EC1101E:
Introduction to Economic Analysis

Lecture 4	**Government Intervention in Markets** ▪ Price Ceilings ▪ Price Floors ▪ Taxes ▪ Subsidies

Government Intervention in Markets

Government Intervention in Markets

- **Price ceiling:** A legal *maximum* on the price of a good or service, *e.g.*, rent control.
- **Price floor:** A legal *minimum* on the price of a good or service, *e.g.*, minimum wage.
- **Tax:** Payment by *buyers/sellers* to the *government* on each unit bought or sold.
- **Subsidy:** Payment by the *government* to *buyers/sellers* on each unit bought or sold.

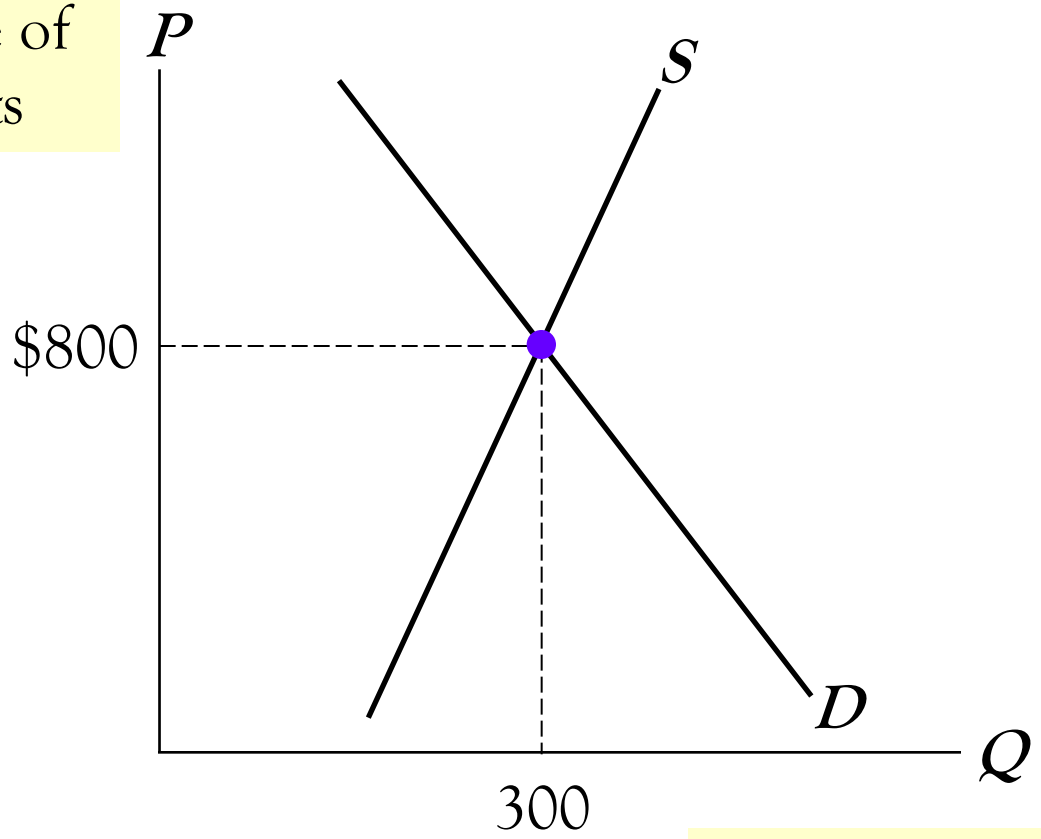
Government Intervention in Markets

- We will use the **supply and demand model** to assess how each policy affects the market outcome:
  - the price buyers pay
  - the price sellers receive
  - the equilibrium quantity

Government Intervention in Markets:
Price Ceilings

EXAMPLE: The Market for Apartments

Rental price of apartments

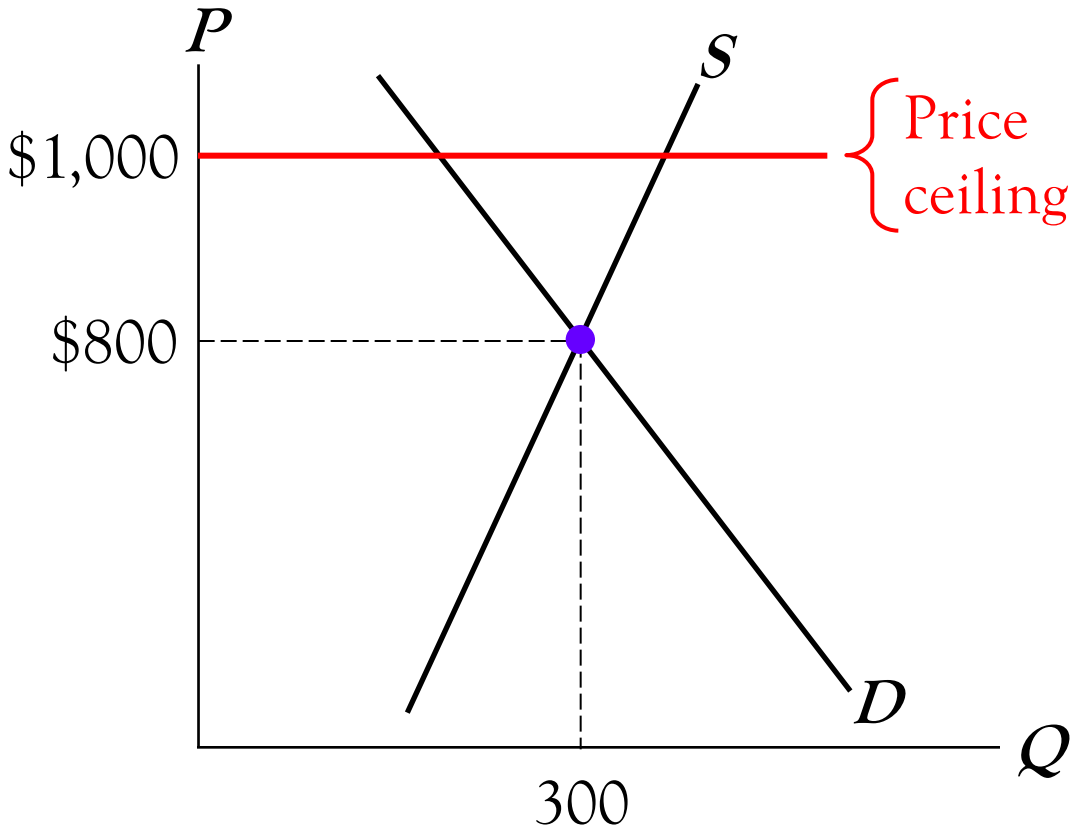


Equilibrium without price controls

Quantity of apartments

How Price Ceilings Affect Market Outcomes

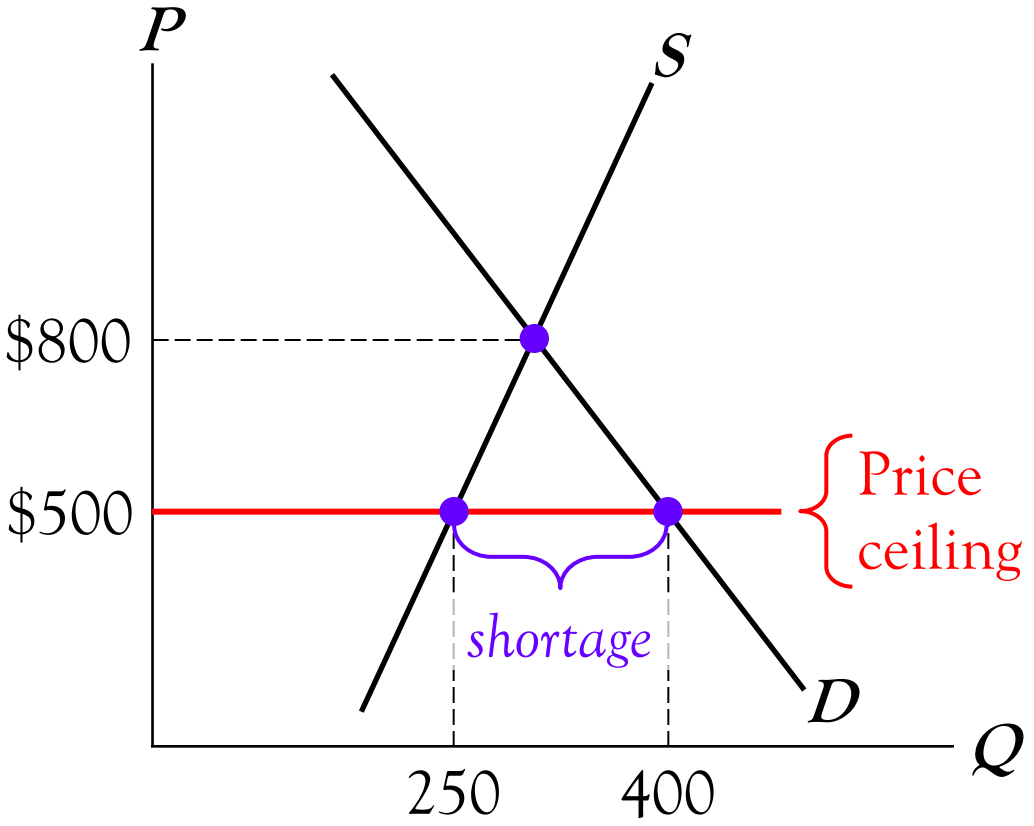
A price ceiling above the equilibrium price is *not binding* — it has no effect on the market outcome.



How Price Ceilings Affect Market Outcomes

The equilibrium price ($800) is above the price ceiling and therefore illegal.

The price ceiling is a *binding* constraint on the price, and causes a **shortage.**



Rent Control in Cambridge, MA

- Between 1970 and 1994, Cambridge, Massachusetts had a rent control law in place for rental properties built in 1969 or earlier.
  - The rent-controlled properties had rents **25** to **40 percent** below the level of non-controlled properties nearby.
  - The maintenance of rent-controlled properties was subpar, with a higher incidence of issues like holes in walls or floors, chipped or peeling paint, and loose railings.

Compare Costs and Benefits

Rent Control in Cambridge, MA

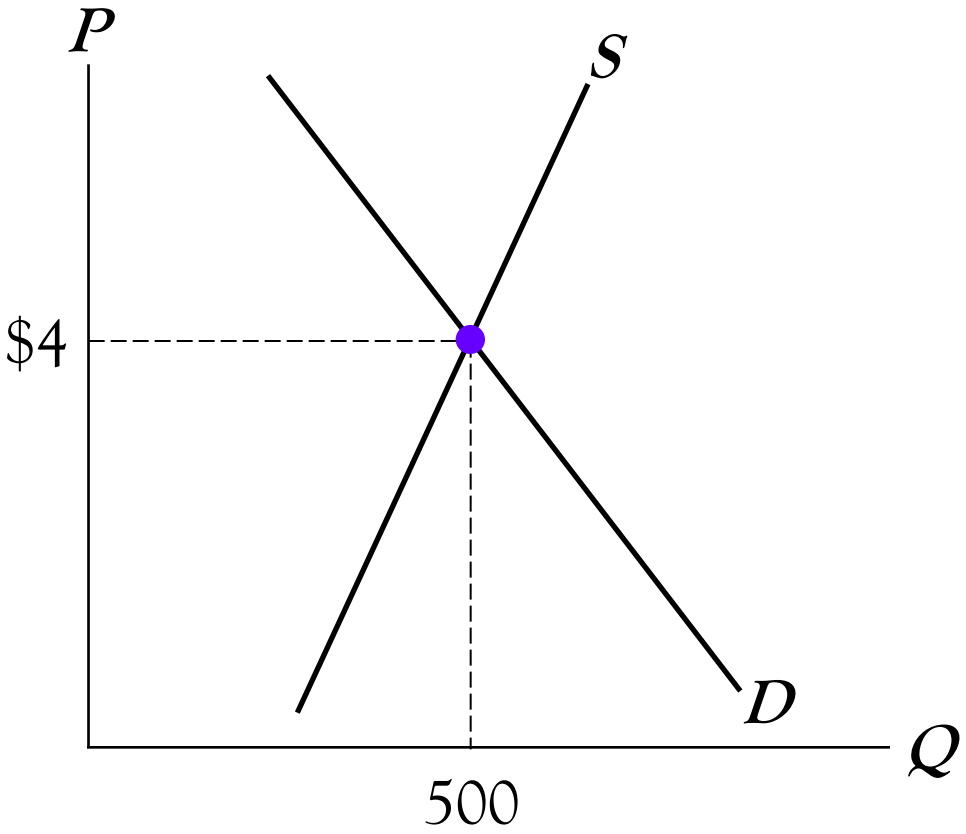
- When rent control ended in 1995:
  - The value of rent-controlled properties rose.
  - The value of non-controlled properties rose as well.
  - Non-controlled properties in neighborhoods
    with a higher percentage of rent-controlled properties
    increased in value
    by more than
    non-controlled properties in neighborhoods
    with a lower percentage of rent-controlled properties.

People Respond to Changes in Costs and Benefits

Government Intervention in Markets:
Price Floors

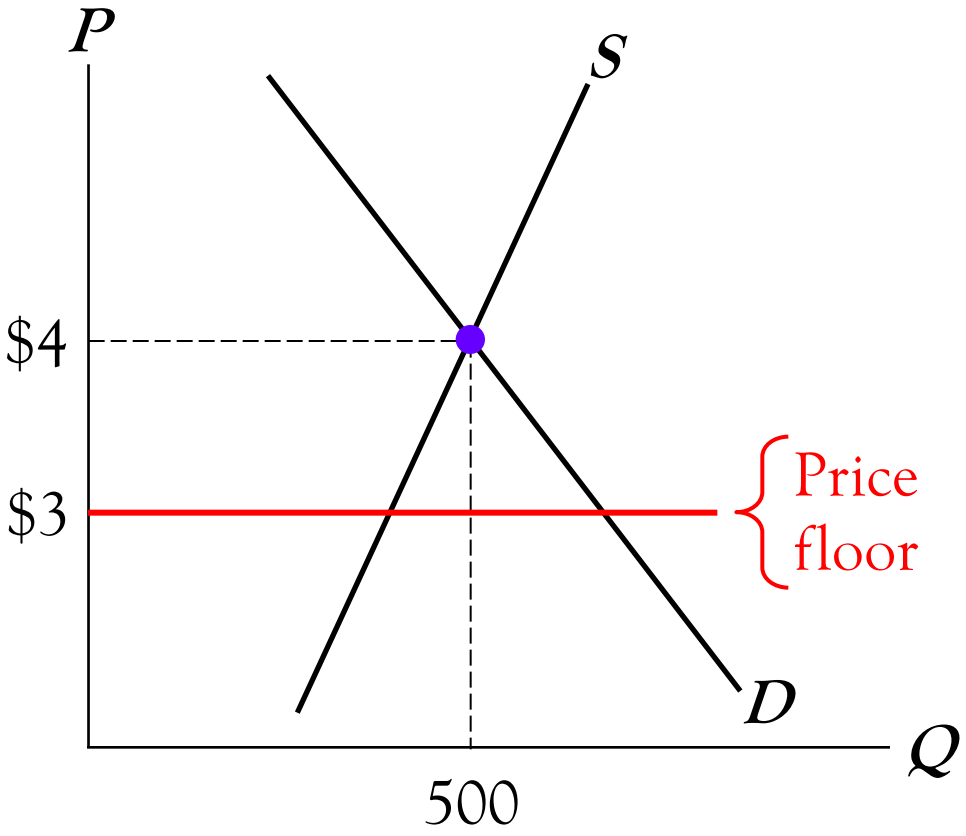
EXAMPLE: The EU's Common Agricultural Policy

Equilibrium
without
price controls



How Price Floors Affect Market Outcomes

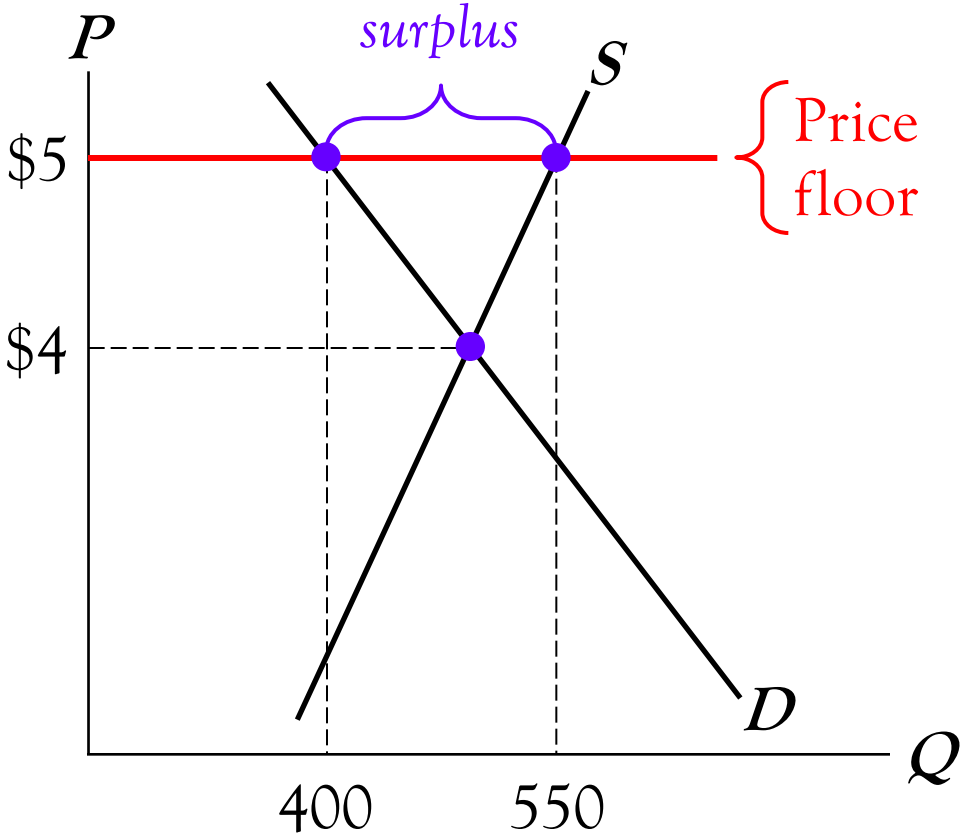
A price floor
below
the equilibrium price
is *not binding* –
it has no effect on
the market outcome.



How Price Floors Affect Market Outcomes

The equilibrium price ($4) is below the price floor and therefore illegal.

