Econ 200
Module 3
Lecture 9

UNIVERSITY of WASHINGTON

Outline

1. Externalities and Efficiency
2. Private Solutions: The Coase Theorem
3. Public Solutions: Pigovian Taxes and Subsidies and Quotas

Readings: Chapter 18

What Is the “Best” Level of Pollution?

Is there a way to know what is the optimal level of pollution for a society?

“No pollution” may be good for the environment, but is probably not good for people—most modern conveniences in some way result in pollution.

But unrestrained pollution is probably not optimal either.

Economics offers some ideas for how to decide on how much pollution to allow.

Electricity Production

Electricity production is an incredibly important industry for a modern economy.

When firms produce electricity, they have costs of production:

- Buildings
- Equipment
- Fuel
- Labor, etc.

Those firms make their decisions about how much to produce based on these **private costs**.

Pollution is an Externality

Firms produce according to their **marginal private cost** and consumers purchase according to their **marginal private benefit**.

But the **social cost** is higher: the cost to society includes both the private cost and the external cost of the pollution.

Pollution is an example of an **externality**: a benefit or cost that affects someone who is not directly involved in the production or consumption of a good or service.

In this case, the choices made by firms and consumers are **not allocatively efficient** because of the unconsidered external cost.

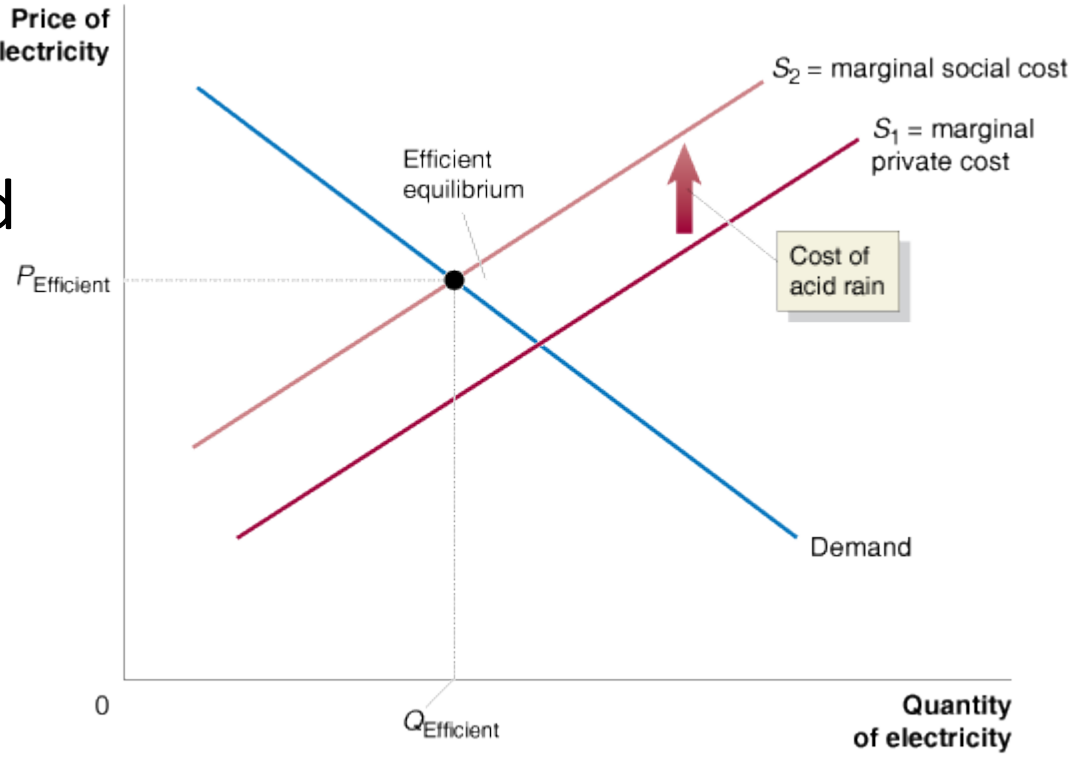
Efficiency in the Electricity Production Market

S_1 = the marginal private cost that the electricity producer has to pay.

