



## **Chapters 6, 8**

**Supply,  
Demand &  
Government  
Policies**

- Recall: In a free, unregulated market system, market forces establish equilibrium prices and exchange quantities.
- While equilibrium conditions may be efficient, it may be the case that not everyone in society is satisfied and the government may want to get involved.
- Now we'll look at government policies and how they affect supply and demand.

# Price Controls

- Are usually enacted when policymakers believe the market price is unfair to buyers or sellers.
- The government will freeze prices at a predetermined level that they feel will make members of society better off.

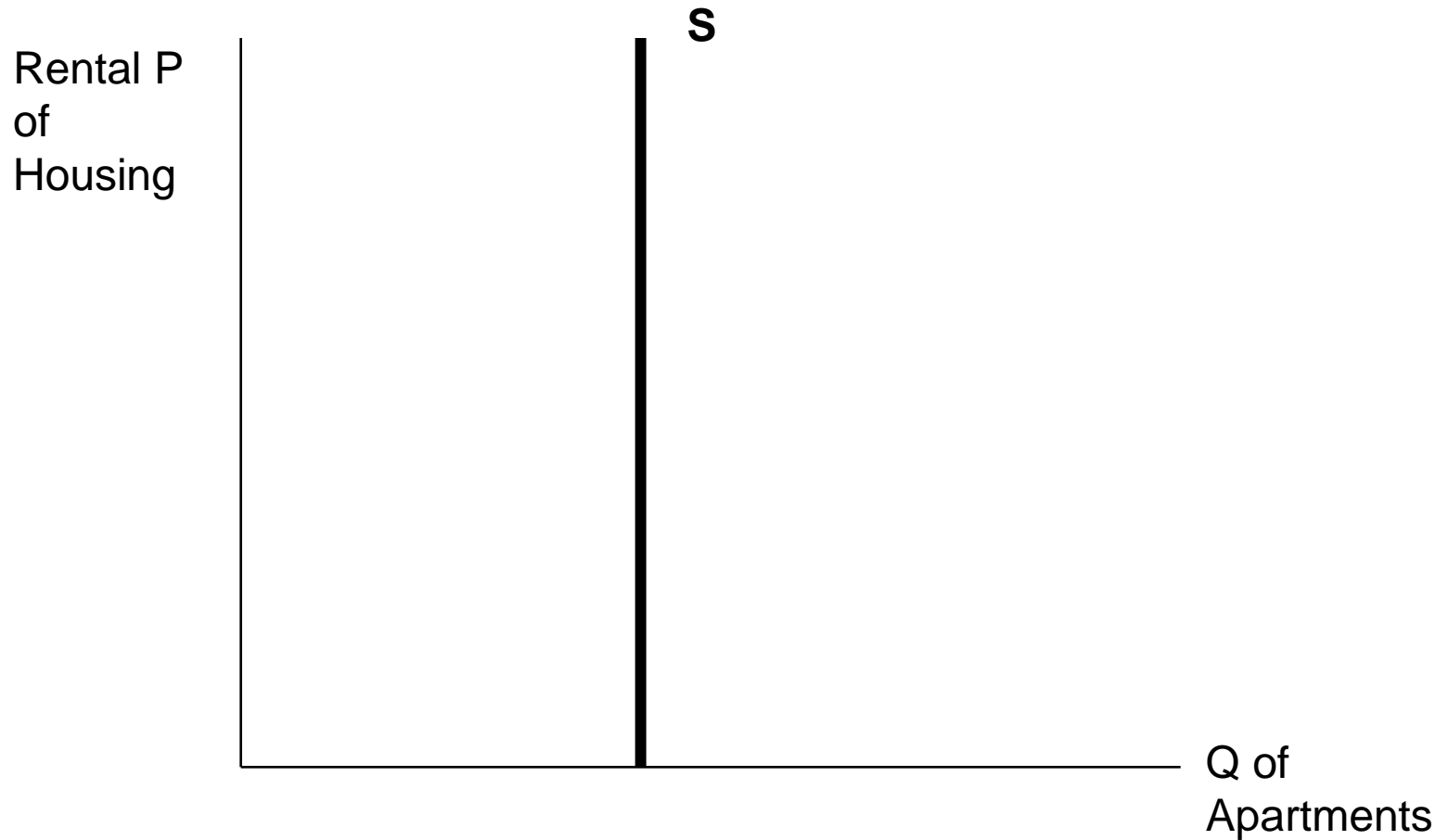
# Price Ceilings

- A **price ceiling** is a legal **maximum** on the price at which a good can be sold.
- The price ceiling is not binding (not effective) if it is set above equilibrium price.
- The price ceiling is binding (effective) if set below equilibrium price, leading to a **shortage**.