The price floor is a *binding* constraint on the price, and causes a **surplus.**



ACTIVE LEARNING *4.1*

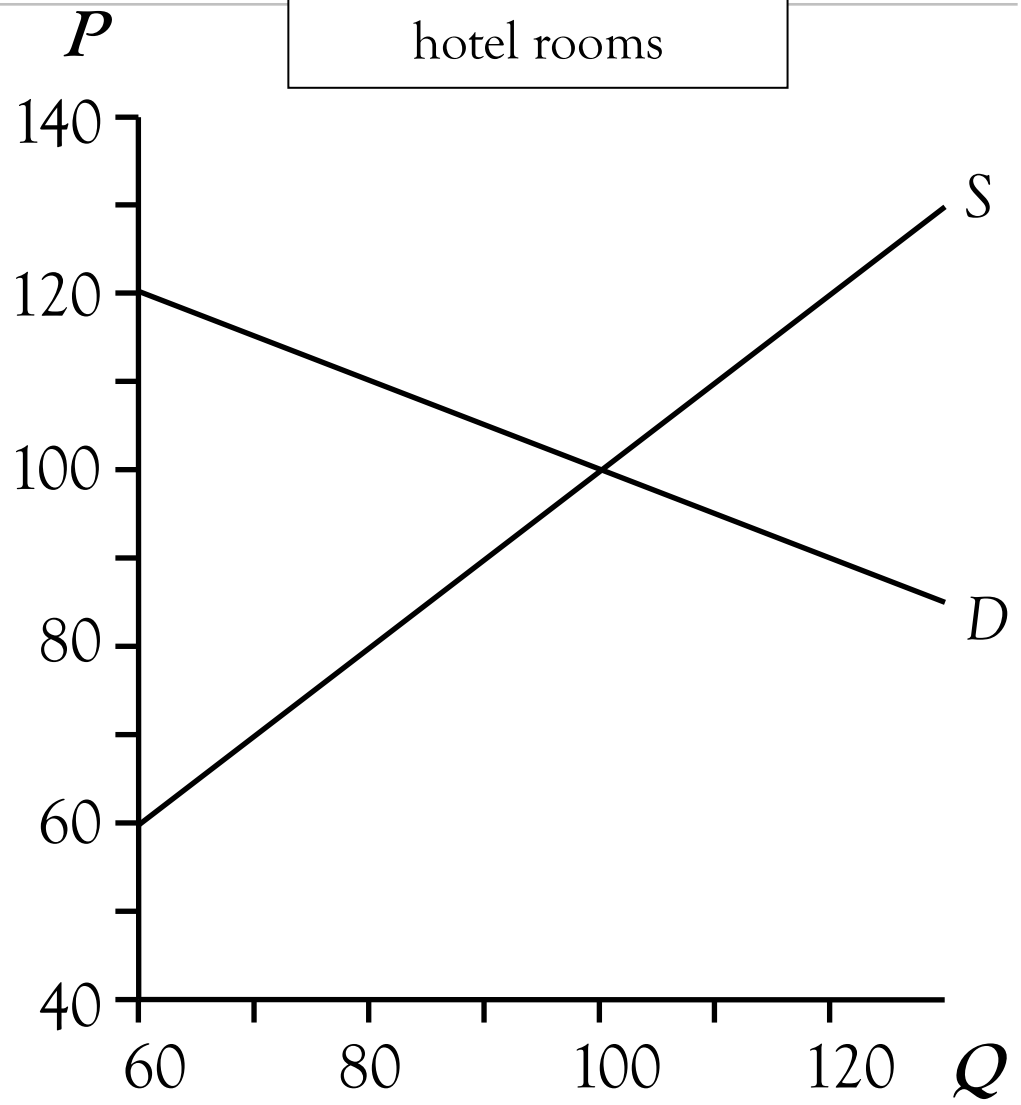
Price Controls

Determine the effects of a:

A. $90 price ceiling

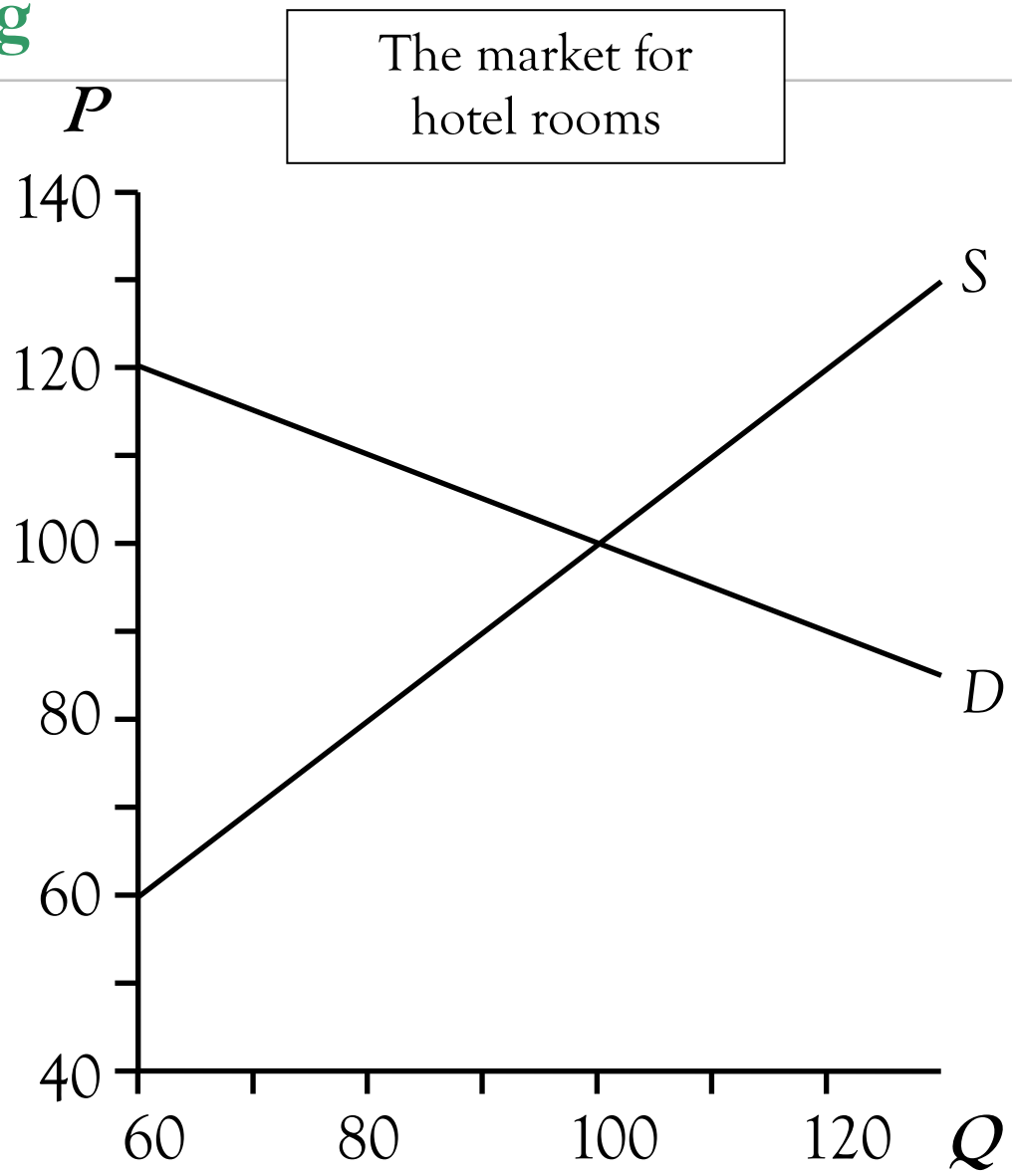
B. $90 price floor

C. $120 price floor



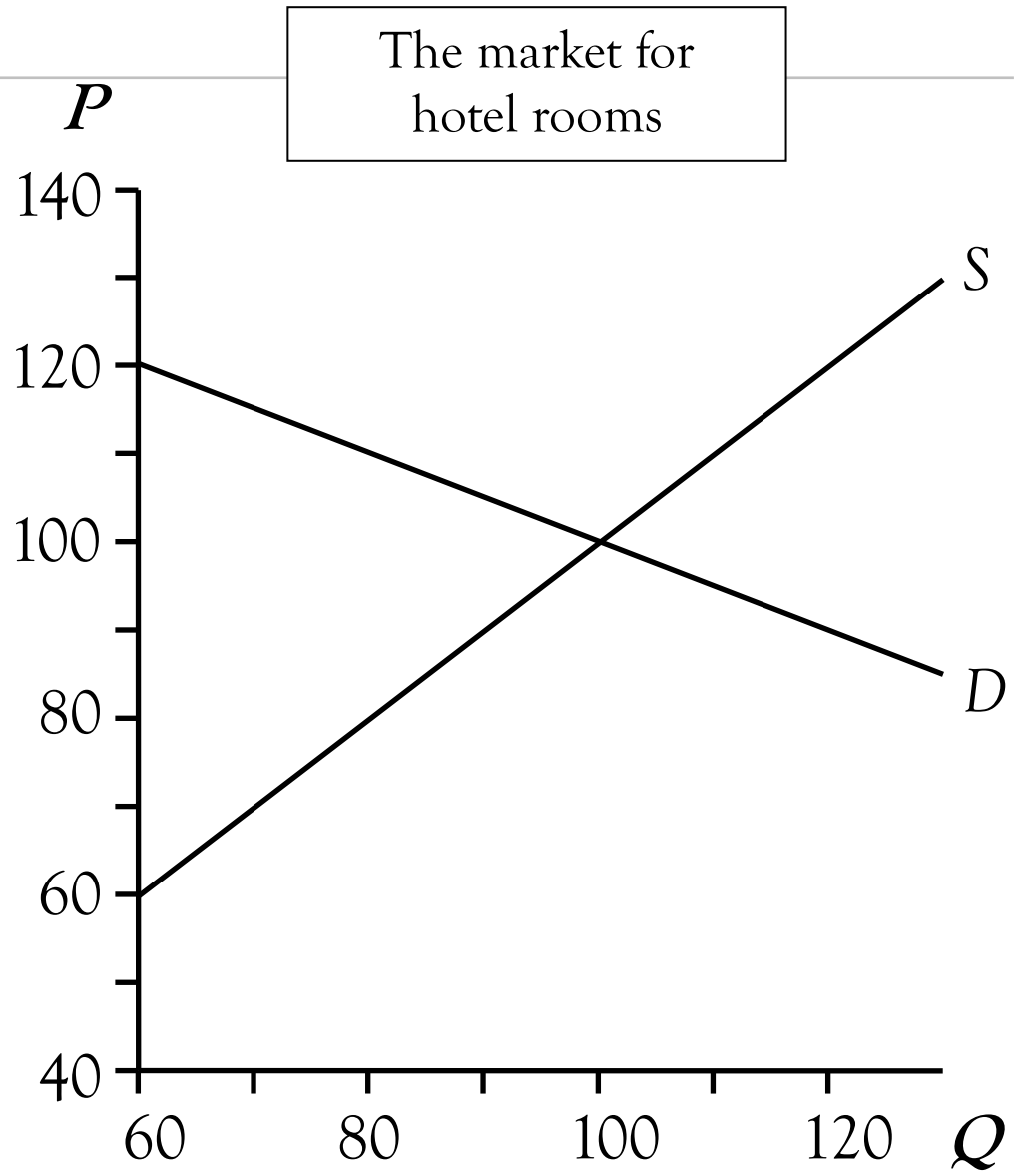
ACTIVE LEARNING *4.1*

A. $90 Price Ceiling



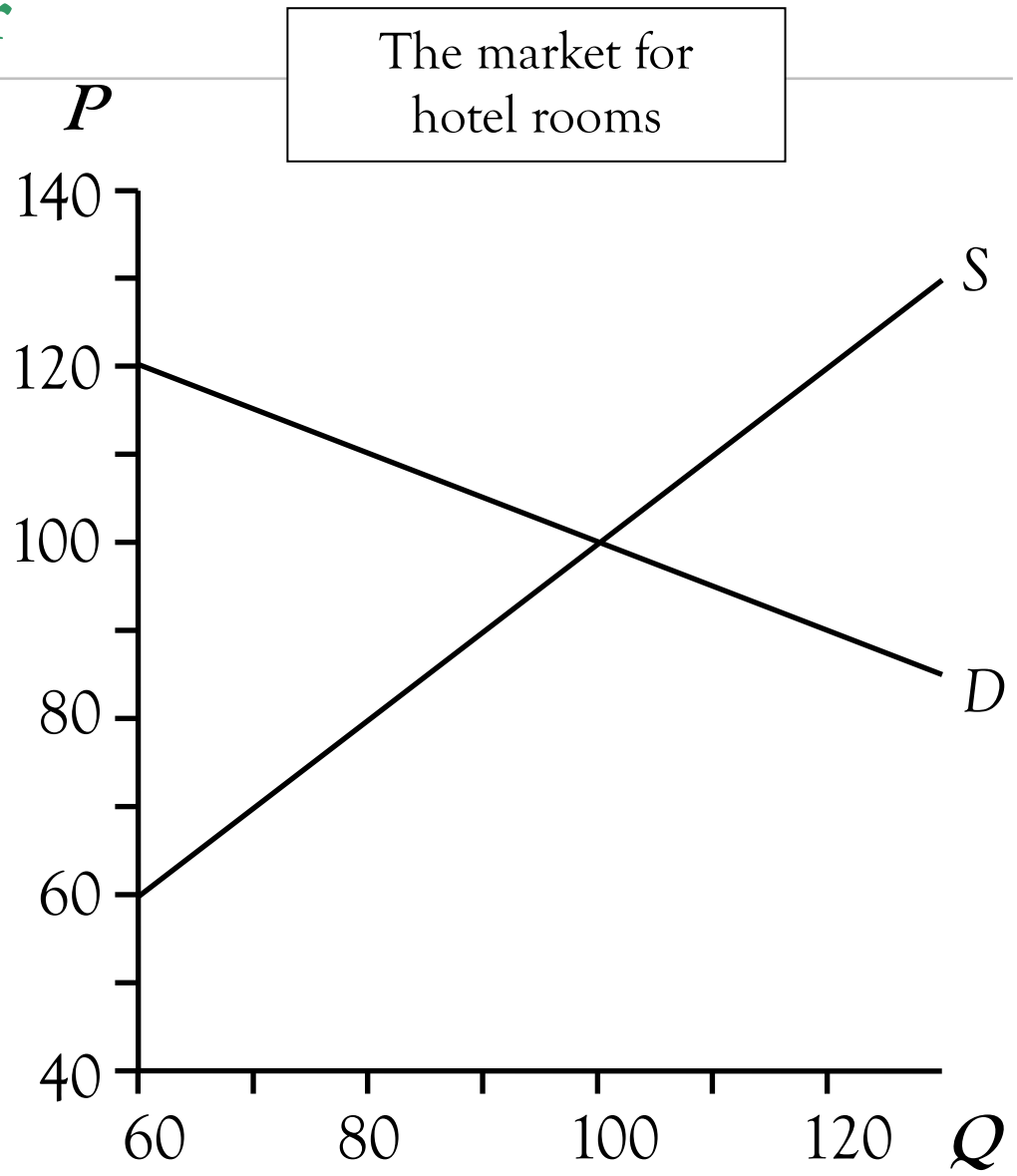
ACTIVE LEARNING *4.1*

B. $90 Price Floor



ACTIVE LEARNING *4.1*

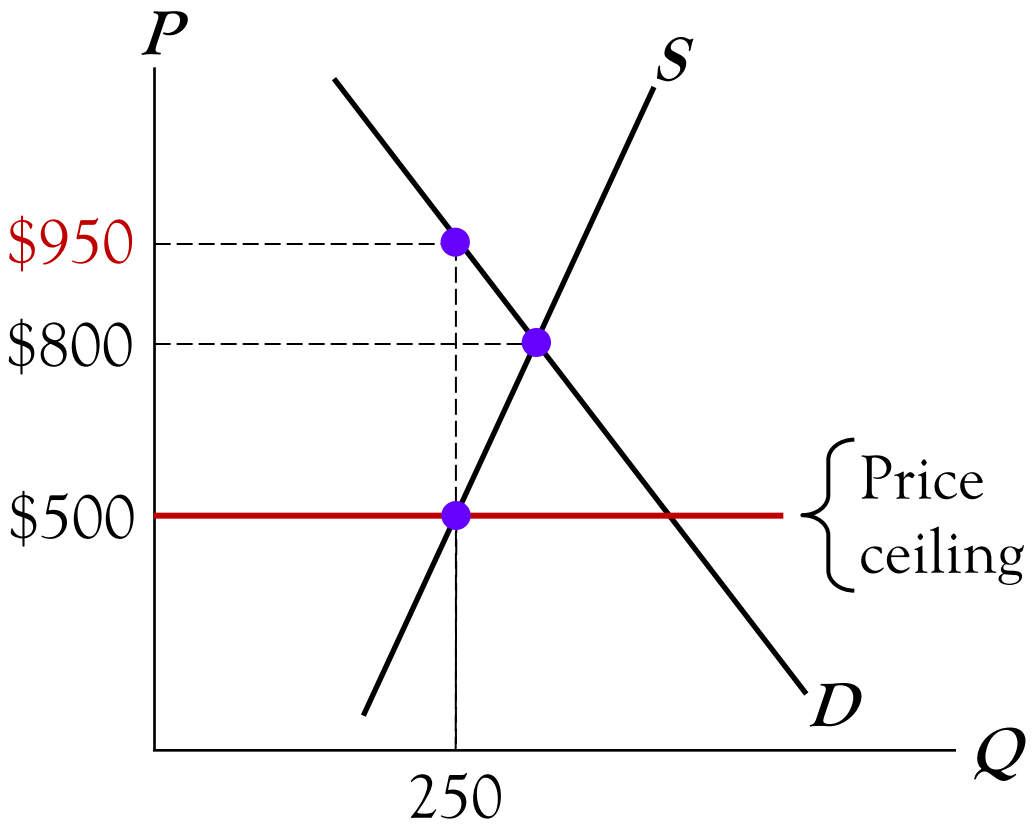
C. $120 Price Floor



Government Intervention in Markets:
The Effects of a Price Ceiling

Black Markets

A price ceiling may result in a **black market,** where goods are sold illegally at prices above the legal ceiling, and typically above the original equilibrium price.



ACTIVE LEARNING *4.2*
Analysis of a Price Ceiling

The market for basketball tickets is described by $Q^S = 100P - 2{,}100$ and $Q^D = 2{,}900 - 100P$. The market equilibrium is $Q = 400$, $P = \$25$.

Suppose the city imposes a $23 price ceiling. A black market develops in which ticket scalpers buy all the available tickets, and sell them at the highest single price the market can bear.

A. Use the supply and demand equations to find the number of tickets available at a price ceiling of $23.

B. Use the supply and/or demand equations to find the black market price set by the ticket scalpers. Show on the graph.

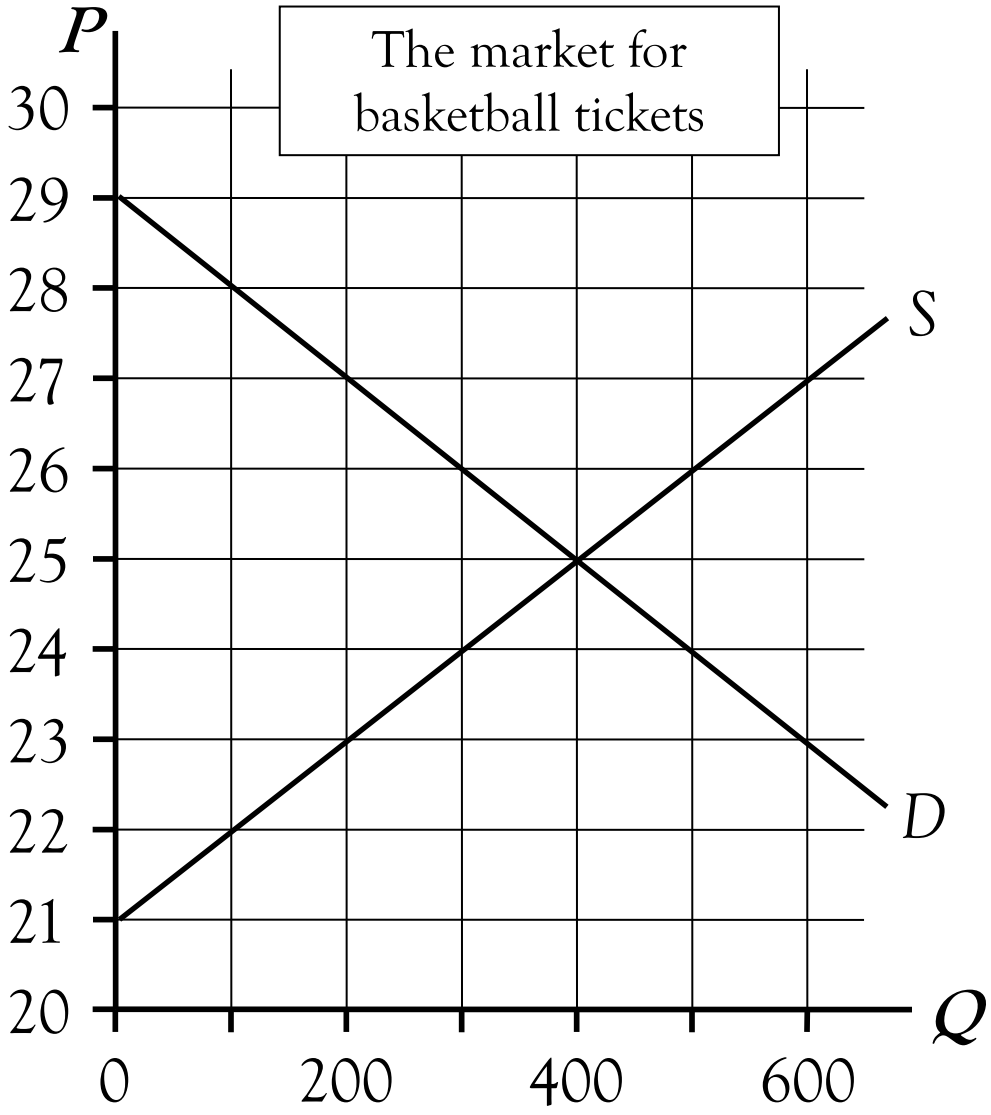
C. Indicate on the graph the consumer surplus, producer surplus, ticket scalpers' profit, and deadweight loss after the imposition of the price ceiling. *(Deadweight loss is the fall in total surplus that results from a market distortion, e.g., price ceiling.)*

ACTIVE LEARNING *4.2*

A. Price ceiling of $23

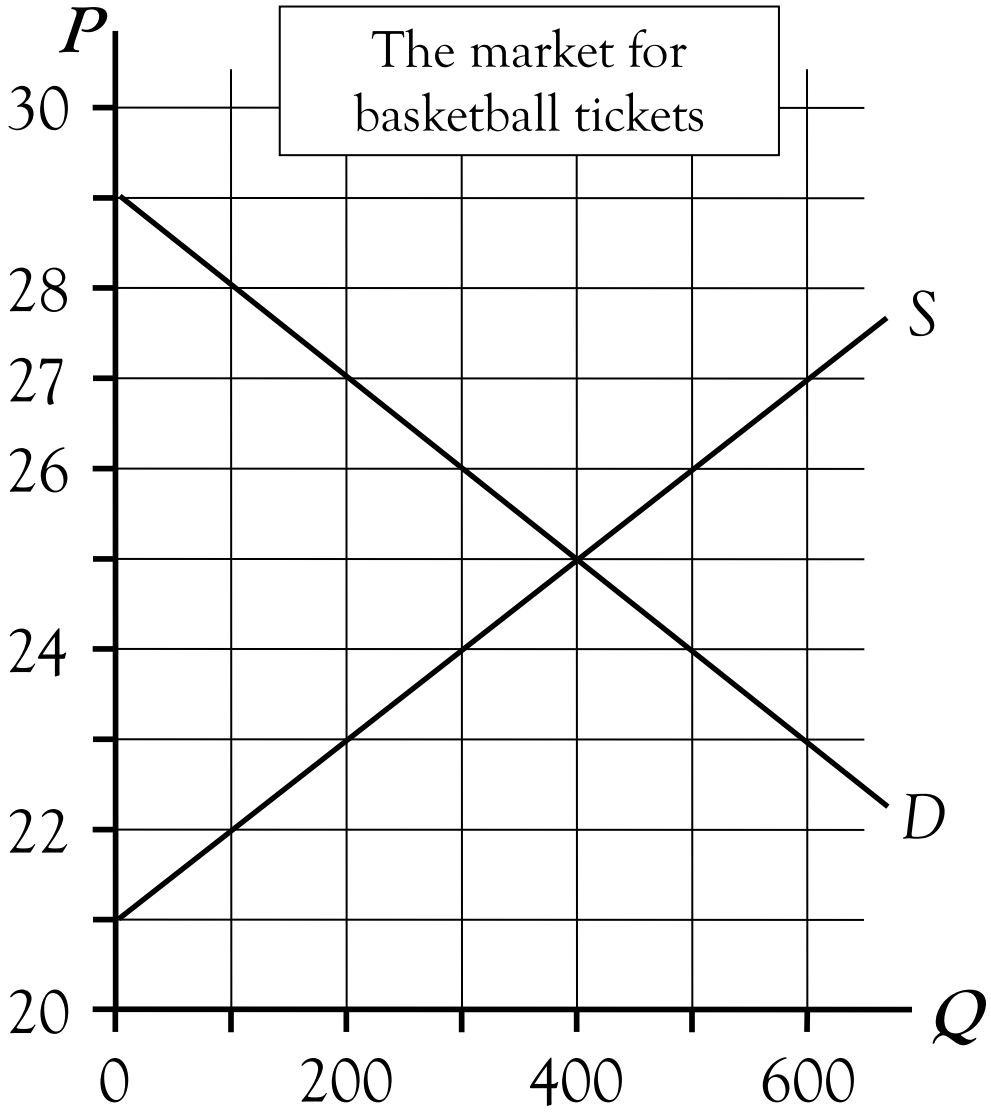
ACTIVE LEARNING *4.2*

B. Black market price



ACTIVE LEARNING *4.2*

C. CS, PS, ticket scalpers' profit, DWL



Government Intervention in Markets:
The Effects of a Price Floor

ACTIVE LEARNING *4.3*
Analysis of a Price Floor

The market for basketball tickets is described by $Q^S = 100P - 2{,}100$ and $Q^D = 2{,}900 - 100P$. The market equilibrium is $Q = 400$, $P = \$25$.