S_2 = the marginal social cost, which includes the costs to those affected by pollution.

The optimal level of production for society is $Q_{efficient}$.

→The marginal cost to society is just equal to the marginal benefit.



Externalities and Market Failure

Wherever there are unconsidered externalities, the market equilibrium will not result in the efficient quantity being produced.

There will be deadweight loss.

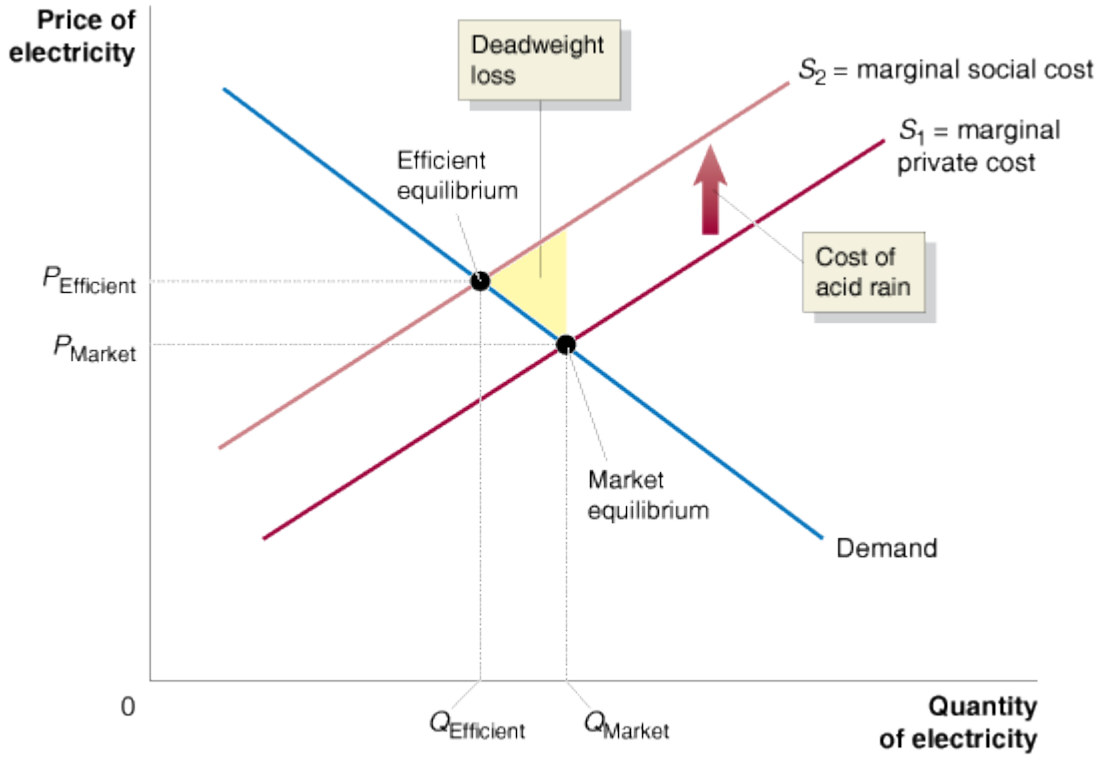
This is an example of **market failure**: a situation in which the market fails to produce the efficient level of output.

Inefficiency Due to Negative Externalities

Price (P_{Market}) is "too low"
Quantity (Q_{Market}) is "too high"

→The cost to society of the additional electricity exceeds its benefit to society.

Too much of the good is produced and deadweight loss results.



Externalities

Negative externalities result in deadweight loss from **overproduction** (or overconsumption).

Externalities might also be positive, with **social benefits** exceeding **private benefits**.

Private benefit: the benefit received by the consumer of a good or service.

