EC1101E:
Introduction to Economic Analysis

First Fundamental Theorem of Welfare Economics

- Assume that:

  - There are *markets* and *market prices* for all goods.

  - All buyers and sellers are *competitive price-takers.*

  - Each person's utility depends *only on his own consumption.*

- Then any market equilibrium is **efficient.**

Market Failures

- If any of the assumptions do not hold,
  e.g., if markets are not perfectly competitive,
  then resources may not be allocated efficiently.

- Examples of market failures:

  - Markets are **not perfectly competitive**,
    i.e., a buyer or seller has **market power**
    — the ability to affect the market price.

  - Transactions have **externalities**
    — side effects that affect bystanders, *e.g.*, pollution.

Externalities

Externalities

- **Externality:**
  A byproduct of consumption or production
  that affects someone other than the buyer or seller.

- Externalities can be *negative* or *positive,*
  depending on whether the impact on the bystander
  is adverse or beneficial.

Externalities

- What matters for society is *social* costs and benefits — the sum of *private* and *external* costs and benefits.

- Self-interested buyers and sellers consider only the *private* costs and benefits of their actions; they neglect the *external* costs or benefits of their actions.

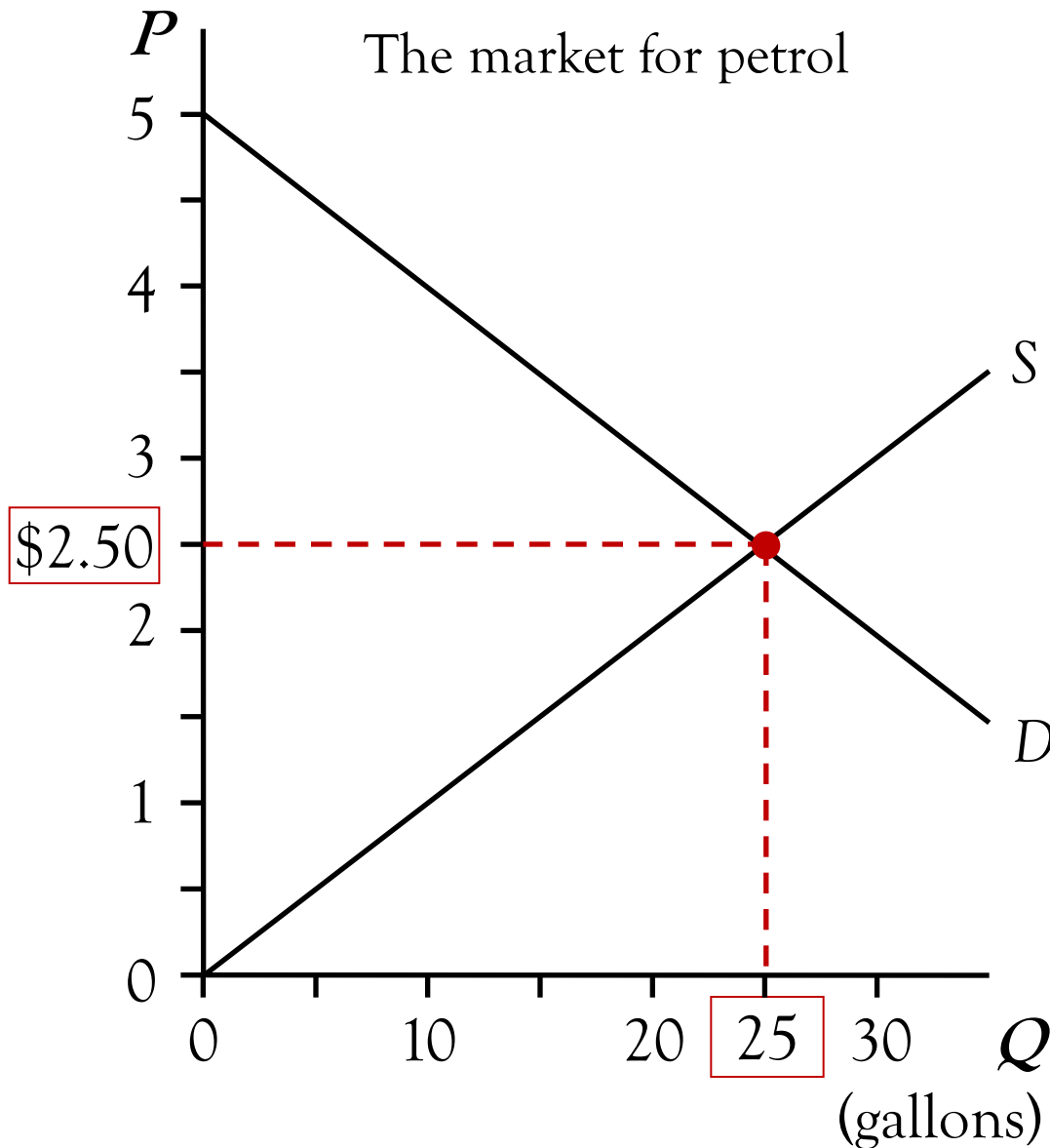- Hence the market outcome is **not efficient.**

Examples of Negative Externalities

- Open burning in Indonesia reduces the air quality.

- The neighbor's dog barks at all hours of the day and night.

- Non-smokers incur health costs due to inhaling the second-hand smoke of smokers.

