Analysis of a Carbon Tax

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Why a Carbon Price?

- A cost-effective way to achieve given emission reductions
  - Trading under Acid Rain Program reduced costs of SO_2 emission cuts by nearly one-half compared to command and control approach
- An alternative to cumbersome and potentially contentious regulatory instruments
  - Using the Clean Air Act to regulate carbon dioxide could delay meaningful steps to reduce emissions
  - An endangerment finding for carbon dioxide could be especially costly

Why a Carbon Tax?

- Revenue
- Allocation
- Administration
- Efficiency
- Price Volatility
- International Trade

Revenue

- Revenue obscured under a cap & trade system
  - $80 billion annually with a $15 per ton CO_2 price
  - Order of magnitude larger than Acid Rain Program
- Including the revenue in the budget process explicitly instills some budgetary discipline
  - Revenue from cap & trade only included in federal budget if auctioned
  - Free permits are a hidden transfer

Allocation

- Permits are valuable assets
  - Big incentive for rent seeking activity
- Current focus on allocation has perverse distributional results
  - Emphasis should be on compensating affected parties, not regulated sectors
  - Carbon Tax Swap addresses this problem

Administration

- IRS in place to administer a carbon tax
- Cap & trade system will need to establish administrative structure
- Considerable lead-time may be needed to establish allocations (CBO, 2008)

Efficiency

- Pure cap & trade fixes quantity but not price
- Pure tax fixes price but not quantity
- Economic modeling consistently shows that tax more efficient to achieve given expected GHG reductions under abatement cost uncertainty

Price Volatility

- EU-ETS prices highly volatile
- Makes planning by firms difficult
- Need for complicated schemes (e.g. Carbon Market Efficiency Board)
- Safety valve mechanisms address upside risk
  - But if binding, converts system to a tax
  - Why not start with the optimum design?

Border Tax Adjustments

- Legality under WTO?
- Implementation
  - How do we know the carbon content of an imported good?
  - Focus on goods with substantial carbon content
  - Base on U.S. carbon content of comparable products to level playing field
- Combination of origin/destination system

Designing a Carbon Tax

- Four key issues:
  - Base
  - Rate
  - Revenue
  - Distribution

Tax Base

- Upstream collection for energy:
  - Impose carbon price on almost all fossil fuels with fewer than 3,000 taxpayers
  - 80 percent of GHG emissions
- Non-energy
  - Quickly becomes more difficult
  - Metcalf and Weisbach (2008) estimate that US can capture 10 percentage points more at a modest cost