Social benefit: The total benefit from consuming a good or service including both the private benefit and any external benefit.

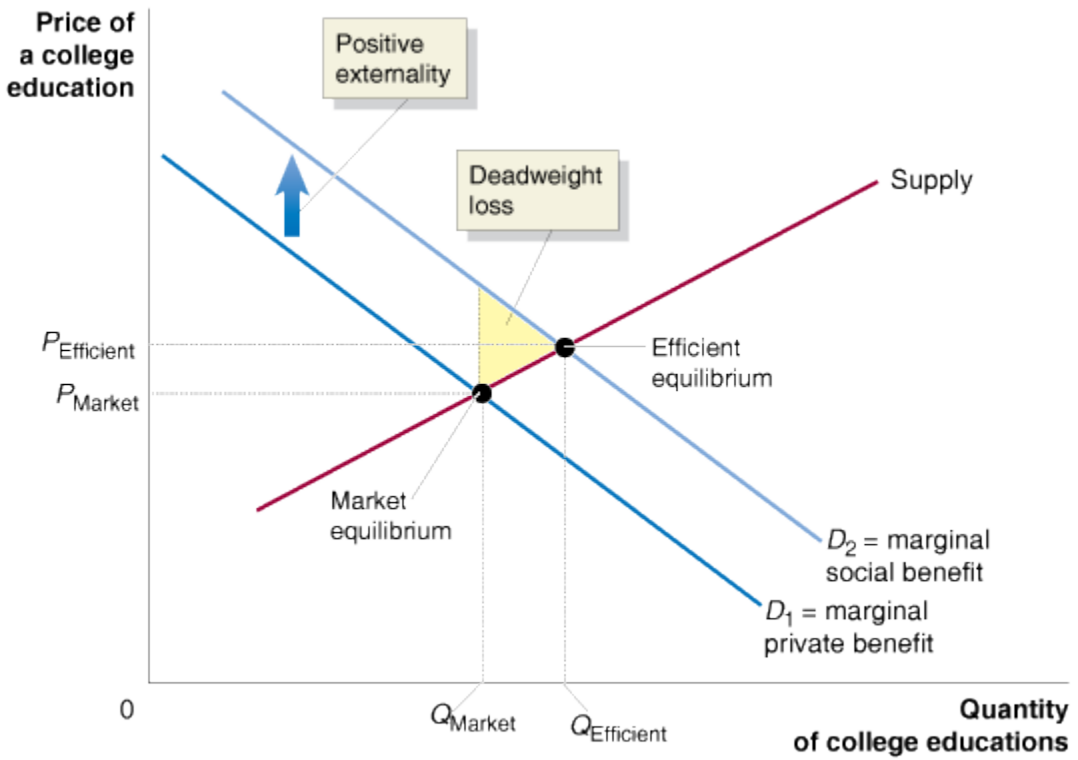
Positive externalities result in deadweight loss from **underproduction** relative to efficiency.

Externalities in the College Education Market

College educations have positive externalities.

The marginal social benefit > marginal private benefit

$Q_{market} < Q_{efficient}$



What Causes Externalities?

One theory is that externalities arise because of *incomplete property rights*, or from the *difficulty of enforcing property rights* in certain situations.

Suppose a farmer and a paper mill share a stream.

- If no one owns the stream, the paper mill will discharge waste into the stream, making it unusable for the farmer.

Either way, if there is deadweight loss from the pollution, property rights allow these parties to come to a mutually beneficial trade and increase surplus.

The Coase Theorem

Theory that private parties can reach the socially efficient allocation of a scarce resource (i.e. solve the externality problem) through private bargaining, no matter who holds the initial property rights, provided:

- Property rights are assigned and enforceable, and
- Transaction costs are low, and
- Parties have full information of costs and benefits involved.

Transaction costs: The costs in time and other resources that parties incur in the process of agreeing to and carrying out an exchange of goods or services.

The Coase Theorem and Property Rights

Perhaps Coase's most important observation was that it did not matter to whom property rights were assigned.

