Economics 4315/7315: Public Economics

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Externalities:

An effect of an agent’s action to another agent’s outcome

- agent = \{firm, consumer\}
- outcome = \{profit, utility\}
Pecuniary vs non pecuniary

Two types:

1. Pecuniary externality
   - Externality through market mechanism

2. Non-Pecuniary
   - Externality outside market mechanism
Pecuniary vs non pecuniary example:

**Pecuniary externality:**
Town A suddenly becomes a popular place to live. Real estate prices go up because the new residents bid up prices. Current property owners benefit while current renters suffer.

**Non-pecuniary externality:**
Town A suddenly becomes a popular place to live. Suddenly the roads, libraries, public schools and parks are too crowded for old (and new) resident to enjoy their benefits fully.
Non-pecuniary externalities

- Pecuniary externality is not a market failure $\rightarrow$ first welfare theorem holds
- Non-pecuniary externality leads to a market failure $\rightarrow$ first welfare theorem fails

**From now on:**

Externality = non-pecuniary externality
Examples of negative externalities

- Environmental externalities:
  - Noise
  - Chemical pollution (local, global)
- Congestion
- Antibiotic Use
Examples of positive externalities

- Research and Development
- Basic Research (externality vs public good)
- Vaccinations
- Antibiotic use
Running example (adapted from Rosen’s textbook):

- Lisa: Commercial Fisher
- Bart: Factory owner
- Common Resource
  - River: negative externality from the factory
Lack of property rights

1. If Lisa owned the river $\rightarrow$ She could charge Bart for pollution
2. If Bart owned the river $\rightarrow$ Lisa could pay Bart not to pollute

Both cases would be efficient (Coase theorem)
Free market outcome

\[ Q_{MC} = \text{Marginal Bene} \]

\[ Q_{MB} = \text{Marginal Benefits} \]

\[ Q_{MD} = \text{Marginal damages} \]

Bart's surplus

Environmental damage

\[ Q* \]

\[ Q \]

\[ $ \]
Optimal allocation

Efficient level of Pollution

SMC = Social Marginal Cost

MC

Positive Social Surplus

Negative Social Surplus

Efficient level of Pollution

Qeff. Q*

Q

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Analytics of the optimal allocation

- Social Marginal Cost = Private Marginal Benefits
- Equivalently: Social Marginal Benefits = Private Marginal Cost

Example

- Marginal Cost=4
- Marginal Benefit=10 − Q
- Negative Externality=1 → Social Marginal Cost=5
- Free market outcome: Q = 6
- Optimal: Q = 5
Practical issues with environmental externalities

1. Objective Uncertainty over Externalities (physical effects)
   - Example Global Warming and CO2

2. Economic Effects of the Physical Effects:
   - Contingent Valuation
   - Hedonic Pricing

3. "Fine tuning" policy to complex externalities
   - Driving example
Contingent valuation

- Consumer valuations in a survey of (say) hypothetical environmental quality improvements
- Problems:
  - Hypothetical questions $\rightarrow$ hypothetical answers
  - framing matters
  - 'Elephants in Africa' problem
Hedonic pricing

Air Quality example:

- House A & B equal in every aspect, except A is in a "clean air" neighborhood while B is in a "dirty air" neighborhood
- Neighborhoods should be otherwise similar

Market price (rental price or sales price) gives the market valuation of clean air

- In practice: Hard regression analysis problem (no two neighborhoods are otherwise similar)
"Fine tuning" policy: externalities from driving

Some externalities from driving:

1. Congestion
2. Air pollution (local)
3. CO2 and other global pollutants

A single instrument (e.g. gas tax) does not address all of these correctly
Coase theorem

Two assumptions

1. Cost of bargaining low (number of parties involved small)
2. Property rights are well defined

Result: Efficiency should prevail and it is independent of the ownership of the assets and "environmental rights"

One practical application of the Coase theorem

- R&D, "Synergies" and mergers
Pigouvian taxes:

- Taxes correcting for market failures
- Tax revenue is a secondary consideration
- Theory of the Pigouvian subsidies (paying polluters not to pollute) similar
Pigouvian tax: optimal tax

Efficient level of Pollution

$Q_e$

$MC + \text{tax}$

Unit tax $= MD$ at the optimum
Pigouvian tax: social surplus and revenue

Efficient level of Pollution

$\text{Qeff.}$

MC + tax

MD

MB

SMC

MC + tax

Social Surplus

Tax Revenue

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Pigouvian tax: example

**Assumptions**
- Marginal Cost = 20Q
- Negative externality = 5Q
- Marginal Private benefit = 100

**Results**
- Free market: $Q = 5$, $P = 100$
- Optimal allocation: $Q = 4$
- Externality at the optimum = 20
- Corrective tax = 20
- Price of the good $80 + 20 = 100$
Efficiency Rule: Equal marginal cost of reduction across sources