Social Cost = Private Cost + External Cost
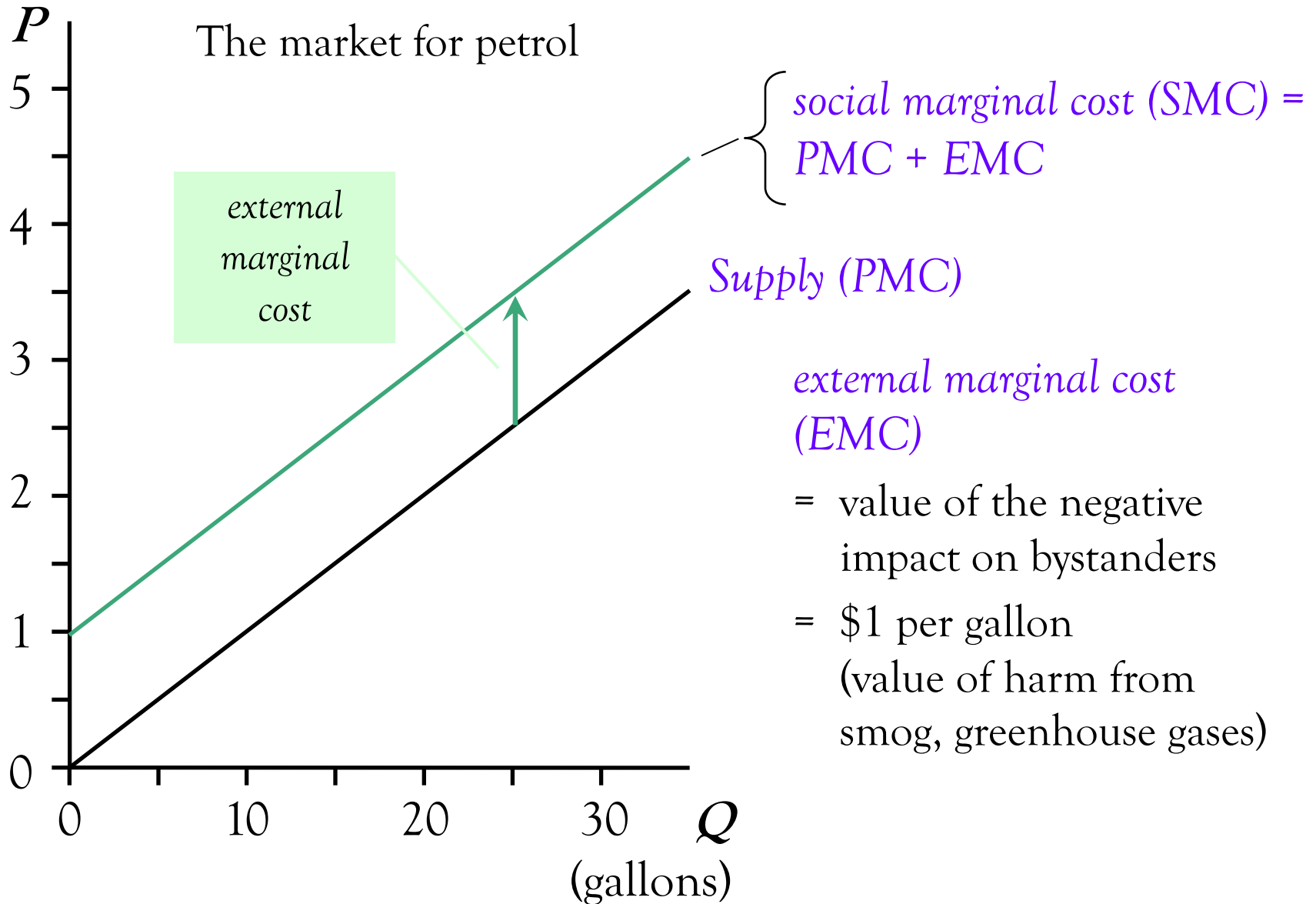
Welfare Economics