In the example of the paper mill and the farmer, the efficient outcome can be realized through bargaining no matter who owns the stream.

- If the farmer owns the stream, she can allow the mill to dump their waste for a fee.
- Or, she can enforce her right to exclude the mill from dumping in court if the mill's willingness to pay isn't high enough to overcome the farmer's cost of accepting the pollution.
- If the mill owner owns the stream, the farmer can offer the mill owner a payment to stop dumping.

→Ultimately, we should find that the outcome with the highest net benefit (MB-MC) will prevail, making the allocation efficient.

→The owner of the stream is likely to capture more of the net benefit here, but that does not alter the efficiency of the outcome.

When Can Two Wrongs Make a Right?

In chapter 6, we learned that taxes caused inefficiency (deadweight loss) by moving the level of production away from the efficient level.

In this chapter, externalities cause inefficiency for the same reason.

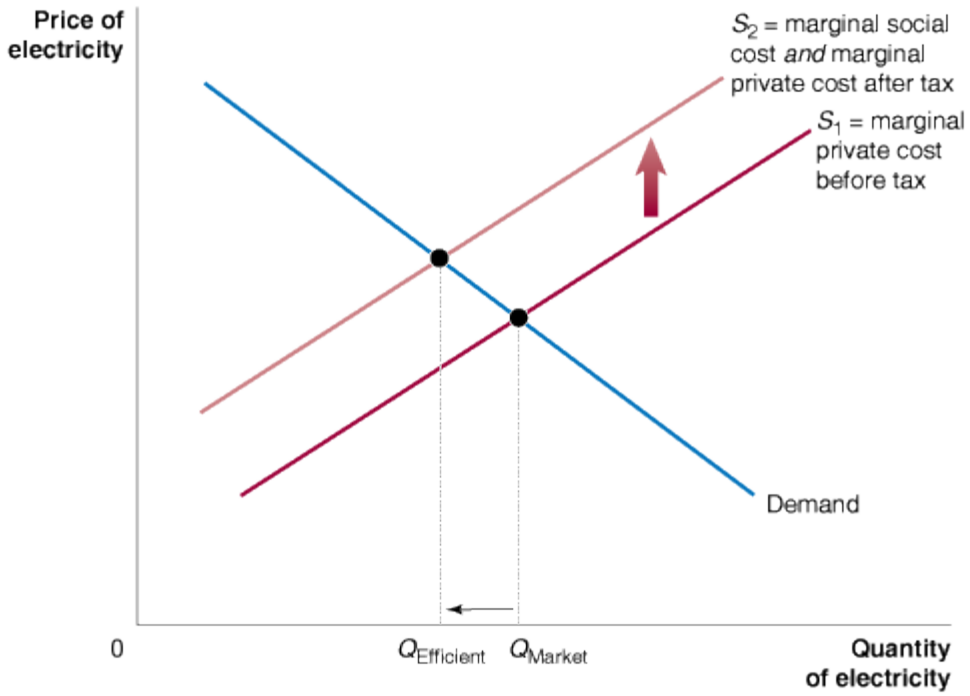
A tax of just the right size could cause these two effects to cancel out, returning us to the efficient level of production.

Corrective Taxes for Negative Externalities

Utilities do not bear the cost of pollution, so they produce too much.

If the government imposes a tax equal to the cost of the pollution, the utilities will internalize the externality.

