

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 **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 **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**.

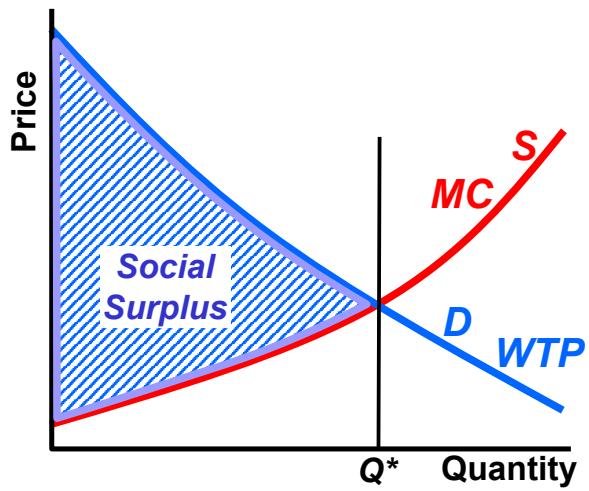
- **Example:** Educated citizens benefit all of society, so governments should pay students to study (or subsidize education).
- **Example:** To discourage students from putting on annoying rock concerts, universities could set fees of \$5,000 per concert.
- **Example:** Taxes on cigarettes could be set to include the costs of illness created by second-hand smoke.
- Such mechanisms increase social surplus by inducing people to **internalize** the externalities.



act as if they themselves suffer or benefit from the externalities that they create

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:

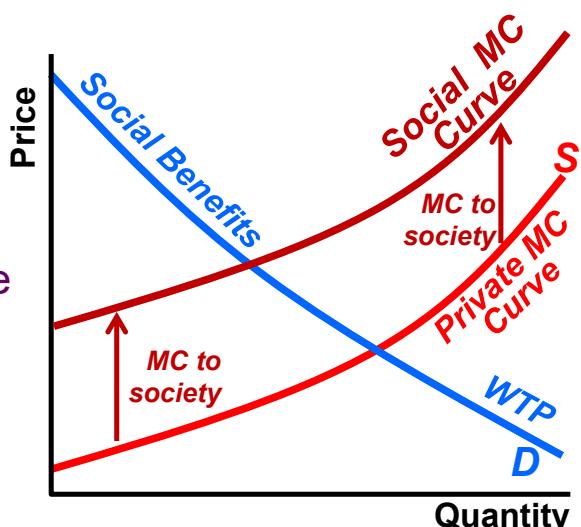
The **private benefits** of a product (the WTP of buyers) **are less than** the **social benefits** to all of society.

- 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.

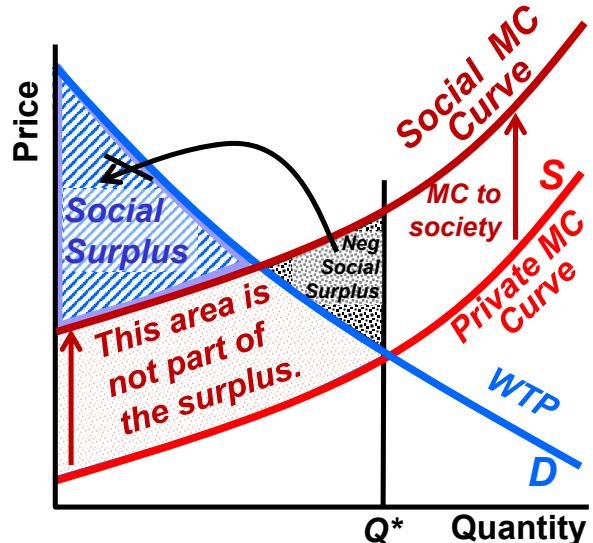
Surplus in Markets with Negative Externalities

■ 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.



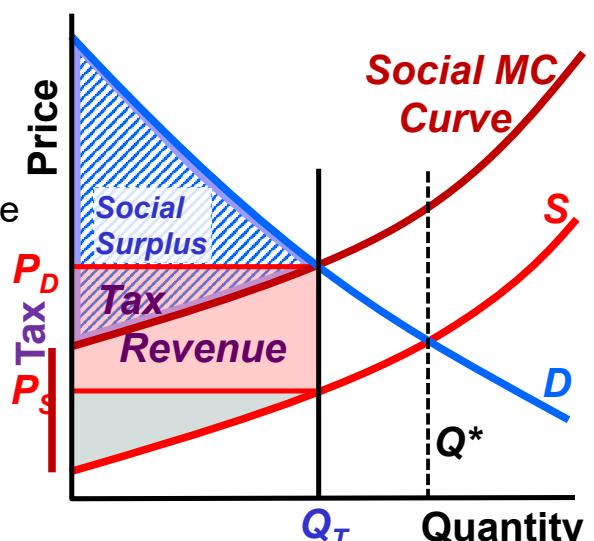
- Social Surplus is less than the area between supply and demand.
- Worse, the market equilibrium quantity Q^* , is larger than what is in the social interest,...
- ...and it creates negative social surplus.



- 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

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:** Your 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).

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?

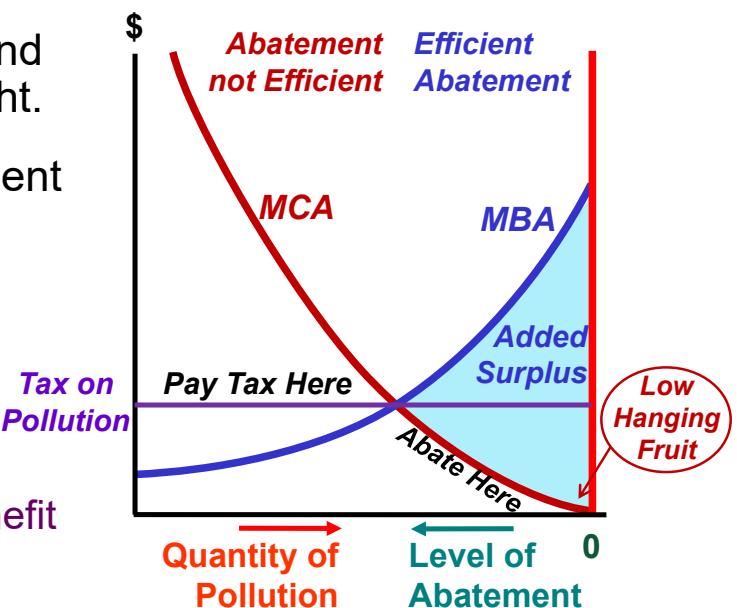
Efficient Abatement

- 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?
 - for example, a carbon tax, now in the news
 - Abate when $MCA < \text{Tax}$, pay tax when $\text{Tax} < MCA$.

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