Microeconomics, 2nd Edition

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Chapter 17: Externalities and Public Goods

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Outline

1. Motivation
2. Inefficiency of Competition with Externalities
3. Allocating Property Rights to Restore Optimality: The Coase Theorem
   - Problems with the Coase Approach
   - Other methods to restore optimality: standards and fees
4. Public Goods
   - A Taxonomy
   - Demand for Public Goods
   - Free Riders and the Supply of Public Goods

Definition: If one agent's actions imposes costs on another party, the agent exerts a **negative externality**, while if the agent's actions have benefits for another party, the agent exerts a **positive externality**.

Network externalities, snob effects
Wind chimes

When externalities are present, the competitive market may not attain the Pareto Efficient outcome.

Let's see why…

The Inefficiency of Competition with Externalities

Competitive firms and consumers do not have to pay for the harms of their negative externalities, they produce too many…

Since they are not compensated for the benefits of their positive externalities, they create too little…

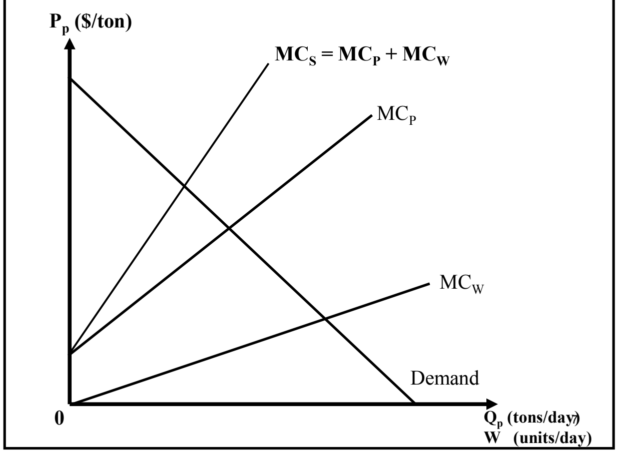
Example

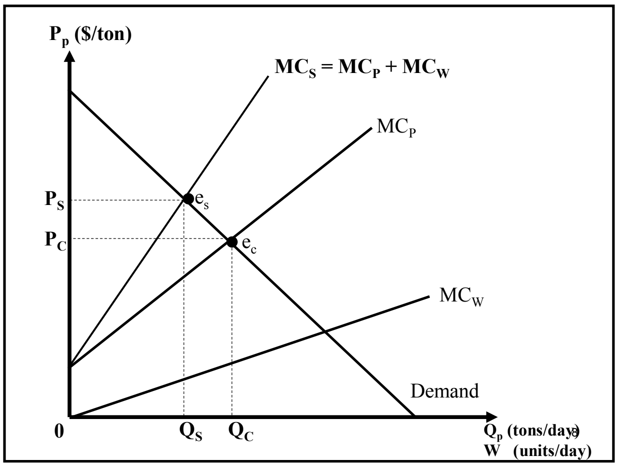
Firm produces paper and harmful by-products

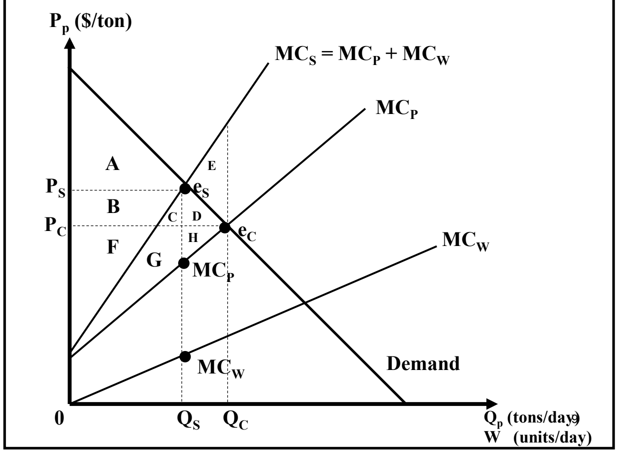
1 ton paper ➔ 1 unit waste

private cost of production does not include harm from waste.

Social cost of production includes the harm from the externality and is, then, greater than the private cost.







	Social Optimum	Private	Change
Consumers Surplus, CS	A	A+B+C+D	B+C+D
Private Producers Surplus, PS_P	B+C+F+G	F+G+H	H-B-C
Externality Cost, C_G	C+G	C+D+E+G+H	D+E+H
Social Producers Surplus $PS_S = PS_P - C_G$	B+F	F-C-D-E	-B-C-D-E
Welfare $W = CS + PS_S$	A+B+F	A+B+F-E	-E=DWL

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Competitive market: $p = MP^P$
Social optimum: $p = MC^S$

⇨Competitive market creates a dead-weight loss (socially *excessive* negative externalities)

⇨This is because the polluter does not have to pay for pollution

⇨Socially optimal amount of waste is non-zero.