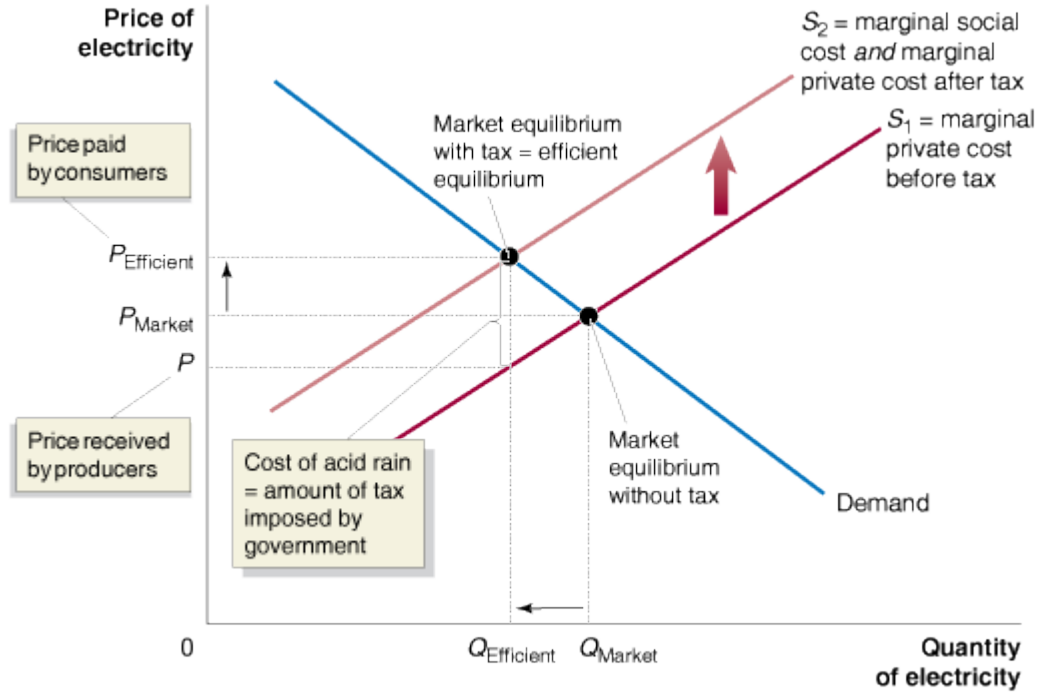
→ The market equilibrium quantity falls to the economically efficient level.



Effect of the Corrective Taxes

The price of electricity will rise from P_{Market}, which does not include the cost of acid rain, to $P_{Efficient}$, which does include the cost.

Consumers pay the price $P_{Efficient}$, while producers receive a price $P=P_{Efficient}$ -t



Can Taxes "Solve" Positive Externalities Too?

Taxes worked to solve the problem of negative externalities because:

- Negative externalities caused too much to be produced, while
- Taxes reduced the amount of output.

When there are positive externalities, *too little* will be produced.

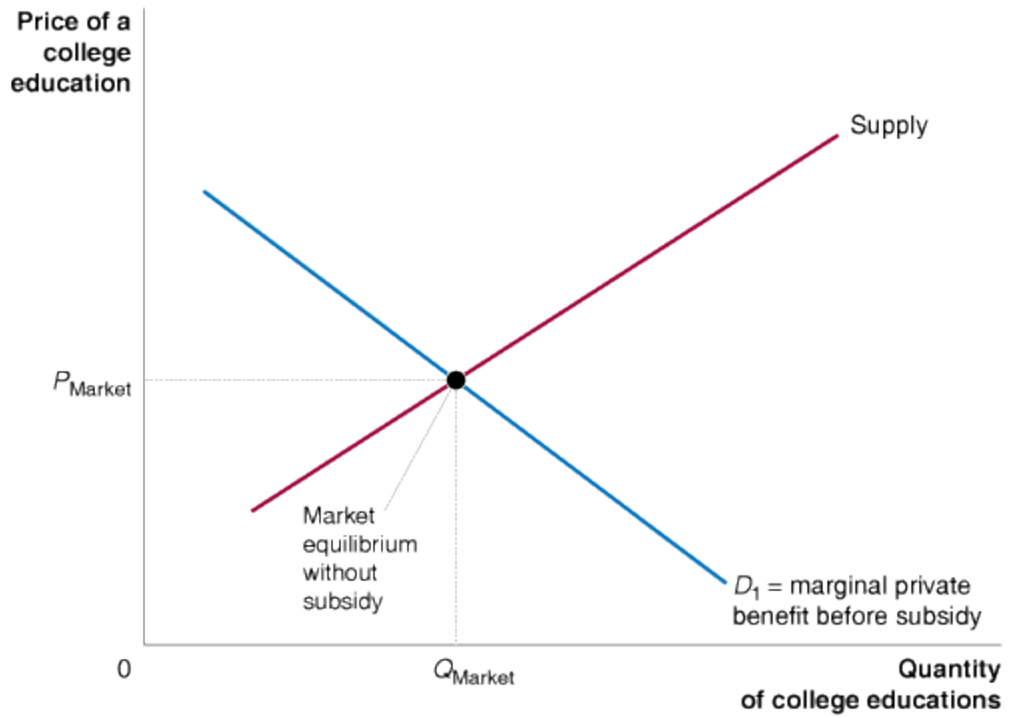
Taxes won't work; but ***subsidies*** might.