Suppose the city is concerned about basketball teams' profits, and imposes a $27 price floor.

A. How many tickets are supplied? How many tickets are demanded? How many tickets are bought and sold?

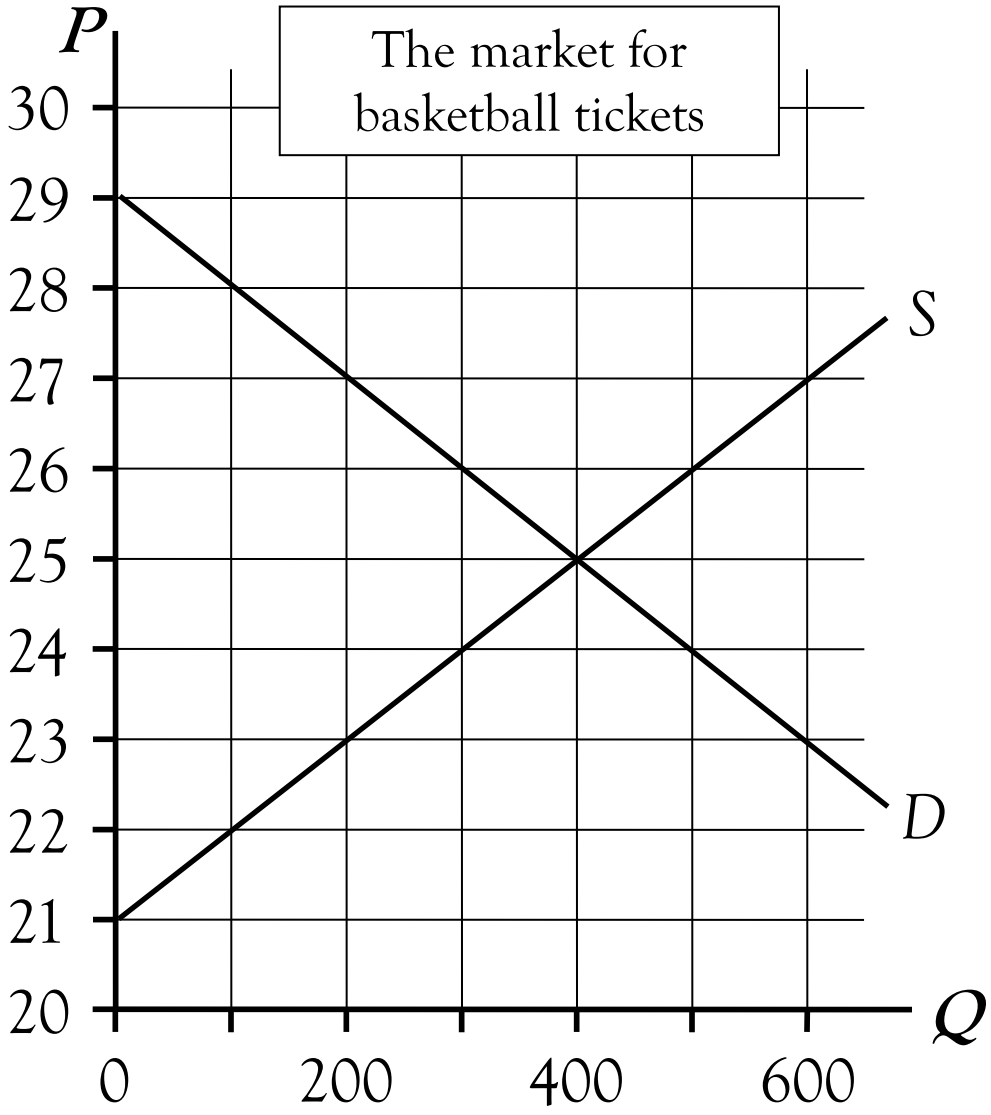
B. Indicate on the graph the consumer surplus, producer surplus, and deadweight loss after the imposition of the price floor. *(Deadweight loss is the fall in total surplus that results from a market distortion, e.g., price floor.)*

ACTIVE LEARNING *4.3*

A. Price floor of $27

ACTIVE LEARNING *4.3*

B. CS, PS, DWL



ACTIVE LEARNING *4.4*
Price Floor

Suppose a price floor of $7.00 is imposed on a good. As a result,

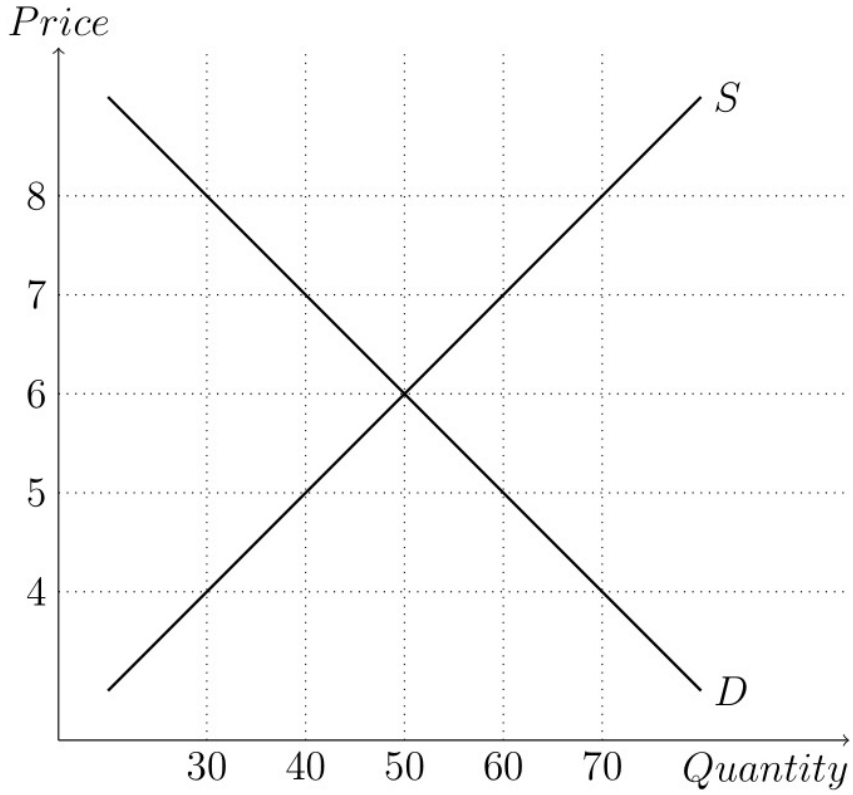
A. sellers' total revenue of the good increases by $10.00.

B. buyers' total expenditure of the good decreases by $20.00.

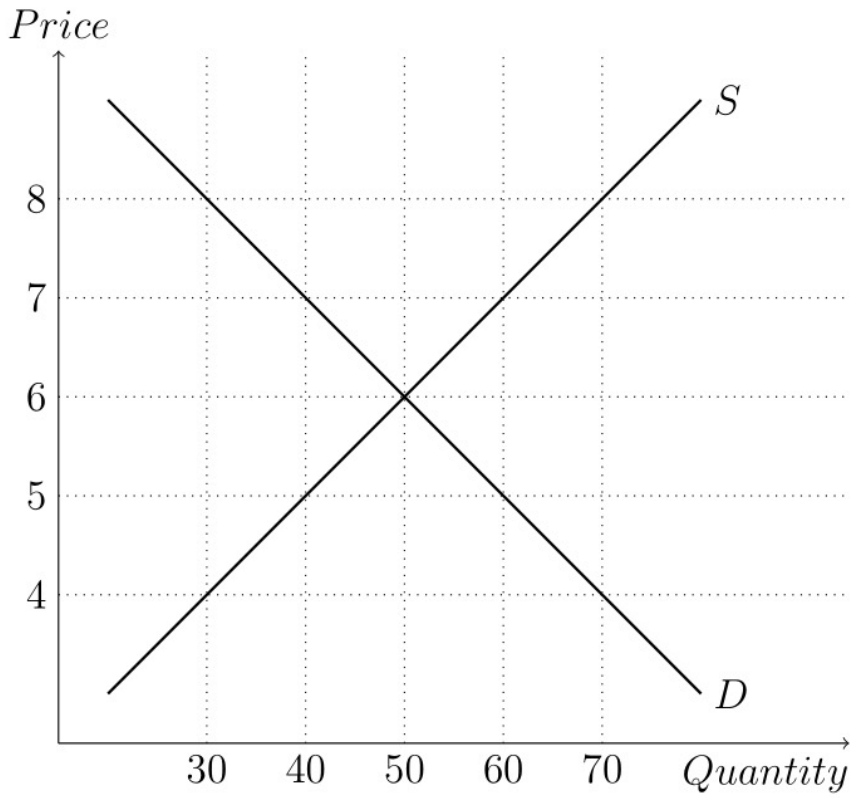
C. the supply curve will shift to the left and pass through the point where $Q = 40$, $P = \$7.00$.

D. the quantity of the good demanded decreases by 20 units.

E. there is a shortage of 20 units.



ACTIVE LEARNING *4.4*
Price Floor



Test Yourself

- A price ceiling is binding if it is _____ the equilibrium price.
- A binding price ceiling leads to a _____, and possibly a _____.

- A price floor is binding if it is _____ the equilibrium price.
- A binding price floor leads to a _____.

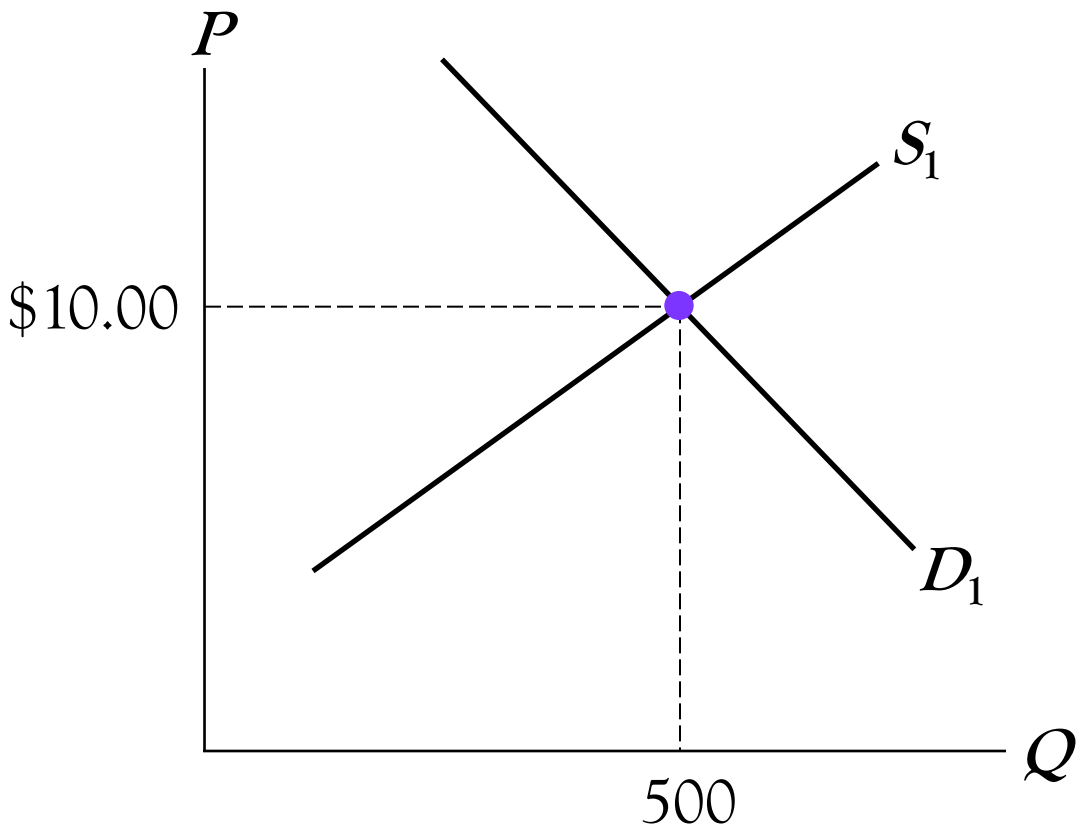
Government Intervention in Markets: Taxes

Taxes

- The government levies taxes on goods and services to raise revenue to pay for national defense, public schools, *etc.*
- The government can make *buyers* or *sellers* pay the tax.
- The tax can be a percent of the good's price, or a specific amount for each unit sold.
  - For simplicity, we analyze per-unit taxes only.

EXAMPLE: The Market for Pizza

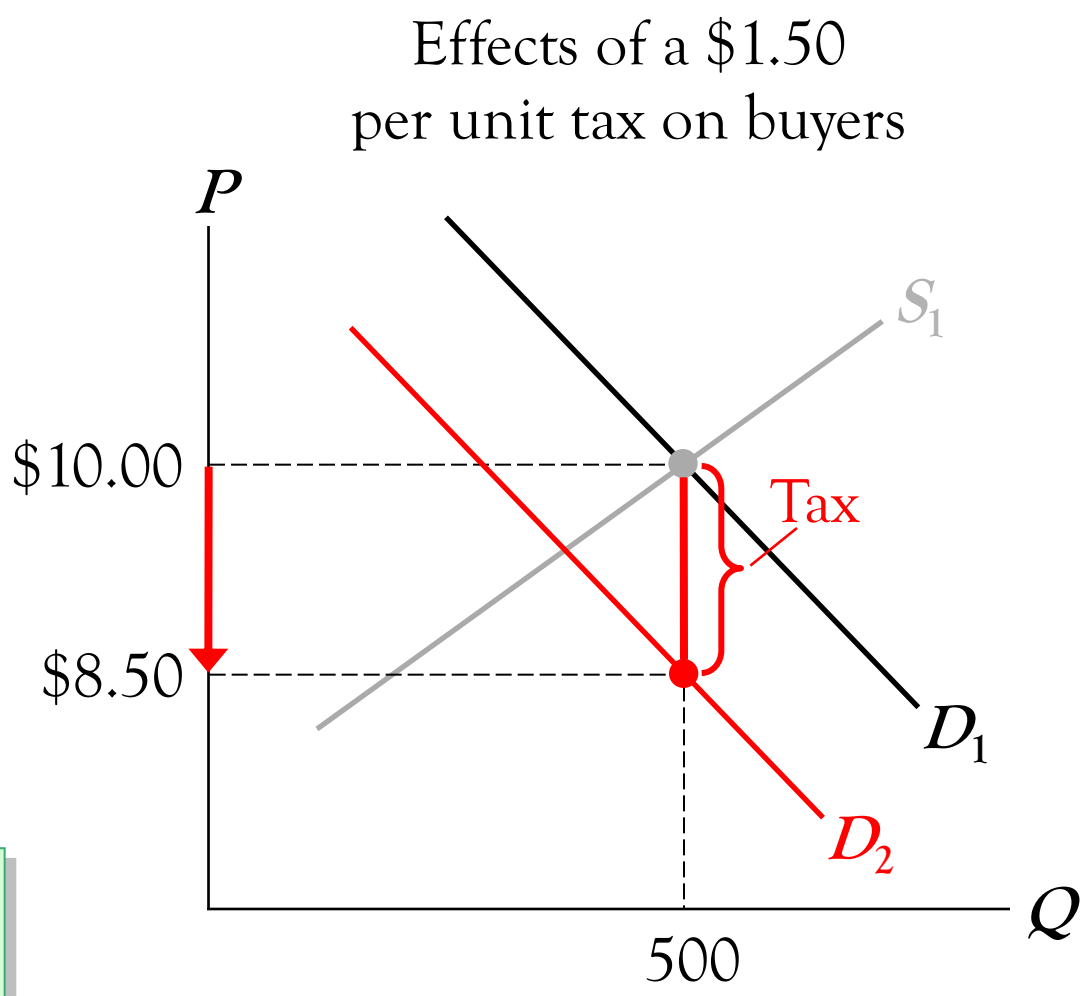
Equilibrium without tax



A Tax on Buyers

The tax effectively raises buyers' expenditure by $1.50 per pizza.

Buyers will buy 500 pizzas only if *P* falls to $8.50 to compensate for the tax hike.



Hence a tax on buyers shifts the *D* curve *down* by the amount of the tax.

