LECTURE 5: REGULATION AND PIGOUVIAN TAXES

Lecture 5

14.42/14.420

Hunt Allcott

MIT Department of Economics

Plan for Today

- We have covered the basics of producer and consumer theory and welfare analysis.
- The next step is to continue applying these to situations where externalities cause the First Welfare Theorem to be inapplicable.
- How to design policy to correct for these externalities?

Today
1. Public Goods and Externalities
2. Pigouvian Taxes

Then:
1. Coase Theorem
2. Cap-and-trade and related issues
3. Application: Sulfur and NOx cap-and-trade programs in the U.S.
4. Pollution trading simulation
5. Visit to MIT power plant
6. Midterm

Theories of Regulation

- Public Interest Theory of Regulation:
  - Government should regulate to promote the public interest.
  - Scope for government intervention to "make the First Welfare Theorem apply"
    - Imperfect information
    - Imperfect competition
    - Externalities
  - Normative
- Interest Group Theory of Regulation
  - Rent seeking is the primary driver of regulation
  - Firms and individuals lobby for regulations that will help their group
  - Positive

Taxonomy of Environmental Regulation

- Prescriptive Regulation
  - "Command-and-Control"
  - Technology standards
    - BACT/MACT
  - Performance standards
    - NSPS
  - Combinations, e.g. with cars
- Economic incentives
  - Pigouvian taxes
  - Marketable permits (cap-and-trade)
  - Liability

Prescriptive vs. Incentive Based Policies

- Benefits of Prescriptive Regulation
  - More flexible if damages vary across time and space
  - Pollution is "immoral," and it shouldn't be "marketized" (Sandel)
  - Administratively easier?
  - Monitoring easier?
  - More certain outcomes
  - Reduces incentives for innovation?

- Benefits of Economic Incentives
  - Equimarginal Principle holds
  - Less information required?
    - (on the production process of the industry)
  - Polluter pays only for emissions control, not for remaining damages (distorts product market)

14.42 Class Notes: 2-17-2011

- Problem Set 1 due Friday
- Then:
  - No class Tuesday (MIT has a Monday Schedule)
  - Next Thursday: Coase and Cap-and-Trade
  - March 1: Topics in Cap-and-Trade
  - March 3: Visit to MIT Cogen
  - March 8: CAAA SO2 and NOx Case Study
  - March 10: Emissions trading simulation
- Change: Midterm is March 17th
  - There will be one more problem set before then
  - These next few classes are bread and butter undergrad environmental economics.
    - Midterm will look like this.
    - And some of the math is not really in the book.

Pigouvian Taxes

- Pigou (1920, 1932, 1962):
  - Externalities => private costs differ from social costs.
  - Correcting this is easy: change prices by the "wedge" between private and social costs
  - Then the First Welfare Theorem applies again!

- In the environmental context:
  - "A Pigouvian tax is an emission fee exactly equal to the aggregate marginal damage caused by the emissions at the efficient level of pollution."

Examples of Pigouvian Taxes

- Gas taxes
- Garbage disposal fees
- Water pollution taxes (some European countries)
- Oil Spill Liability Trust Fund (US)
- CFC Taxes (US, 1989)
- Hazardous chemicals
  - Established in 1980 to fund Superfund

- More info in Barthold (1994) JEP article
- Not all were originally intended as incentive taxes
  - Some designed around "user pays" principle.

Issues with Pigouvian Taxes

1. Setting the optimal Pigouvian tax
2. Entry and Exit
3. Market Power
4. Double Dividend

Entry and Exit

- Let's also expand the game such that firms decide whether to exit or not
  - Fixed cost = 1/10

- Let's say we want to be "fair," and recycle half of tax revenues to each of the two firms
- Should the revenue recycling be available only to firms that don't exit?

Entry and Exit: Takeaways

- Efficient outcome: Old firm exits.
- The revenue recycling is fully separable from the efficient outcome.
- "Recycling only to remaining firms" is like a subsidy to not exit. We don't want that distortion.
  - In this example, the old inefficient firm is creating negative value. It only stays in business to claim the recycled tax revenue.
- Much of improving energy efficiency and pollution reductions is old plants exiting and new firms entering.
- Want to design environmental policy so as to not distort the entry/exit choice.

- Recycling is purely an equity issue
- Want to design any transfers for equity such that they do not generate additional inefficiencies.

- Can you tell a similar story with entry?

Market Power and Pigouvian Taxes

- Let's say there's no Pigouvian emissions tax. The intuition is that adding a tax at the level of marginal damages increases welfare.

- Question: What happens if the polluter has market power in the output market?

Market Power: Takeaways

- Market power is a pre-existing distortion.
- When the polluter has market power in the output market, production is less than the efficient level.
  - Thus pollution may already be less than the efficient level.
- Thus Pigouvian taxes may actually worsen welfare!
- Crucial to understand pre-existing distortions

- Another example: Regulated natural gas prices (Davis and Muehlegger 2010).

- Labor taxes are an additional pre-existing distortion.

The Double Dividend

- Most of government revenue is raised through taxes on labor and capital.
- These taxes distort the economy: we work less than we would in the optimum
  - A lump sum tax would be non-distortionary.
- Revenue Recycling Effect: Revenues raised through environmental taxes can be used to reduce labor taxes
- Tax Interaction Effect: Many goods are substitutes for leisure. Increasing their prices increases leisure demand further.
  - Since leisure demand was already too high, this introduces an additional distortion.
- Net effect = Pigouvian + Revenue Recycling – Interaction
- Ian Parry (1995): Optimal pollution tax=0.63*Marginal Damage

Takeaways from Today's Class

1. Externalities cause market outcomes to be inefficient (1st Welfare Theorem)
2. Pigouvian taxes are a natural solution
3. This works nicely in many cases
4. But interactions with other distortions must be considered

- My attitude: Policymakers haven't even gotten to (2). It is important for us as economists to understand (4), but this is the 20 in the 80/20 rule.

For Next Class

- This class was chapters 11 and 12
  - Interesting reading: Sandel (2000)
  - Double dividend material: Goulder (1998)
- Next class: Kolstad Chapter 13

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