Subsidy: An amount paid to producers or consumers to encourage the production or consumption of a good.

Corrective Subsidies for Positive Externalities

Individuals make decisions about whether or not to "consume" a college education, with a resulting market price and quantity.

But what if there are positive externalities to a college education?

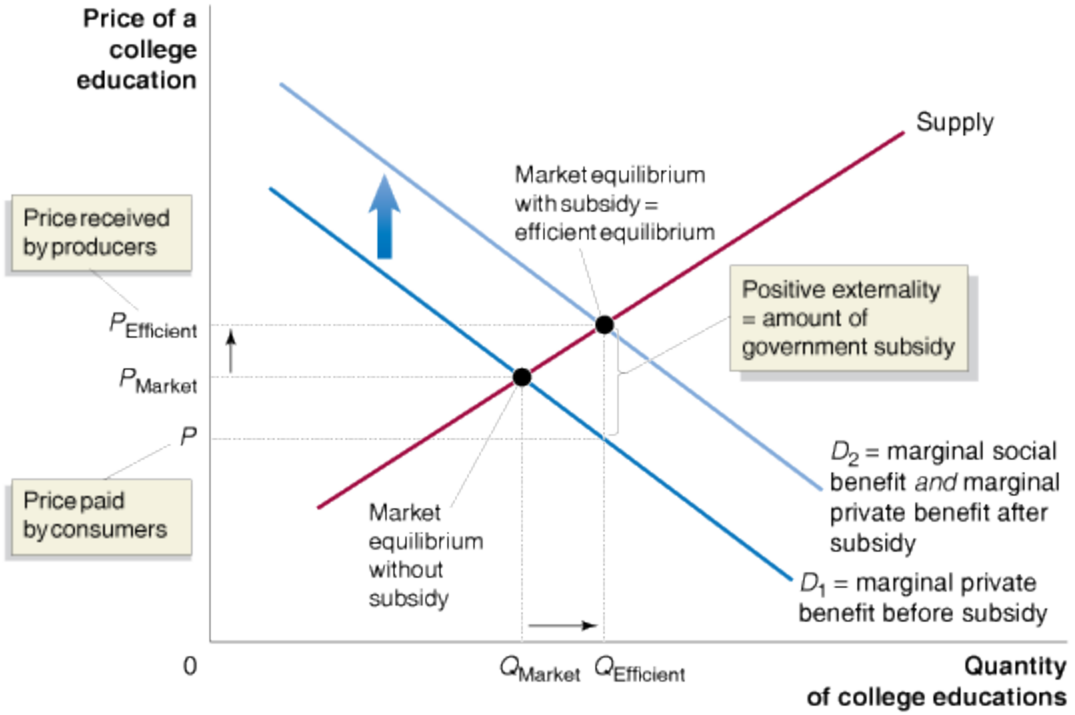


Effect of the Corrective Subsidies

The subsidy will cause the demand curve to shift up, from D_1 to D_2.