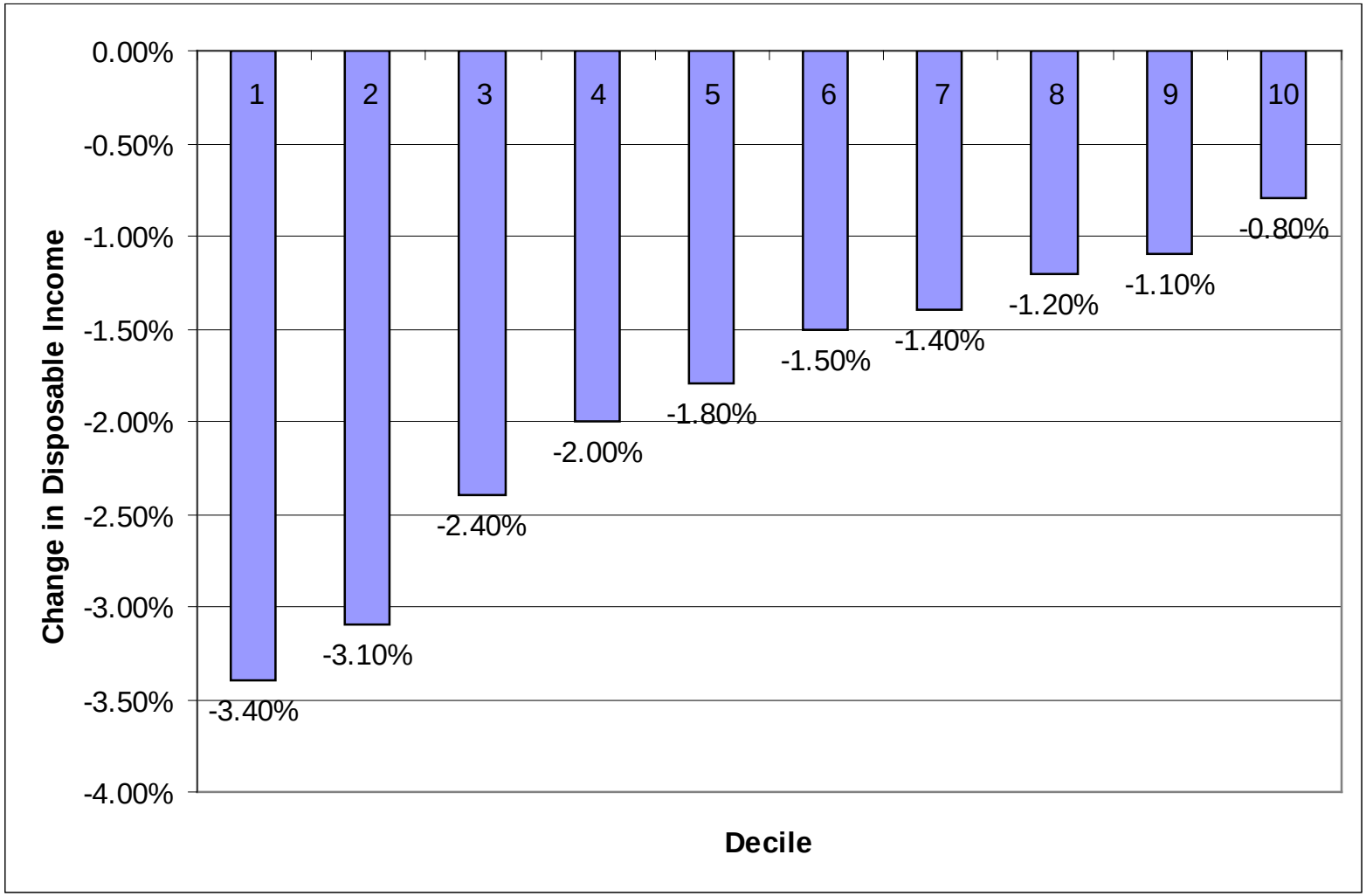
A Carbon Tax Swap

- A tax on emissions at an initial rate of $15 per metric ton of CO2 equivalent and gradually increasing over time
- A refundable tax credit for sequestered GHGs and other approved sequestration activities
- Border tax adjustment for fossil fuels
- An environmental earned income tax credit in the personal income tax equal to the employer and employee payroll taxes on initial earnings up to a limit.
  - For 2003 emissions and earnings, the credit would offset payroll taxes paid on the first $3,660 of earnings per worker up to a maximum credit of $560 per covered worker.

