Topic 14 Part 2

Externalities (Chapter 17)

LEARNING-BY-DOING EXERCISE 17.2

Emissions Fee

Consider a variation of the chemical manufacturing example. Suppose the inverse demand curve for the chemical (which is also the marginal benefit curve) is $P^d = 24 - Q$, where Q is the quantity consumed (in millions of tons per year) when the price consumers pay (in dollars per ton) is P^d.

The inverse supply curve (also the marginal private cost curve) is $MPC = 2 + Q$, where MPC is the marginal private cost when the industry produces Q.

The industry emits one unit of pollutant for each ton of chemical it produces. As long as there are fewer than 2 million units of pollutant emitted each year, the external cost is zero. But when the pollution exceeds 2 million units, the marginal external cost is positive. The marginal external cost curve is

$$MEC = \begin{cases} 0, & \text{when } Q \leq 2 \\ -2 + Q, & \text{when } Q > 2 \end{cases}$$

where MEC is marginal external cost in dollars per unit of pollutant when Q units of pollutant are released.

Also suppose the government wants to use an emissions fee of $\$T$ per unit of emissions to induce the market to produce the economically efficient amount of the chemical.

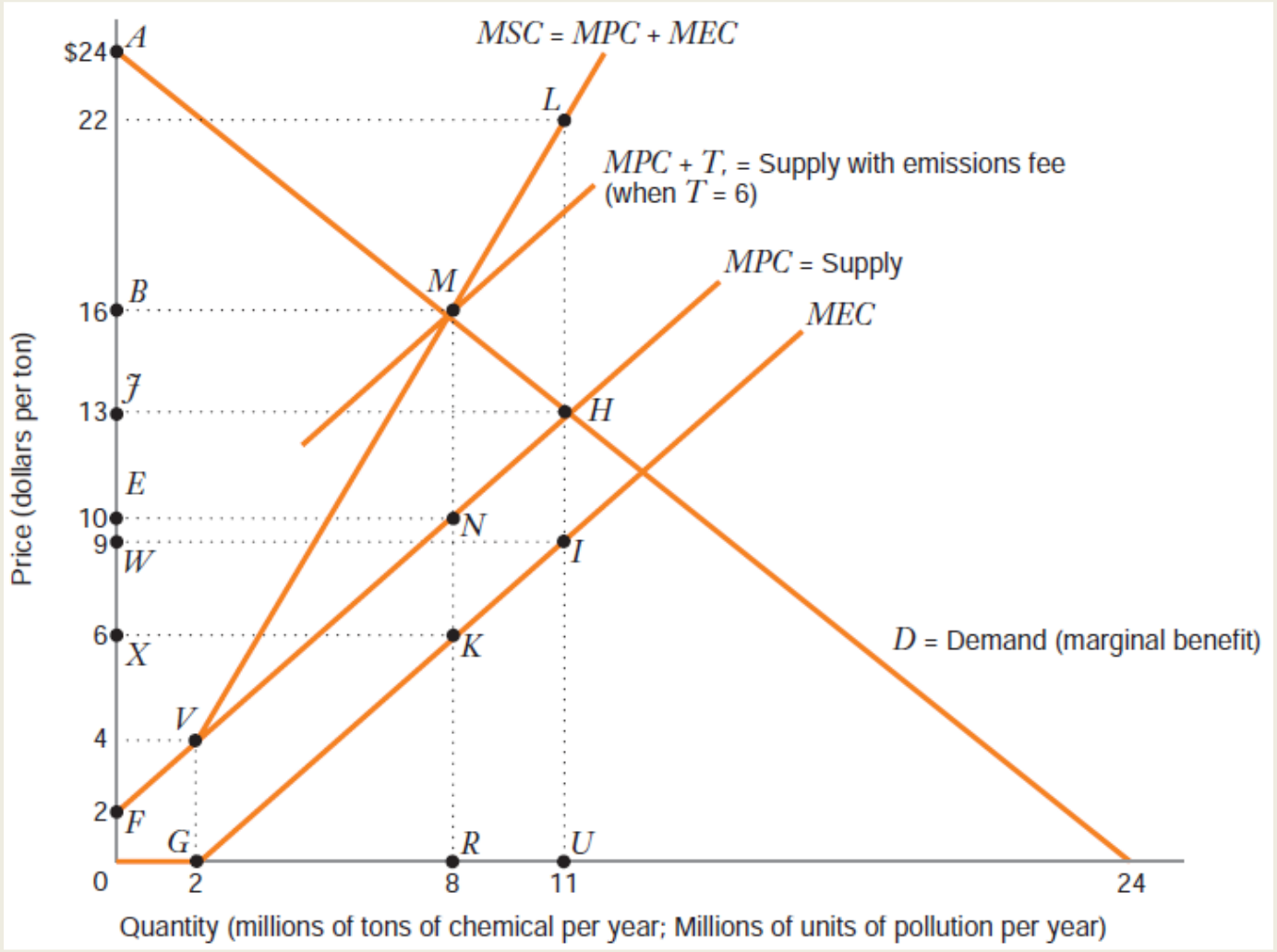
Problem

(a) Construct a graph and a table comparing the equilibria with and without the emissions fee:

- Graph the demand, supply (with no emissions fee), marginal external cost, and marginal social cost curves. Label two points on the graph: the point that represents the equilibrium price and quantity when there is no correction for the externality (i.e., no emissions fee) and the point that represents the amount of the chemical the market should supply at the social optimum. Indicate the actual price and quantity at each point.
- Graph the supply curve after the imposition of an emissions fee that induces the production of an economically efficient amount of the chemical. Indicate the price consumers will pay and the price producers will receive.
- In the table, indicate the amount of the emissions fee (dollars per unit) that will lead to the economically efficient production of the chemical. Fill in the table with the following information for the equilibria with and without the fee (indicate both the areas on the graph and the actual dollar amounts): consumer surplus, private producer receipts from the fee, net social benefits, and deadweight loss.

(b) Explain why the following sum is the same with and without the fee: consumer surplus + private producer surplus − external cost + government receipts from the fee + deadweight loss.