How can we restore optimality?

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Allocating Property Rights to Restore Optimality

Definition: A **property right** is a legal rule that describes what economic agents can do with an object or idea.

Deed to parcel of land; patent on a method

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Example: Paper mill and fishermen

Suppose that paper mill may reduce its emissions of gunk by installing filters and fishermen can reduce emissions by installing a water treatment plant…

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Specifically, assume following payoffs…

Fishermen

Mill		No treatment	Treatment
	No filter	500,100	500,200
	filter	300,500	300,300

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Fishermen

Mill		No treatment	Treatment
	No filter	500,100	500,200
	filter	300,500	300,300

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Case 1: No explicit rights allocation

Nash outcome: no filter, treatment plant

Joint payoff = 700 (not Pareto efficient)

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Case 2: Fishermen have property right to no Pollution (and so, set a fee of, say, $500 for receiving pollution)

Fishermen

Mill		No treatment	Treatment
	No filter	0,600	0,700
	Filter	300,500	300,300

Nash Outcome: Filter, No treatment

Joint Payoff = 800 (Pareto Efficient)

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Case 3: Mill has right to pollute

Suppose the mill "sells" right to fresh water (i.e. obligation to install filter) for $250:

Fishermen

Mill		No treatment	Treatment
	No filter	500,100	500,200
	filter	550,250	550,50

Nash Outcome: Filter, No Treatment
Joint Payoff = 800 (Pareto Efficient)

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The Coase Theorem:

- *If there are no impediments to bargaining, assigning property rights results in the efficient outcome (at which joint profits are maximized).*
- *Efficiency is achieved regardless of who receives the property rights.*
- *Who gets the property rights affects the income distribution: the property rights are valuable. (The party with the property rights is compensated by the other party.)*

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Problems with the Coase approach:

-Transaction Costs may be high

-Large numbers of injured parties

-Incomplete/Asymmetric Information

e.g. What are the long run effects of genetic engineering?

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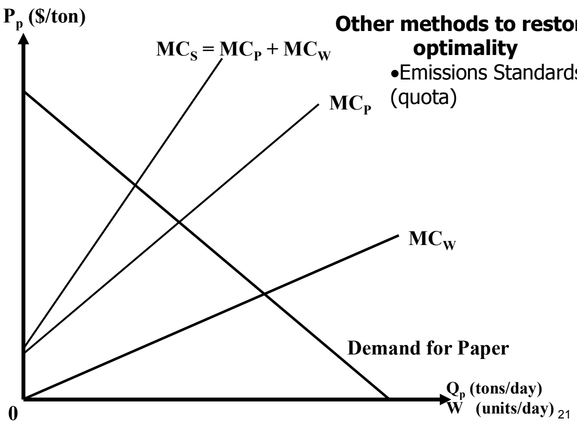
Other methods to restore optimality

- Emissions Standards (quota)



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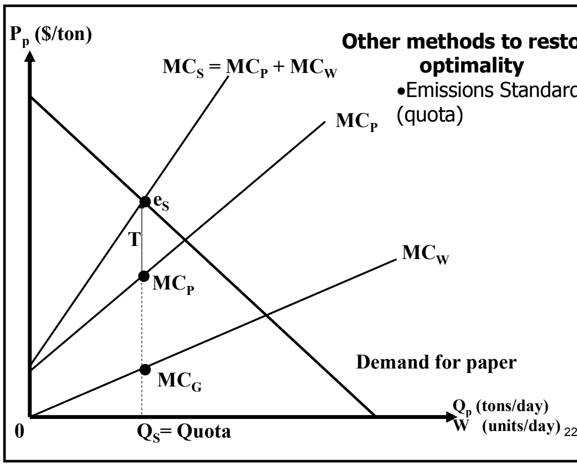
Other methods to restore optimality

- Emissions Standards (quota)



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but…information problems? Enforcement?

- Emissions Fee (tax)

Graphically…see above…

but…what is the marginal cost of pollution at the social optimum?

