Tuesday, Oct 26, Lecture 14
Externalities, Social Surplus and Abating Pollution

Externalities

■ A rational self-interested agent undertaking an economic activity considers the effect of the activity on his own welfare,…

■ …and the rational agent’s reaction to the market price is intended to maximize his welfare.

○ You buy when your $WTP > P$, …

○ …but you don’t buy when $WTP < P$.

■ The direct effects of an agent’s activities on other people are called externalities,…

■ …and the rational agent does not consider externalities in making his decisions.

■ Because of externalities, an agent may act against the interests of society.
Examples: Externalities

- I plant a flower garden for myself, but people on my street enjoy looking at it.

- I rent my apartment to noisy students who annoy the neighbors.

- I drive my car and create more traffic.

- These effects are \textit{not} considered when the rational agent reacts to the market price.

External Costs and Benefits

Example: Student music

- Students arrange a concert for themselves on the BU beach.

- Bob, in a nearby office, is trying to work.

- Students do not think about the effect of their so-called music on others —this activity has an \textit{external cost}.

- To promote social welfare, students should have fewer concerts.
**Example: Covid-19 face mask**

- People enjoy the freedom of not wearing a face mask.
- But if those people are infected, they could transmit Covid-19 to people who might die.
- Some people decide that not wearing a face mask is worth the health risk *to themselves*,…
- But they do not consider the risk to others—an **external cost**.
- To promote social welfare, they ought to grow up and put on a mask.

**Example: Flu shot**

- Anil thinks he ought to protect himself from the flu by getting a flu shot,
- but doesn’t get it because he’s afraid of the needle.
- He doesn’t worry about infecting his classmates, who could die from the flu.
- Anil’s flu shot would help protect the students sitting near him in EC101—an **external benefit**.
- To increase social welfare, Anil ought to ???
Positive and Negative Externalities

- An activity with an external benefit is said to have a *positive externality*.

- An activity with an external cost is said to have a *negative externality*.

Externalities *reduce economic efficiency,*…

- because when deciding what activities to pursue,…

- most people consider an activity’s benefits to themselves, and compare those benefits with its market price,

- but they *lack the incentive* to consider the externalities those activities create.

How should externalities be controlled?

- Externalities are very common—most activities have them.

- They affect people not involved in decision making, so controlling them is important.

- Should the authorities *ban* activities with negative externalities (e.g. rock concerts, smoking)?

- Should the authorities *force* the performance of activities with positive externalities (e.g. flu shots)?

- In the opinion of most economists, such extreme solutions could make inefficiency even worse!

- Economists advocate using incentives (taxes and subsidies) to induce people to *do the right thing*. 
- **Example:** Educated citizens benefit all of society, so governments should pay students to study (or subsidize education).

- **Example:** To discourage students from putting on annoying rock concerts, universities could set fees of $5,000 per concert.

- **Example:** Taxes on cigarettes could be set to include the costs of illness created by second-hand smoke.

Such mechanisms increase social surplus by inducing people to *internalize* the externalities.

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### Social Surplus in Markets without Externalities

- **Social surplus** in a market is the difference between *social benefit* and *social cost*.

- For goods *without externalities*, only the buyers benefit from the goods, and only the producers have costs.
  - Private benefits and costs are the same as social benefits and costs.

- On a graph:
  - The demand curve shows private benefits.
  - The supply curve shows private costs.
  - The area between them measures social surplus.

- Social surplus = private surplus = $CS + PS$
Social Surplus with Externalities

- **When negative** externalities exist:
  The *private costs* of a product (paid by private producers) are less than the *social costs* to all of society.

- **When positive** externalities exist:
  The *private benefits* of a product (the WTP of buyers) are less than the *social benefits* to all of society.

- Social surplus is the difference between social benefits and social costs.

- But social benefits and social costs can no longer be measured with just demand and supply...

  ...because demand and supply reflect only private benefits and costs.

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Surplus in Markets with Negative Externalities

- When there are negative externalities,
  - The demand curve shows *private benefits = social benefits*.
  - But the supply curve shows only private costs.
  - Social costs include private costs,
  - but costs to the rest of society must be added,
  - so social costs are greater than private costs.
Social Surplus is less than the area between supply and demand.

Worse, the market equilibrium quantity $Q^*$, is larger than what is in the social interest,…

…and it creates negative social surplus.

And the negative surplus cancels some positive surplus.

Using a Tax to Internalize a Negative Externality

Suppose the government imposes a tax equal to the external social cost.

Then the quantity will be reduced to the efficient level.

The full positive social surplus will become available (no negative surplus).