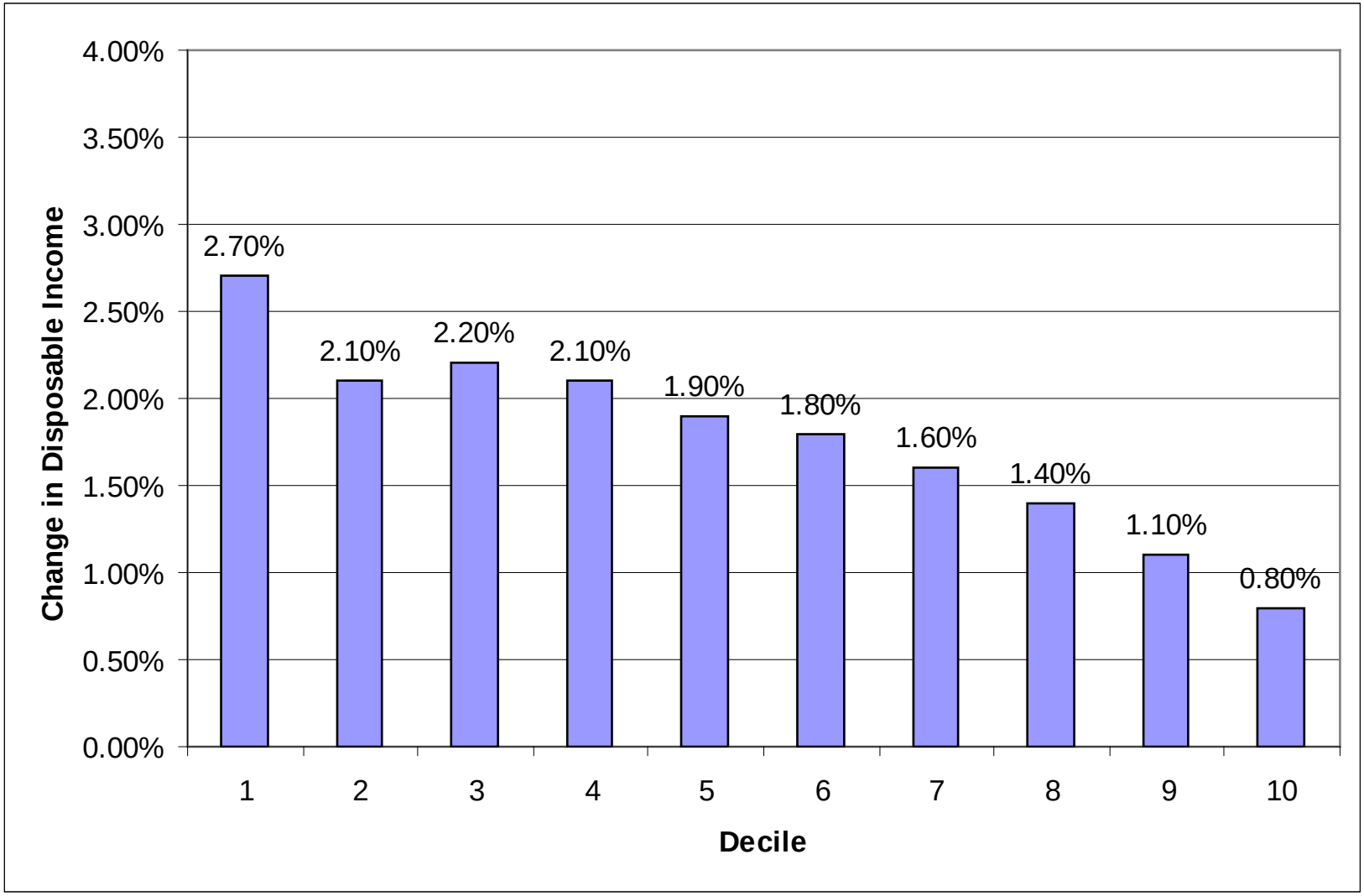
Important Design Elements

- Upstream system provides comprehensive coverage at low administrative cost
- Capped environmental earned income tax credit achieves distributional neutrality
- Revenue neutrality important on political grounds
  - Should not let carbon policy get caught up in debate over size of government and tax revenues
  - Shifts from taxing “goods” (labor, capital) to “bads” (emissions)

