

Externality

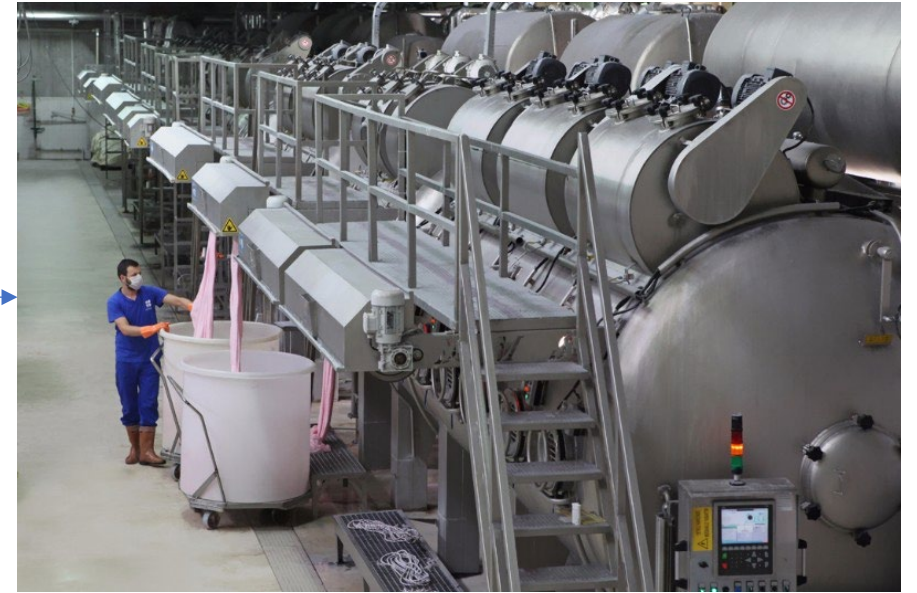
- 1. An example of externality**
- 2. What are externalities**
- 3. How externalities create inefficiency**
- 4. Regulating externalities**

A hypothetical example: Apple farm and dye house



river

Pesticide



Land + Apple tree + Water + Labor + Pesticide → Apple

Production cost of apple

producer theory

Price of apple

Water + Yarn + Water treatment → Textile

Production cost of textile

- Neither the producer nor the consumer of apples pays for the pollution!

Externality

- An externality occurs when a person's well-being or a firm's production capability is directly affected by the actions of other consumers or firms **rather than indirectly through changes in price.**
 - Can be both positive or negative.
 - Can originate from producers or consumers.
- Externalities occur when the costs (or benefits) to society do not equal private costs (or benefits).
 - In our apple farm case, producer and consumer of apples are not accounting for the additional water treatment cost.
- **Marginal Social Cost: Marginal private cost + the cost borne by others**
- unintended impact→external cost/benefit→take a **social** perspective

- Pollution
- noises
- sanitation
- research

How externalities create inefficiency

Go to the board.

Regulating externalities

- **Taxes**

- Goal: to set prices so that the actor includes social costs in their decisions.
- Often referred to as Pigouvian Tax for the economist who first expressed this idea.
 - A Pigouvian Tax is a tax equal to the marginal damage inflicted by an activity.
- Two types of taxes:
 - Tax on output: Levied on each unit of output.
 - Emission fees: Levied on each unit of pollutant emitted.
 - More direct, but might be difficult to measure.

Numerical example of Pigouvian tax

Go to the board.

Regulating externalities

- **Regulations**

- The government limits output to the optimal level, at which $MB = MSC$.
- Simple, but can be inefficient when there is more than one firm.

- **Tradable permits**

- Combines direct regulation with market forces.
- The government determines the desired level of pollution and gives firms permits to pollute equal to that amount.
- Then, firms can buy and sell the permits among one another.
- Leads to more efficient allocation of responsibility for reducing pollution.

Minimizing abatement costs

- Two firms with different marginal abatement cost.
- Suppose both firms are emitting 8 units of pollution.
- Suppose the socially optimal level of pollution from each firm is 5 units.

Firm A	
Abatement	Marginal Abatement Cost
1	2
2	4
3	6
4	8
5	10
6	12
7	14
8	16

Firm B	
Abatement	Marginal Abatement Cost
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Minimizing abatement costs

- Require each firm to reduce 3 units of pollution

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Minimizing abatement costs

- Require each firm to reduce 3 units of pollution
 - What is the total cost to firm A?