Graph for Exercise 17.2



More on Coase Theorem

Property Right is the exclusive control over the use of an asset or resource.

With property right over the area, firms cannot pollute or they must compensate for pollution. MEC is now internalized.

Thus, Coase Theorem believes that externalities arise due to property rights not being properly assigned.

Coase Theorem suggests that when bargaining is costless (zero transaction cost), assigning property rights for an externality leads to an efficient outcome.

More on Coase Theorem

Consider the following example

Farm A: raise cattles **Farm B**: raise crops

Cattles of Farm A damage Crops of Farm B (Neg. Externality).

Some party can build a fence to prevent the damage.

LEARNING-BY-DOING EXERCISE 17.3

The Coase Theorem

Problem

(a) In the case of the roaming cattle just described, suppose it is costless for the parties to bargain. Verify the Coase Theorem when the cost of the fence is $2,000 and the cost of the damage is $1,000.

(b) Verify the Coase Theorem if the fence costs $2,000 and the damage cost is $4,000.

More on Coase Theorem

We can use Game Theory to demonstrate Coase Theorem:

Let cost of the fence = 200 and cost of the damage = 100.

Suppose cattle farmer and crop farmer have initial income of X.

Consider two cases when one of them has the property right.

		Cattle Farmer	
		Build a fence	Do not build
Crop Farmer	Build a fence		
	Do not build		

More on Coase Theorem

Crop Farmer	Cattle Farmer (with Property Right)	
	Build a fence	Do not build
Build a fence	X – 200, X – 200	X – 200, X
Do not build	X, X – 200	**X – 100, X**

Crop Farmer (with Property Right)	Cattle Farmer	
	Build a fence	Do not build
Build a fence	X – 200, X – 200	X – 200, X
Do not build	X, X – 200	**X, X – 100**

Note that the **BOLD** text indicated the NE.

When Crop Farmer has property right, Cattle Farmer has to pay for the damage.

More on Coase Theorem

With a property right, the most "SOCIALLY" efficient outcome is guaranteed.

The total payoff for the whole society will be 2X – 100, which is the highest possible.

However, as previously mentioned, the "DISTRIBUTION of income" is affected by whoever owns a property right.

In this example, the one who owns the property right is better off with payoff of X while the one who does not own the right gets payoff of X – 100.

Efficient Provision of a Public Good

A public good is a good that is non-rivalrous and non-excludable.