A Tax on Buyers

New equilibrium:

$Q = 450$

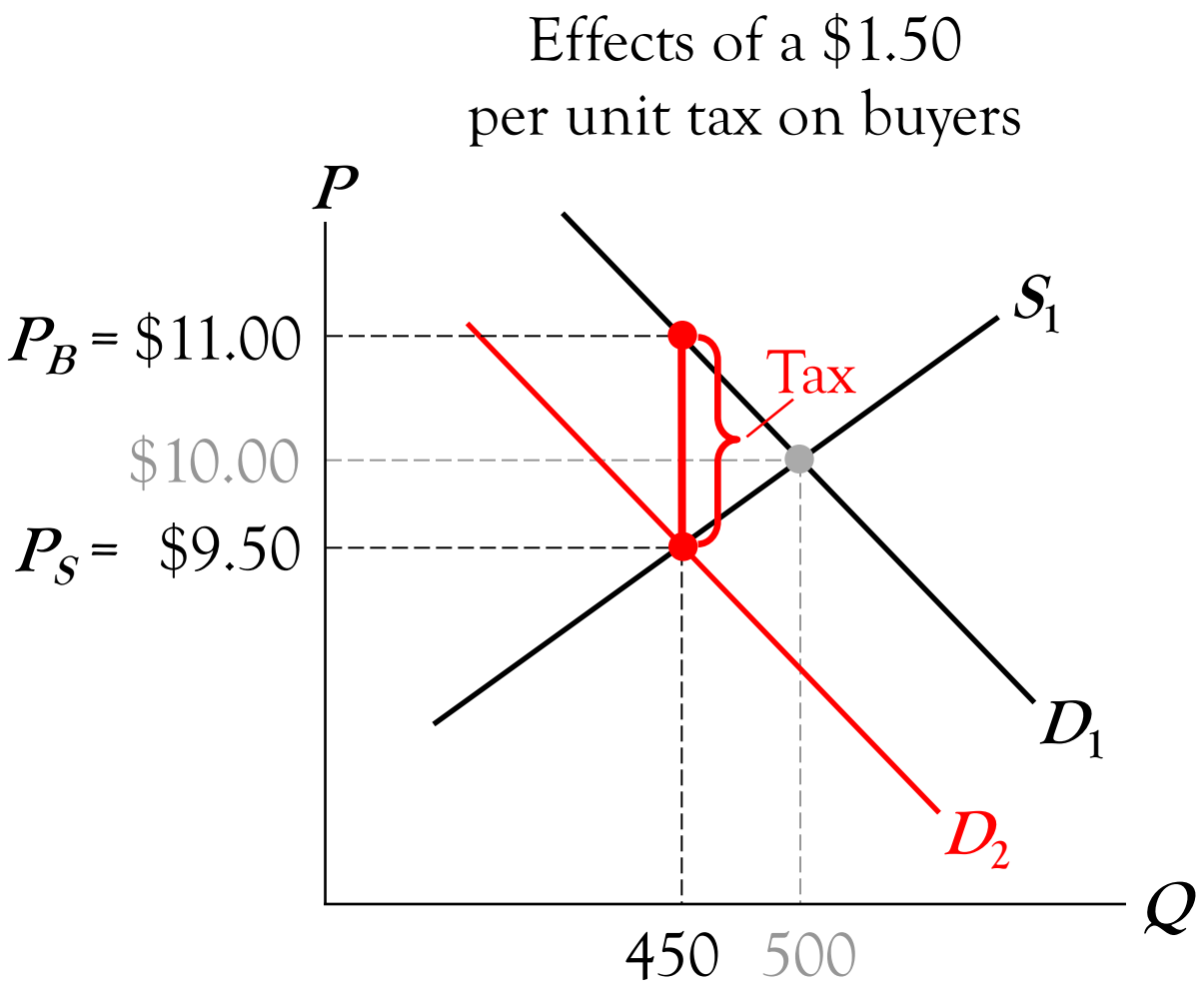
Sellers receive

$P_S = \$9.50$

Buyers pay

$P_B = \$11.00$

Difference between them = \$1.50 = tax



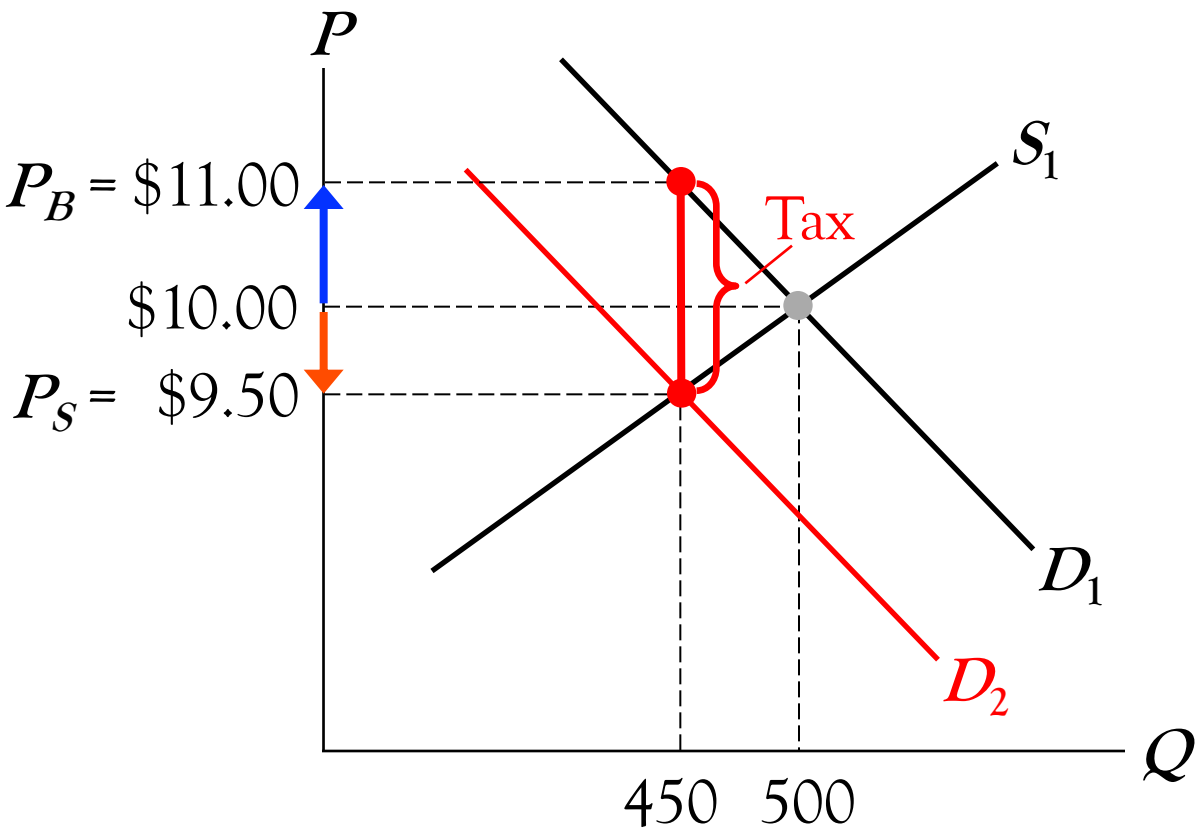
The Incidence of a Tax:

how the burden of a tax is shared between *buyers* and *sellers*

In our example,

buyers pay $1.00 more,

sellers receive $0.50 less.

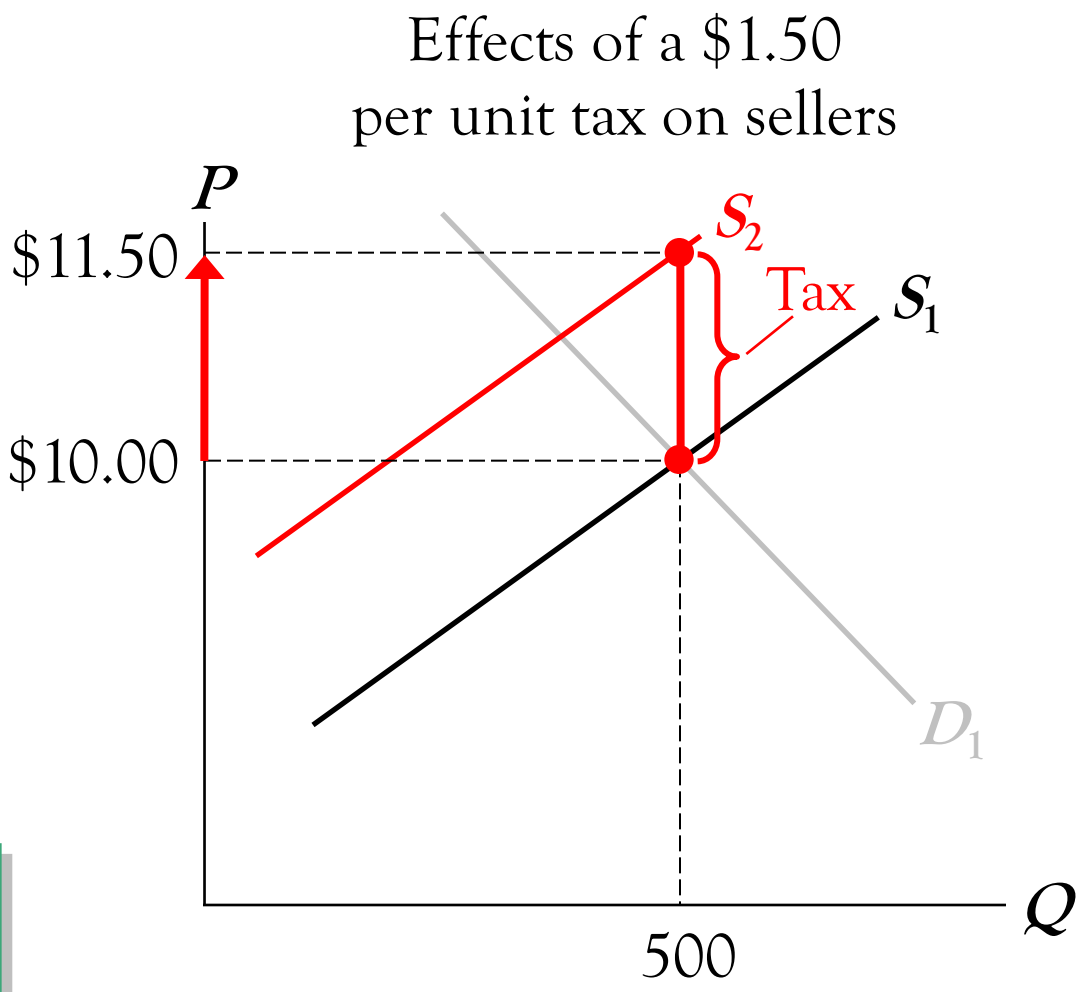


A Tax on Sellers

The tax effectively raises sellers' costs by $1.50 per pizza.

Sellers will supply 500 pizzas only if ***P*** rises to $11.50 to compensate for the cost increase.

Hence a tax on sellers shifts the ***S*** curve *up* by the amount of the tax.



A Tax on Sellers

New equilibrium:

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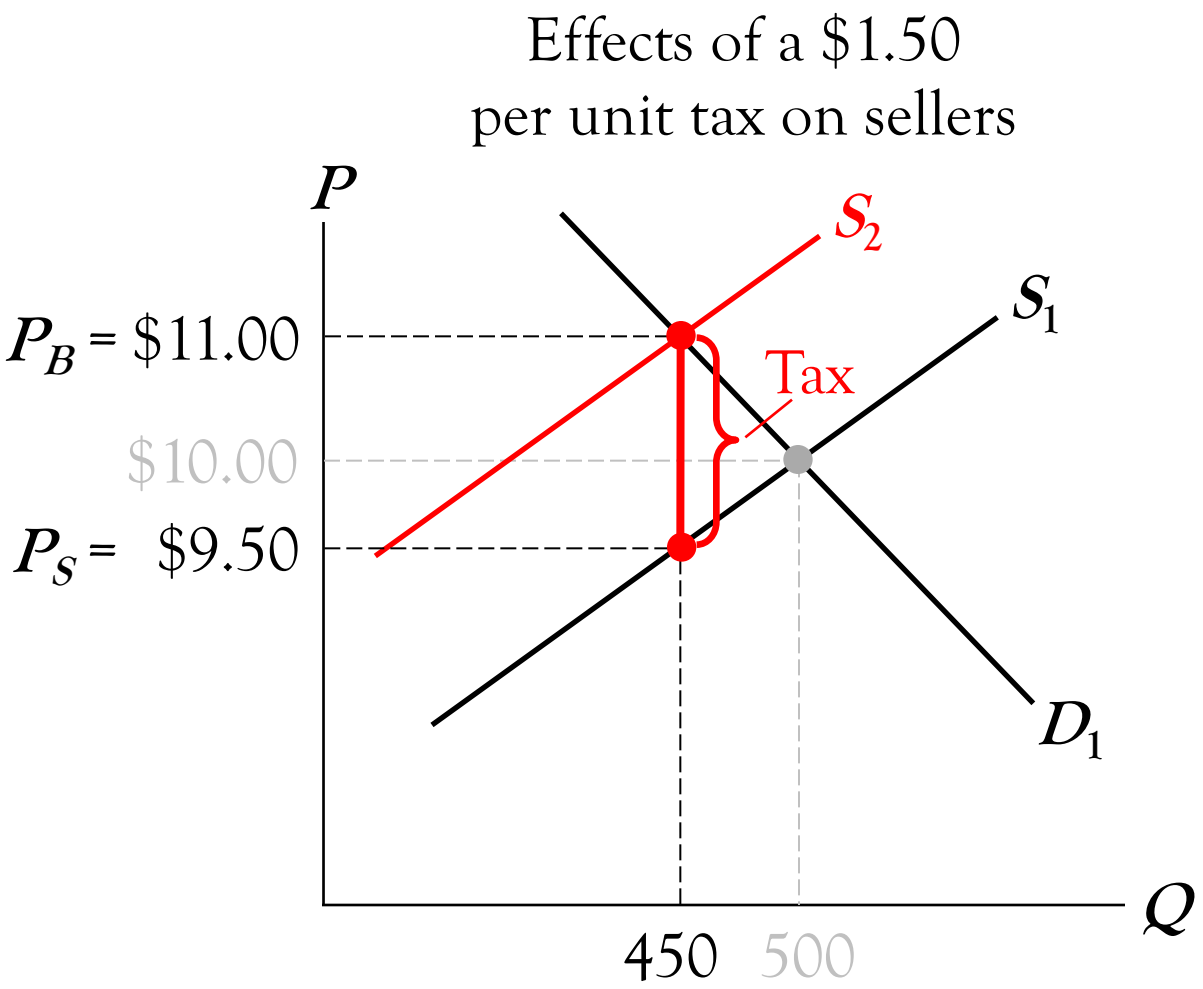
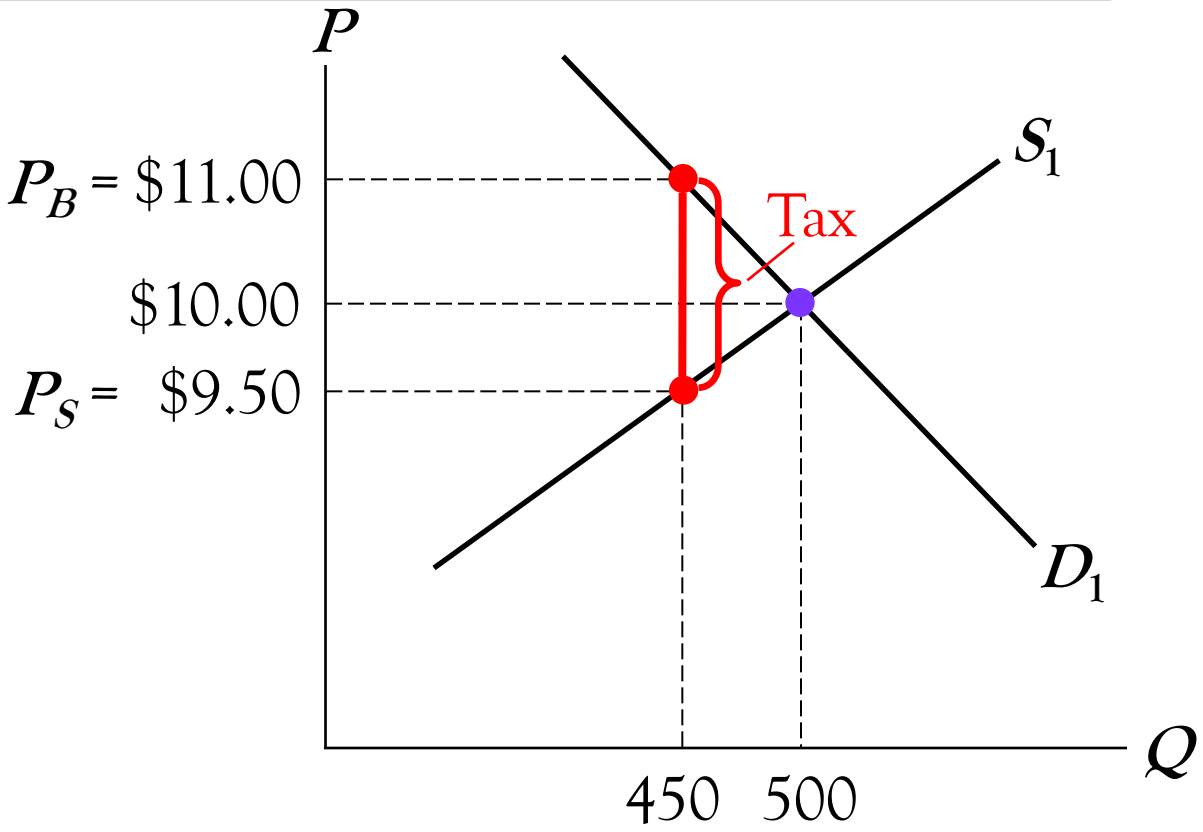


The Outcome Is the Same in Both Cases!

*The effects on **P** and **Q** and the tax incidence are the same whether the tax is imposed on buyers or sellers.*

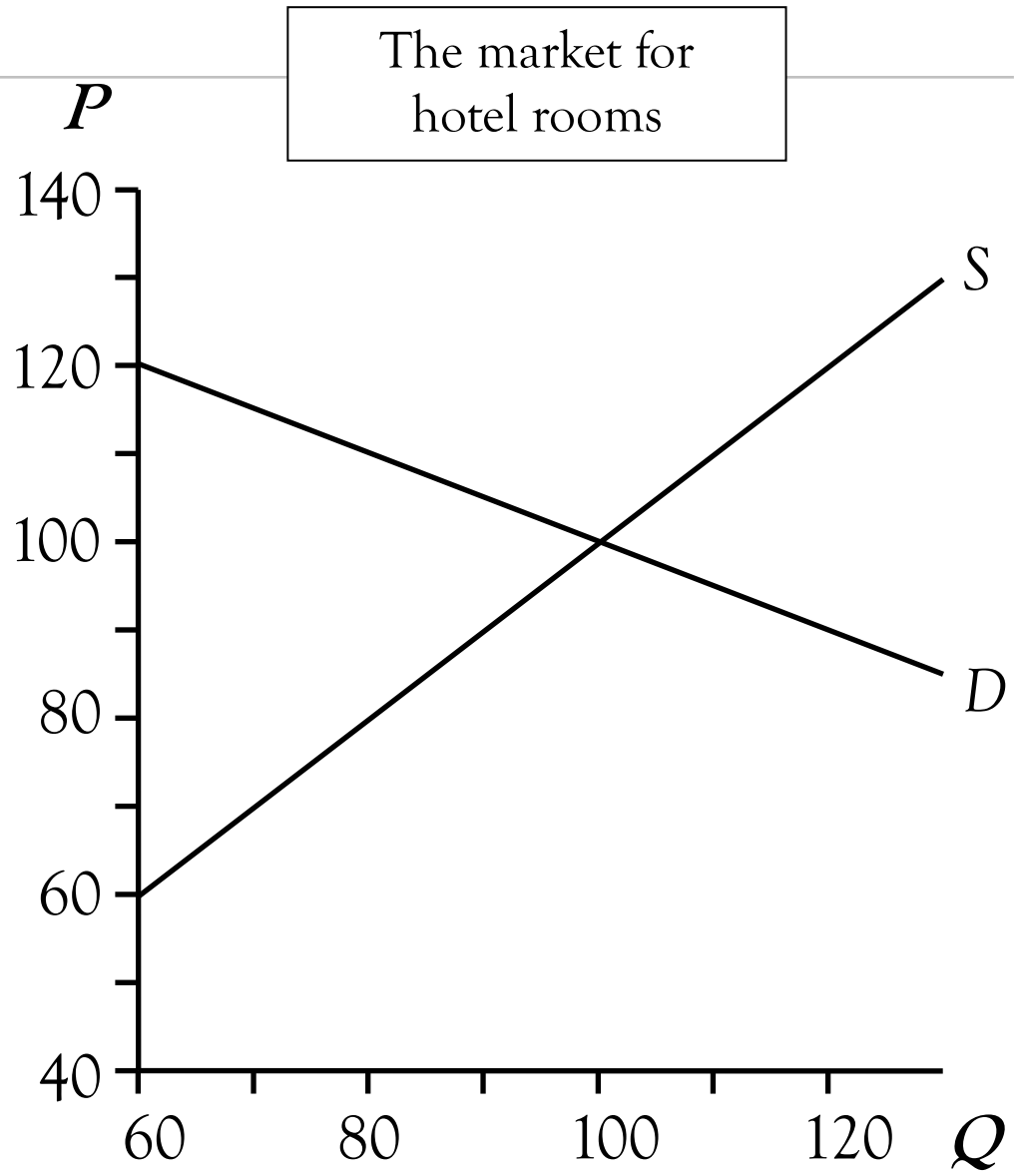
A tax drives a wedge between the price *buyers pay* and the price *sellers receive*.



ACTIVE LEARNING *4.5*

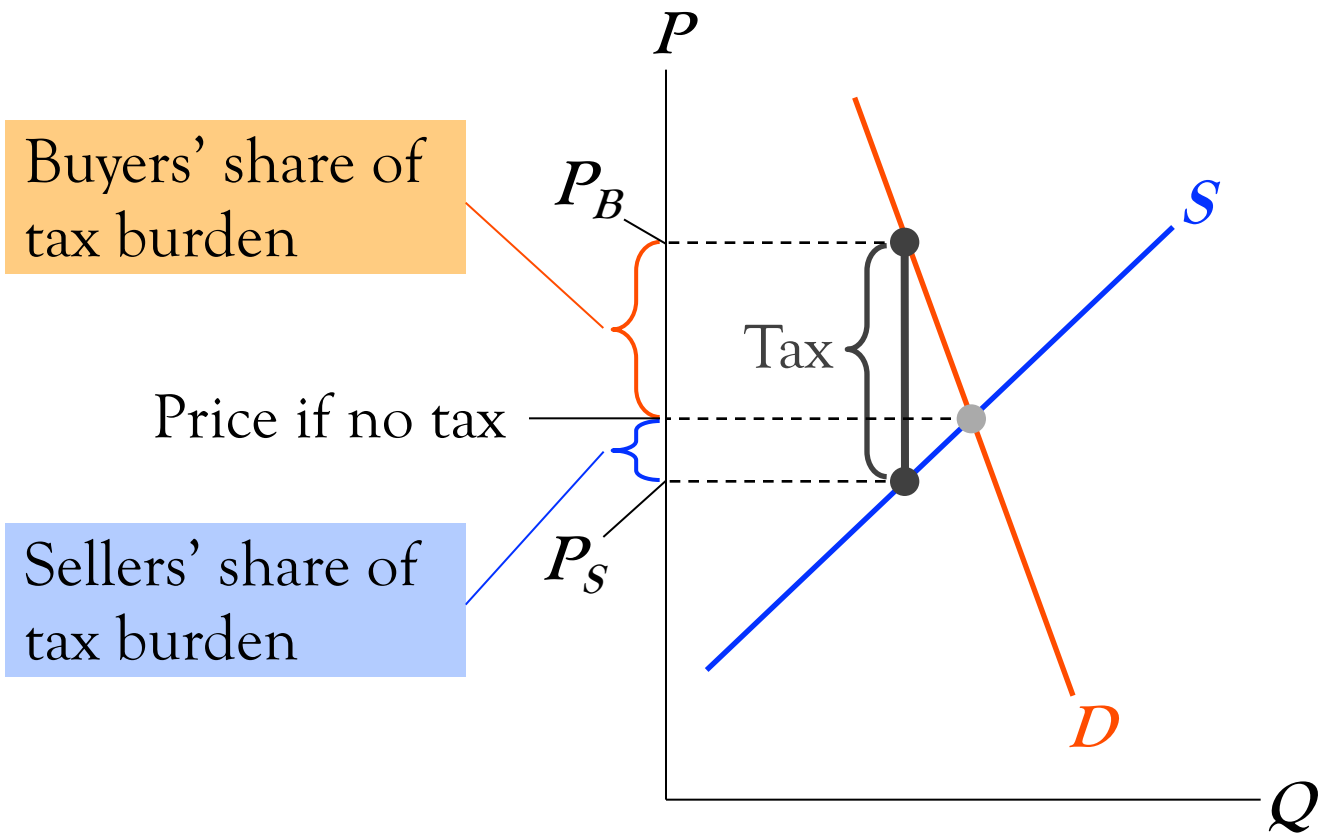
Effects of a Tax

Suppose the government taxes buyers $30 per room. Find the new Q, P_B, P_S, and tax incidence.