The market for petrol

The market equilibrium maximizes consumer surplus and producer surplus.
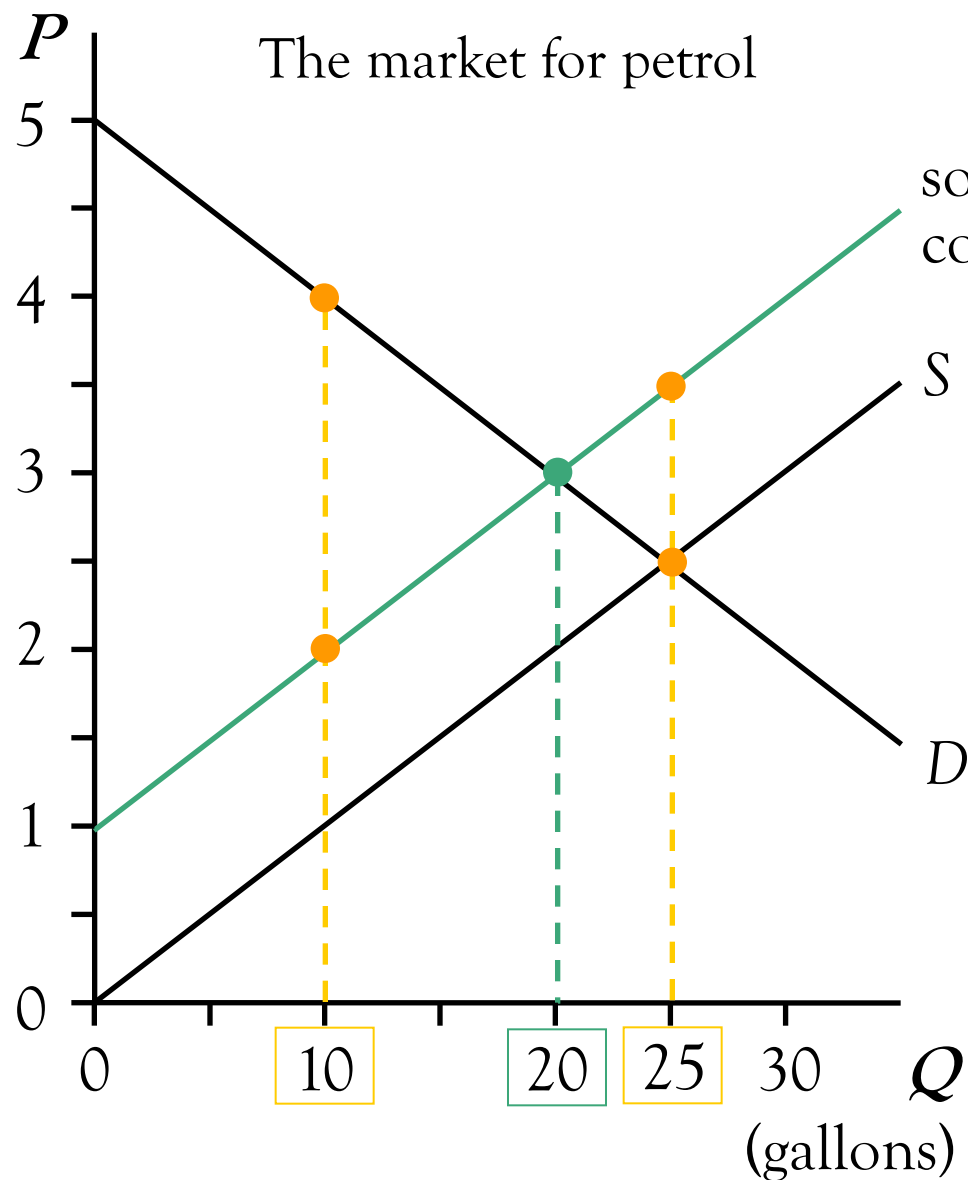
The supply curve shows *private marginal cost (PMC)* – the costs directly incurred by sellers.

The demand curve shows *private marginal benefit (PMB)* – the value to buyers (the prices they are willing to pay).

Analysis of a Negative Externality

The market for petrol

social marginal cost (SMC) = PMC + EMC

Supply (PMC)

external marginal cost (EMC)

= value of the negative impact on bystanders

= $1 per gallon (value of harm from smog, greenhouse gases)

external marginal cost

Analysis of a Negative Externality

The market for petrol
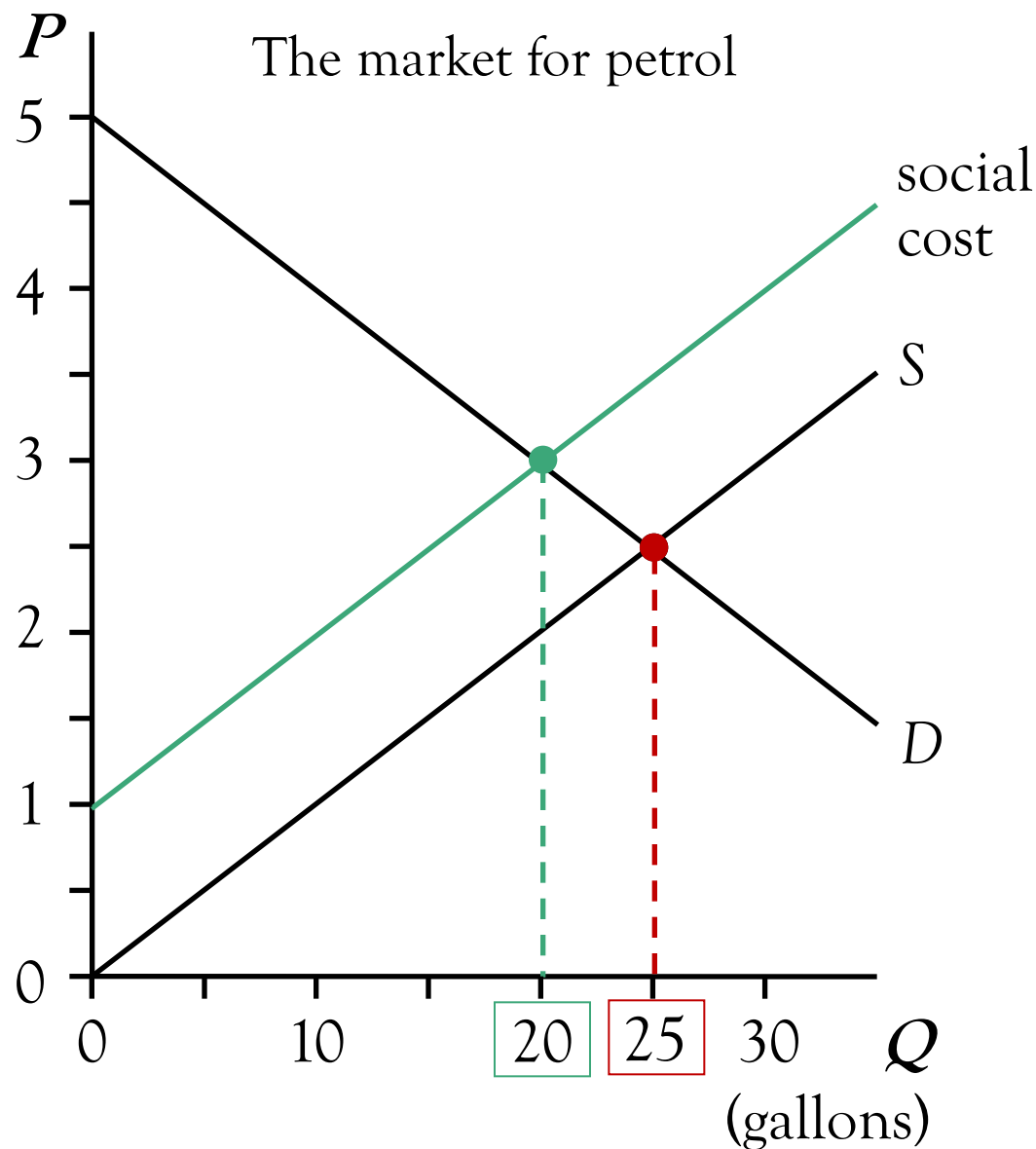
social cost

S

D

The **socially optimal** quantity is **20** gallons.