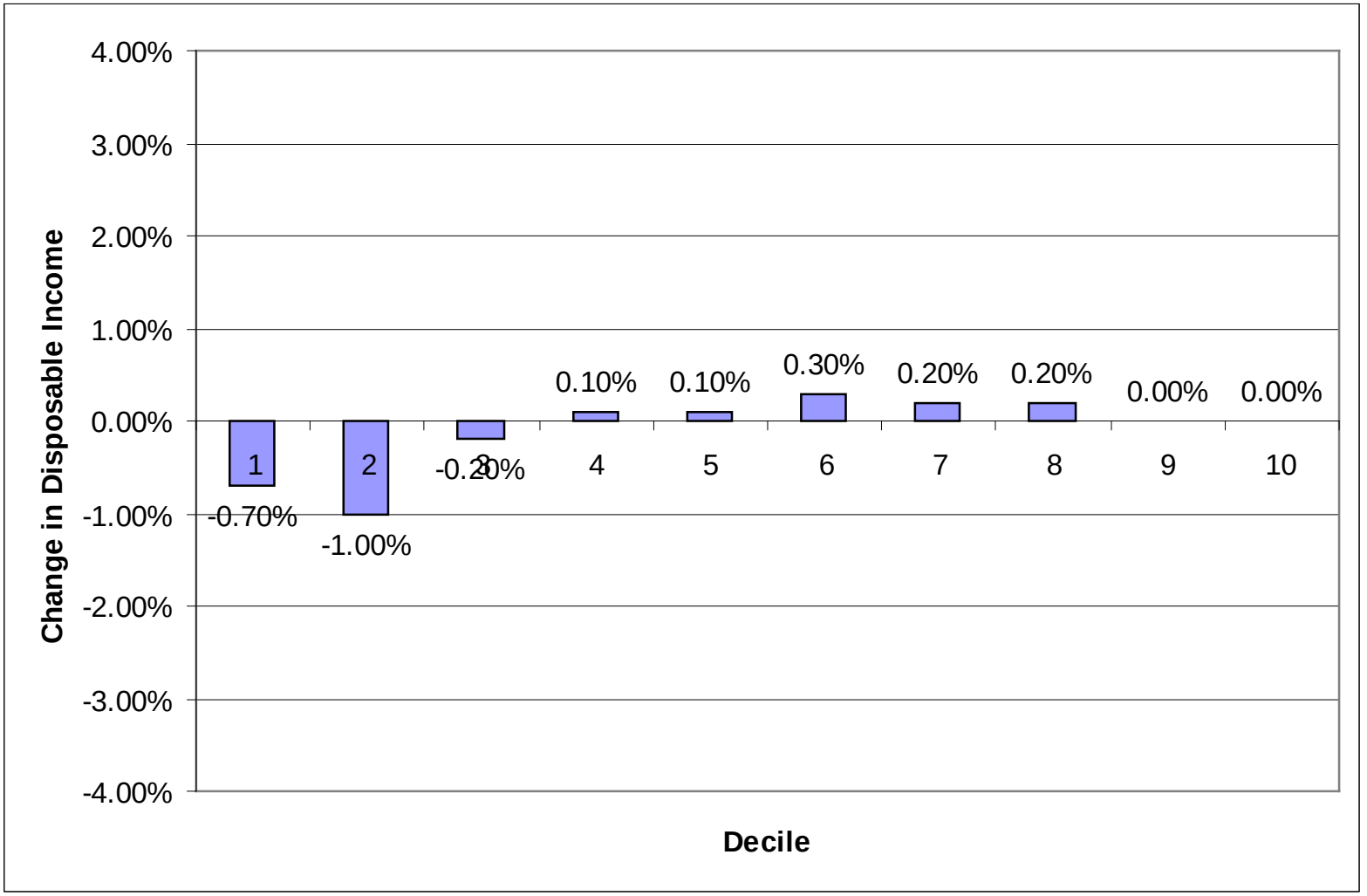
Impact of Carbon Tax on Income



Impact of Tax Credit on Income



Net Impact


4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
-4.00%
Change in Disposable Income
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-1.00%