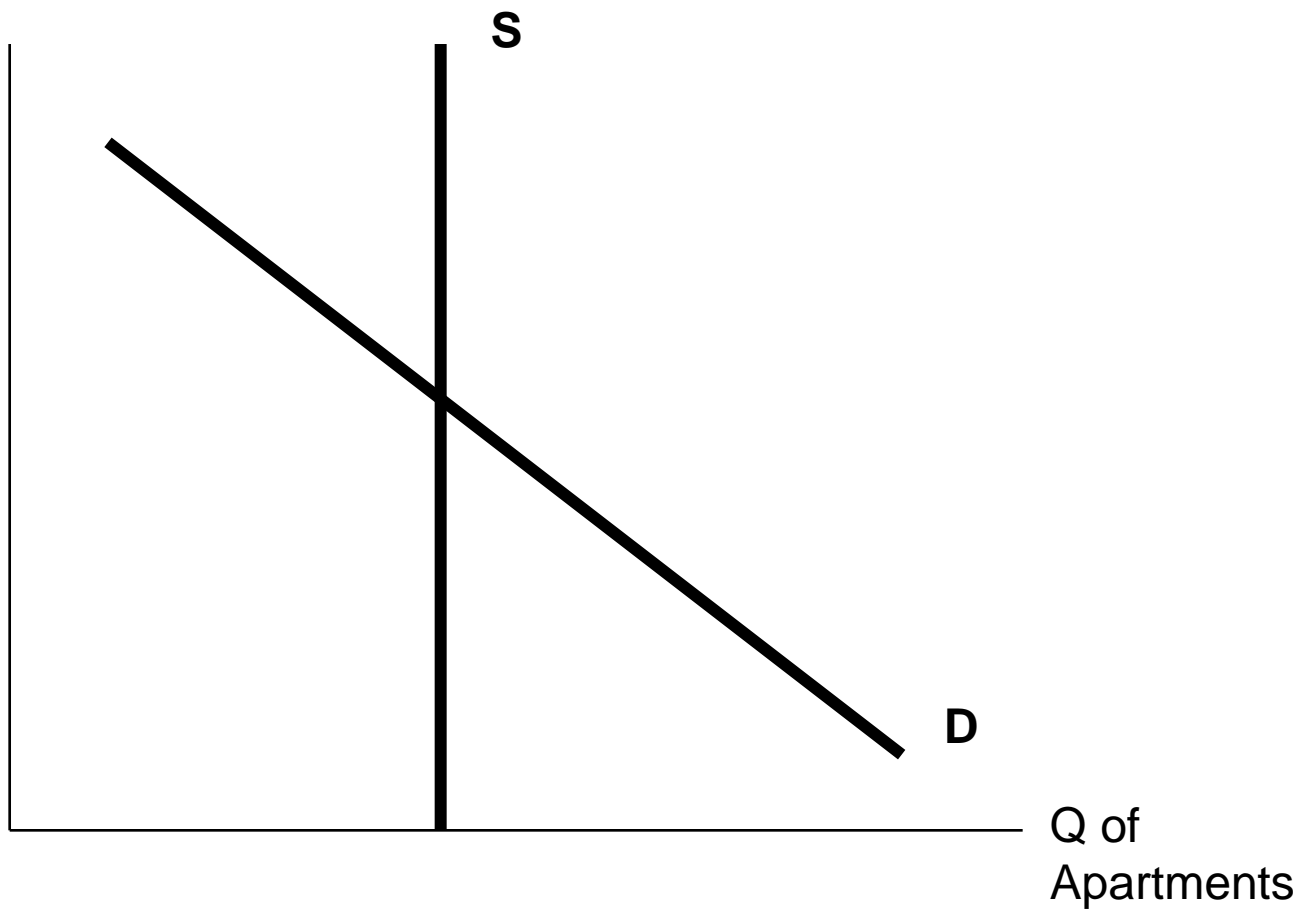
- Example: Rent Control
- The government's goal: to help the poor by making housing more affordable.
- It sets a maximum price (rent) for housing that is below equilibrium price.

- In the SR, the number of apartments is fixed, so Supply of housing is inelastic.
- Potential renters may not be highly responsive to rents because they take time to adjust their housing arrangements (eg. give notice to current landlord), so Demand for housing in the SR is relatively inelastic.