At any $Q < 20$,
the *social benefit* of an additional gallon exceeds its *social cost.*

At any $Q > 20$,
the *social cost* of an additional gallon exceeds its *social benefit.*

Analysis of a Negative Externality

The market for petrol

social cost

S

D

Market equilibrium ($Q = 25$) is greater than **social optimum** ($Q = 20$).

To **internalize the externality,** introduce a **tax** of $1 per gallon, shift the *S* curve up by $1.
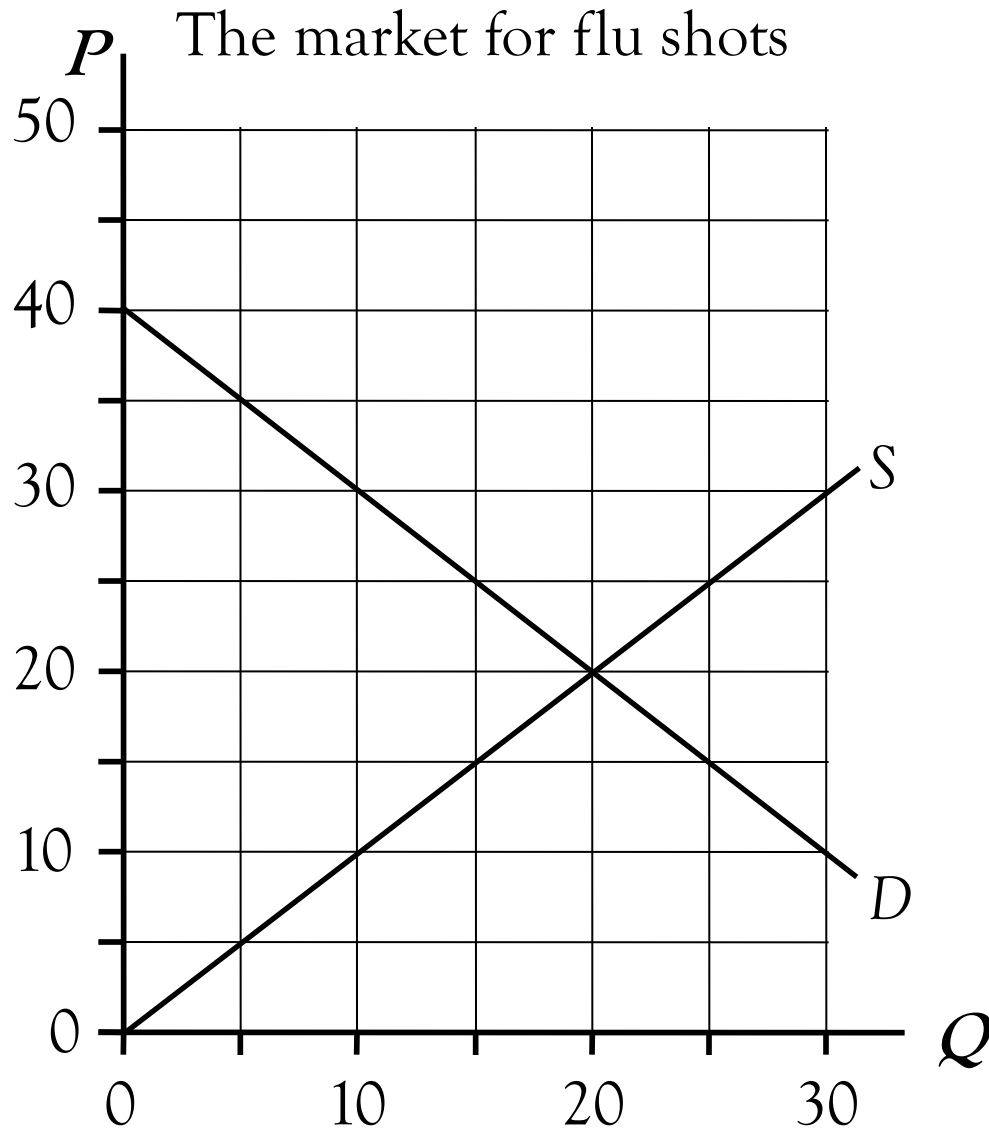
Examples of Positive Externalities

- Being vaccinated against contagious diseases protects not only you, but the people you interact with.

- R&D creates knowledge that others can use.

- People going to college raise the population's education level, which reduces crime and improves government.

