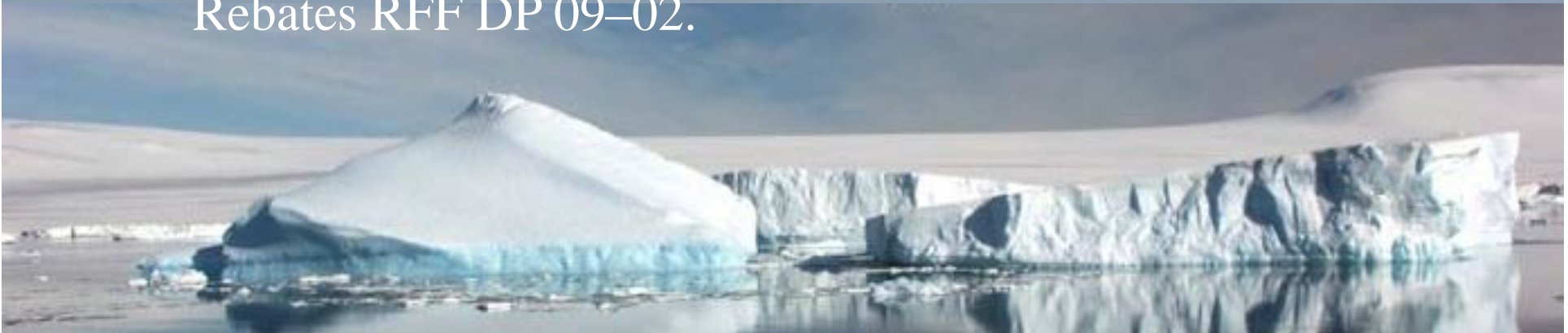


# Conclusions and Caveats

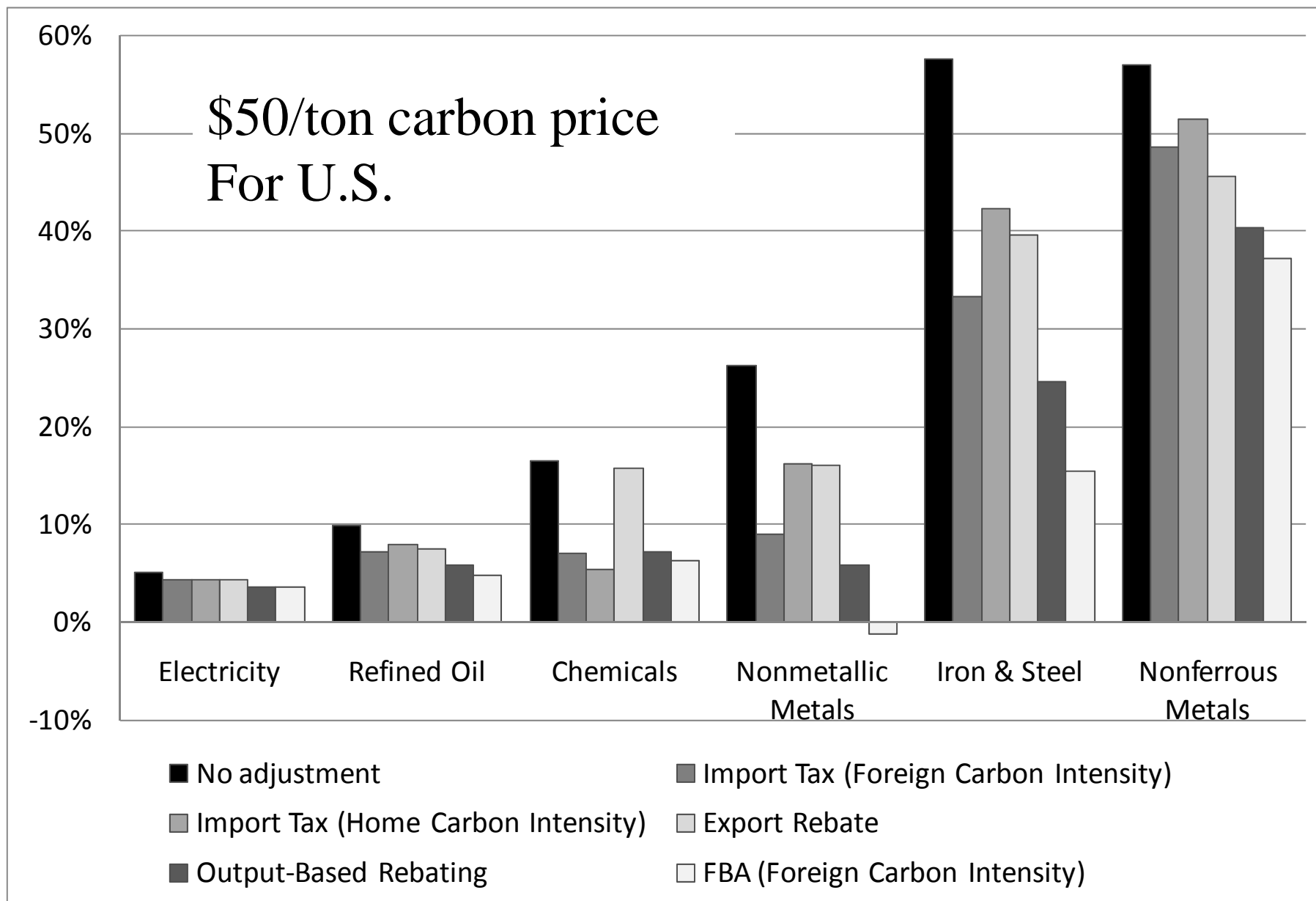
- OBR and BCA have potential to improve efficiency and reduce leakage from unilateral climate policy
  - If appropriately circumscribed
  - Must phase out OBR as more trade partners regulate CO<sub>2</sub>
- Not recycling the revenue is costly
- Serious practical challenges for both OBR and BCA
  - defining appropriate metrics for eligibility, consistent units of production, benchmarks that do not mute the effectiveness of the carbon price, embodied carbon calcs
- Most models (like ours) lack sufficient sectoral detail to capture these issues and further research is needed.