Producers receive surplus, but that’s not part of social surplus, because producers are imposing costs on the rest of society.

By taxing goods with negative externalities,

- governments obtain tax revenues…
- …that they can use to reduce other taxes that lower surplus.

In markets with negative externalities, taxes can increase efficiency.
**Clicker Question**

In a market for a good with a large positive externality, a small tax…

a. would make the market more efficient.

b. would make the market less efficient.

c. would not change efficiency.

d. Impossible to know without more information

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**Pollution**

- Pollution is an undesirable byproduct of production (or consumption).

- Pollution represents a major class of negative externalities.

  - Acid rain
  - Global warming
  - Ozone depletion
  - Contaminated water
  - Environmental mercury, lead, other heavy metals
Pollution as a Negative Externality

- Pollution is created when certain products (e.g. electricity, transportation) are produced.

- People who produce and purchase products…
  
  - electric utilities and consumers
  - chemical producers and consumers
  - automobile drivers

- …do not pay for the damage their pollution causes,…

- so producers/buyers don’t have the incentive to prevent or clean up (“abate”) the pollution.

How clean is clean?

- **Example:** You mother is coming to your dorm room.

- You need to clean up.

- But how much should you clean?
  
  - Put away your bottles?
  - Throw out the trash?
  - Vacuum the floor?
  - Disinfect the bathroom?
  - Wash the walls?
  - Filter the air?
There is no such thing as completely clean.

Cleaning up a dorm room (or abating pollution) is not an all-or-nothing decision.

There is a *tradeoff*.

It normally would *not* make sense, say, to *sterilize* your room.

We must figure out where to stop cleaning (or stop abating pollution).

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**Abating Pollution**

Pollution caused by production activities can be controlled.

For example, electricity generating companies can install “scrubbers”…

Scrubbers prevent acid rain by removing some of the sulfur from exhaust gases.

But as they try to remove more and more sulfur, the process becomes more and more costly.

And electricity becomes increasingly expensive.
How much pollution should be abated?

- Every unit of pollution emitted tends to cause more and more environmental damage.

- Abating (preventing or cleaning) a small amount of the pollution is relatively easy and inexpensive.
  
  - We can do the easy things first, like washing the coal to remove some of the sulfur.
  
  - Economists call the easy, inexpensive things “low-hanging fruit.”

- However, abating pollution becomes increasingly costly as standards of cleanliness increase.

The Benefits and Costs of Abatement

- For a given unit of pollution, the marginal benefit of abatement \((MBA)\) is the value of the environmental damage avoided by abating an additional unit of pollution.

- The opportunity cost of abating an additional unit of pollution is the marginal cost of abatement \((MCA)\).

- Abatement creates social surplus as long as \(MCA < MBA\). Why?

- How much should pollution be abated?
Efficient Abatement

- Economic efficiency (maximizing social surplus) requires that abatement continues as long as \( MCA < MBA \) …

- and that abatement stops before \( MCA > MBA \).

  - This means that the dividing line between abatement and no abatement should be at

\[
MCA = MBA
\]

- Additional abatement would NOT be efficient! Why not?

  - There is such a thing as too clean 😞.

We graph pollution and abatement on the right.

With zero (0) abatement we have a lot of pollution.

We plot:

- the marginal cost of abatement \( (MCA) \),
- and the marginal benefit of abatement \( (MBA) \)

If we abate efficiently,

- pollution decreases,
- and social surplus increases.

What happens if the government taxes each unit of pollution?

- Abate when \( MCA < \text{Tax} \), pay tax when \( \text{Tax} < MCA \).

(For example, a carbon tax, now in the news)
The Coase Theorem

- Ronald Coase [rhymes with “nose”] was a law professor at the University of Chicago.

*Watch Coase video on Course Schedule*

- He suggested that externalities would often be internalized by negotiation between the private parties affected.

  - **Example:** Anil’s roommate offers to pay Anil if Anil gets the flu shot.

  - **Example (True):** An economist stepped into an elevator and noticed a young women smoking a cigarette.

    He offered her $1 to put it out.

- Such negotiations internalize the externalities by connecting the agents with a market.

The Coase Theorem *does not work very well* when the costs of reaching agreements are high; for example, when

- the externality is produced by many people (or firms),

- the externality affects many people, or

- legal costs are high.

- **Example:** Global warming.

- **Example:** [Barcelona] Noisy motorcycles (motos) passing your apartment.
Clicker Question

The Coase Theorem says that when the activity of one agent directly affects the welfare of others,

a. the matter should be settled by lawyers.

b. it is often police business.

c. the problem is best resolved by government intervention.

d. The problem may be resolved by private negotiation.

End of Lecture 14