Social Benefit = Private Benefit + External Benefit

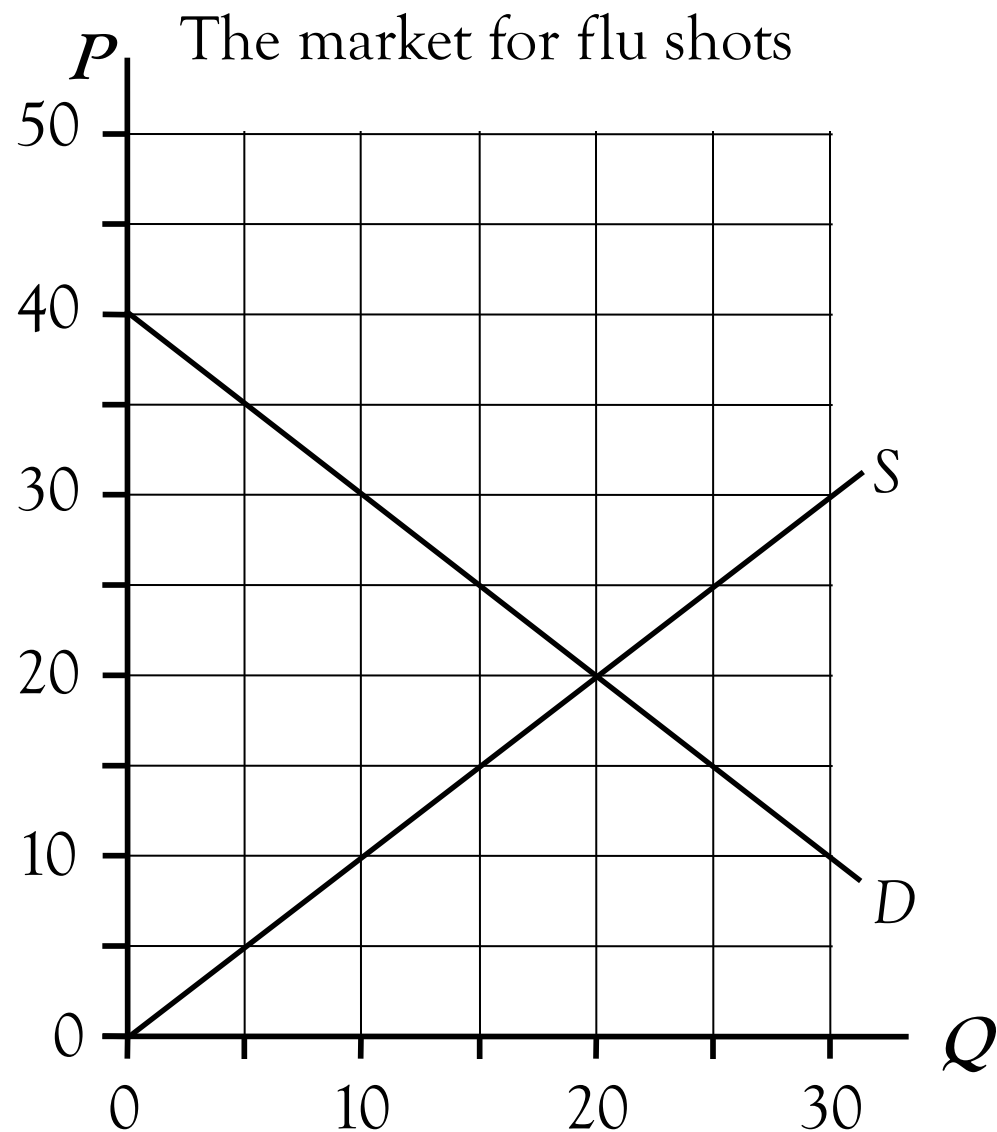# Analysis of a Positive Externality

The market for flu shots

External benefit
   = $10/shot

- Draw the social benefit curve.

- Find the socially optimal *Q.*

- What policy would internalize this externality?

Analysis of a Positive Externality

The market for flu shots

Externalities:
Public Policies

Public Policies on Externalities

- **Command-and-control policies** regulate behavior directly, *e.g.*,

  - Limit the amount of pollution permitted.

  - Require firms to adopt a particular technology to reduce emissions.

- **Market-based policies** provide incentives so that private decision-makers will take into account the external costs and benefits of their actions, *e.g.*,

  - Corrective taxes and subsidies.

  - Tradable pollution permits (cap and trade).

Corrective Taxes & Subsidies

- **Corrective tax:**
  A tax designed to induce private decision-makers
  to take account of the external costs
  that arise from a negative externality.

- Also called **Pigouvian taxes** after Arthur Pigou (1877–1959).

- For activities with *negative* externalities,
  the ideal corrective *tax* would equal
  the *external marginal cost (EMC).*

- For activities with *positive* externalities,
  the ideal corrective *subsidy* would equal
  the *external marginal benefit (EMB).*

Corrective Taxes & Subsidies

- Other taxes and subsidies distort incentives and move the economy away from the social optimum.

- Corrective taxes and subsidies
  - align *private* incentives with society's interests
  - induce private decision-makers to take into account the *external* costs and benefits of their actions
  - move the economy toward a more *efficient* allocation of resources

People Respond to Changes in Costs and Benefits

Externalities:
Private Solutions

Private Solutions to Externalities

- **Coase Theorem:**
  If private parties can *costlessly* bargain
  over the allocation of resources,
  they can solve the externalities problem on their own.

Coase Theorem

- Jack owns a dog named Naughty Dog.

- Naughty Dog's barking disturbs Jack's neighbor, Jill.

- The socially efficient outcome maximizes both Jack's and Jill's well-being.

- If Jack values having Naughty Dog more than Jill values peace and quiet, then the dog should stay.

Coase Theorem

- Benefit to Jack of having Naughty Dog: $1,000
- Cost to Jill of Naughty Dog's barking: $ 500
- **Efficient outcome:** Does Naughty Dog stay or go?

Scenario 1: Jack has the right to keep Naughty Dog.

- **Private outcome:** Does Naughty Dog stay or go?
  - What is the minimum Jack/Jill must be paid?
  - What is the maximum Jack/Jill is willing to pay?