# Thanks!

- Fischer, C. and A.K. Fox. 2010. “On the Scope for Output-Based Rebating in Climate Policy: When Revenue Recycling Isn’t Enough (or Isn’t Possible)” RFF DP 10-69.
- Boehringer, C., C. Fischer, and K.E. Rosendahl. 2011. “Cost-Effective Unilateral Climate Policy Design: Size Matters” RFF DP 11-34.
- Boehringer, C., C. Fischer, and K.E. Rosendahl (2010) “The Global Effects of Subglobal Climate Policies” B.E. Journal of Economic Analysis & Policy. 10 (2) (Symposium): Article 13.
- Fischer, C. and A. K. Fox. 2009. Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates RFF DP 09–02.



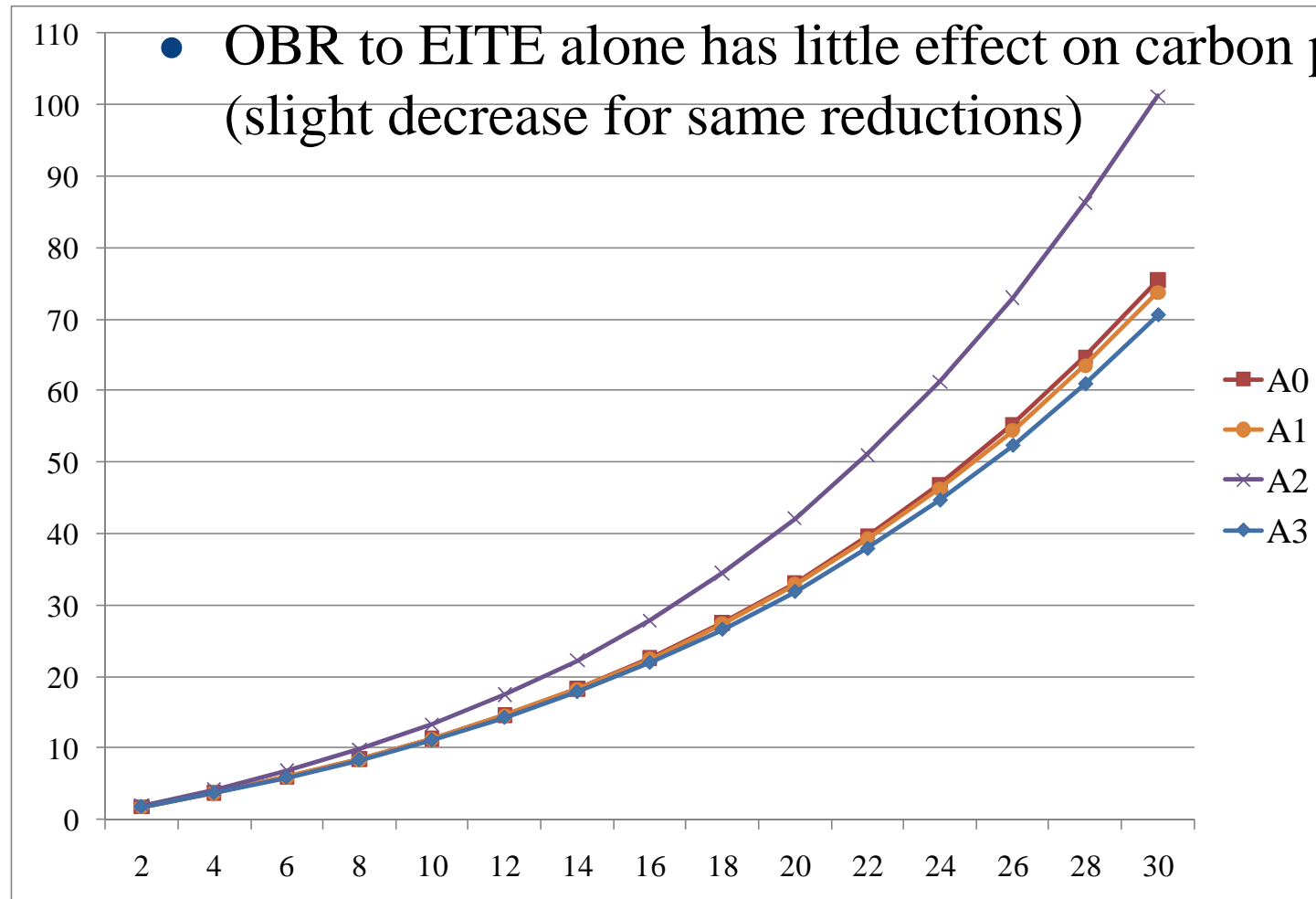
# Leakage Rates and Policy Options



# Sensitivity of Carbon Tax Required

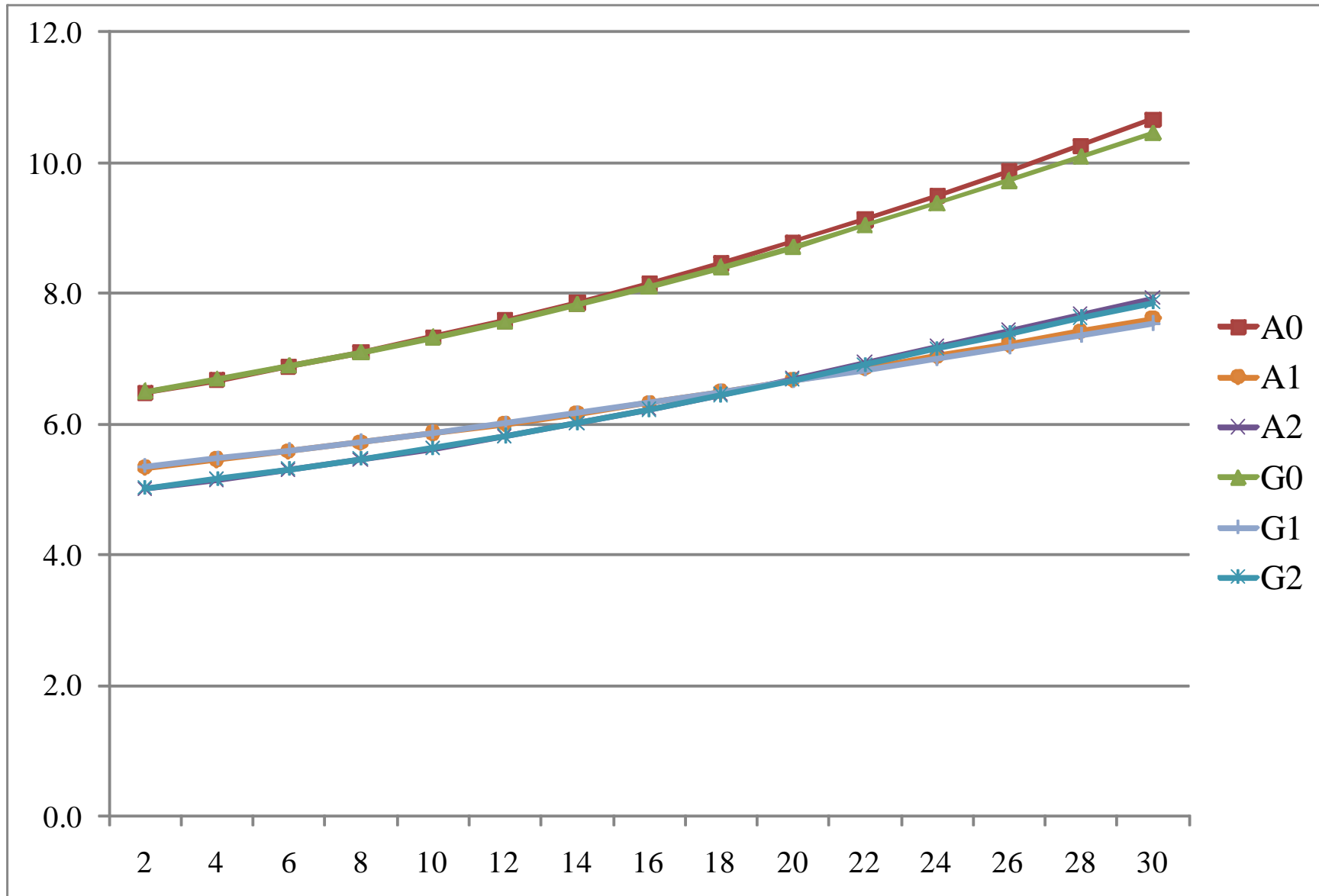
to Stringency of Emissions Reduction Target (USD per ton CO<sub>2</sub>)