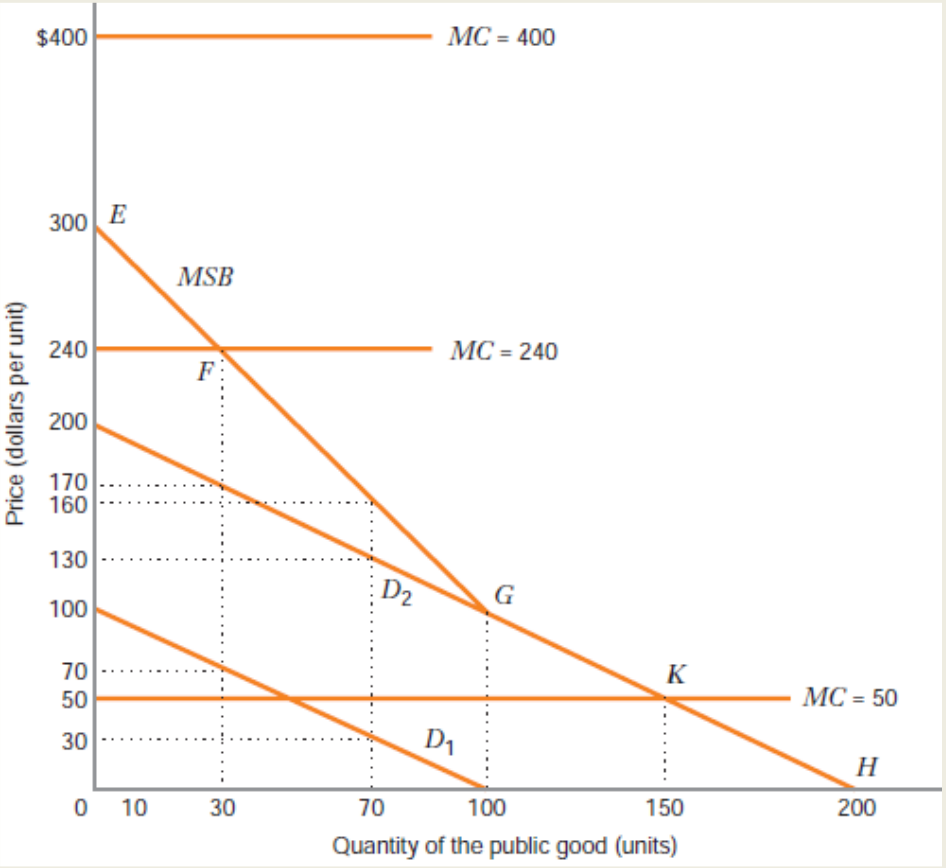
Non-rivalrous means that consumption of a good by one person does not reduce the quantity that can be consumed by others.

Non-excludable means that one person cannot exclude others from consuming the good.

Examples of public goods include street lighting, knowledge, national defense, etc.

Free-Rider Problem is when no one wants to pay for the provision of public goods because he/she expects others to pay.

Efficient Provision of a Public Good



The MC (= MSC = MPC = S) of a public good is constant because it is the opportunity cost of using resources to produce the good instead of other goods.

The MSB will be the "VERTICAL" sum of all individual demands. For example, at Q = 30, MR.1 values the good at P = 70, while MR.2 values the good at P = 170. Thus, MSB = 240 at Q = 30.

If MC = 50, Q* = 150. If MC = 240, Q = 30. If MC = 400, Q* = 0.

Efficient Provision of a Public Good

LEARNING-BY-DOING EXERCISE 17.4

Optimal Provision of a Public Good

In Figure 17.7, demand curve D_1 is $P_1 = 100 - Q$, and demand curve D_2 is $P_2 = 200 - Q$. (We have written these in *inverse* form, with price on the left and quantity on the right, for reasons explained below.)

Problem

(a) Suppose the marginal cost of the public good is \$240. Determine the efficient level of production of the public good algebraically.

(b) Suppose the marginal cost of the public good is \$50. Determine the efficient level of production of the public good both graphically and algebraically.

(c) Suppose the marginal cost of the public good is \$400. Determine the efficient level of production of the public good both graphically and algebraically.

Hint:

1) MSB = $P_1 + P_2$
2) MSB = MC

Answer:

a) Q* = 30
b) Q* = 150
c) Q* = 0

Causes of Market Failure

1) **Lack of Competition** (Monopoly Power)
2) **Externalities**
3) **Provision of Public Goods** (Free-Rider Problem)
4) **Asymmetric Information**
    1) Adverse Selection (hidden information): One party with better private information about the quality of a product will selectively participate in trades which benefit them the most, at the expense of the other party.
    2) Moral Hazard (hidden action): Some people increases their exposure to risk when they are insured.
    3) Principal-Agent Problem (hidden action): Agents may act according to their own interests, instead of the interests of principals, e.g. citizens and politicians.