Coase Theorem

- Benefit to Jack of having Naughty Dog: $1,000
- Cost to Jill of Naughty Dog's barking: $ 500
- **Efficient outcome:** Does Naughty Dog stay or go?

Scenario 2: Jill has the right to peace and quiet.

- **Private outcome:** Does Naughty Dog stay or go?
    - What is the minimum Jack/Jill must be paid?
    - What is the maximum Jack/Jill is willing to pay?

Coase Theorem

- The private market achieves the _____ outcome regardless of the initial distribution of rights.

  - In both cases, the private outcome equals the _____ outcome – Naughty Dog _____.

- _____ determine the direction in which compensation payments are made.

  - In scenario 1 where Jack has the right to keep Naughty Dog, _____.

  - In scenario 2 where Jill has the right to peace and quiet, _____.

Why Private Solutions Do Not Always Work

- **Transaction costs**
  - Parties may incur costs in the process of agreeing to and following through on a bargain that make it impossible to reach a mutually beneficial agreement.

- **Stubborness**
  - Even if a beneficial agreement is possible, each party may hold out for a better deal.

- **Coordination problems**
  - If the number of parties is very large, coordinating them may be costly, difficult, or impossible.

Test Yourself

- **Negative externality:** The market quantity is _____ than socially desirable.

    - Examples:

- **Positive externality:** The market quantity is _____ than socially desirable.

    - Examples:

- To remedy the problem, _____ the externality:

    - _____ goods with negative externalities.

    - _____ goods with positive externalities.

Public Goods and Common Resources

Important Characteristics of Goods

- A good is **excludable** if a person can be prevented from using it.

  - *Excludable:* fries
  - *Not excludable:* national defense

- A good is **rival in consumption** if one person's use of it diminishes other people's use of it.

  - *Rival:* hamburger
  - *Not rival:* an MP3 file of Beyoncé's latest single

"Priceless" Goods

- We consume many goods without paying:
  clean air, parks, wi-fi (sometimes), online news.

- When goods have no *prices,*
  the market forces that normally allocate resources
  are absent.

- The private market may fail to provide the *socially optimal*
  quantity of such goods.

  - In such cases, governments may improve market
    outcomes.

The Different Kinds of Goods

	Rival	Not Rival
Excludable	*Private Good*	*Natural Monopoly*
Not Excludable	*Common Resource*	*Public Good*

Categorizing Wi-fi

Wi-fi is *which* of the four kinds of goods?

Hint: When is wi-fi rival in consumption? When is wi-fi excludable?

Public Goods

- Since public goods are **not excludable,**
  people have incentive to be *free riders* –
  they receive the benefit of a good without paying for it.

- Firms do not produce the good,
  even if the cost of providing the good is less than
  the collective benefit of the good.

- If the benefit of a public good *exceeds* the cost of providing it,
  the government should provide the good and
  pay for it with a tax on the people who benefit from it.

Common Resources

- Common resources are **not excludable.**

  - Free riders cannot be prevented from using them.

  - There is little incentive for firms to provide them.

  - Role for the government: ensuring that they are provided.

- Furthermore, common resources are **rival in consumption.**

  - Each person's use of a common resource reduces others' ability to use it.

  - Role for the government: ensuring that they are not overused.

Tragedy of the Commons

- The **tragedy of the commons**
  - Illustrates why common resources are overused.
  - Describes many environmental problems like overfishing and climate change.

- Negotiated agreements can solve the tragedy of the commons; the players just need to find a way to align their individual incentives with the goals of the group as a whole. *E.g.,*
  - Agree to keep the fishery sustainable by using a tradable permit system.
  - Agree to impose a carbon tax on fossil fuels.

The Role of the Government

- Policies to prevent overconsumption of common resources include:

  - *Privatize* the resource, *e.g.*, convert land to a private good by dividing and selling parcels to individuals.

  - *Regulate* use of the resource, *e.g.*, Beijing's license plate policy.

  - Impose a *corrective tax*, *e.g.*, hunting and fishing licenses, entrance fees for national parks.

  - Auction off *permits* allowing use of the resource, *e.g.*, electromagnetic frequency spectrum.

Grizzly bear paws

Residents of Hong Kong are able to find restaurants that advertise a dish containing grizzly bear paws. Since it is unlikely that grizzly bear paws are purchased from a private producer of animal paws, we can conclude that

A. international laws making it illegal to sell grizzly bear paws are likely to be very effective at eliminating these offerings at Hong Kong restaurants.

B. higher penalties for poaching grizzly bears will prevent poachers from selling grizzly bear paws.

C. there is an asymmetry of information concerning the sale of grizzly bear paws.

D. allowing individuals to own and raise grizzly bears for meat would likely reduce the threat of extinction to grizzly bear populations.

E. the dish that contains grizzly bear paws is likely to be delicious.

Test Yourself

- Public goods tend to be _____,
  while common resources tend to be _____.

- The market fails to allocate resources efficiently because _____ are not well-established:
  - Nobody can charge people who benefit from public parks.
    Result: _____
  - Nobody owns the ocean, so nobody can charge fishermen.
    Result: _____

- The _____ can potentially solve these problems with the appropriate policies.

Market Structure

Market Structure

- We will study the behavior of firms in four markets.

  - **Perfect competition**

  - **Monopoly**

  - **Monopolistic competition**

  - **Oligopoly**

Profit Maximization

Profit Maximization

- Assume that the firm's goal is to maximize profit.

Profit = Total Revenue – Total Cost

the amount a firm receives from the sale of its output

the market value of the inputs a firm uses in production

Compare Costs and Benefits

Profit Maximization

- How many cups of coffee should you brew?

