LECTURE 6: COASE AND CAP-AND-TRADE

Lecture 5

14.42/14.420

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Knowledge Check

- I want to see how the class is doing on understanding Pigouvian taxes.
  - We will do a quick “Knowledge Check.”
  - This will be part of your class participation score.
- Please sit in the front
- Begin at 2:35.
- You must hand this paper to me before 2:38:00 by my computer clock.
- I will not accept papers after that time.

Administrative Notes

- Problem Sets:
  - Mean 35.1 out of 40
  - Standard deviation: 5.2
  - Available in Jennifer's mail folder.

- March 1: Case Study of the Acid Rain Program (Discussion)
- March 3rd: Visit to MIT power plant
- March 10th: Topics in Cap-and-Trade (Formal Theory)

- No section tomorrow (Jennifer is out of town)
- I will not hold office hours the next two weeks (I am out of town)

Coase and Cap-and-Trade

- Today:
  - The Cheshire Transaction and the Coase Theorem
  - Cap-and-Trade

The Gavin Power Plant

Photo by Jeff Lovett on Flickr.

- Owned by American Electric Power (AEP)
- 2.6 GW
  - Enough power for 2 million people
- Original Cost: $650 million (nominal)
  - Replacement cost: ~$3 billion ($nominal 2011)
- FGD Installed 1994/1995
  - Total cost: $700 million.
- SCR Installed 2001
  - Controls NOx emissions
  - Byproduct: Sulfur Trioxide
  - Total cost was probably ~$260 million

Greenpeace 1984 Protest

Image removed due to copyright restrictions.

The Cheshire Transaction

- Property owners receive 3.5x assessed value
  - Outside village: 2x assessed value
- Renters receive $5k for each year lived in Cheshire, up to $25k.
- Must sign a health waiver prohibiting them from suing AEP for future health problems
  - Must also sign a confidentiality agreement
- Cheshire residents over age of 71 able to remain in homes rent free until death.

- Original population: 221. Current population: <20
- Total settlement disbursed by AEP: $20 million
  - Attorneys take about 1/3 of settlement money
  - More info: http://www.cheshiretransaction.com/powerplant/sub/cng.html

Boots Hern

- “The 82 year-old Boots claims she’s got a mind of her own. She owns prime real estate in Cheshire, nearly two acres of riverfront between Gavin and other villagers. Under the original buyout proposal Boots was offered $242,700, not even half as much as others with less property. She is furious that the “Johnny-come-latelys” will get more than her.
  - She is not going to sell, unless her demands are met.
- Boots Hern remained a Cheshire Resident until her passing in February 2008. After the buyout, she became a council member and even the mayor of Cheshire.”
  - http://www.cheshiretransaction.com/town/sub/ccharacters.html

Was the Cheshire Transaction “a Good Thing?”

Takeaways from Cheshire/Gavin

- The property owners had the right to “more clean air than they had in 2001.”
  - We know this because AEP transferred them money
  - We do not know exactly how much more they implicitly had the right to.
- The efficient pollution control decision was made
  - We know this because AEP could have abated instead of compensating
  - This ignores CO2 and other remaining externalities
- The efficient housing allocation probably did not obtain
  - Transfers were a subsidy to movers
  - Too many people probably moved.
- Sometimes it’s not obvious who “should” initially have the property right.

The Coase Theorem

- Now imagine that AEP Gavin's control costs were low, and the efficient outcome would be to install additional control equipment.
- Would it matter whether we granted the "right to clean air" to the town or to AEP?

The Coase Theorem

- Assume a world in which some producers are subject to externalities generated by others.
- Assume also:
  - Perfect information
  - Consumers and producers are price takers
  - There is a costless court system for enforcing agreements
  - Profits and utility maximized
  - No income or wealth effects
  - No transactions costs
- Then:
  - If there are property rights, the efficient allocation will obtain
  - The initial assignment of rights does not matter for efficiency

Cap-and-Trade

- A “cap-and-trade” program implements the Coase Theorem at large scale.
  - Allocate a number of “rights to pollute,” i.e. “permits” or “allowances.”
  - The total number of permits is the “cap.”