The market equilibrium quantity will shift from Q_{Market} to $Q_{Efficient}$.

Producers receive the price $P_{Efficient}$, while consumers pay a price $P = P_{Efficient}$ –subsidy.



Corrective Taxes and Subsidies

The taxes and subsidies seen in the last few slides “correct” the externality problem.

They are known as **Pigovian taxes and subsidies**.

Pigovian taxes are especially popular with economists, because they increase efficiency while bringing in tax revenue; then (in theory) this allows inefficiency-causing taxes in other markets to be reduced, a ***double dividend of taxation***.

Other Public Solutions

Quotas can counteract inefficiently high consumption, but don't always maximize surplus.

We can improve on quotas by permitting the buying and selling of quota allowances, a *tradable allowance*.

- Market quantity is socially optimal (efficient).
- Total surplus is maximized.
- Tradable allowance does not create any government revenue, because no taxes are imposed.

Johnston Forest in Rhode Island has a cave that houses thousands of fruit bats. The bats reside near the town of Johnston, where residents value the bats at $400,000, as a tourist attraction. Slightly further away, in the town of Foster, residents find the bats to be a nuisance because their droppings ruin the paint jobs on their cars. They value the removal of the bats at $500,000. Which of the following solutions is an example of the Coase Theorem?

a. Foster pays Johnston $499,999 to remove the bats
b. Johnston pays Foster $400,000 to compensate them for the ruined paint jobs
c. Foster lobbies the governor to sign an executive order eliminating all bats in the state
d. The state assembly imposes a “bat tax” to force Johnston to “consume” fewer bats.

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a. Foster pays Johnston $4999,999 to remove the bats

Assume that the market for sriracha sauce can be represented by the following supply and demand equations:

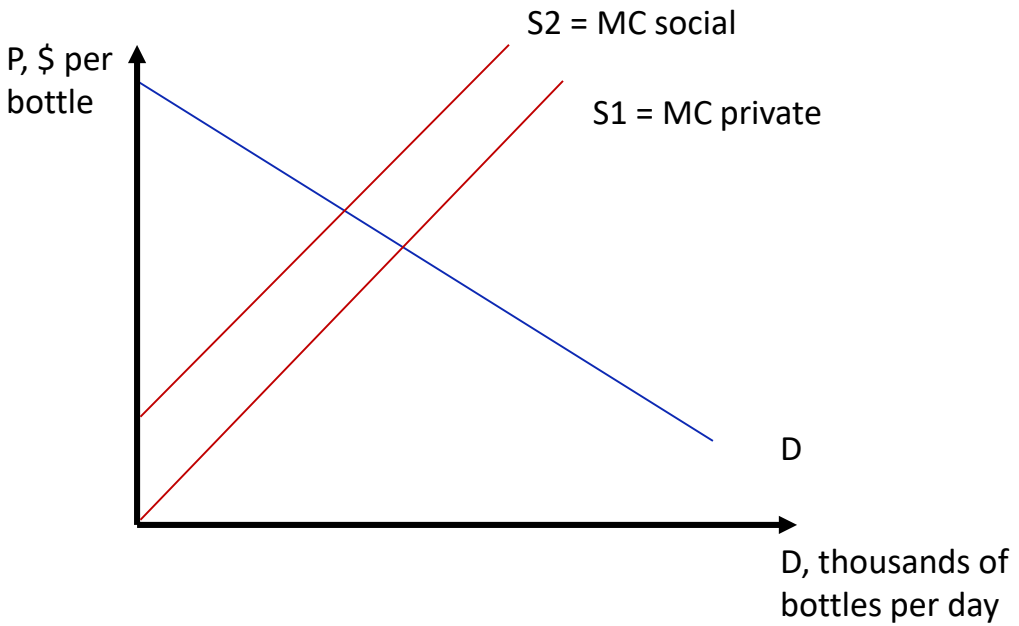
$P=0.1Q^s$

$P=10-0.1Q^D$

The production of each bottle of sriracha sauce creates an external cost of $3 so that the Marginal Social Cost of sriracha production is given by