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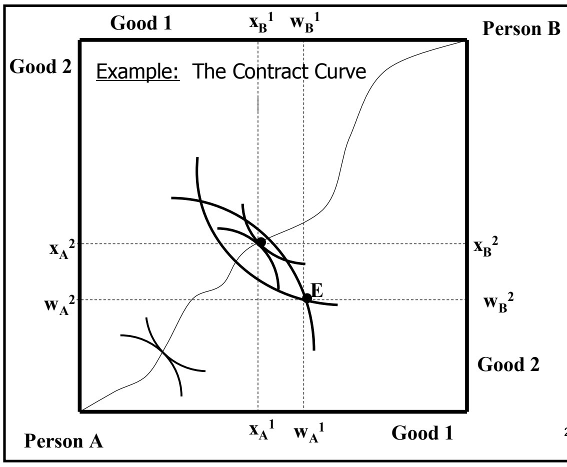

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Public Goods

Definition: **Rivalry** in consumption means that only one person can consume a good: the good is used up in consumption (it is depletable).

Definition: **Exclusion** in consumption means that others can be prevented from consuming a good.

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Definition: **Private goods** have properties of rivalry and exclusion. **Pure Public goods** lack both rivalry and exclusion. **Club goods** lack rivalry but have property of exclusion. **Common property** lacks exclusion but does have the property of rivalry.

Examples:

	Exclusion	No exclusion
Rivalry	Pure Private goods: *Apple*	Commons: *Fisheries*
No Rivalry	Club goods: *concert*	Pure public good: *clean air*

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Demand for Public Goods

Because public goods lack rivalry, the aggregate demand is the aggregate willingness to pay curve: the *vertical* sum of the individual demand curves.

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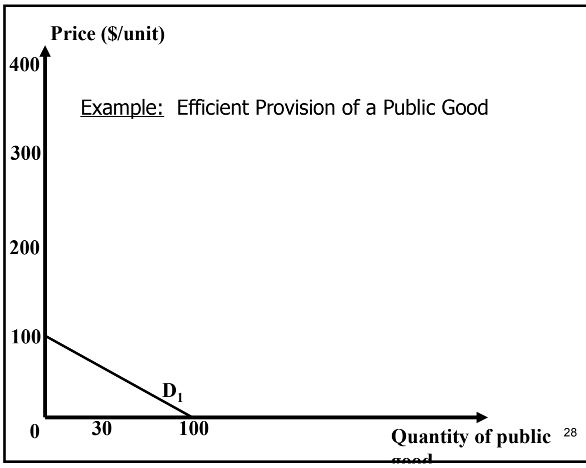
Example: Efficient Provision of a Public Good



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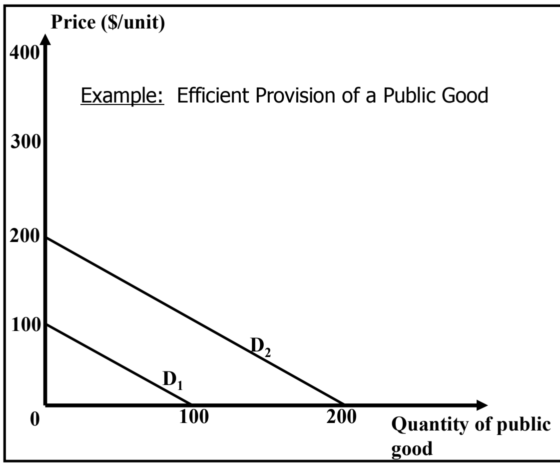
Example: Efficient Provision of a Public Good



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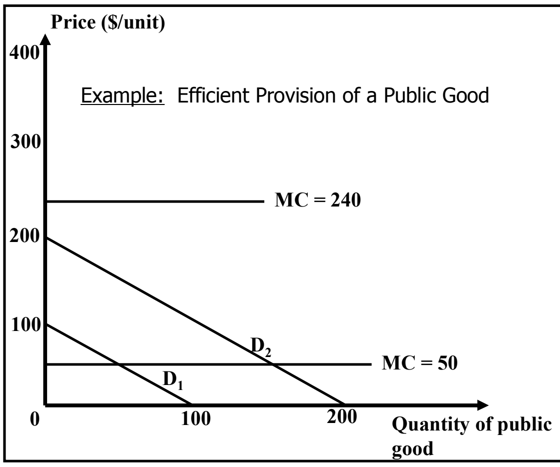
Example: Efficient Provision of a Public Good