- We need to think at the *margin.*

  - If the cost of an additional cup of coffee (MC)
    is less than
    the revenue you will get from selling it *(MR)*,
    then your profits will rise if you produce more.

- Produce as long as MR ≥ MC.

Revenue

- **Total Revenue** *(TR)* $TR = P \times Q$

- **Average Revenue** *(AR)* $AR = \dfrac{TR}{Q} = P$

- **Marginal Revenue** *(MR):* $MR = \dfrac{\Delta TR}{\Delta Q}$
  the change in *Total Revenue*
  from an additional unit sold

Revenue

Q	P	Total Revenue (TR)	Average Revenue (AR)	Marginal Revenue (MR)
0	$10		–	–
1	$10			
2	$10			
3	$10			
4	$10			
5	$10			
6	$10			

Cost

- **Total Cost** (*TC*)

- **Average Total Cost** (*ATC*) $ATC = \dfrac{TC}{Q}$

- **Marginal Cost** (MC): $MC = \dfrac{\Delta TC}{\Delta Q}$
  the change in *Total Cost*
  from an additional unit
  produced

Cost

Q	Total Cost (TC)	Average Total Cost (ATC)	Marginal Cost (MC)
0	$0	–	–
1	$7		
2	$15		
3	$24		
4	$34		
5	$45		
6	$57		

EXAMPLE: Calculating your CAP

Semester	Semester CAP (Marginal CAP)	Overall CAP (Avg Total CAP)
1	3.9	3.9
2	3.7	3.8
3	4.1	3.9

EXAMPLE: ATC & MC

When MC < ATC,
    ATC is *falling.*

When MC > ATC,
    ATC is *rising.*

The MC curve
    crosses the
ATC curve
    at the *ATC curve's*
    minimum.
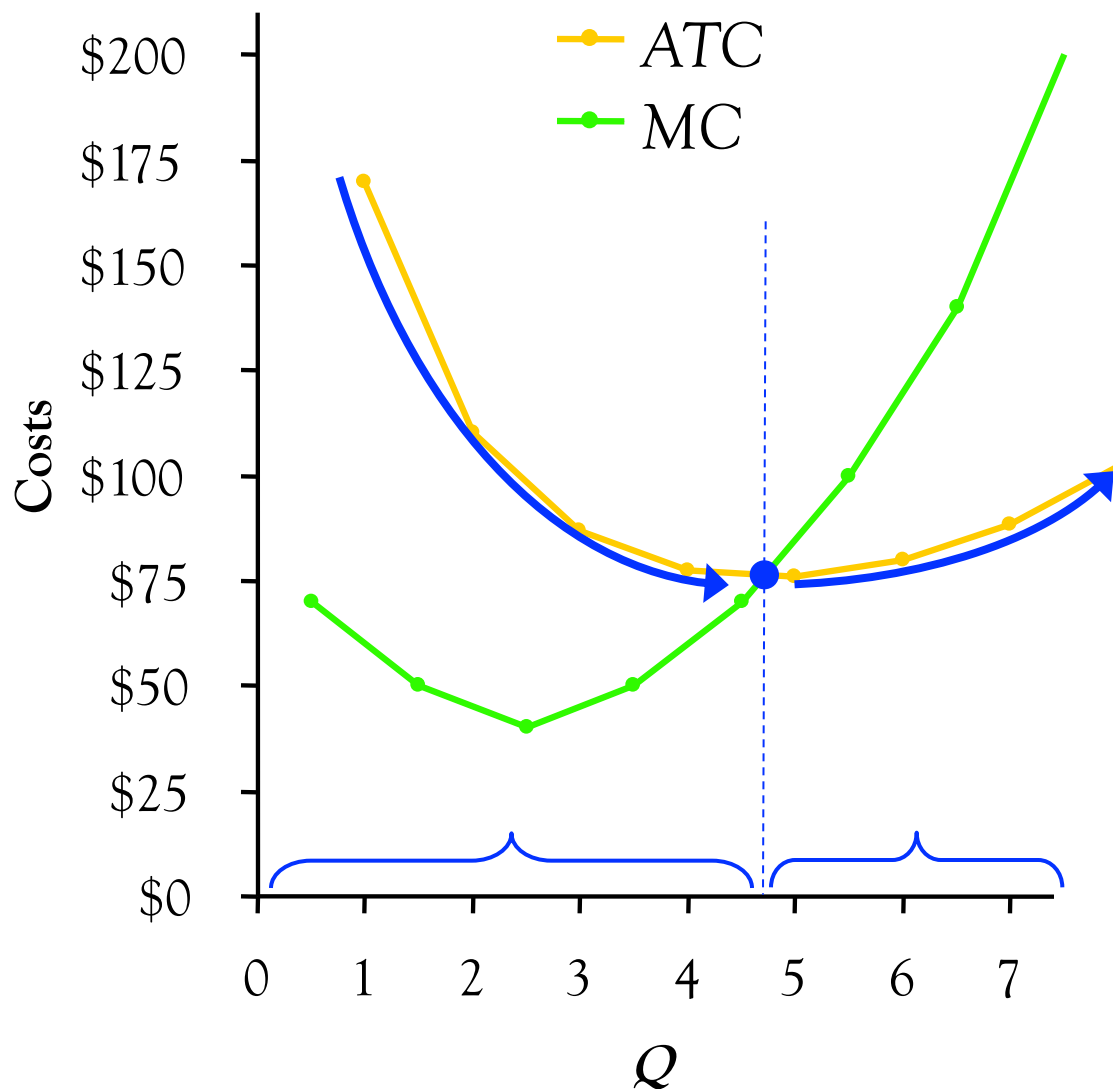
Profit Maximization

- What Q maximizes the firm's profit?