# Rent Control in the SR

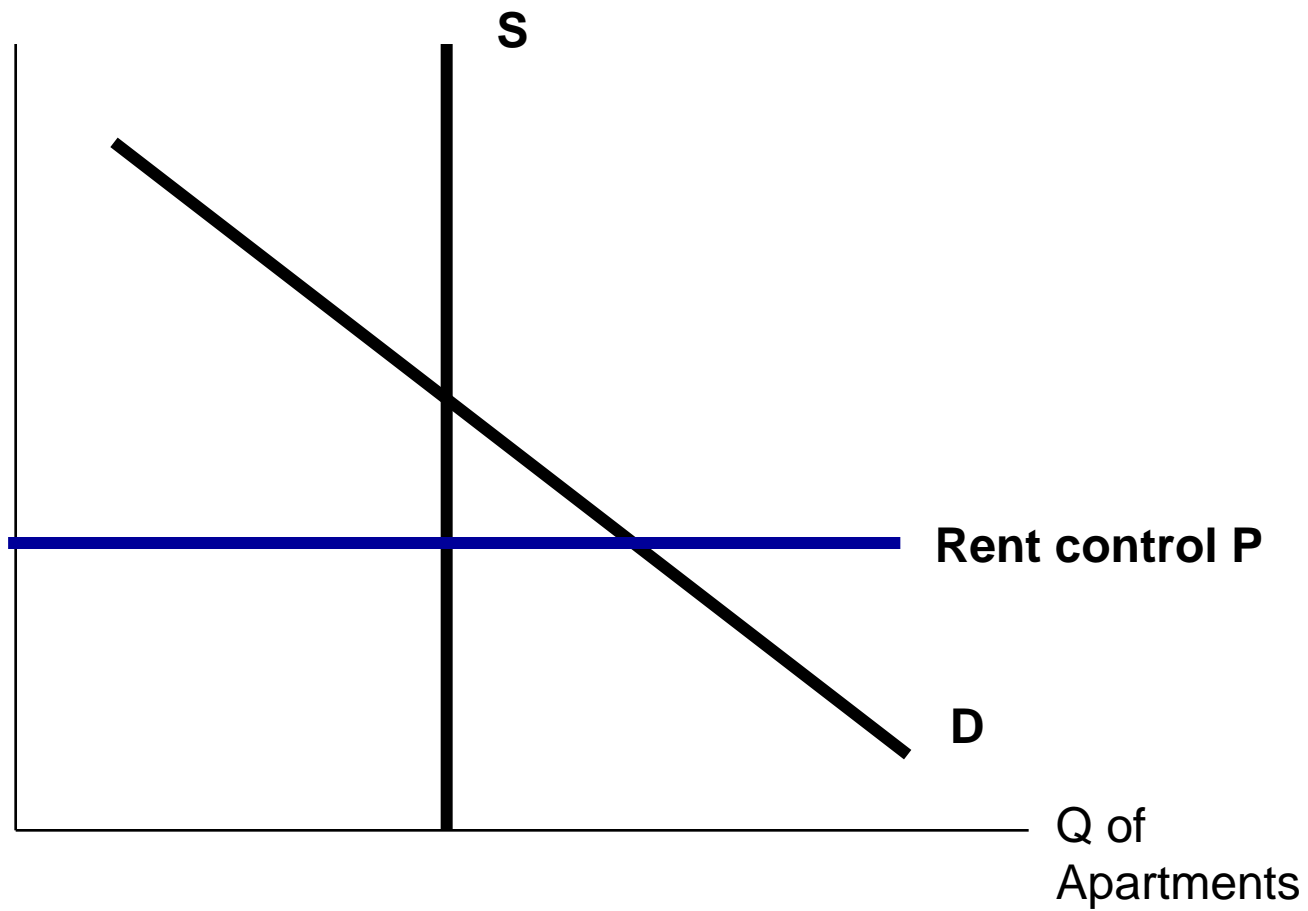


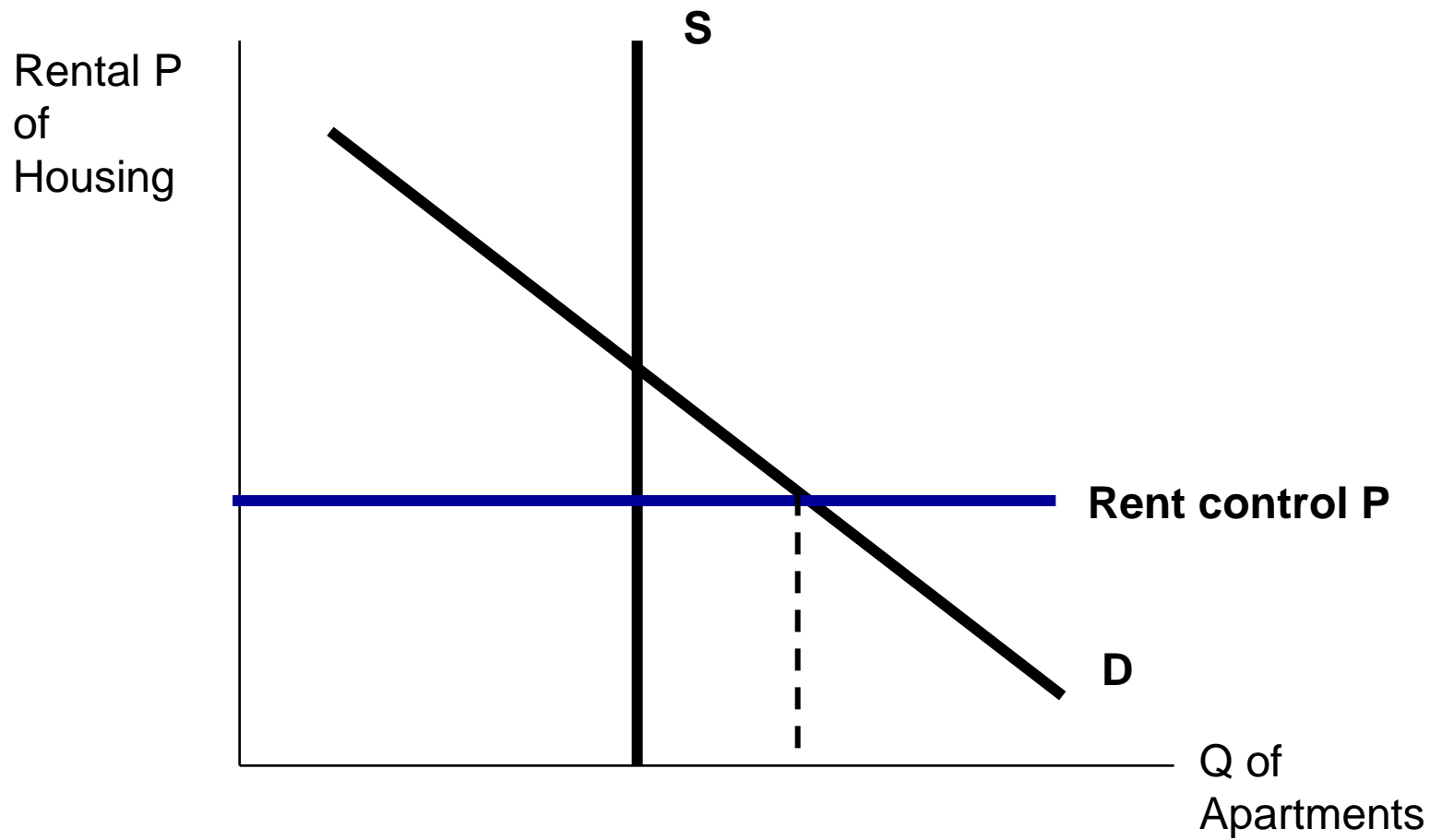
Rental P  
of  
Housing