Elasticity and Tax Incidence

Case 1: Supply is more elastic than demand.

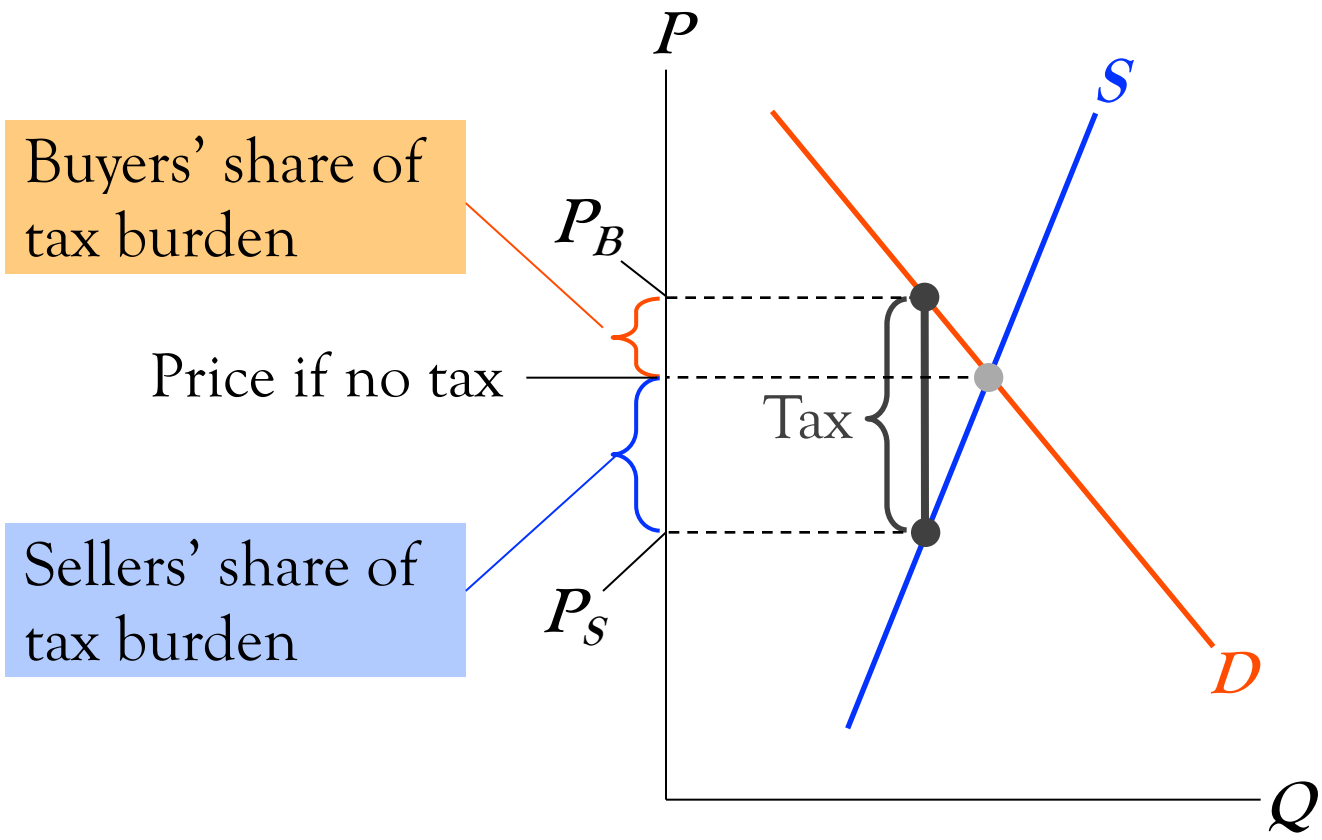


It's easier for *sellers* than for *buyers* to leave the market.

So *buyers* bear most of the burden of the tax.

Elasticity and Tax Incidence

Case 2: Demand is more elastic than supply.



It's easier for *buyers* than for *sellers* to leave the market.

So *sellers* bear most of the burden of the tax.

Government Intervention in Markets:
The Effects of a Tax

The Effects of a Tax

- We apply welfare economics to measure the gains and losses from a tax.
- We determine **consumer surplus (CS), producer surplus (PS), tax revenue,** and **total surplus** with and without the tax.
- Tax revenue can fund beneficial services (*e.g.*, education, roads, police) so we include it in total surplus.

The Effects of a Tax

Equilibrium with no tax:

Price = P_E

Quantity = Q_E

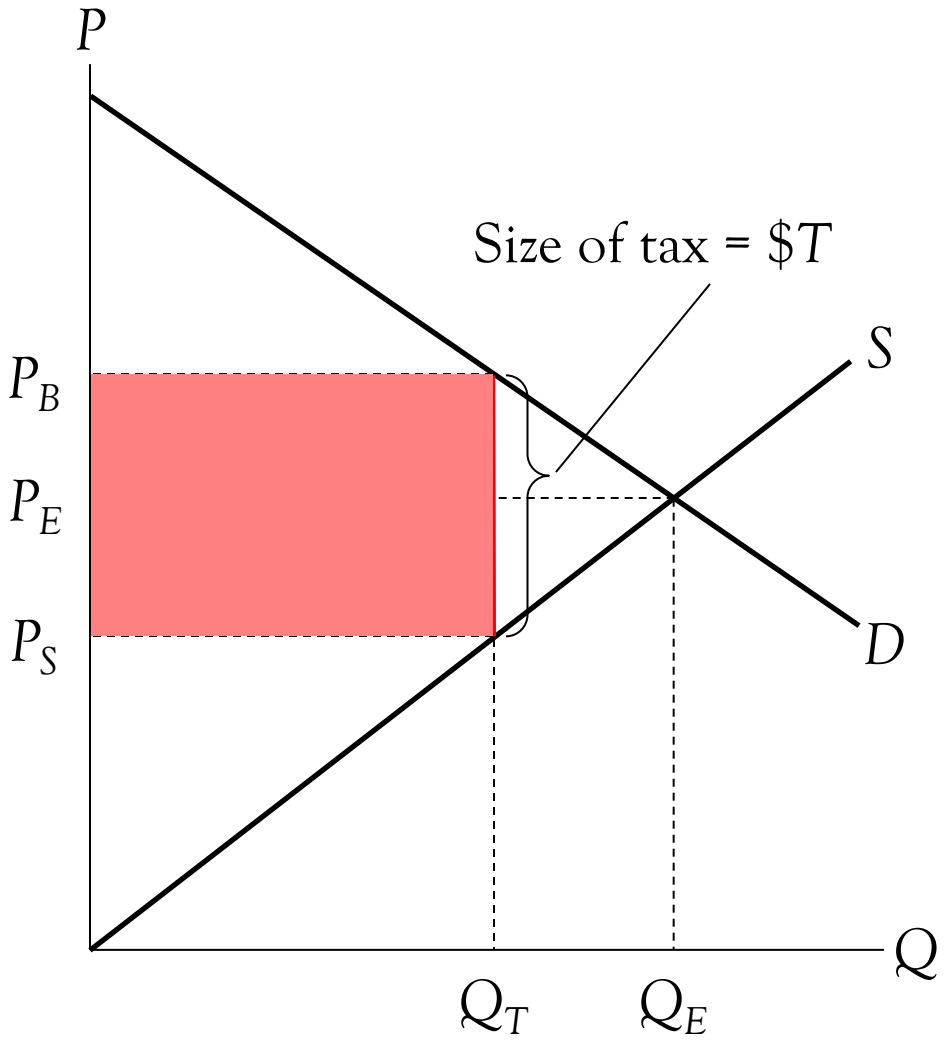
Equilibrium with tax = $\$T$ per unit:

Buyers pay P_B

Sellers receive P_S

Quantity = Q_T

Tax revenue = $\$T$ x Q_T



The Effects of a Tax

Without a tax:

CS = A + B + C

PS = D + E + F

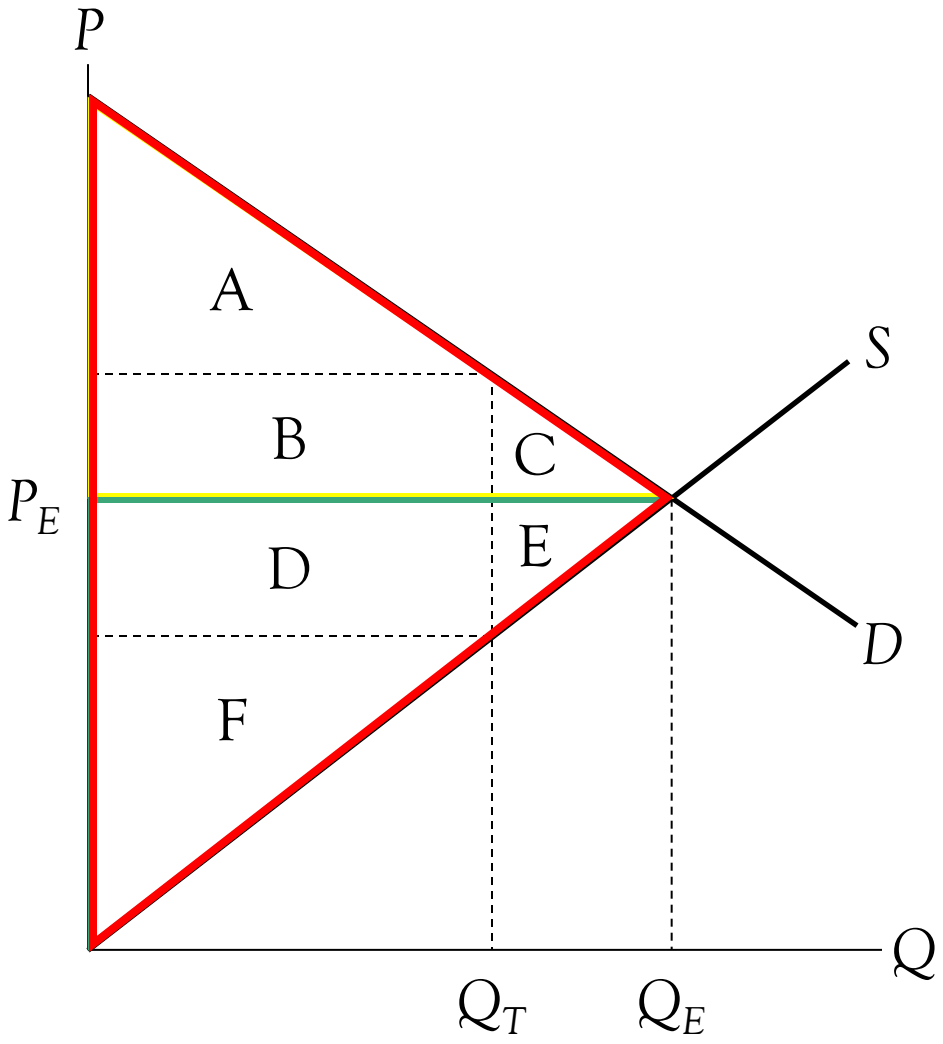
Tax Revenue (TR)

= 0

Total Surplus

= CS + PS + TR

= A + B + C
+ D + E + F



The Effects of a Tax

With a tax:

CS = A

PS = F

Tax Revenue (TR)

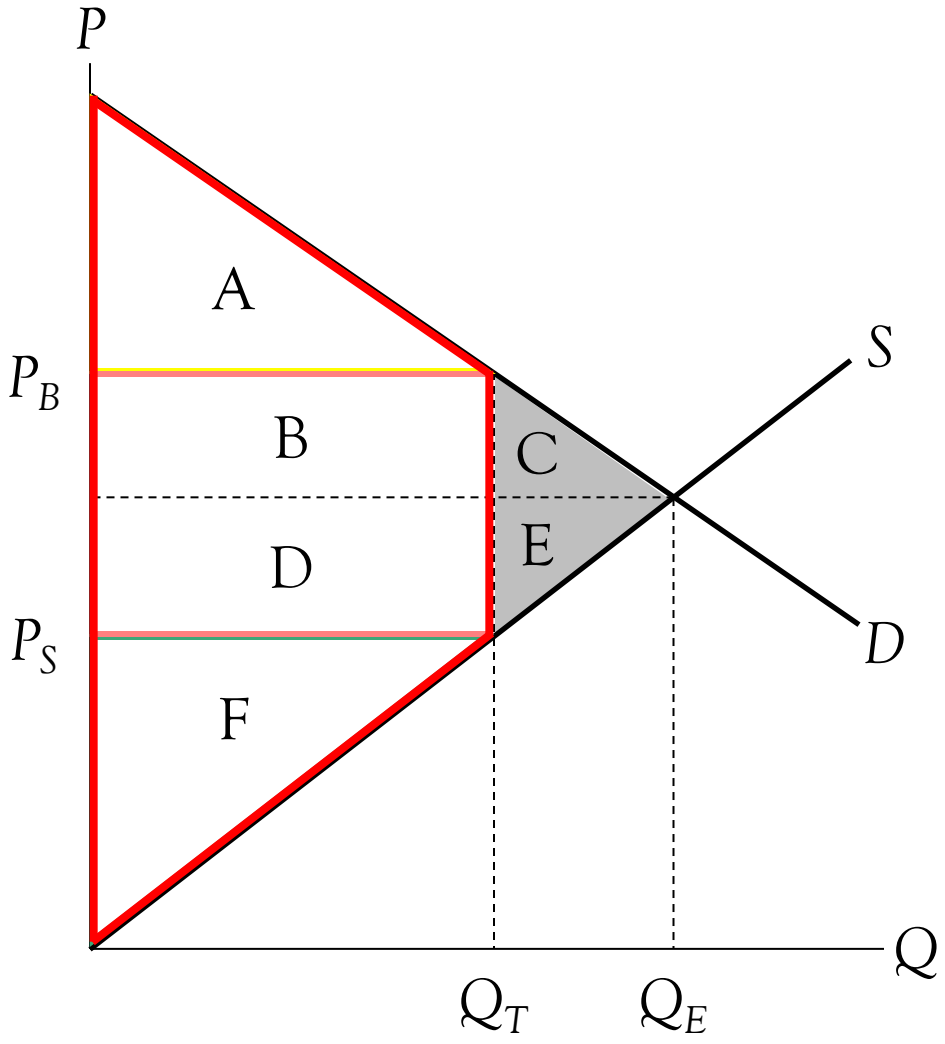
= B + D

Total Surplus

= CS + PS + TR

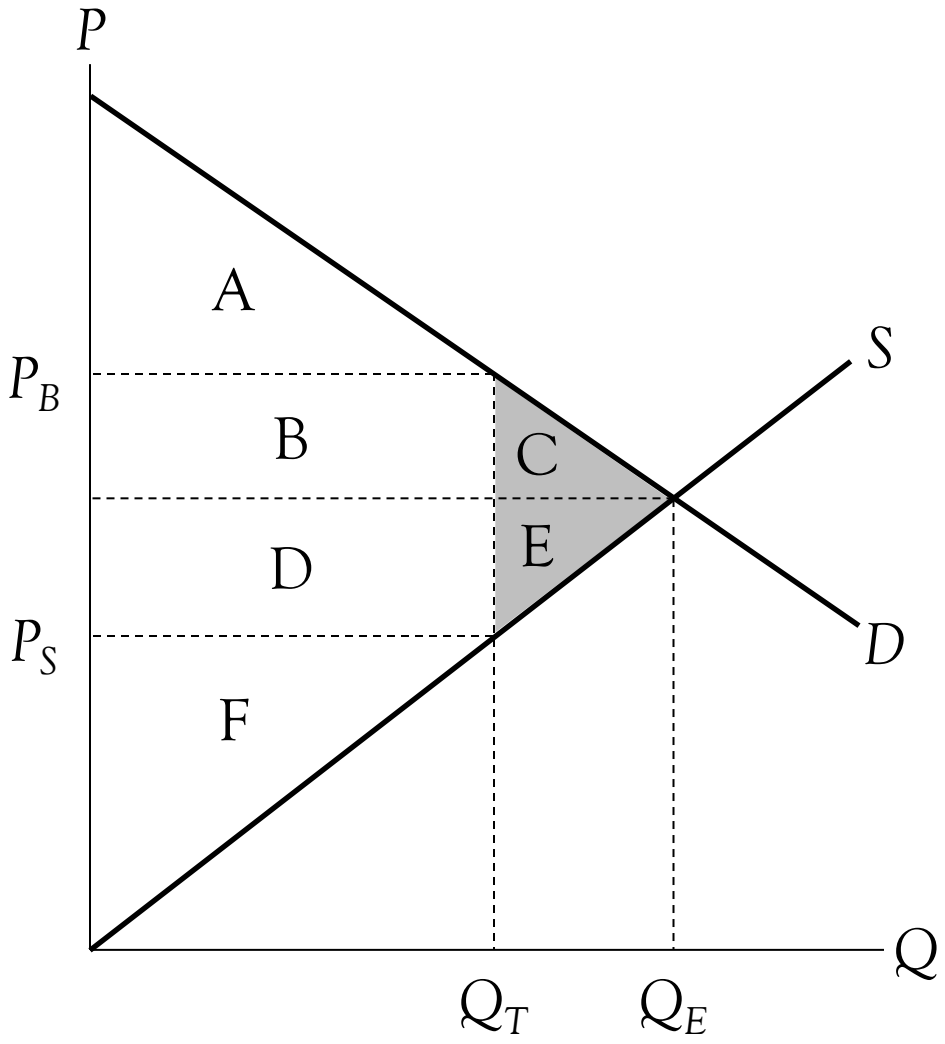
= A + B + D + F

The tax reduces total surplus by C + E.



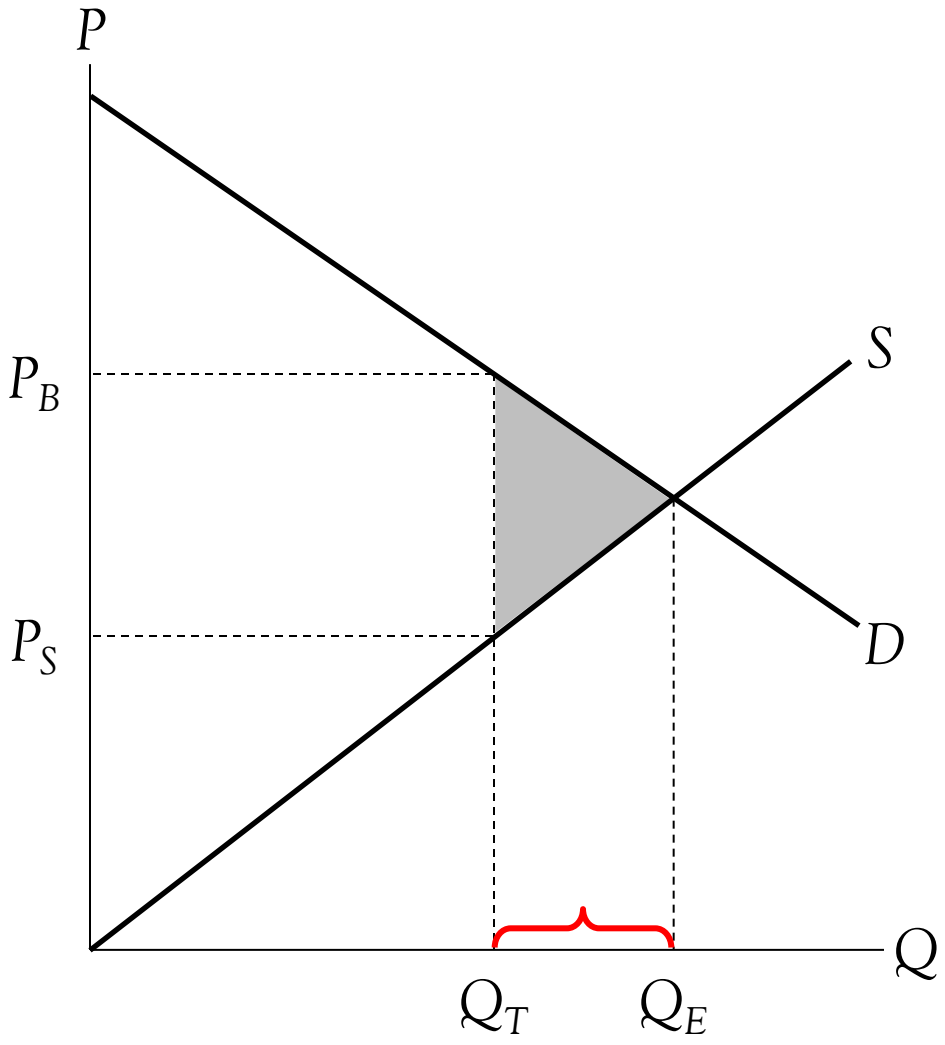
Deadweight Loss (DWL)

C + E is called the **deadweight loss (DWL)** of the tax – the *fall* in total surplus that results from a market distortion such as a tax.