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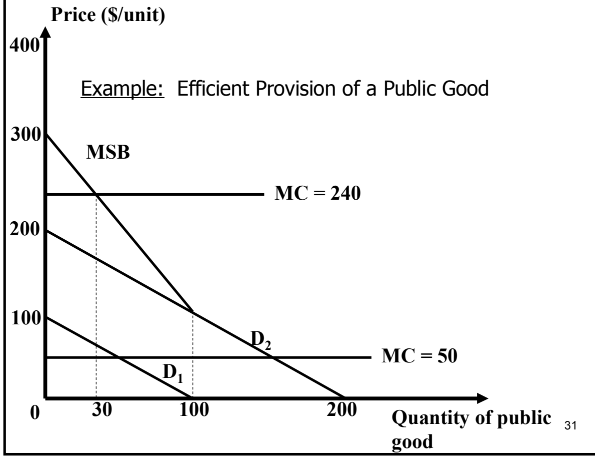

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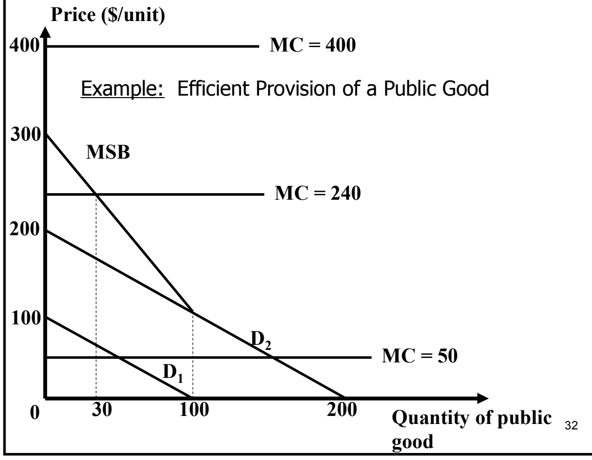

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Example

Consumer 1: $P_1 = 100 - Q$
Consumer 2: $P_2 = 200 - Q$

How would we determine the efficient level of the public god algebraically assuming the marginal cost of the public good is $240?

Summing P_1 and P_2, we obtain

$MSB = P_1 + P_2 = 100 - Q + 200 - Q =$

$300 - 2Q$

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Setting MSB = MC, we have:

$300 - 2Q = 240$ … or…

$Q^* = 30$

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Free Riders

Definition: a **free rider** benefits from an action of other(s) without paying for that action.

Solutions to the free rider problem

- social pressure (small numbers)
- government action (compulsion)
- transformation into private good (metering)

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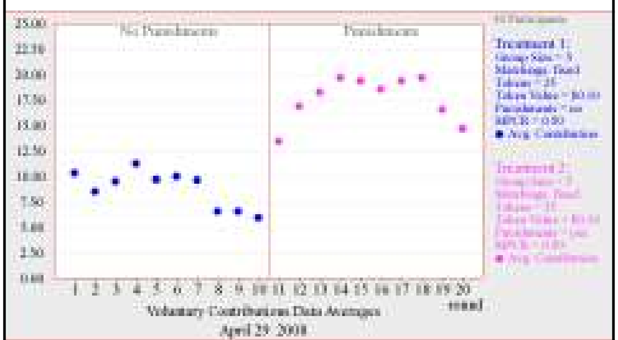

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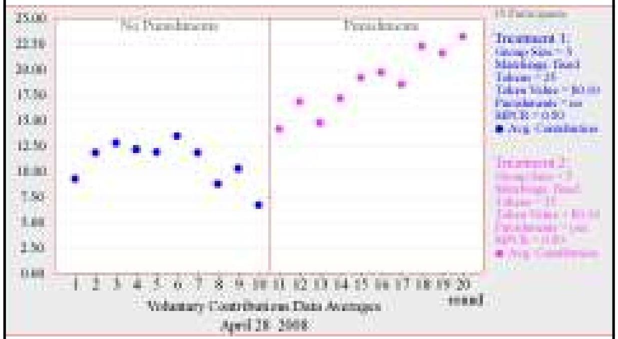

Summary

1. When one agent's actions affect another agent, the agent exerts an externality.

2. When externalities are present the competitive market may not attain the Pareto Efficient outcome.

3. We can restore optimality by assigning property rights to the cause of the externality (The Coase Theorem).

4. If we follow this approach, efficiency is achieved regardless of who receives the property rights; however, the property rights affect the income distribution.

5. When transaction costs are high or there is asymmetric or incomplete information, allocating property rights may not restore optimality.

6. Other methods of restoring optimality include standards and fees.

7. Private goods have the properties of rivalry and exclusion. Other types of goods exist that do not have these properties.

8. Goods that lack rivalry and exclusion are called pure public goods.

9. The demand for pure public goods is the vertical sum of the individual willingness to pay for the good.

10. Pure public goods tend to be undersupplied by the market.