- OBR to electricity drives up prices 1/3
- OBR to EITE alone has little effect on carbon price (slight decrease for same reductions)



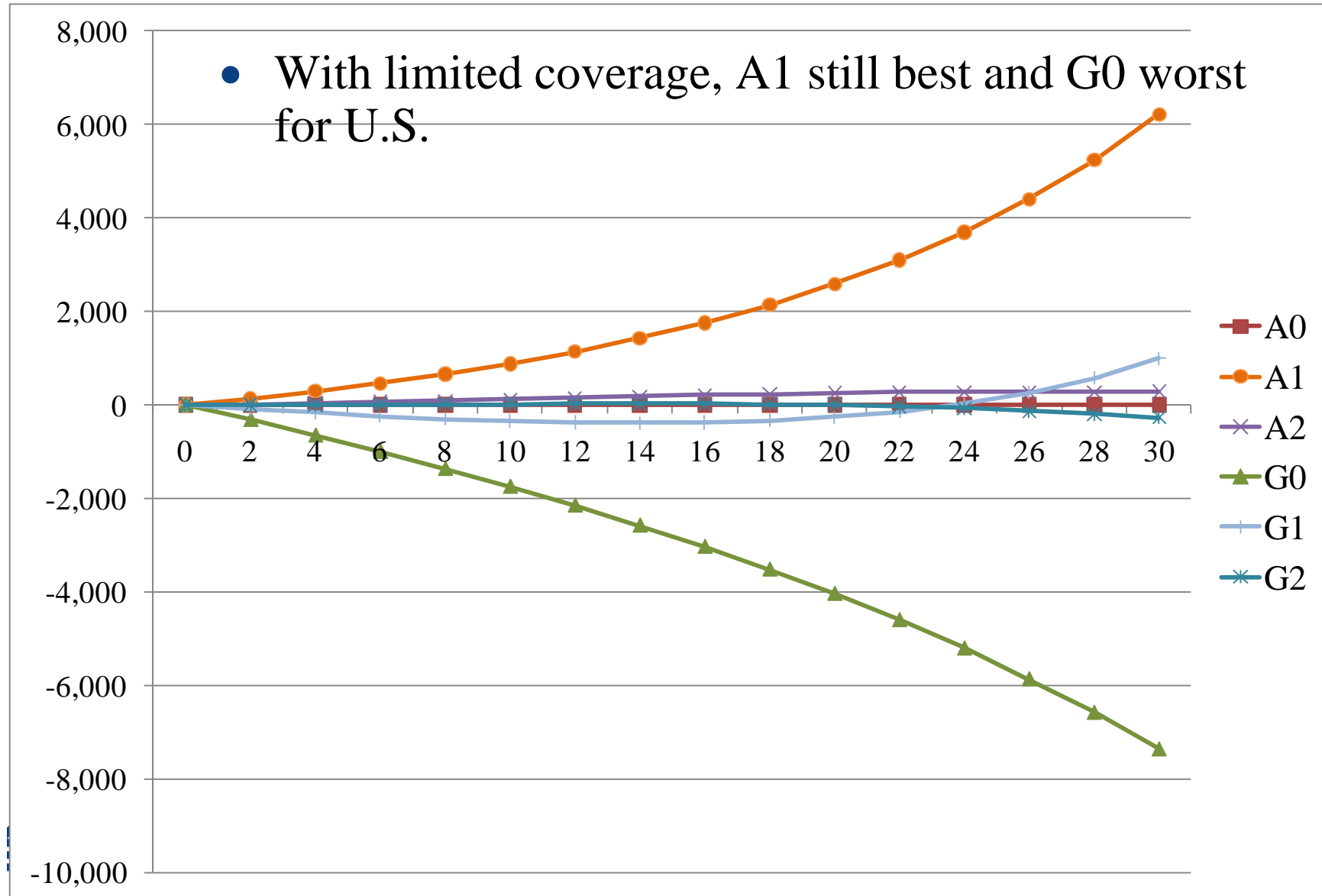
# Sensitivity of Leakage Rate

to Stringency of Emissions Reduction Target (% of US Reductions)



# Sensitivity of U.S. Welfare Changes

to Stringency of Emissions Reduction Target (Millions of 2004 USD)  
Compared to 100% Recycling (Energy Intensive Sectors)



# Sensitivity of Global Net Welfare Changes

to Stringency of Emissions Reduction Target (Millions of 2004 USD)  
Compared to 100% Recycling (Energy Intensive Sectors)