Deadweight Loss (DWL)

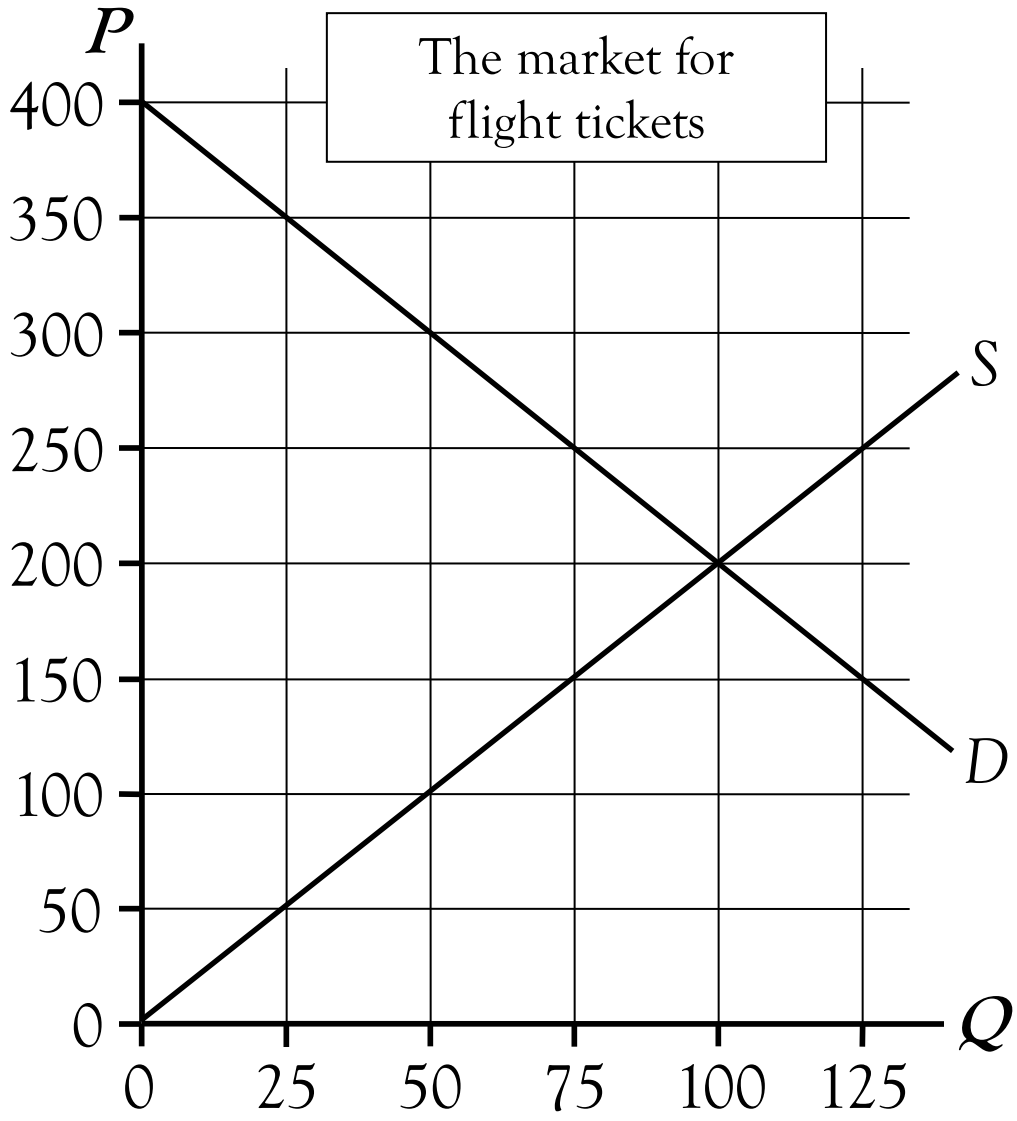
Because of the tax,
the units between
Q_T and Q_E are not sold.
The **value** of these units
to buyers
is *greater* than
the **cost** of producing
them;
the tax prevents
some mutually
beneficial trades.



ACTIVE LEARNING *4.6*
Analysis of a Tax

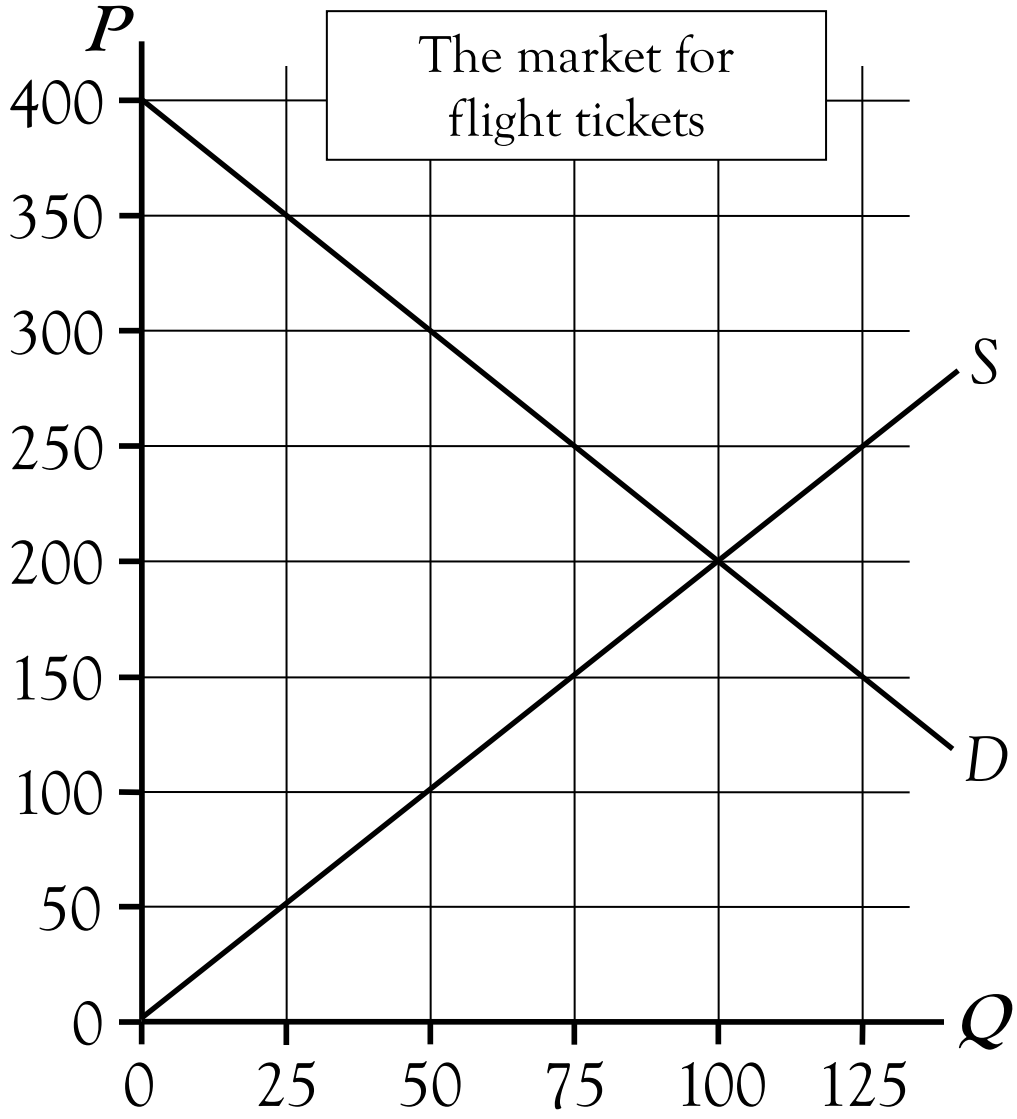
A. Indicate on the graph CS, PS, and total surplus without a tax.

B. Suppose there is a $100 tax per ticket. Indicate on the graph CS, PS, tax revenue, total surplus, and DWL.



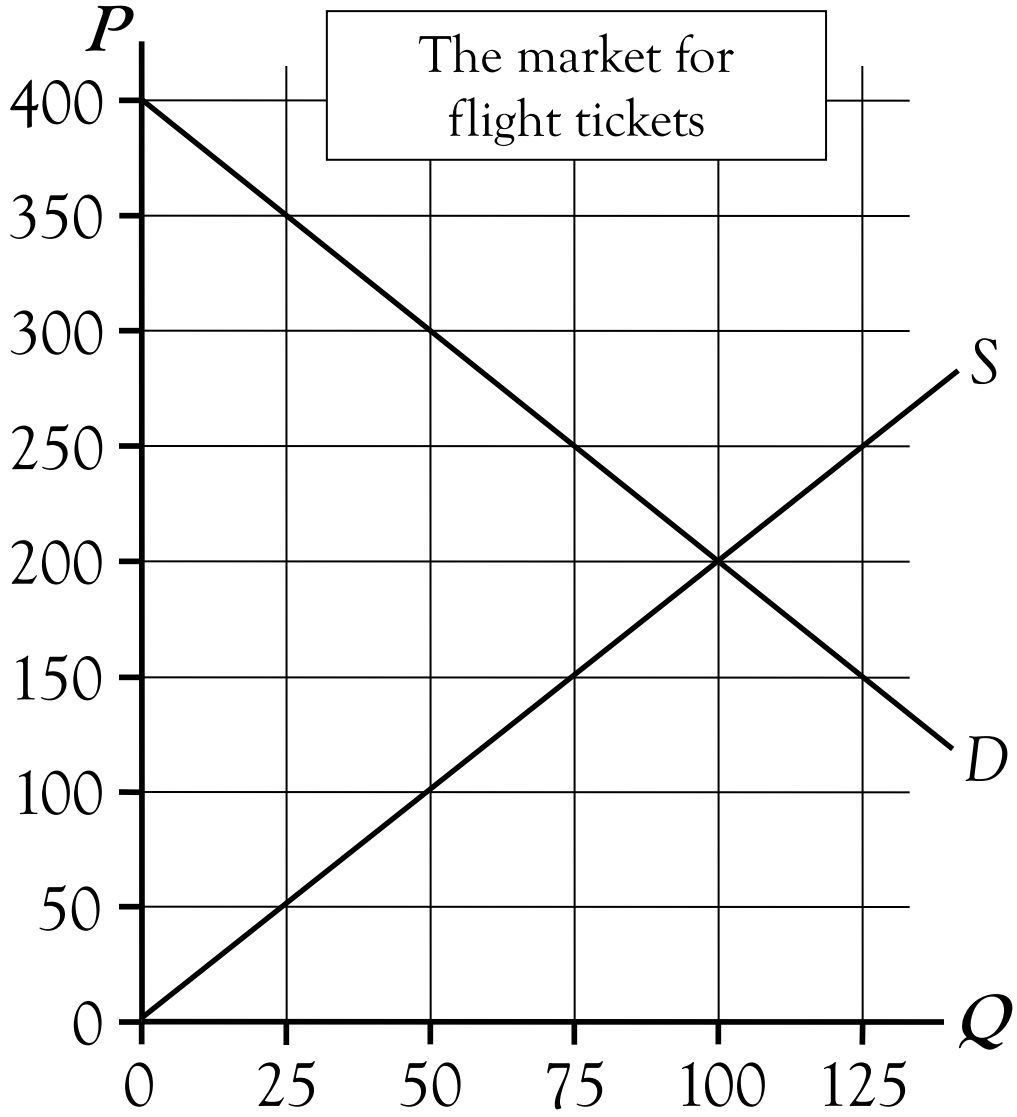
ACTIVE LEARNING *4.6*

A. Without a Tax



ACTIVE LEARNING *4.6*

B. With a $100 Tax



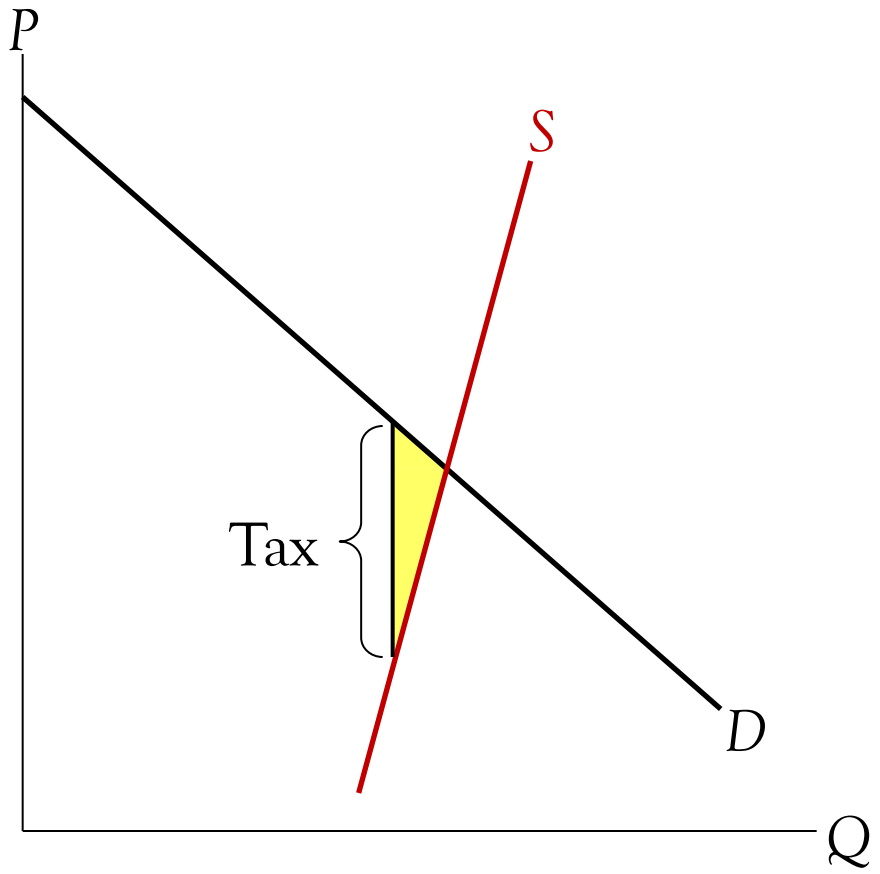
What Determines the Size of the DWL?

- Which goods or services should the government tax to raise the revenue it needs?
- *One answer:* The goods or services with the *smallest* DWL.

- What determines the size of the DWL?
  The price *elasticities* of supply and demand.
- *Recall:* The **price elasticity of demand** (or **supply**) measures how much Q^D *(or* Q^S*)* changes when P changes.

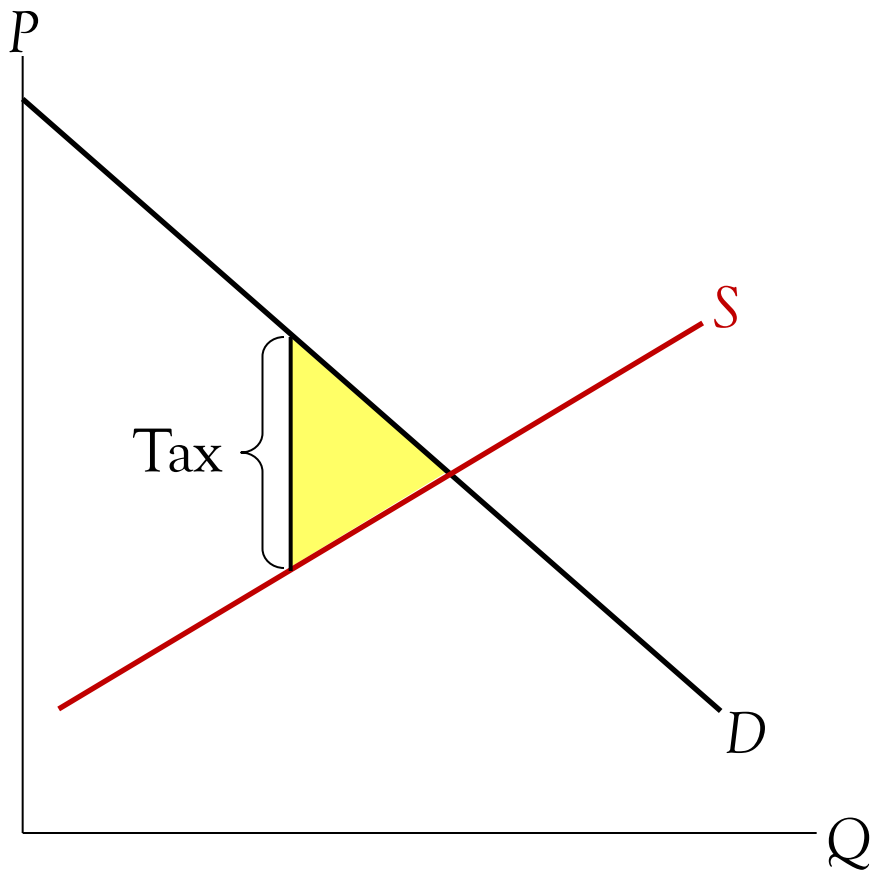
DWL and the Price Elasticity of Supply

When supply is *inelastic*,
it's harder for *sellers*
to leave the market
when the tax lowers
P_S.
So, the tax only reduces
Q a little,
and DWL is *small*.

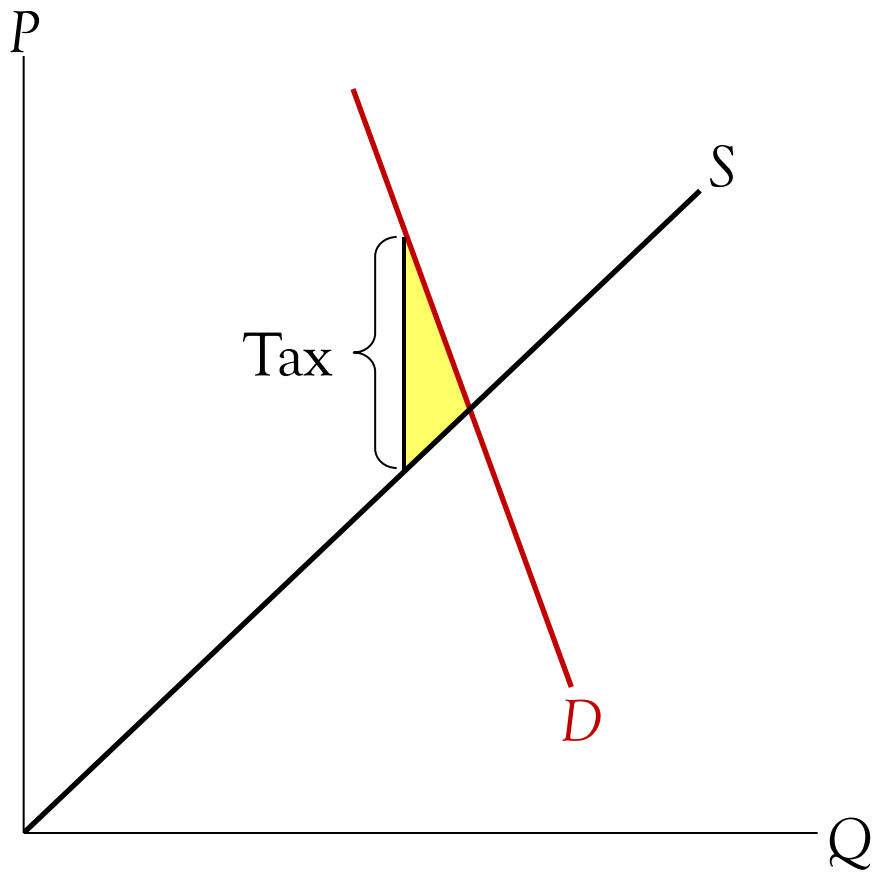


DWL and the Price Elasticity of Supply

The more *elastic*
the supply,
the easier it is for *sellers*
to leave the market
when the tax lowers P_S,
the more Q falls below
the surplus-maximizing
quantity,
and the *greater* the DWL.