- Coase Theorem: (Under the stated conditions), the initial allocation of rights does not matter.
- The lowest-cost allocation of emission abatement will be achieved.

Example: U.S. Acid Rain Program

- Concern during 1980s about acid rain
- Clean Air Act Amendments of 1990: reduce annual sulfur dioxide emissions from 20 to 10 million tons.
  - Covered facilities: large power plants, refineries, and steel mills.
- Allocate nearly 10 million rights to existing polluters
  - Auction some others

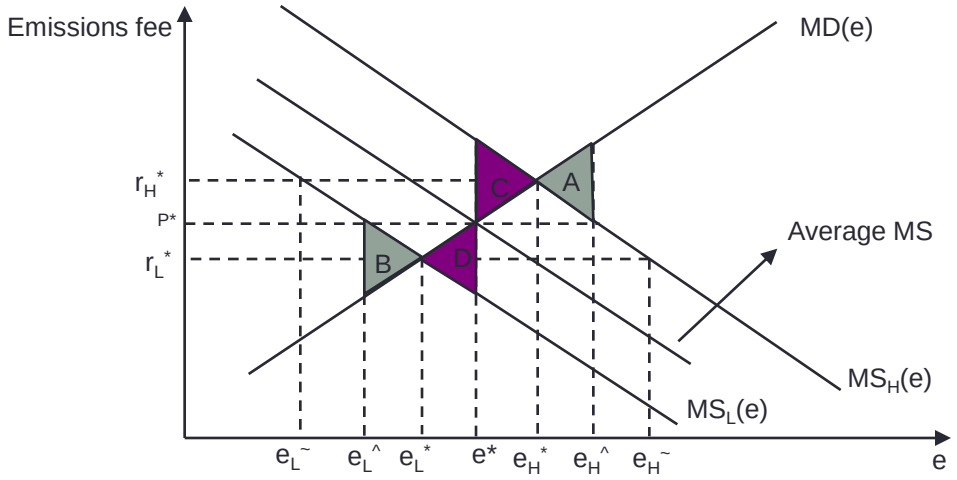
- Responses:
  - Larger plants put on Flue Gas Desulfurization (FGD, or “scrubbers”)
  - Smaller plants switched to low-sulfur coal.
  - Some plants did neither.

Theoretical Equivalence of Prices and Quantities

- Do policymakers use quantities or prices more? Why?

Prices vs. Quantities (Weitzman 1974)

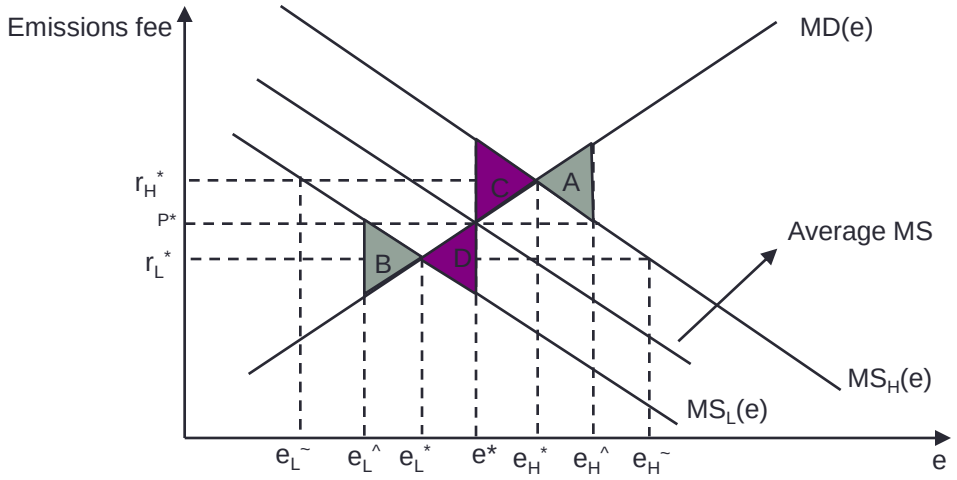
Regulation with Unknown Control Costs



Consider a regulator who can use permits or fees and knows the MD function but not the firm's cost structure. There is one firm and it knows its own MS function.