-0.20%
0.10%
0.10%
0.30%
0.20%
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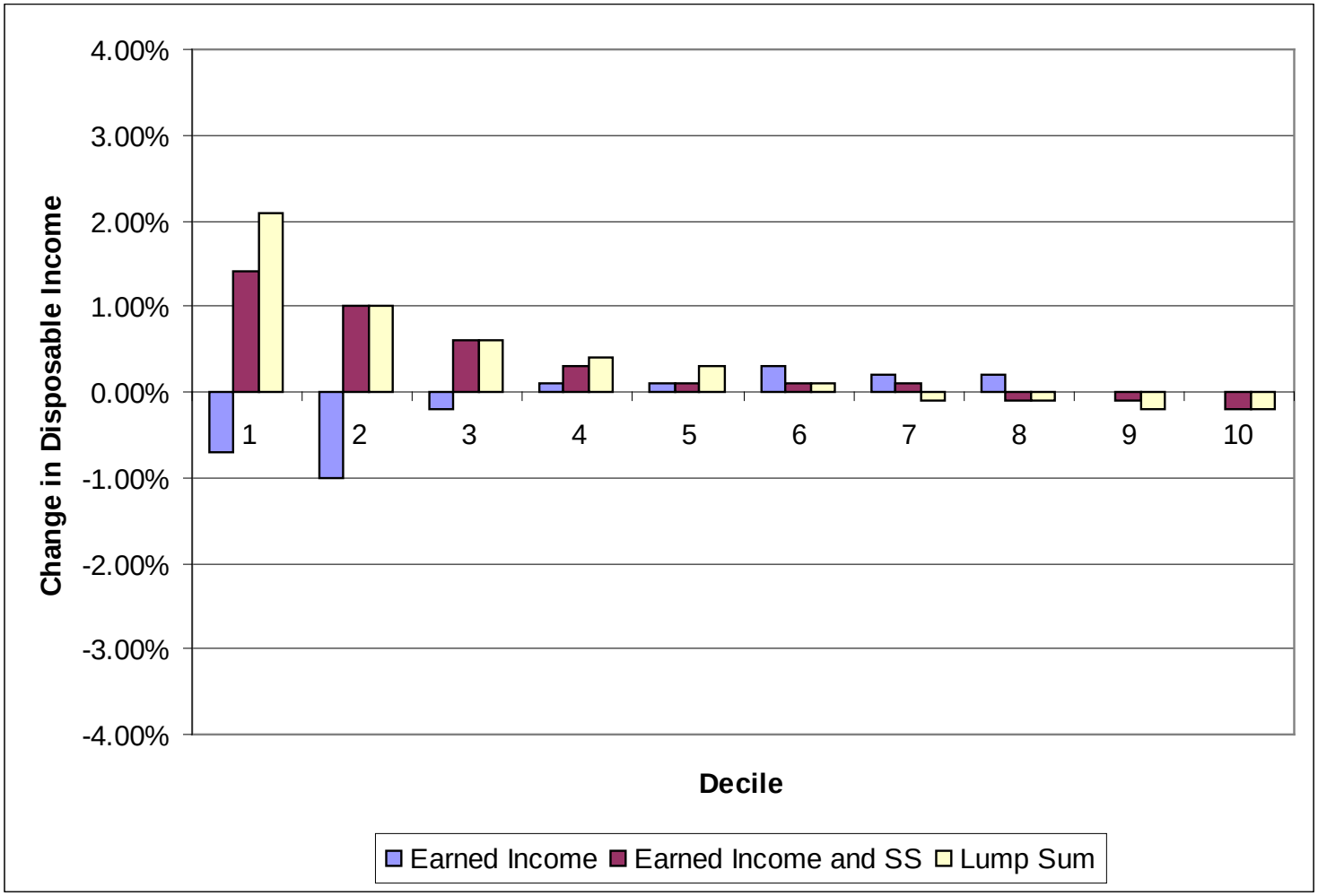
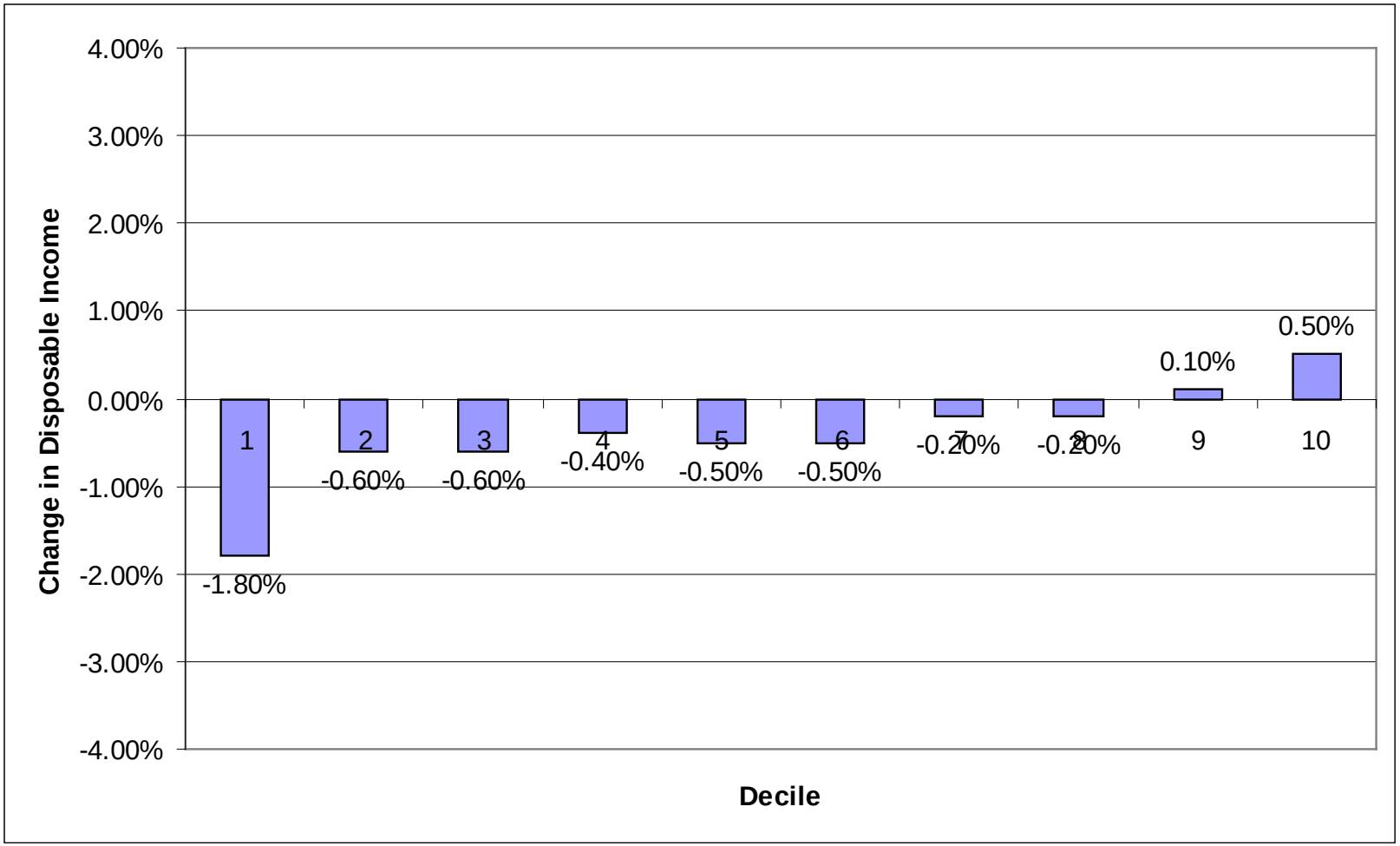
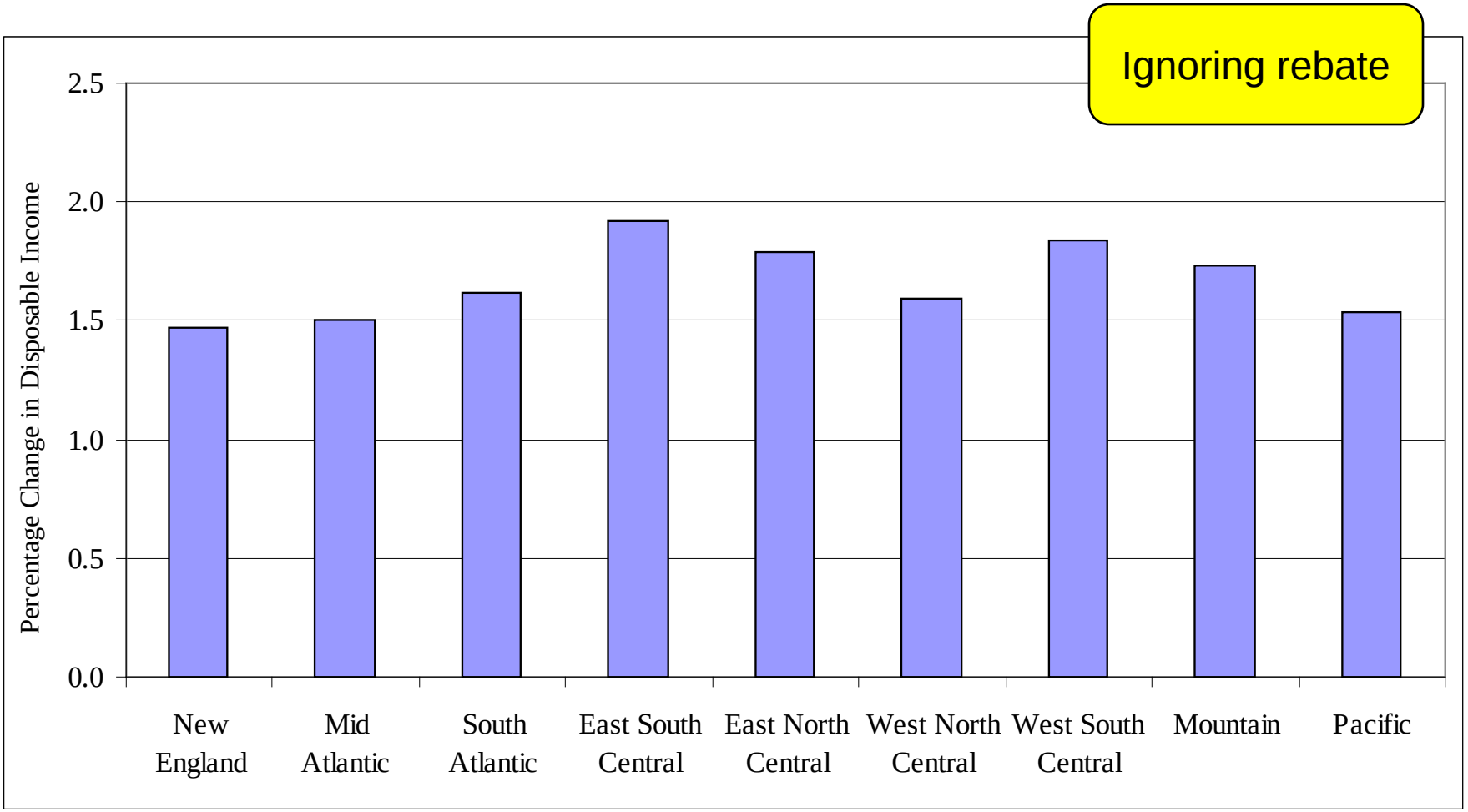
Alternative Rebate Options