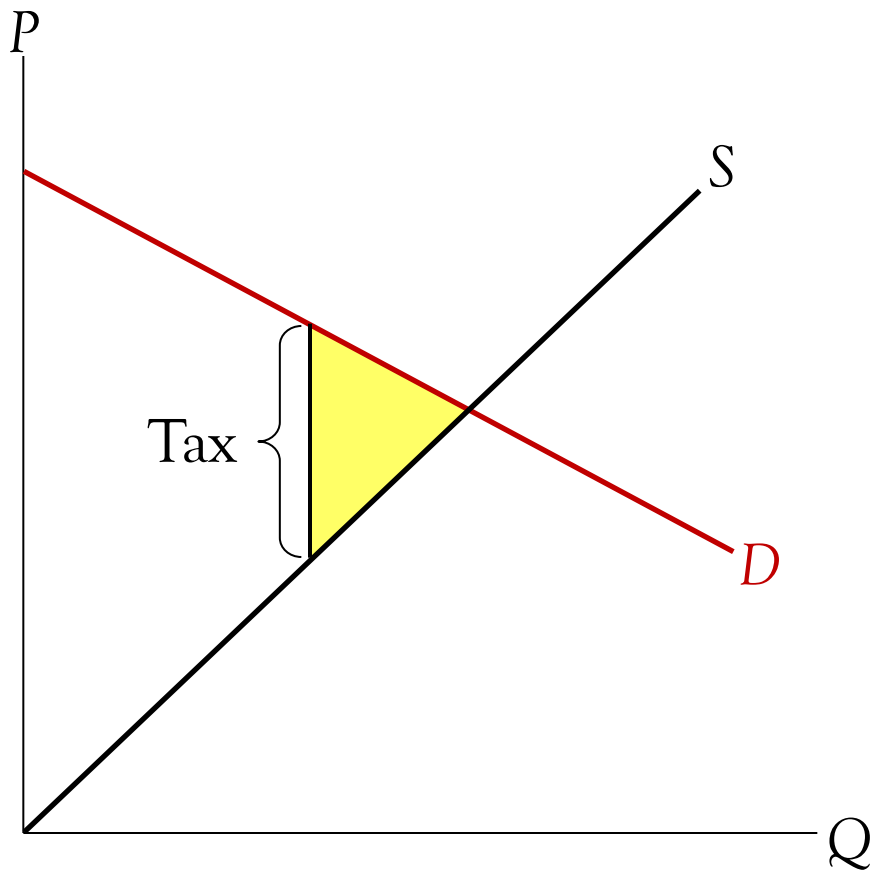


DWL and the Price Elasticity of Demand



When demand is *inelastic*,
it's harder for *buyers*
to leave the market
when the tax raises
P_B.
So, the tax only reduces
Q a little,
and DWL is *small*.

DWL and the Price Elasticity of Demand



The more *elastic*
the demand,
the easier it is for *buyers*
to leave the market
when the tax raises P_B,
the more Q falls below
the surplus-maximizing
quantity,
and the *greater* the DWL.

DWL and Price Elasticity

The *greater*
the **price elasticities** of supply or demand,
the *greater*
the **deadweight loss** of a tax.

Would the deadweight loss of a tax be larger if the tax were
on groceries or
on meals at fancy restaurants?

Government Intervention in Markets: Subsidies

Subsidies

- In many countries, the government subsidizes goods and services such as medical care for the poor and elderly, college education, *etc.*

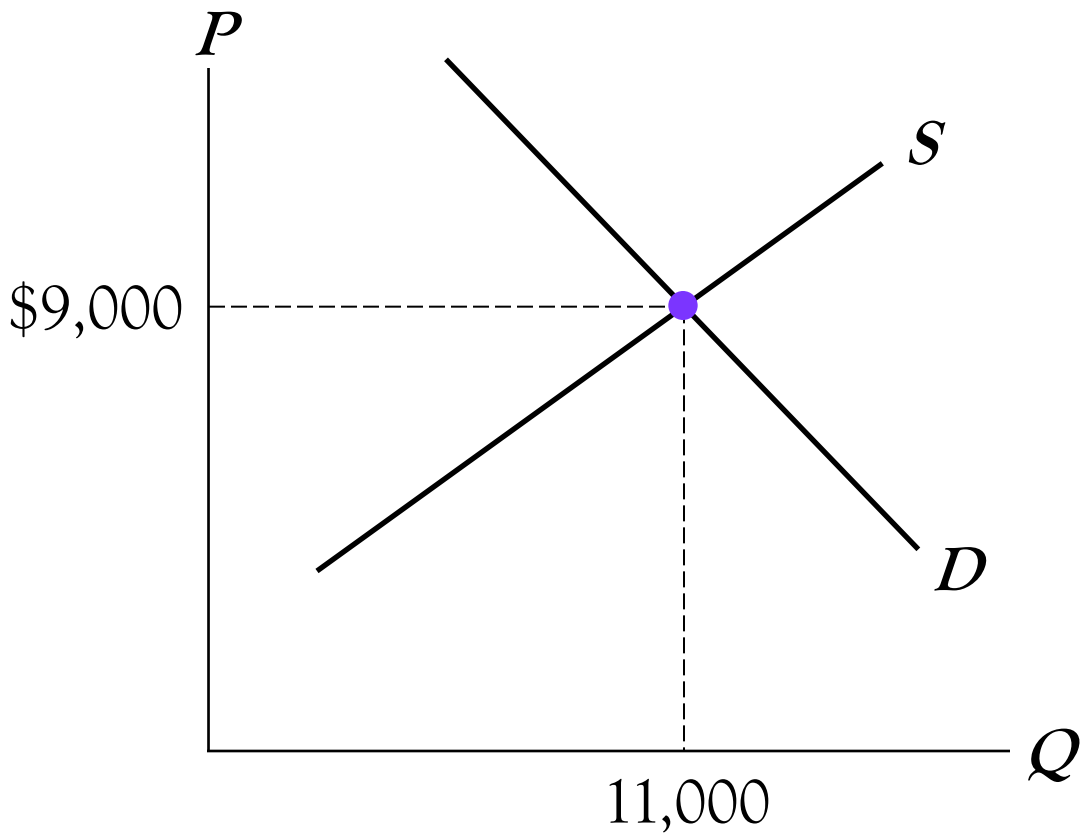
- A subsidy to buyers shifts the ***D*** curve *up* by the amount of the subsidy.

- A subsidy to sellers shifts the ***S*** curve *down* by the amount of the subsidy.

*The effects on **P** and **Q** and the subsidy incidence are the same whether the subsidy is paid to buyers or sellers.*

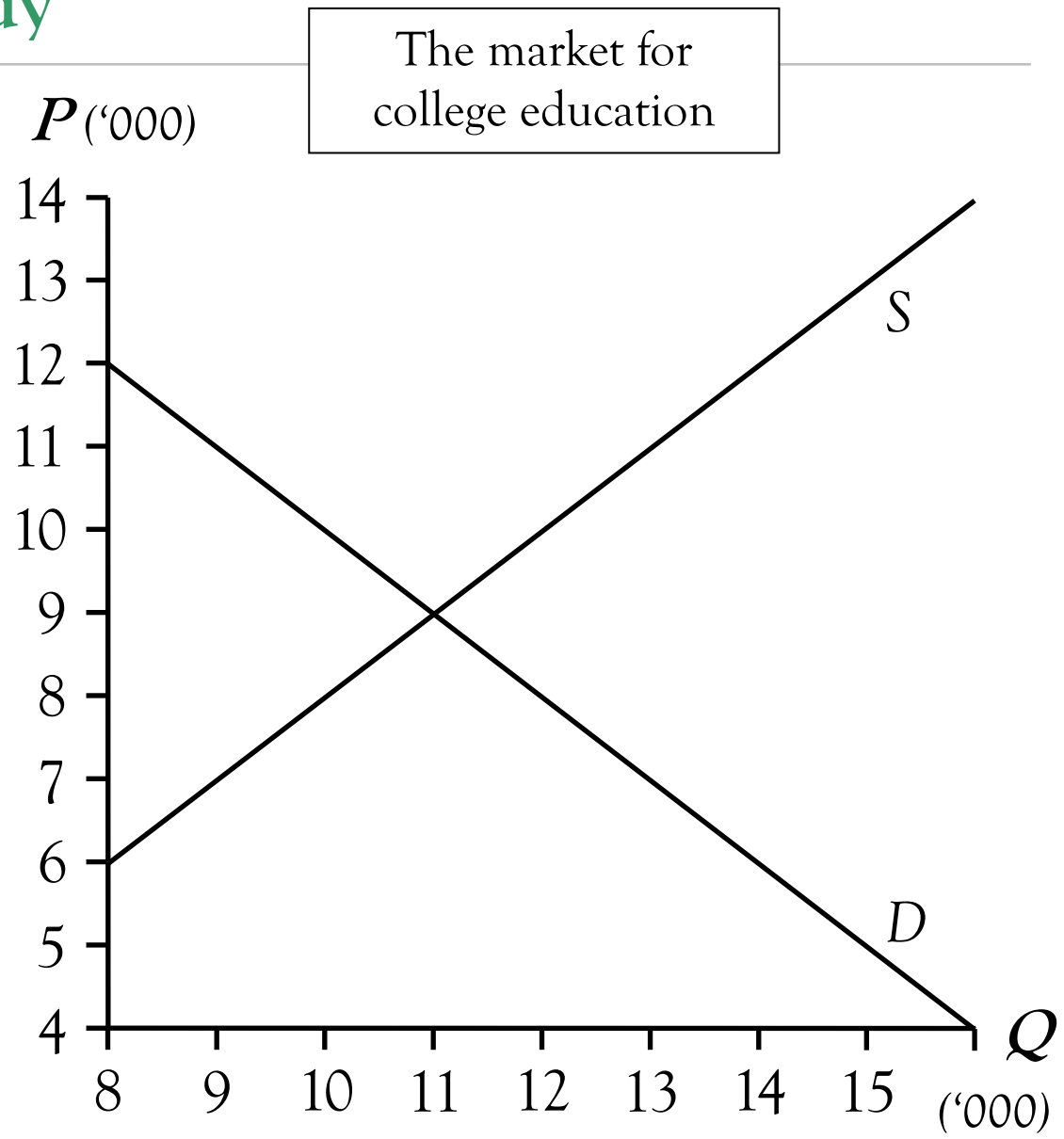
EXAMPLE: The Market for College Education

Equilibrium without subsidy



ACTIVE LEARNING *4.7*
Effects of a Subsidy

Suppose the government grants a $4,000 subsidy to college students. Find the new Q, P_B, P_S, and distribution of benefits.



Government Intervention in Markets:
The Effects of a Subsidy

The Effects of a Subsidy

Equilibrium with no subsidy:

Price = P_E

Quantity = Q_E

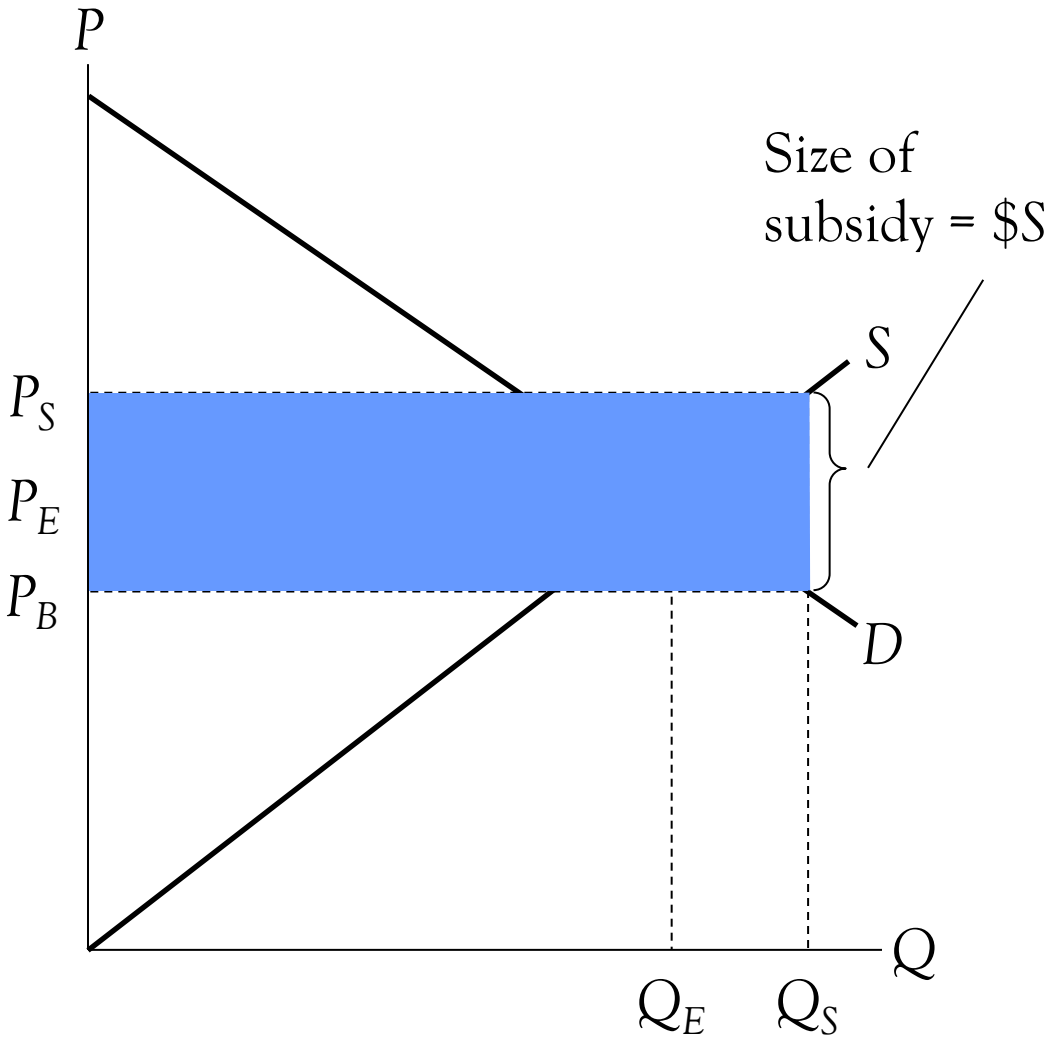
Equilibrium with subsidy = $S per unit:

Buyers pay P_B

Sellers receive P_S

Quantity = Q_S

Cost of subsidy = $S x Q_S



The Effects of a Subsidy

Without a subsidy:

CS = A + B

PS = C + D

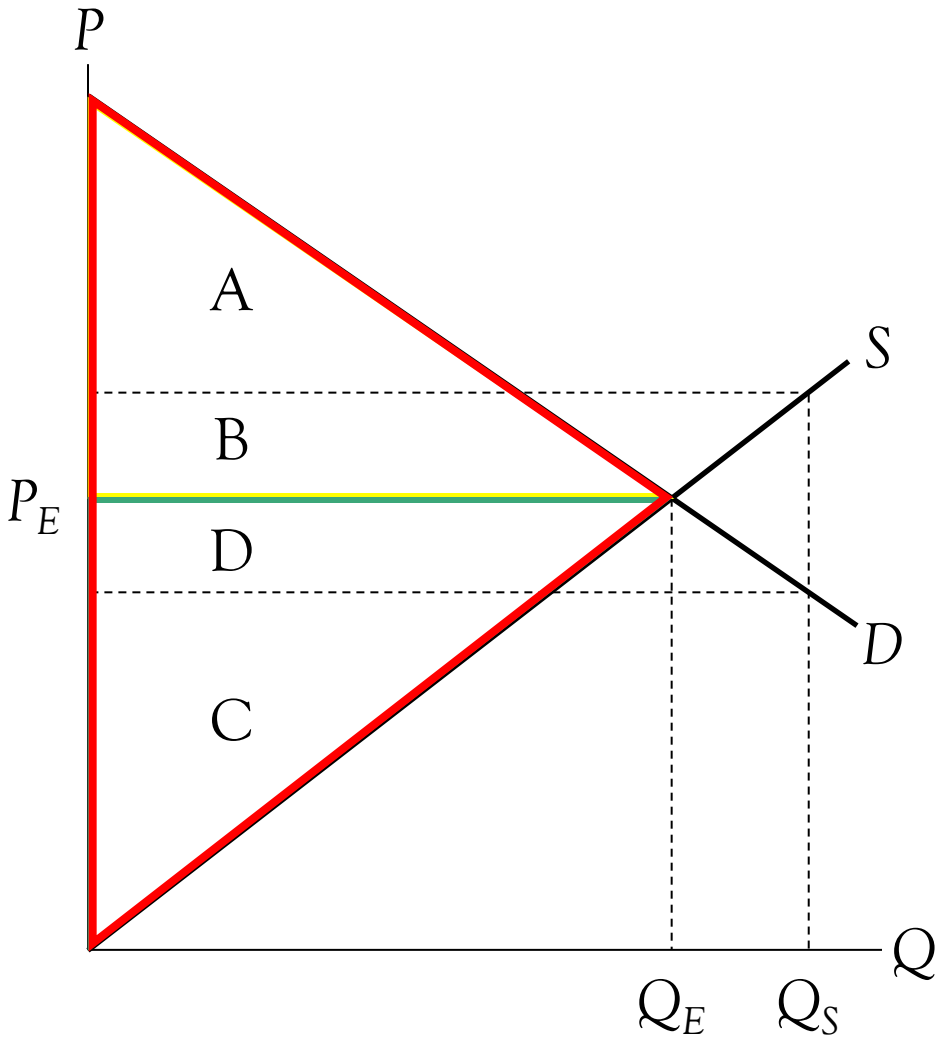
Subsidy Cost (SC)

= 0

Total Surplus

= CS + PS + SC

= A + B + C + D



The Effects of a Subsidy

With a subsidy:

CS = A + B + D + F

PS = C + D + B + E

Subsidy Cost (SC)

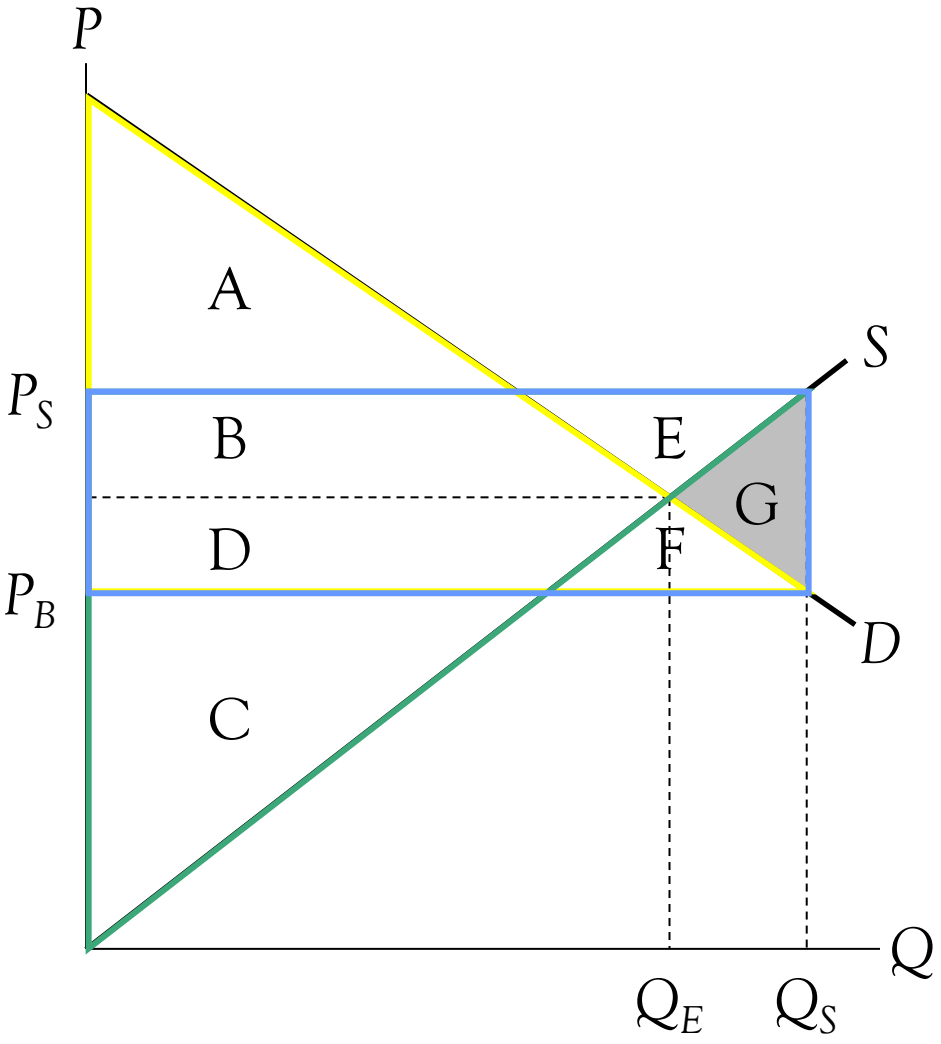
= – B – E – D – F – G

Total Surplus

= CS + PS + SC

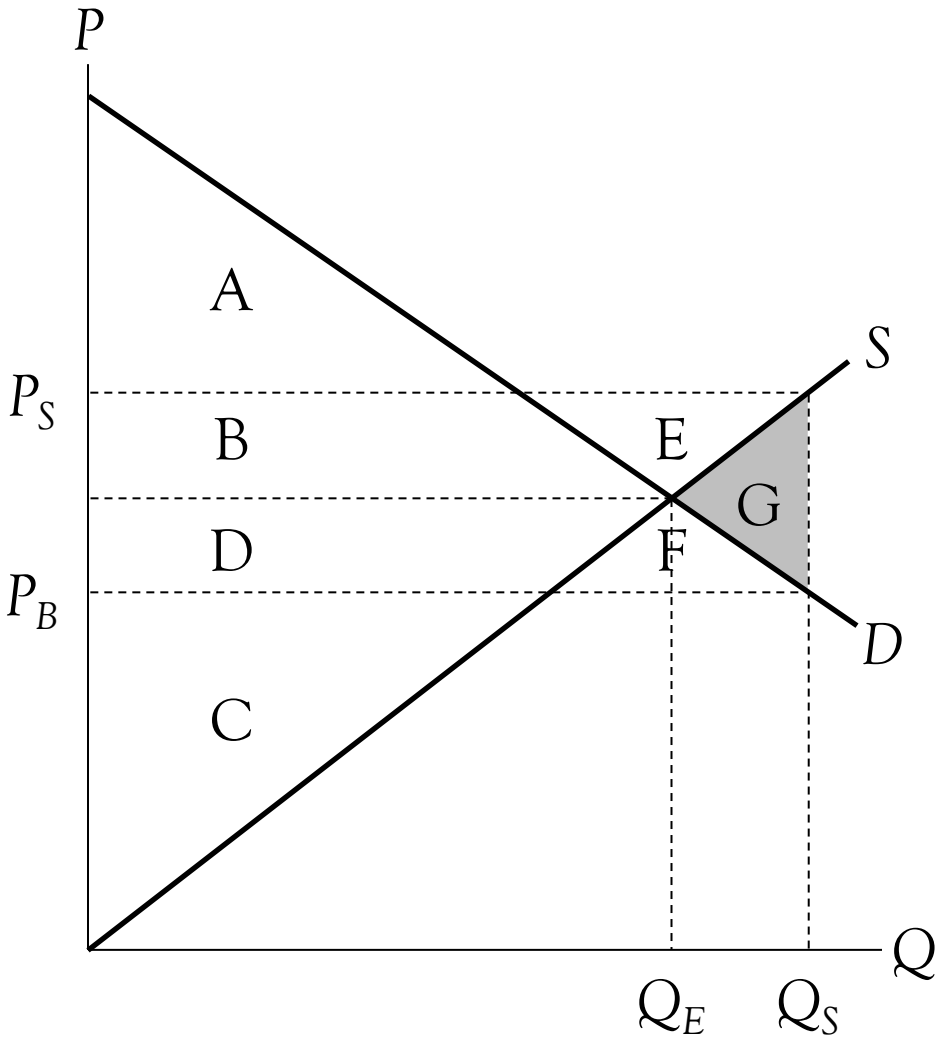
= A + B + C + D – G

The subsidy reduces total surplus by G.