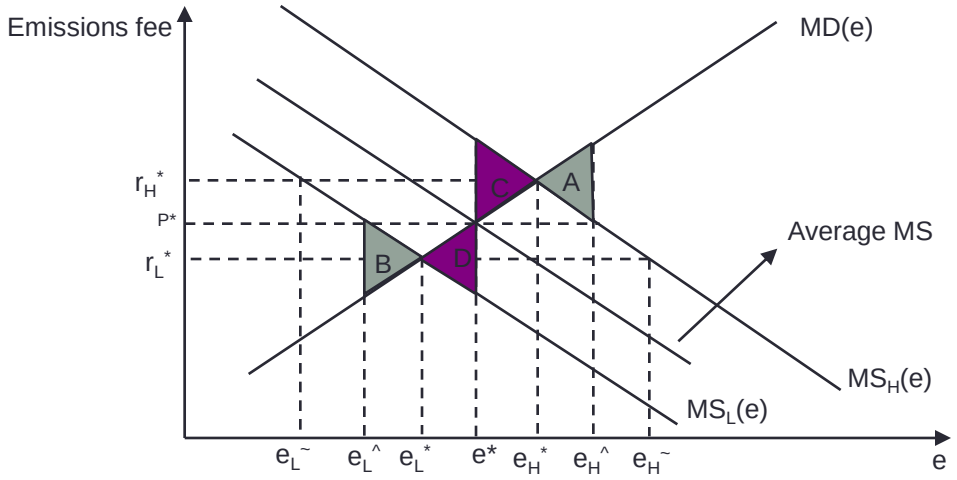
- The grey triangles represent deadweight loss from price regulation
- The purple triangles represent deadweight loss from quantity regulation.
- In the absence of uncertainty, we would have efficiency regardless of fees or permits.
- If the regulator chooses e*, then e* is emitted regardless of the cost curves;
- If the regulator chooses p*, then $e_l^{\wedge}$ or $e_H^{\wedge}$ will be emitted.

Regulation with Unknown Control Costs



- Consider the high cost world:
  - Now e_H^* is optimal.
  - Imposing e* gives a deadweight loss (triangle C) because not enough pollution is produced—MS_H > MD at e*.
  - Imposing p* gives a deadweight loss (triangle A) because too much pollution is produced—MS_H < MD.
- A similar analysis holds for the L firm.

Regulation with Unknown Control Costs



Depending on the slope of the MS and MD functions, we can obtain cases where quantity regulation is relatively better or worse—Mentally rotate the MD function clockwise around (e*,p*) and notice that the loss from a fee is reduced and the loss from a quantity regulation is increased; as the MD curve approaches horizontal, the optimal choice changes.

→ A similar result can be obtained by rotating MS curves clockwise.

Prices vs. Quantities with Uncertainty

- **Proposition** (Weitzman 1974):
- With uncertainty over MCs of emissions, quantity regulations are preferred if MD are more steeply sloped than MS from emissions.
- Emission fees are preferred if MS are more steeply sloped than MD.

Market Power in Emissions Markets

- One of the assumptions of the Coase Theorem was that "producers and consumers are price takers."
- What if one firm is a large share of the emissions market?

- How does the story depend on initial allocations?

- Last class, we decided that we didn't want to grandfather permits to entrants, because this would be a subsidy that induces supra-optimal entry. How does this affect that story?

Takeaways

- Today we covered perhaps the two most fundamental papers in environmental economics: Weitzman (1974) and Coase (1960).

- Coase Theorem:
  - Nice theoretical result about how property rights give the efficient outcome
  - Transactions costs keep it from being applicable
  - Policy implication: assign property rights and keep transactions costs low!

- Cap-and-Trade
  - Theoretically equivalent to taxes
  - Different expected welfare gains under uncertainty
  - (In practice) different distributional consequences

- Next class: Policy Application: U.S. Acid Rain Program
- Read:
  - Schmalensee et al 1998
  - Stavins 1998
  - http://online.wsj.com/article/SB10001424052748704258604575360821005676554.html#articleTabs%3Darticle
  - http://www.epa.gov/airmarkets/progress/ARP09_2.html
  - http://www.epa.gov/airmarkets/progress/NBP_2.html

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