Grandfathered Cap and Trade

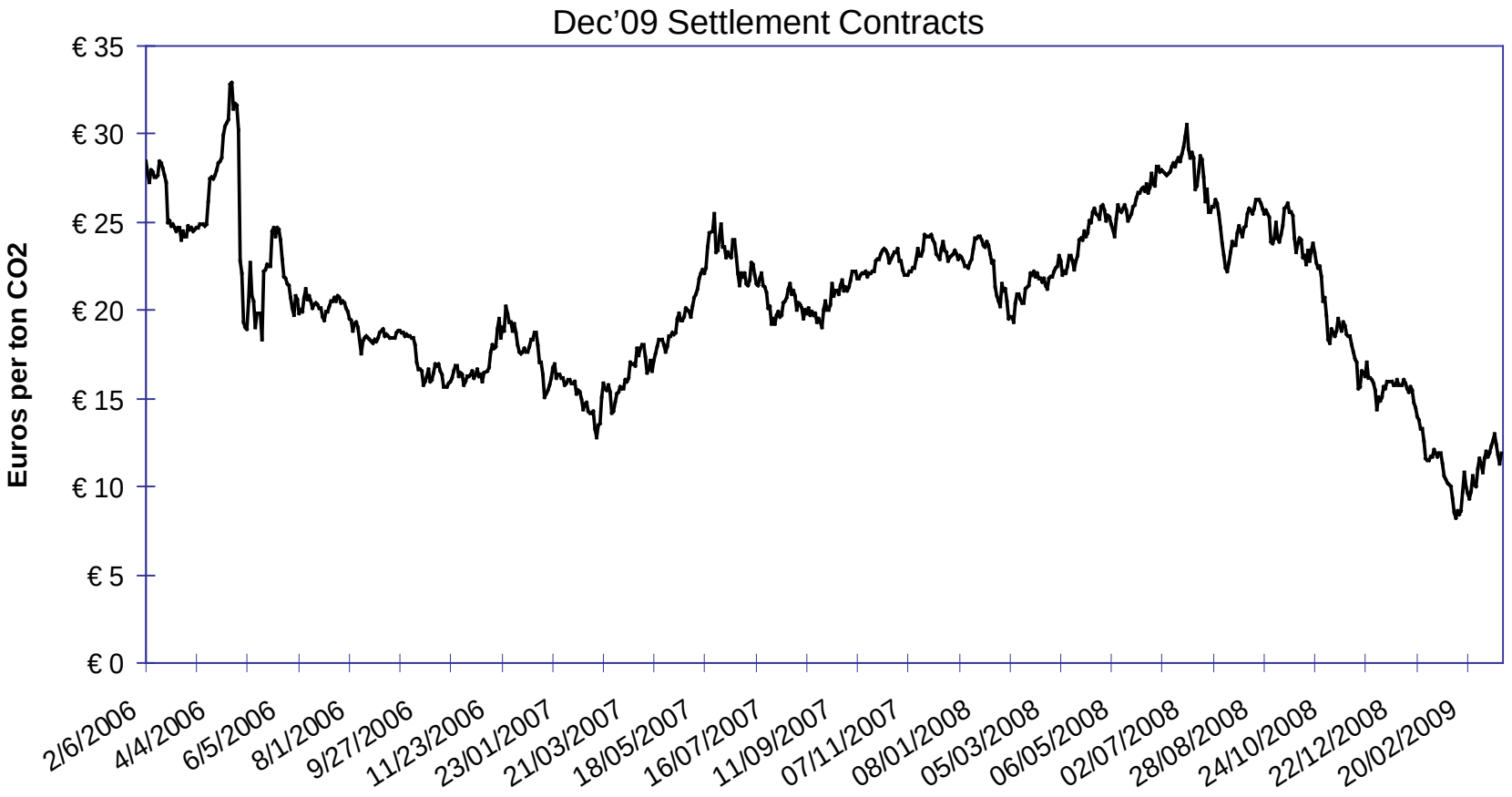


Regional Burden



Hassett, Mathur, and Metcalf (2009)

Price Volatility in the EU-ETS



Source: European Climate Exchange

Price Volatility and Cost Containment

- Policy should distinguish between short run and long run price uncertainty
- Carbon tax provides the greatest certainty over future price path
- Hybrid policies can bridge the difference between tax and cap-and-trade systems