- If we ⬆ Q by one unit,

  revenue ⬆ by *MR,*

  cost ⬆ by MC.

- If *MR* > MC, then ⬆ Q to raise profit.

- If *MR* < MC, then ⬇ Q to raise profit.

Compare Costs and Benefits

Profit Maximization

Q	P	Marginal Revenue (MR)	Marginal Cost (MC)
0	$10	–	–
1	$10	$10	$7
2	$10	$10	$8
3	$10	$10	$9
4	$10	$10	$10
5	$10	$10	$11
6	$10	$10	$12

Perfect Competition

Perfect Competition

- In a **perfectly competitive market**:
  - There are *many* buyers and sellers.
  - Sellers offer a *standardized* product.
  - Sellers can *freely* enter or exit the market.
  - Buyers and sellers are *well-informed.*

- Thus, each buyer and seller is a **price-taker** — the price is taken as given.

Profit Maximization

Q	P	Marginal Revenue (MR)	Marginal Cost (MC)
0	$10	–	–
1	$10	$10	$7
2	$10	$10	$8
3	$10	$10	$9
4	$10	$10	$10
5	$10	$10	$11
6	$10	$10	$12

$MR = P$ for a Competitive Firm

- A competitive firm can keep increasing its output without affecting the market price.

- So, each unit increase in Q causes revenue to rise by P, i.e., MR = P.

$MR = P$ is only true for
firms in competitive markets.

Profit Maximization

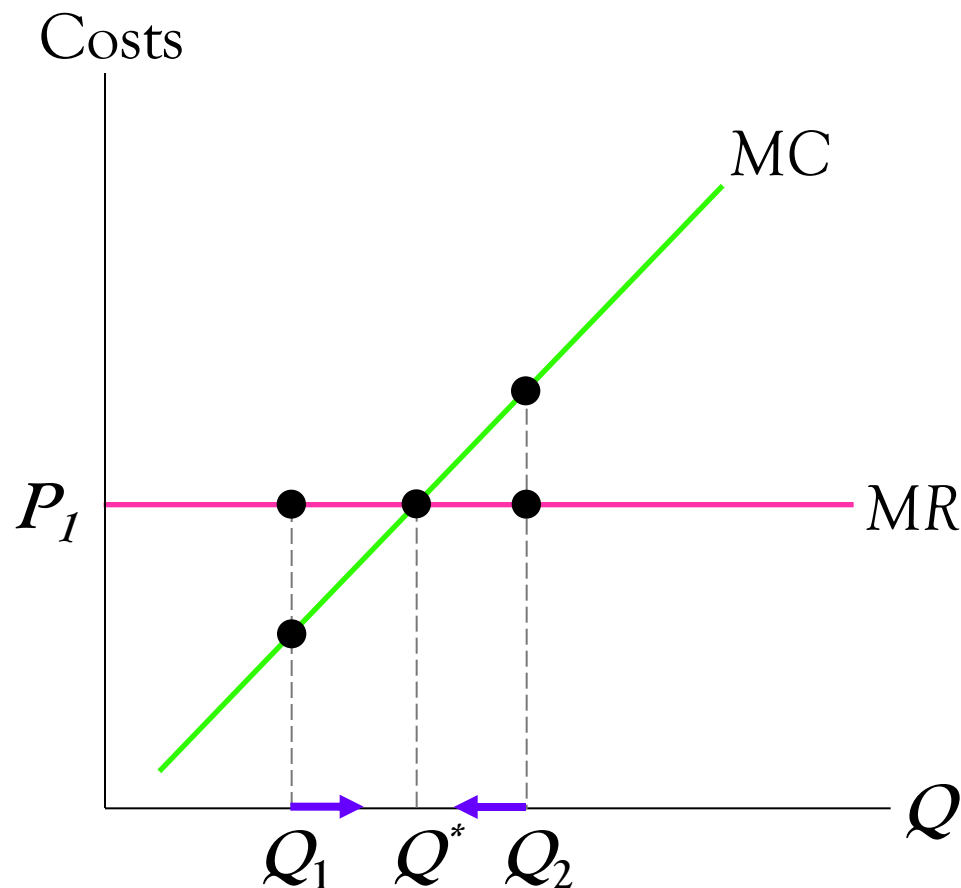$MR = MC$ at the profit-maximizing Q.

At Q_1, MR > MC.
To raise profit, ⬆ Q.

At Q_2, MR < MC.
To raise profit, ⬇ Q.

At Q^*, MR = MC.
Changing Q
would ⬇ profit.

The Efficiency of a Competitive Market

- Profit maximization: $MR = MC$

- Perfect competition: $P = MR$

- So, in the competitive equilibrium: $P = MC$

- MC is the cost of producing the marginal unit.
  P is the value to buyers.

- So, the competitive equilibrium is *efficient;*
  it maximizes total surplus.

Perfect Competition

The market for gizmos is perfectly competitive; the market price is $20 per unit. Gizmos Inc., which produces gizmos, has the following cost function:

$$TC = 81 + Q^2 + 2Q$$

A. Find the firm's marginal cost.

B. Find the firm's marginal revenue.

C. How many units should the firm produce?

D. Find the firm's profit.

E. Is the market for gizmos in a long-run equilibrium?

Test Yourself

- To maximize profit, compare _____ and _____.

  Produce as long as _____.

- In a perfectly competitive market, firms are price-_____. Therefore, marginal revenue equals _____.

- A perfectly competitive market is _____ as total surplus is maximized.