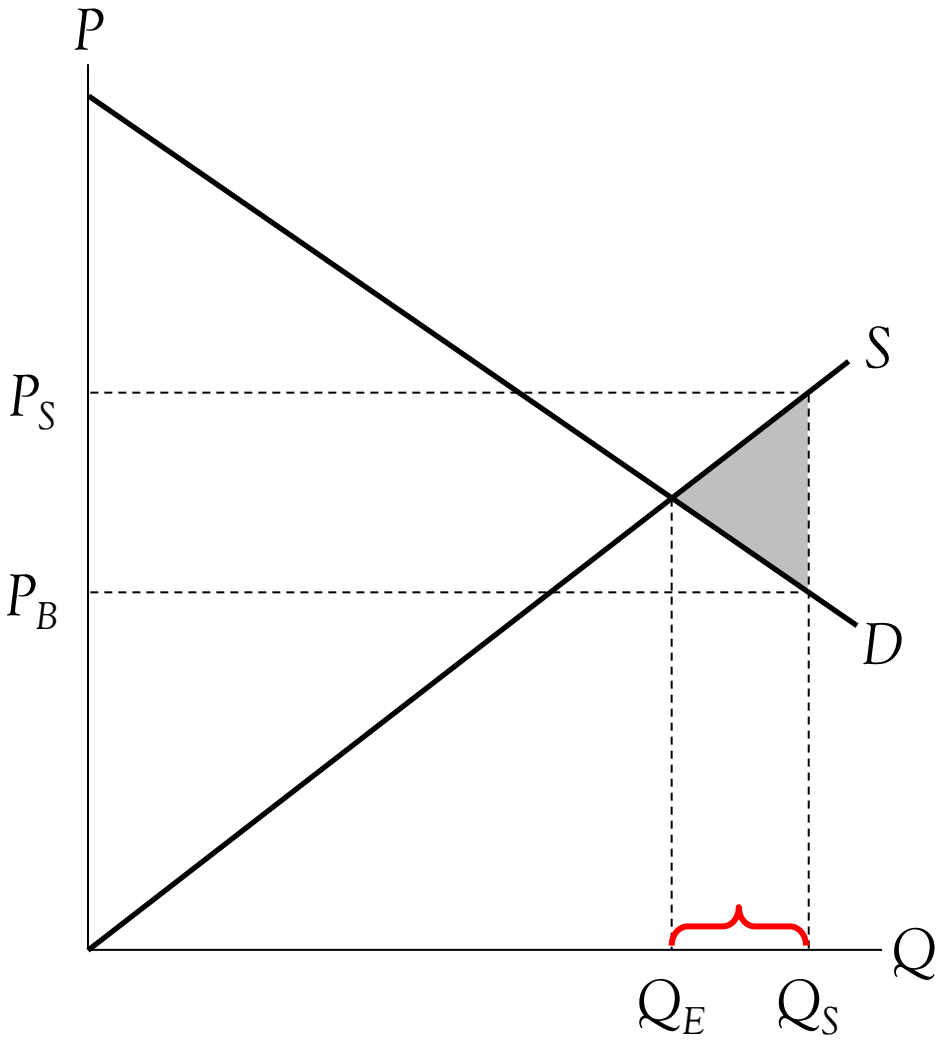
Deadweight Loss (DWL)

G is called the **deadweight loss (DWL)** of the subsidy – the *fall* in total surplus that results from a market distortion such as a subsidy.



Deadweight Loss (DWL)

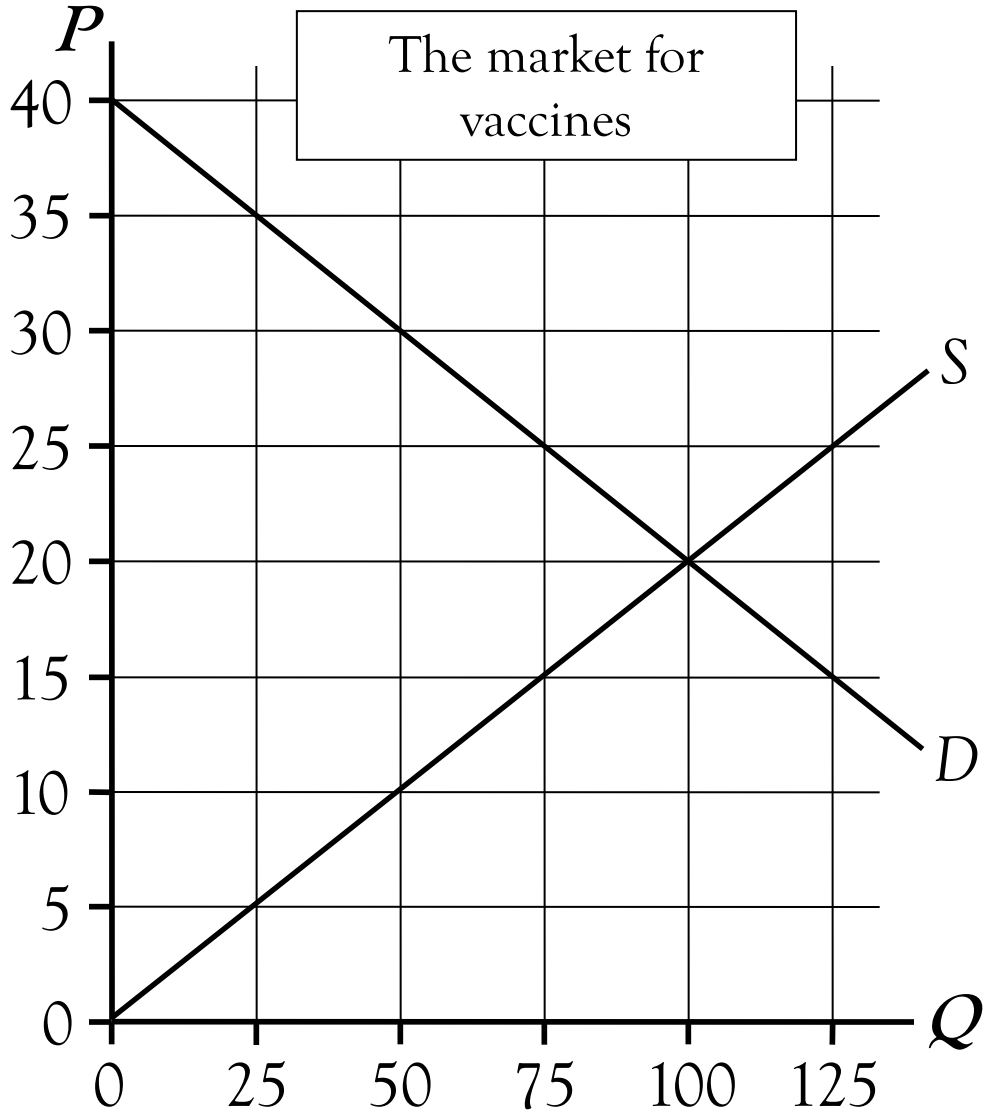
Because of the subsidy,
the units between
Q_E and Q_S are sold.
The **value** of these units
to buyers
is *less* than
the **cost** of producing
them;
the subsidy induces
some wasteful trades.



ACTIVE LEARNING *4.8*
Analysis of a Subsidy

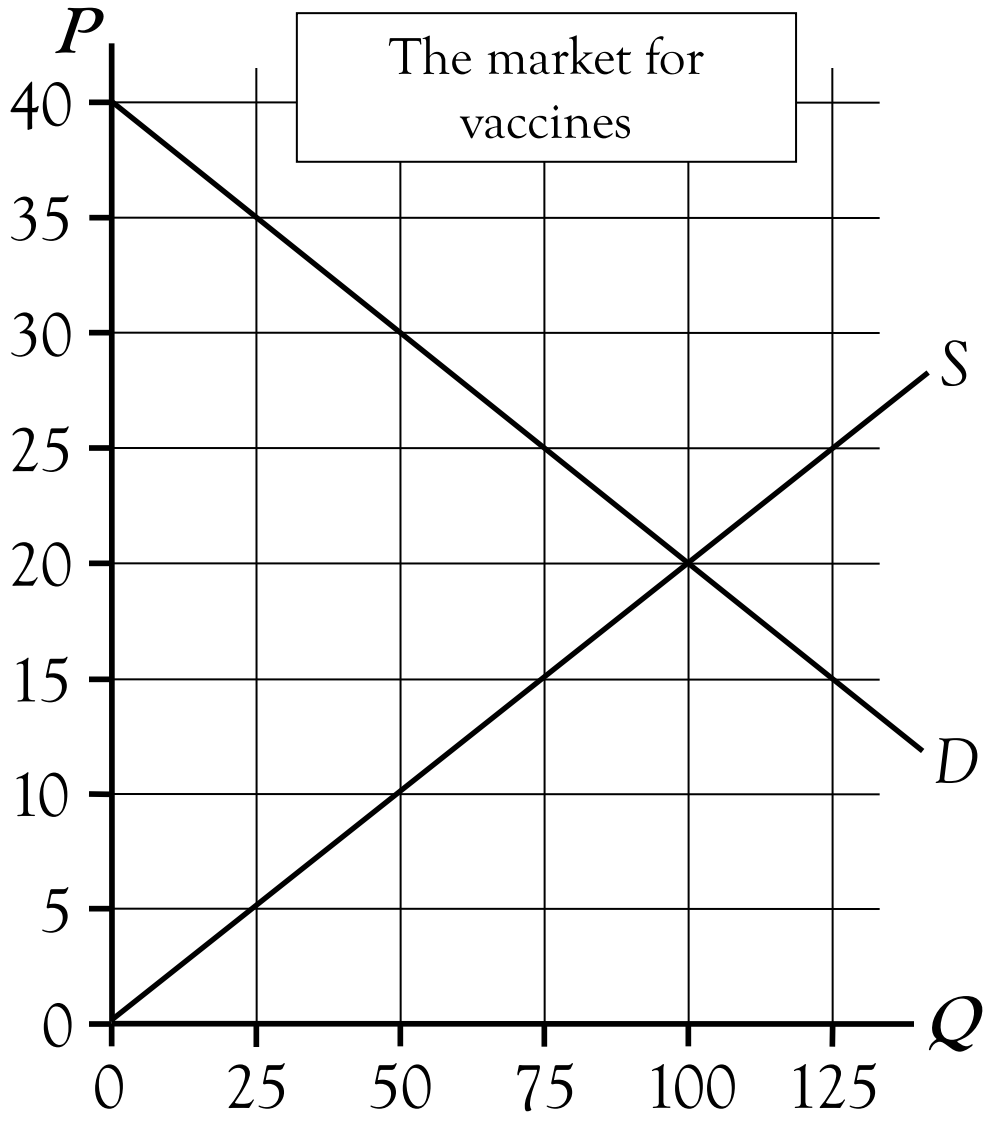
A. Indicate on the graph CS, PS, and total surplus without a subsidy.

B. Suppose there is a $10 subsidy per vaccine. Indicate on the graph CS, PS, subsidy cost, total surplus, and DWL.



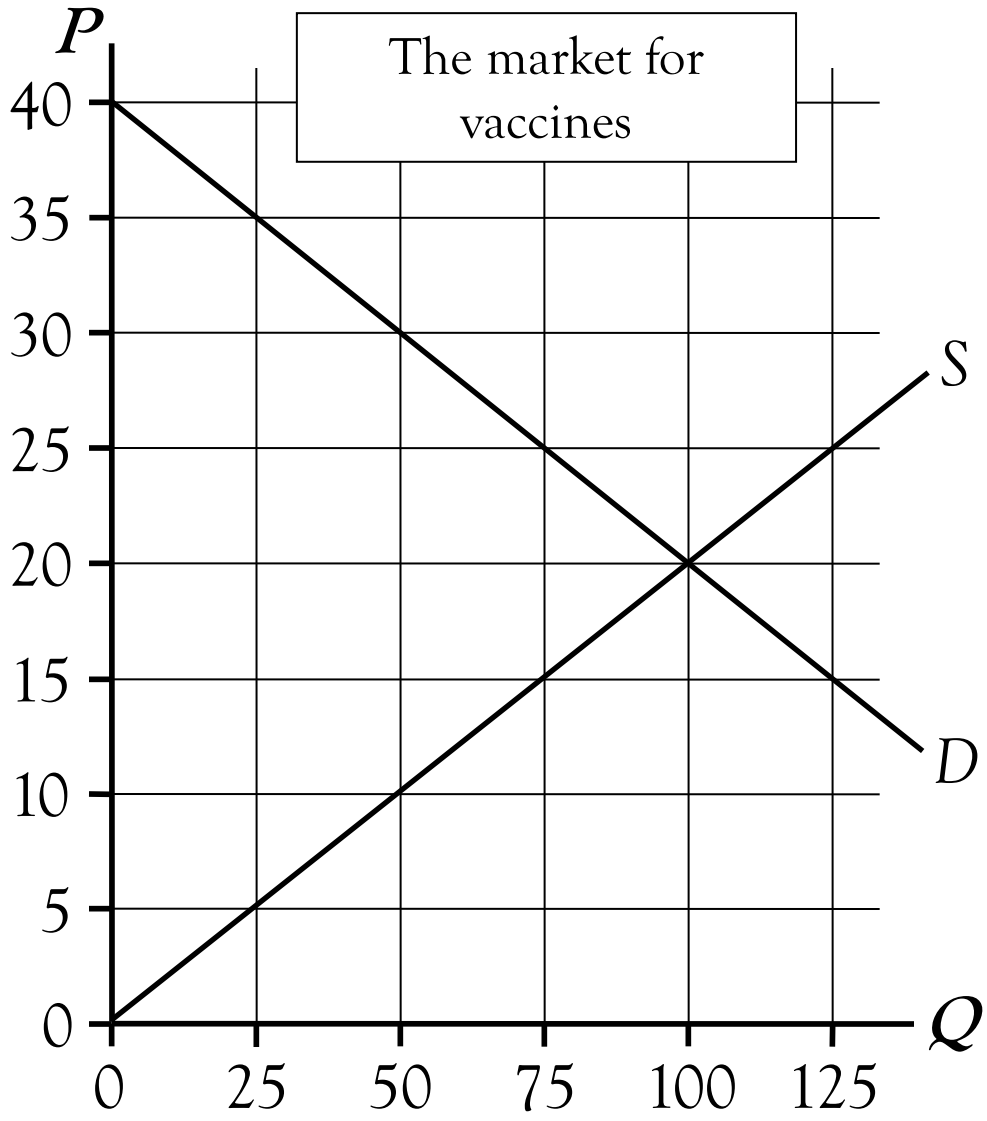
ACTIVE LEARNING *4.8*

A. Without a Subsidy



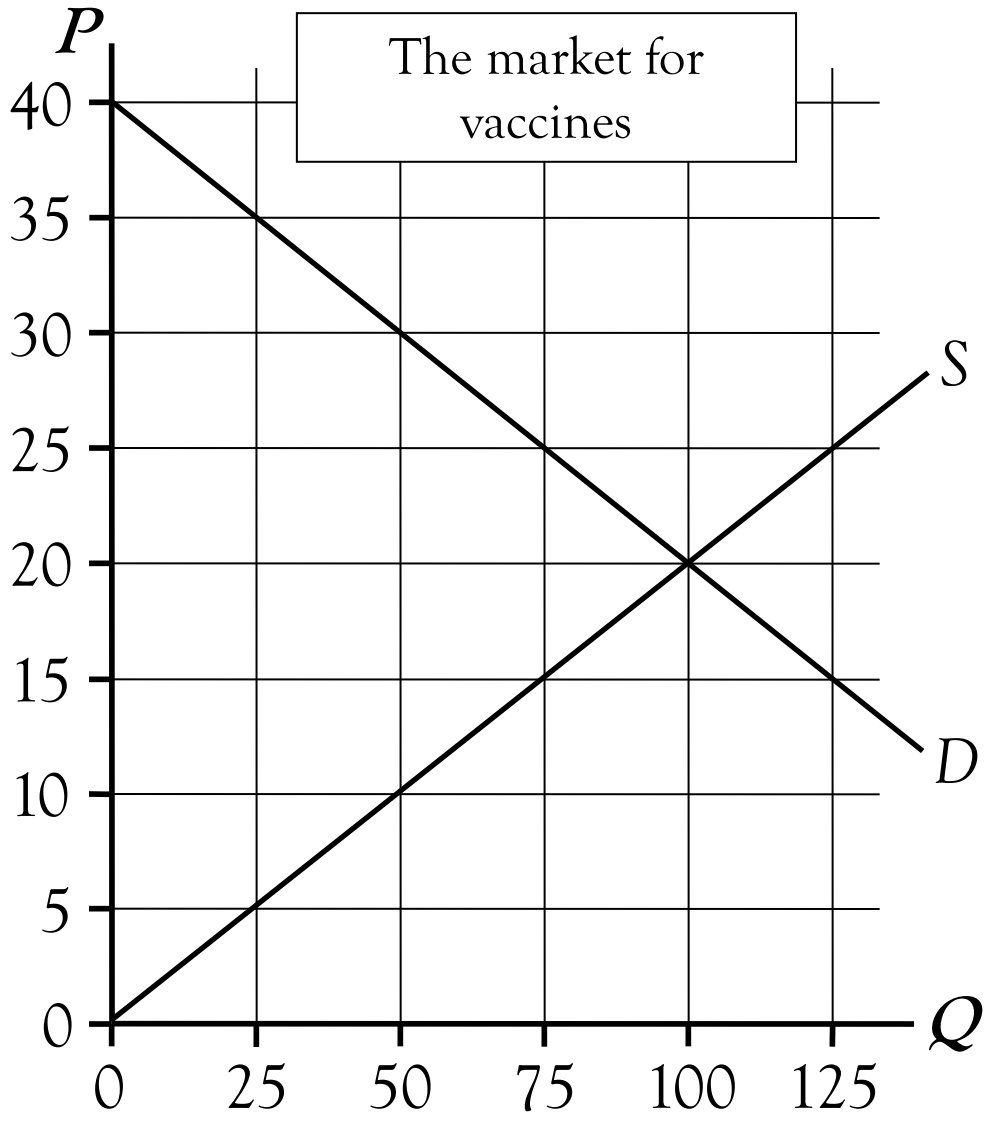
ACTIVE LEARNING *4.8*

B. With a $10 Subsidy



ACTIVE LEARNING *4.8*

B. With a $10 Subsidy



Test Yourself

- When the government **taxes** a good:
  - the equilibrium quantity of the good _____
  - the price paid by buyers _____
  - the price received by sellers _____

- When the government **subsidizes** a good:
  - the equilibrium quantity of the good _____
  - the price paid by buyers _____
  - the price received by sellers _____

Test Yourself

- Deadweight loss is defined as the fall in _____ that results when a tax/subsidy distorts a market outcome.
- A _____ prevents some mutually beneficial trades, while a _____ induces some mutually wasteful trades.
- The _____ the price elasticities of supply or demand, the greater the deadweight loss of a tax/subsidy.