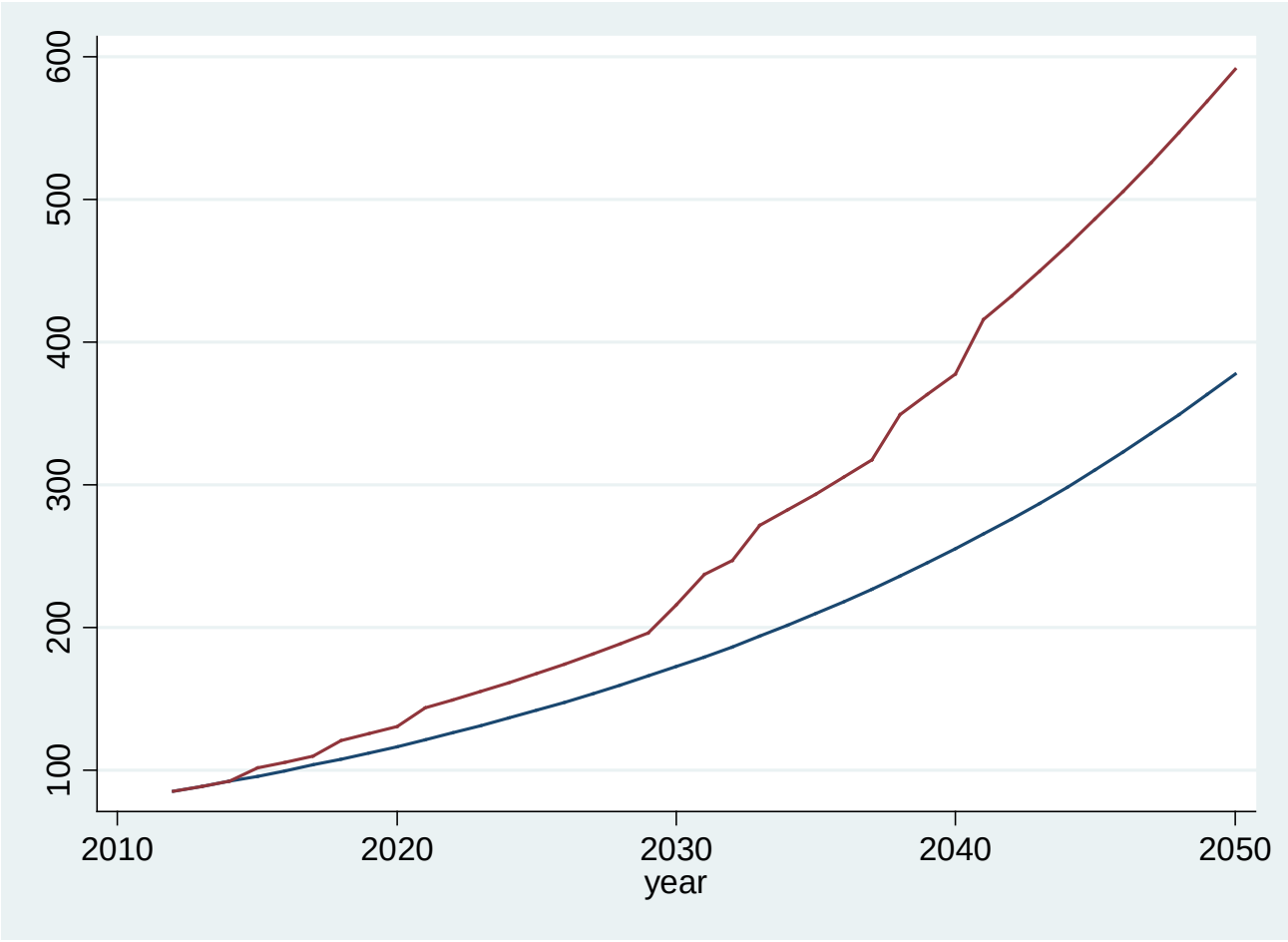
Cost Containment Approaches

- Safety valve approach is transparent
  - Potential arbitrage opportunity in anticipation of future tightening of policy
- Allowance reserve is a restricted safety valve
  - Less transparent
  - Effectiveness may be undermined by strong demand for banking

Responsive Emissions Autonomous Carbon Tax (REACT)

- An initial tax and standard growth rate for the tax
- Benchmark targets at set intervals for cumulative emissions over the control period
- Exceeding the target in benchmark years triggers an increase in the growth rate of the tax to a higher catch-up rate until cumulative emissions fall below the target again.