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Minimizing abatement costs

- Require each firm to reduce 3 units of pollution
 - What is the total cost to firm A?
 - $\$2 + \$4 + \$6 = \12

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Minimizing abatement costs

- Require each firm to reduce 3 units of pollution
 - What is the total cost to firm A?
 - $\$2 + \$4 + \$6 = \12
 - What is the total cost to firm B?

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Minimizing abatement costs

- Require each firm to reduce 3 units of pollution
 - What is the total cost to firm A?
 - $\$2 + \$4 + \$6 = \12
 - What is the total cost to firm B?
 - $\$1 + \$2 + \$3 = \6

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Minimizing abatement costs

- Require each firm to reduce 3 units of pollution
 - What is the total cost to firm A?
 - $\$2 + \$4 + \$6 = \12
 - What is the total cost to firm B?
 - $\$1 + \$2 + \$3 = \6
 - **Total costs = \$18**

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Minimizing abatement costs

- Consider instead allowing firm A to pollute 1 unit more, and firm B one unit less

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Minimizing abatement costs

- Consider instead allowing firm A to pollute 1 unit more, and firm B one unit less
 - Firm A saves \$6 by not cleaning up the third unit

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Minimizing abatement costs

- Consider instead allowing firm A to pollute 1 unit more, and firm B one unit less
 - Firm A saves \$6 by not cleaning up the third unit
 - Firm B spends \$4 more by cleaning up a fourth unit

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Minimizing abatement costs

- Consider instead allowing firm A to pollute 1 unit more, and firm B one unit less
 - Firm A saves \$6 by not cleaning up the third unit
 - Firm B spends \$4 more by cleaning up a fourth unit
 - Total costs fall by \$2
 - (= \$2 + \$4 = \$6 for A, and \$1 + \$2 + \$3 + \$4 = \$10 for B)

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Minimizing abatement costs

- Consider instead allowing firm A to pollute 1 unit more, and firm B one unit less
 - Firm A saves \$6 by not cleaning up the third unit
 - Firm B spends \$4 more by cleaning up a fourth unit
 - Total costs fall by \$2
 - (= \$2 + \$4 = \$6 for A, and \$1 + \$2 + \$3 + \$4 = \$10 for B)
 - At this point, MAC's are equal. No further cost savings possible.

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Minimizing abatement costs

- What policies will give us this efficient outcome?
 - Tradable permits
 - Start with 5 permits each (i.e., each firm needs to abate 3 units)
 - Firm A can buy a permit for B for a price between \$4 and \$6
 - Saves \$6 if reduces one less
 - Costs firm B \$4 to reduce one more

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Minimizing abatement costs

- What policies will give us this efficient outcome?
 - Emission fees
 - Each firm will compare its marginal abatement costs to the emissions fee
 - Consider a fee of \$4.01

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Minimizing abatement costs

- What policies will give us this efficient outcome?
 - Emission fees
 - Each firm will compare its marginal abatement costs to the emissions fee
 - Consider a fee of \$4.01
 - Firm A abates 2 units

Firm A	
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1	2
2	4
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Firm B	
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Minimizing abatement costs

- What policies will give us this efficient outcome?
 - Emission fees
 - Each firm will compare its marginal abatement costs to the emissions fee
 - Consider a fee of \$4.01
 - Firm A abates 2 units
 - Firm B abates 4 units

Firm A	
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1	2
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Efficient environmental policies

- **When marginal costs of abatement vary across firms:**
 - Regulation may be far from efficient, since it forces firms with higher marginal abatement costs to abate as much as firms with lower marginal abatement costs.
 - Unless the government knows the marginal abatement costs for each firm to determine efficient levels of abatement for each firm.
 - Market-based policies (taxes, emission fees, tradable permits) are more efficient because they encourage firms with lower abatement costs to reduce more pollution.
 - The end result: marginal abatement cost of the last unit of abatement would be equal across firms.
 - The tax or permit price equals the marginal abatement cost of the last unit of abatement.
 - Can reduce the same amount of pollution at the lowest possible cost.

Your feedback is highly appreciated!

