

AAE 343 Discussion Section 4

February 15, 2019

I. Big-picture: environmental policy

- Environmental policy can take different approaches. A useful heuristic is thinking about policy as falling somewhere on the decentralized/centralized scale.
 - *Decentralized approaches*: generally avoids gov't involvement; individuals/private entities work out environmental disputes independently
 - Assignment of property rights (and Coasean bargaining)
 - Liability laws: rooted in Common Law
 - *Polluter pays principle*: the party who produces environmental pollution is responsible for paying for damages. Generally holds in OECD countries
 - Education/"Moral suasion": information provision when environmental issues aren't salient (i.e. Toxic Release Inventory, Superfund lists); actions like eco-certification and -labelling used to influence (intrinsic) attitudes towards the environment.
 - *Centralized approaches*: some kind of central authority exists to mediate, create and enforce policy that addresses environmental problems
 - Command and control
 - Green (i.e. Pigouvian) taxes
 - Tradable pollution permits (Cap & Trade)
 - Tax-permit hybrids
 - Implicit in centralized approaches is need for *costly monitoring* by regulator
 - When are decentralized approaches unlikely to work?:
 - High transaction costs; many polluters/many victims; difficult to measure damages; unclear scientific link between environment and damages; free-riding on others' volunteered contributions to public goods
- Can also be useful to think of policy falling on a spectrum between *liability-based* and *regulation-based*.
 - Regulation is *ex-ante*: policy to mitigate environmental harm before it occurs.
 - Liability is *ex-post*: aims to correct an externality/damage after it has occurred.
 - Key trade-off: regulation sets a single rigid standard, and cannot accommodate individual scenarios where the standard is too strict. Liability allows for flexibility in firms' operation, but provides insufficient incentives for caution because parties may be unable to pay fully for harm done or may not be sued (Shavell (1984), RAND; Kolstad et al, 1990, AER)
- The takeaway: many different ways to skin the cat when it comes to environmental policy. Thinking through incentives of all parties at the table in order to select the right tool for a given scenario is key challenge.

Top Hat Question 1: Agricultural runoff from regional farms works through the Yahara watershed and pollutes Madison's lakes every summer. In its worst form, this pollution results in blue-green algae, a toxic byproduct of phosphorus. Does a decentralized or centralized approach to environmental policy seem more likely to work in this context? Why? (participation graded only)

II. More centralized approaches

- **Command and Control (CAC)**
 - Command and control (CAC) policies require all polluting firms to implement prescribed pollution-reducing action or face a civil penalty.
 - *Technology standard*: must use a technology or process
 - *Emission standard*: never exceed quantity **X** of pollution emissions
 - *Ambient standard*: never exceed level **X** of pollution in ambient environment
 - Gov't likely doesn't know MACs of firms, so...
 - This approach is rarely economically efficient b/c of heterogeneous firm MACs
 - “Uniform burden”: all firms abate the same level or % of their output
 - “Regulatory capture”: firms lobby the gov't and influence the regulation they face. CAC requires public officials to always pursue public interest
- **Green Taxes: a price regulation**
 - Taxes (or subsidies in the case of *positive externalities*) are a direct way to make firms internalize the external costs(/benefits) of their actions
 - Green taxes induce polluters to reduce emissions until their marginal abatement cost equals the tax. Thus, **green taxes offer the least cost solution.**
 - If the tax is set equal to the true marginal external damage of emissions, then the regulation will also be economically efficient.
 - Government doesn't know firm-level MAC curves; their estimate of aggregate MAC used to forecast the level of emissions obtained under the tax.
 - From firm's perspective, cost is tax + TAC; from social perspective, cost is TAC.
- **Tradable Pollution Permits (TPP): a quantity regulation**
 - Since property rights don't necessarily exist for environmental goods/bads, TPP aims to create them through an emissions permit market
 - Permit gives firms the right to emit some level **X** of a pollutant
 - Firms trade pollution permits with each other and the market clears when MAC for all firms equals the price of a permit. Thus, **TPPs offer the least cost solution.**
 - If a regulator knows the optimal amount of pollution, the equilibrium permit price would be the same as the optimal tax set by the regulator.
 - How to allocate permits?: grandfathering, auctioning...
 - Allow banking/borrowing of permits for use in future years?
- What do we do with tax/permit revenues?
 - *Revenue neutral*: lessons from public economics suggest best use is lump-sum return to citizens (e.g. marijuana tax revenues in CO), or use revenues to offset other distortionary taxes (income tax, sales tax, etc.)

Problem *Different pollution control approaches* - The production processes of firms A and B generate nasty emissions. The firms' marginal abatement cost curves are $MAC_A = 200 - E_A$ and $MAC_B = 200 - (1/2)E_B$. Suppose the pollution from these firms is uniformly mixed, so there is only one marginal damages curve, given by $MPD = (2/9)E_{Total}$.

1. What is the socially optimal amount of pollution?
2. Under command-and-control, the regulator assigns a uniform burden policy, allowing each firm to emit a maximum of 180 units. What are the total costs of this policy to each firm and what is the total social cost?
3. Suppose now that the regulator wants to use a Pigouvian tax to enforce pollution reduction. How much should per-unit tax be in order to achieve the economic efficiency? What are the total costs of compliance for each firm? The total social cost of compliance?
4. Finally, if the regulator decides to use cap-and-trade, how many permits should be allocated to obtain this level of pollution? Suppose the regulator splits the number of permits evenly between the two firms and gives them out for free. When the firms are allowed to trade, who will buy permits and who will sell? How much pollution will each firm emit? What is the equilibrium permit price? What are the total costs of compliance for each firm and the total social costs?
5. Which policy would the firms prefer? Which would the social planner prefer?

Top Hat Question 2: Suppose a regulator determines that the economically efficient pollution level is 10 and at that point the firm's MAC curve is at \$20. At what price should the regulator set the per-unit green tax to achieve the optimal level of pollution? (answer graded)