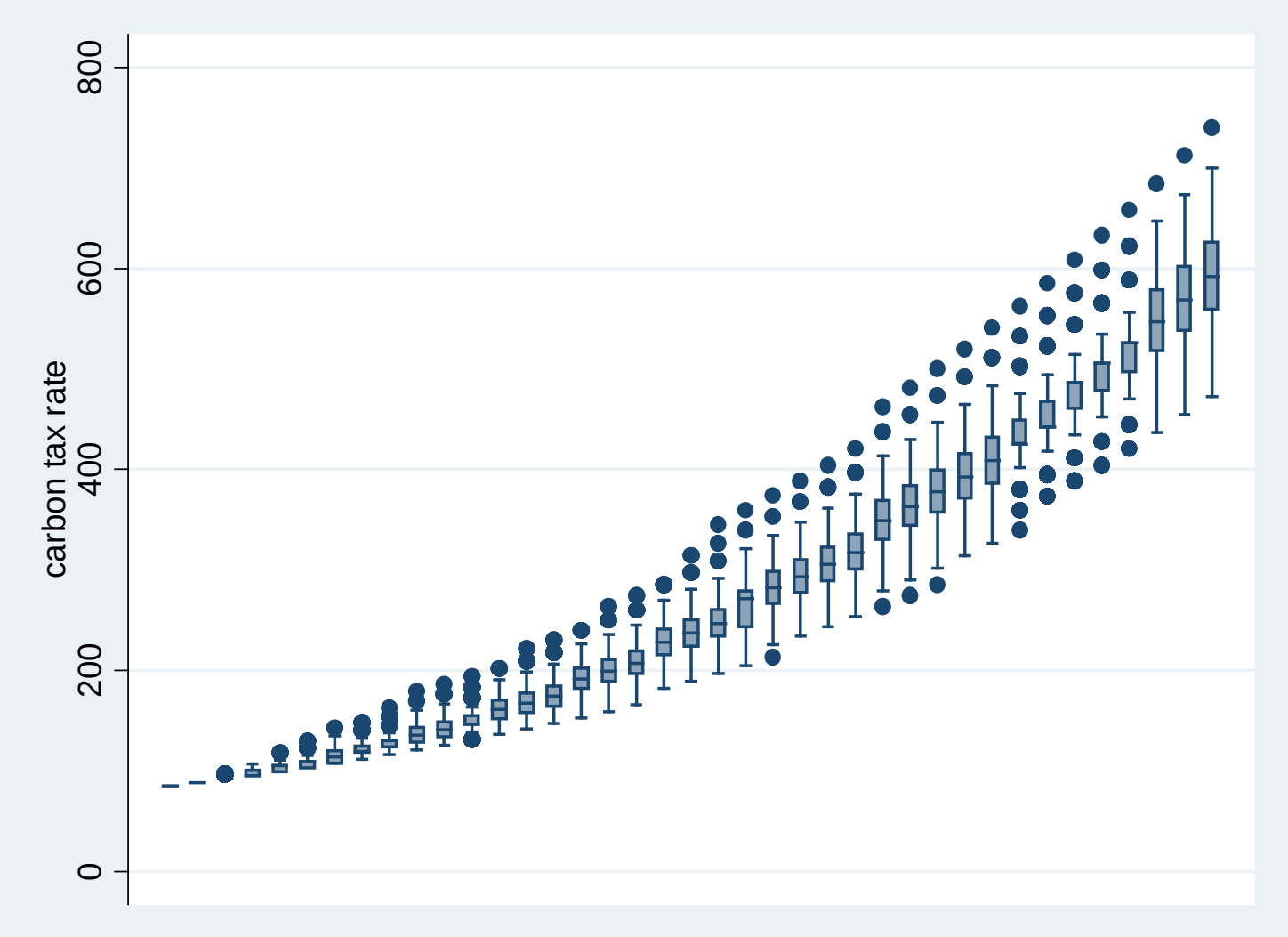
Sample Price Path



A REACT Approach

- 4 percent standard growth rate of tax
- 10 percent “catch-up” growth rate
- Designed to achieve emission targets of the Climate Security Act of 2007
  - 20 % emissions reduction by 2020
  - 70 % emissions reduction by 2050
- Cumulative emissions of 146 bmt of CO_2

Tax Rates Under Uncertainty



Benefits of REACT

- Short run price volatility eliminated
- Uncertainty over long run price path reduced
- Transparent mechanism for price changes
- Emission targets over the control period are maintained

Summary

- Carbon tax has a number of advantages over cap & trade
  - Price certainty
  - Efficiency
  - Trade considerations
  - Administration and speed of implementation
- Cap and trade dominates on political expediency grounds
- Any form of carbon pricing strictly preferred to a regulatory approach
- Hybrid cap & trade blurs some of the distinction between permits and taxes

Summary

- Carbon pricing is regressive
- Carbon tax neutral across regions
- Carbon tax swap can be designed to be distributionally neutral across income groups

Further Resources

- **Metcalf, Gilbert E.** 2007. "A Proposal for a U.S. Carbon Tax Swap: An Equitable Tax Reform to Address Global Climate Change," Washington, DC: The Hamilton Project, Brookings Institution.

- **Metcalf, Gilbert E.; Paltsev, Sergey; Reilly, John M.; Jacoby, Henry D. and Holak, Jennifer.** 2008. "Analysis of a Carbon Tax to Reduce U.S. Greenhouse Gas Emissions," Cambridge, MA: MIT Joint Program on the Science and Policy of Global Change Report No. 160.

- **Metcalf, Gilbert E. and Weisbach, David.** 2008. "The Design of a Carbon Tax," Tufts University and the University of Chicago.

- **Hassett, Kevin A.; Mathur, Aparna and Metcalf, Gilbert E.** 2009. "The Incidence of a U.S. Carbon Tax: A Lifetime and Regional Analysis." *The Energy Journal*, *30*(2). 157-79.