$P=3 + 0.1Q^s$

Find the Deadweight Loss in this market



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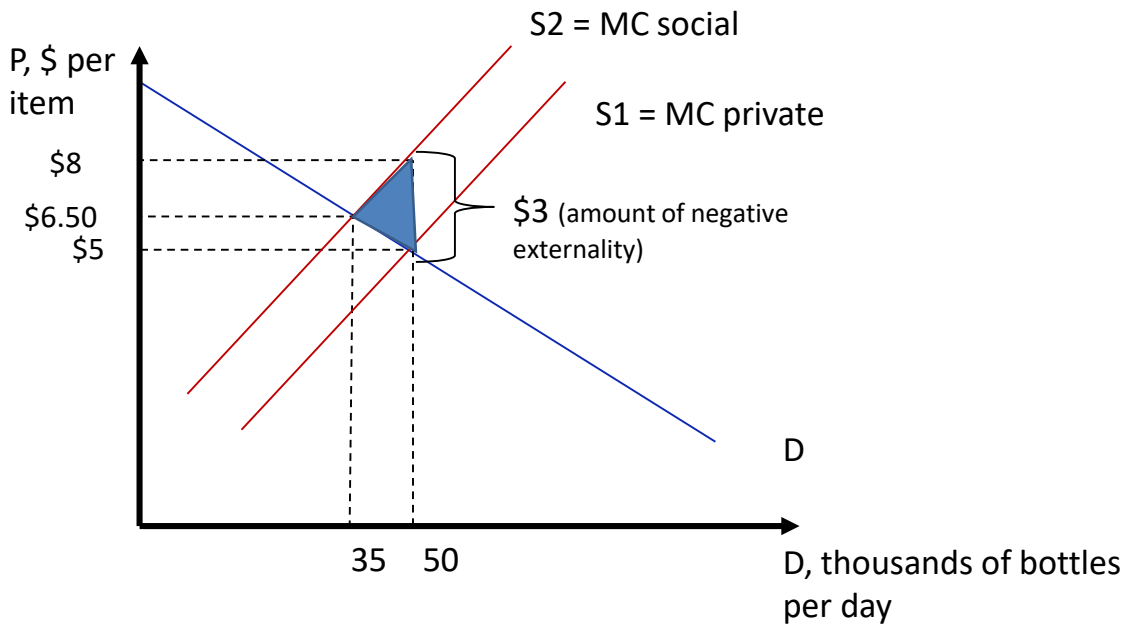

Find the Deadweight Loss in this market

Qe=35 (Solve $3 + 0.1Q^s = 10-0.1Q^D$)
Pe=$6.50

Qm = 50 (Solve $Q^s/10 = 10-Q^D/10$)
Pm=$5

DWL = ½ ($3)(15,000)=$22,500

The table below shows the willingness to pay for a good that creates a negative externality when it is consumed (think pollution). Imagine that the government wants to limit consumption of the good to 4 total units and issues 2 tradeable permits to both Nicole and Andrew. Do Nicole and Andrew trade their permits?

a. No.
b. Yes, Nicole purchases at least one from Andrew
c. Yes, Andrew purchases at least one from Nicole
d. Yes, but we have no way of knowing who purchases from whom.

Quantity	Nicole's WTP	Andrew's WTP
1	50	25
2	40	20
3	30	15
4	20	10
5	10	5
6	0	0

The table below shows the willingness to pay for a good that creates a negative externality when it is consumed (think pollution). Imagine that the government wants to limit consumption of the good to 4 total units and issues 2 tradeable permits to both Nicole and Andrew. Do Nicole and Andrew trade their permits?

Nicole purchases exactly one from Andrew! (Andrew wants more than she is willing to pay for the second.)

Quantity	Nicole's WTP	Andrew's WTP
1	50	25
2	40	20
3	30	15
4	20	10
5	10	5
6	0	0