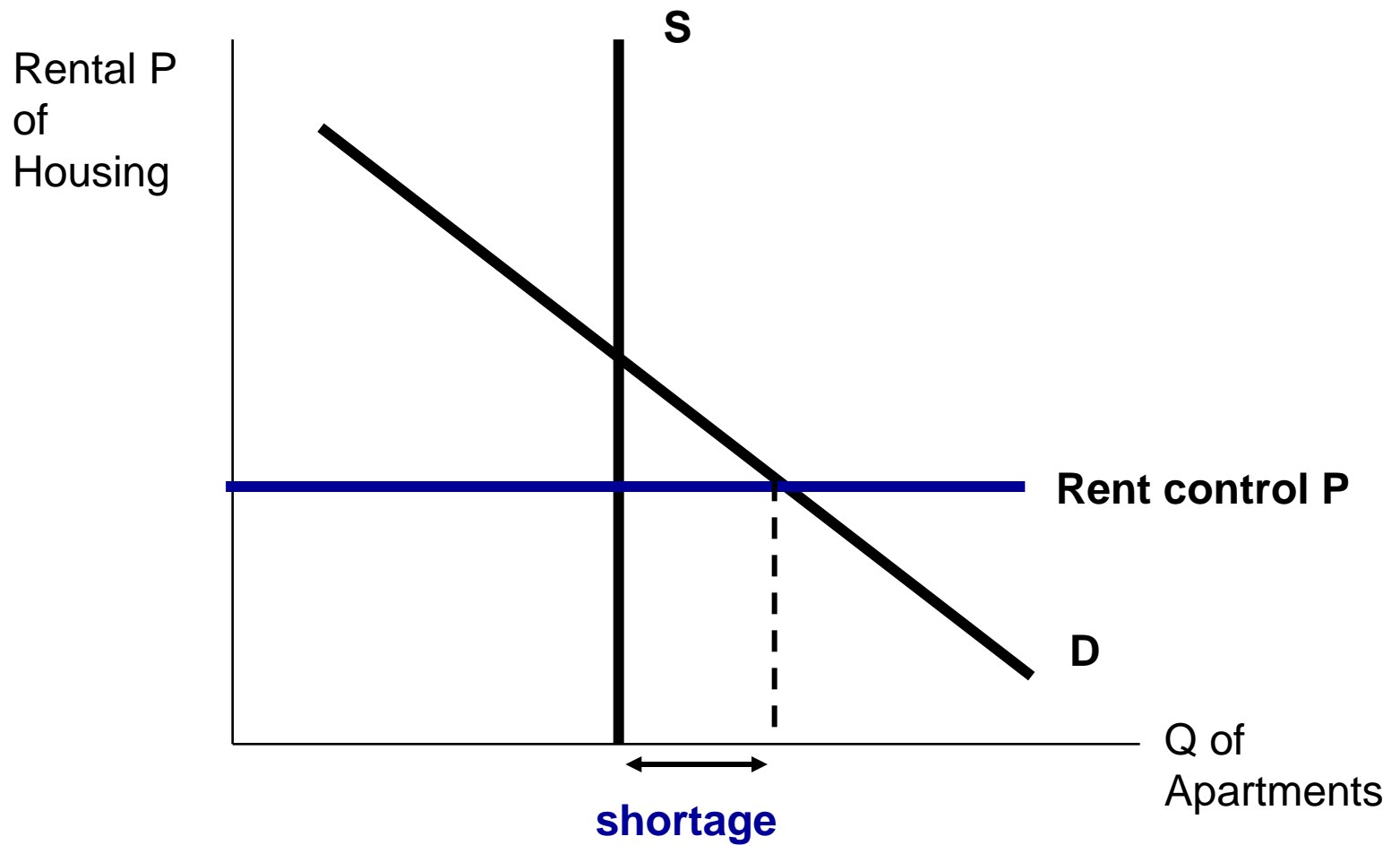




Rental P  
of  
Housing

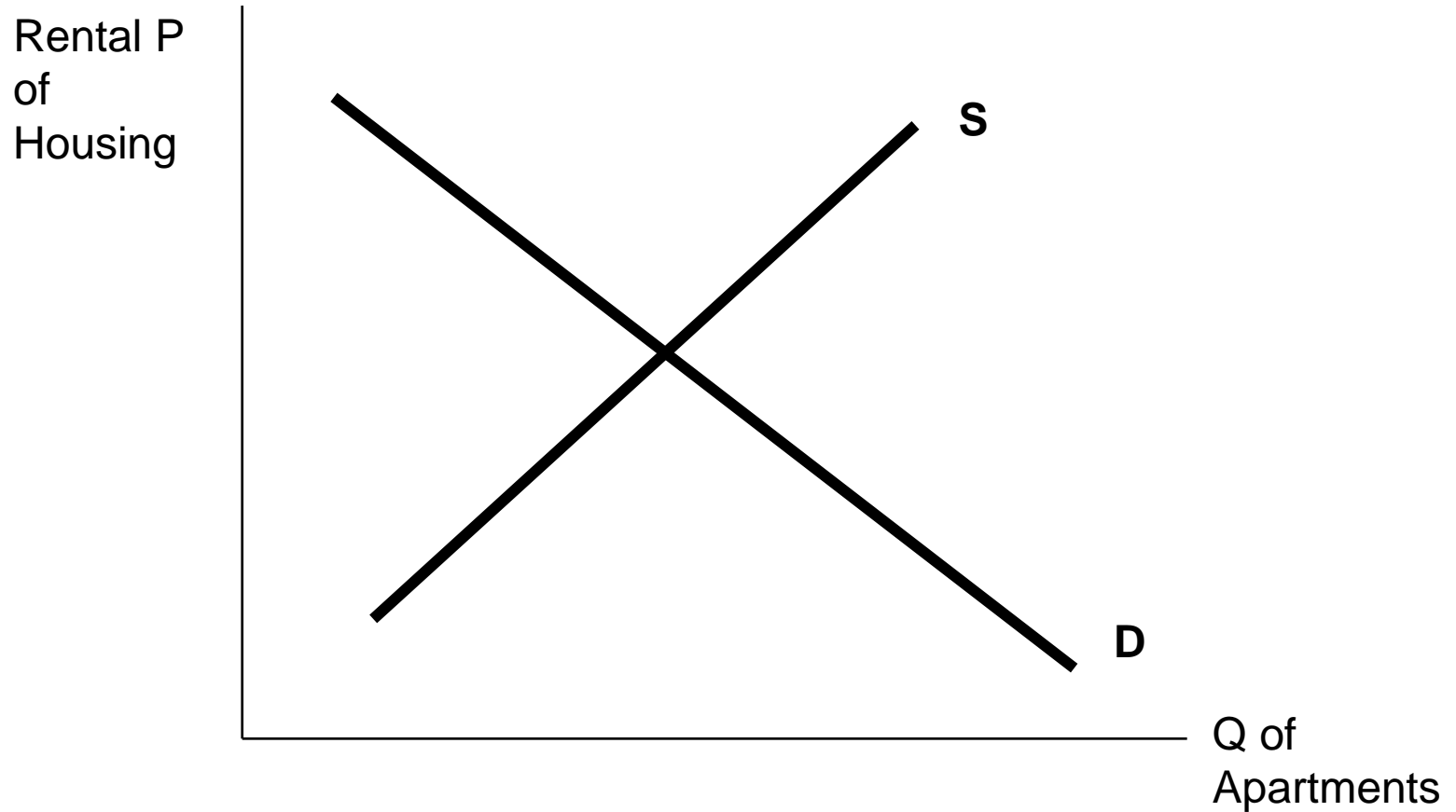




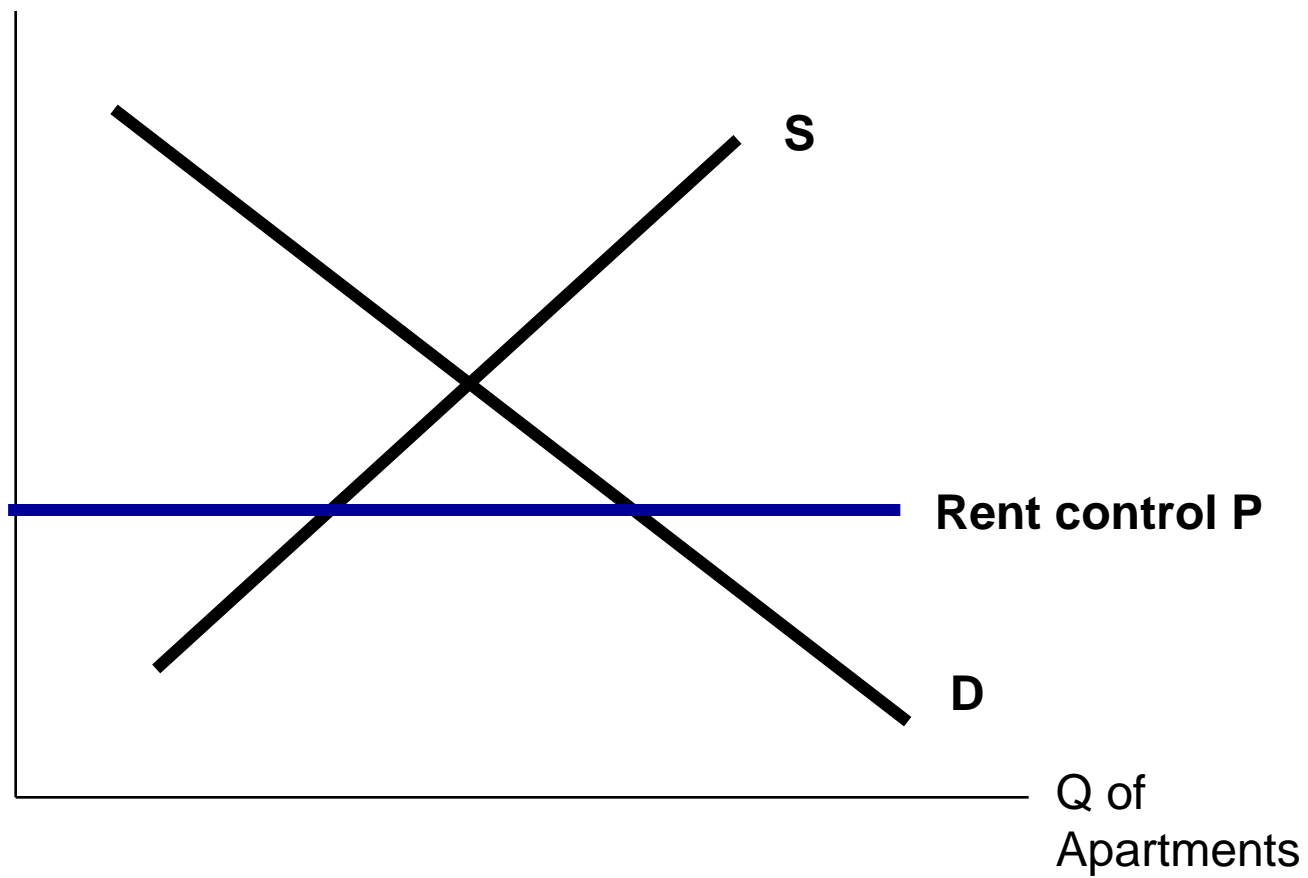


- In the LR, low rents can mean that landlords may convert to condos, get out of the rental business and/or won't maintain existing apartments, so Supply is elastic.
- Low rents encourage people to look for housing (move out from your parents if the price is right), so Demand is elastic.