- MC = Marginal Cost of pollution reduction
- SMB = MD = Marginal Damage
Uncertainty

- Very simple presentation of the marginal cost of reduction uncertainty
  - Note this gives the market response to (say) a tax
- Working assumption is that the marginal cost $= MC(1)$
- Analyze the consequence of the true marginal cost of $MC(2)$
Inelastic marginal damage

Taxes relatively efficient

- $\text{MC}(1)$
- $\text{MC}(2)$
- $Q_{\text{eff}}$
- $\text{MD}$
- Deadweight loss of a tax
- Deadweight loss of regulation
- $t=\text{tax}$

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Elastic marginal damage

Regulation more efficient

$\text{Deadweight loss of a tax}$

$\text{Deadweight loss of regulation}$

$\text{Deadweight loss}$

$\text{MC(1)}$

$\text{MC(2)}$

$\text{Qeff}$

$\text{Pollution Reduction}$

$\text{t=tax}$
Uncertainty: conclusions

- Inelastic marginal damage (horizontal) $\rightarrow$ environmental consequences of missing the target low $\rightarrow$ non-environmental cost of setting the quantity wrong high $\rightarrow$ taxes good

- Elastic marginal damage (vertical) $\rightarrow$ environmental consequences of missing the target high $\rightarrow$ regulation good
Permission markets

- Government sponsored trading scheme to regulate pollution
- Government either sells or issues permits to pollute that are also traded → market price for pollution
- Used in the US for $SO_2$ (acid rain) control successfully
- EU has a carbon trading scheme (global warming)
## Comparison of policy tools

<table>
<thead>
<tr>
<th>Policy Tool</th>
<th>Efficient allocation across multiple sources</th>
<th>Certain amount of pollution</th>
<th>Tax Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Regulation</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Taxes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Permit Markets</td>
<td>Yes</td>
<td>Yes</td>
<td>Depends on the politics</td>
</tr>
</tbody>
</table>
Fiscal externalities

- A fiscal externality is an externality from market behavior to government’s budget → Not a proper externality
- Can be an added reason to intervene in the markets

Subsidies to college education

- Incentives to get a degree are diminished by (progressive) income taxation: government is a silent partner in education
- Subsidizing education (partially?) pays itself back with future tax revenue
Self control and "internalities"

What about smoking, fatty foods, alcohol, drugs and soda?

- Smoking, alcohol and drugs cause regular externalities
- All of them cause fiscal externalities (e.g. smoking: fires, healthcare cost vs. pension savings)
- All of them involve self-control issues
"Internality and hyperbolic discounting"

- Hyperbolic discounting: overvaluing the immediate present too much
- Involves inconsistency: tomorrow I will overvalue tomorrow too much, the optimal trade off between tomorrow and two days from now changes when we reach tomorrow
- Causes "present bias" in behavior
- Supported by strong empirical evidence
- Market responses: Christmas Clubs, Gym memberships
Internality

- Addictive goods an additional problem with internalities
- Two competing theories of addiction: rational addiction theory and time-inconsistent preferences (hyperbolic discounting)
- If the former is the right theory, then strong public policy reasons for soda taxes, drug prohibition, alcohol taxes etc.
Double-dividend hypothesis

- Pigouvian taxes
  1. correct externalities
  2. raise revenue

Double-dividend hypothesis

Environmental taxes "doubly" good because the revenue can be used to reduce other distortive taxes
Double-dividend hypothesis

- Double-dividend hypothesis sounds like common sense
- In reality it is more often a fallacy
- Typically there is a trade off between environmental and non-environmental goals of (tax) policy
Why no double dividend: an example

Assume the government has a budget need: $1 billion/year

Assume this can be raised with labor income taxes and environmental taxes

Assume that the taxes have a non-environmental efficiency cost and potential environmental benefits

Difference from a simple Pigouvian case: the existence of other distortive taxes
Example continued

- Assume we start with just labor income taxes
- Double dividend: moving towards environmental taxes make both the environment better and the non-environmental efficiency cost lower
- Means that we would want to use environmental taxes for non-environmental reasons
- The case for this seems extremely weak
- The justification for an environmental intervention has to be better environmental quality