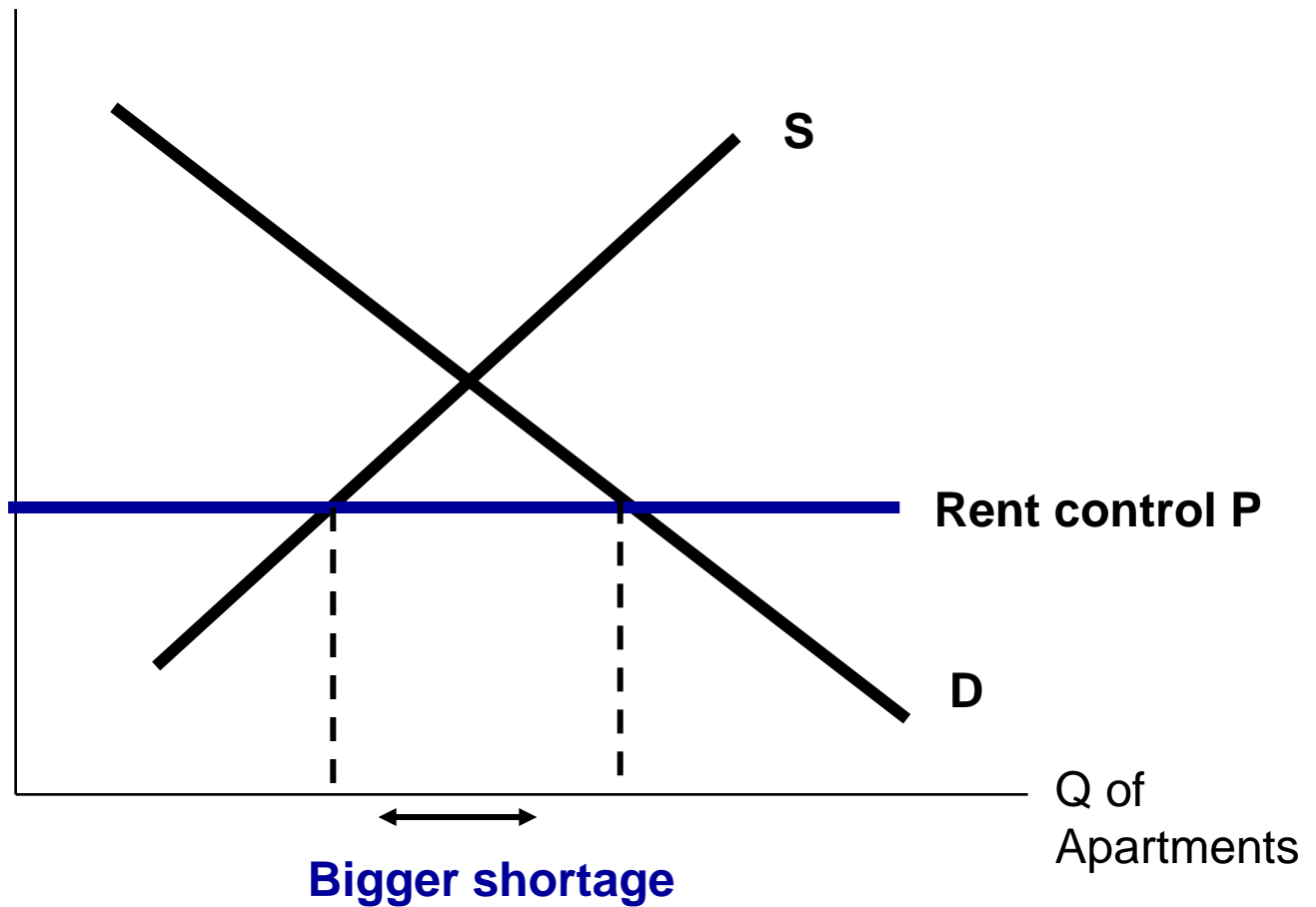
# Rent Control in the LR



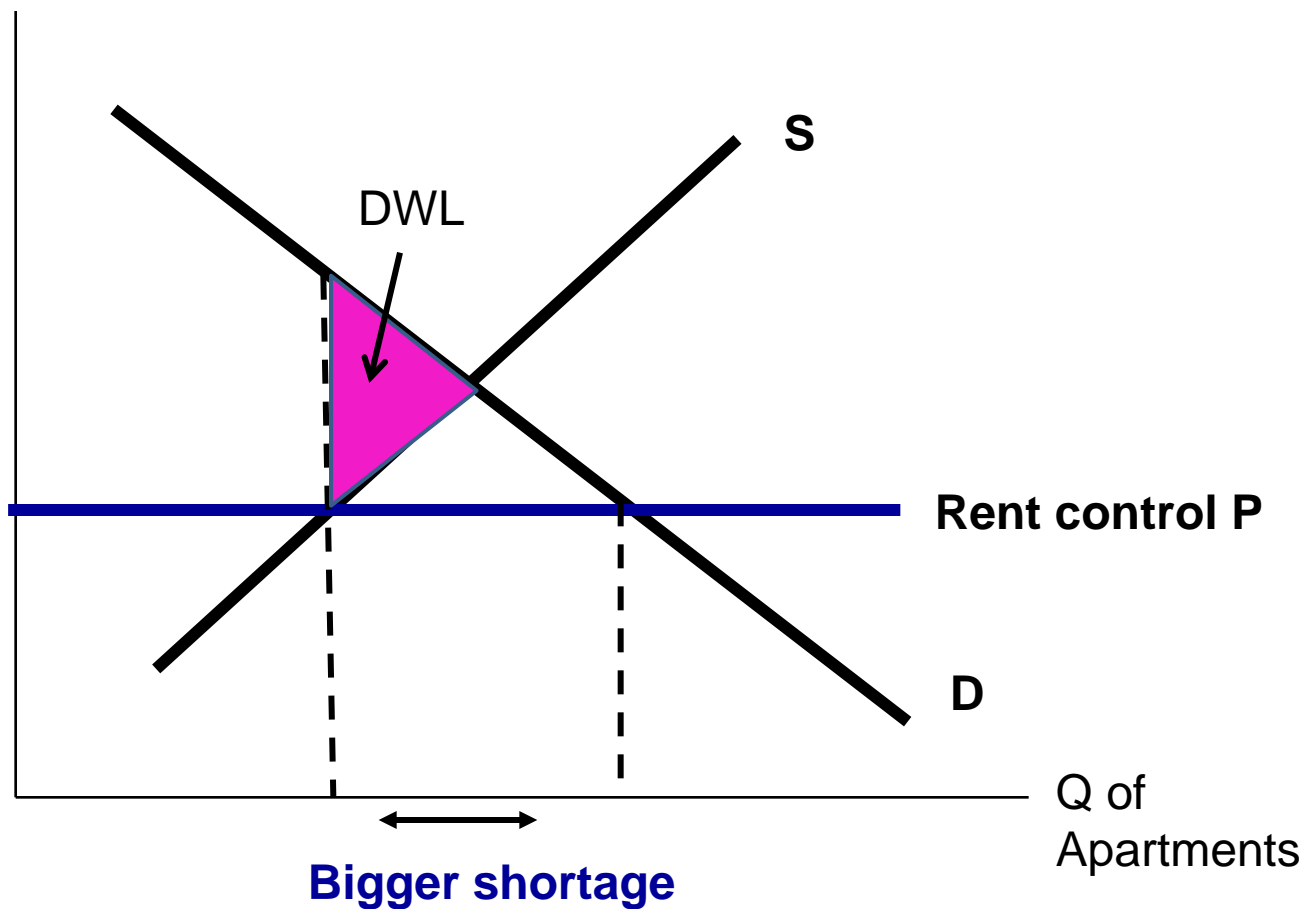
Rental P  
of  
Housing



Rental P  
of  
Housing



Rental P  
of  
Housing





- In the LR, the housing shortage is large.
- Where rent controls exist, landlords must resort to non-price rationing of housing.
- Can keep long waiting lists.
- Can discriminate (no children, pets, etc.).
- Some take bribes (key money).
- Some may convert existing apartments to condominiums, making the shortage even greater.

# Numerical Example

- The equations for demand and supply for 1-bedroom apartments in Glanbrook are:
  - $Q_d = 1700 - 2P$
  - $Q_s = 2P - 900$

What is equilibrium rental price and apartments rented?

In eqm.,  $Q_d = Q_s$

$$1700 - 2P = 2P - 900$$

$$4P = 2600$$

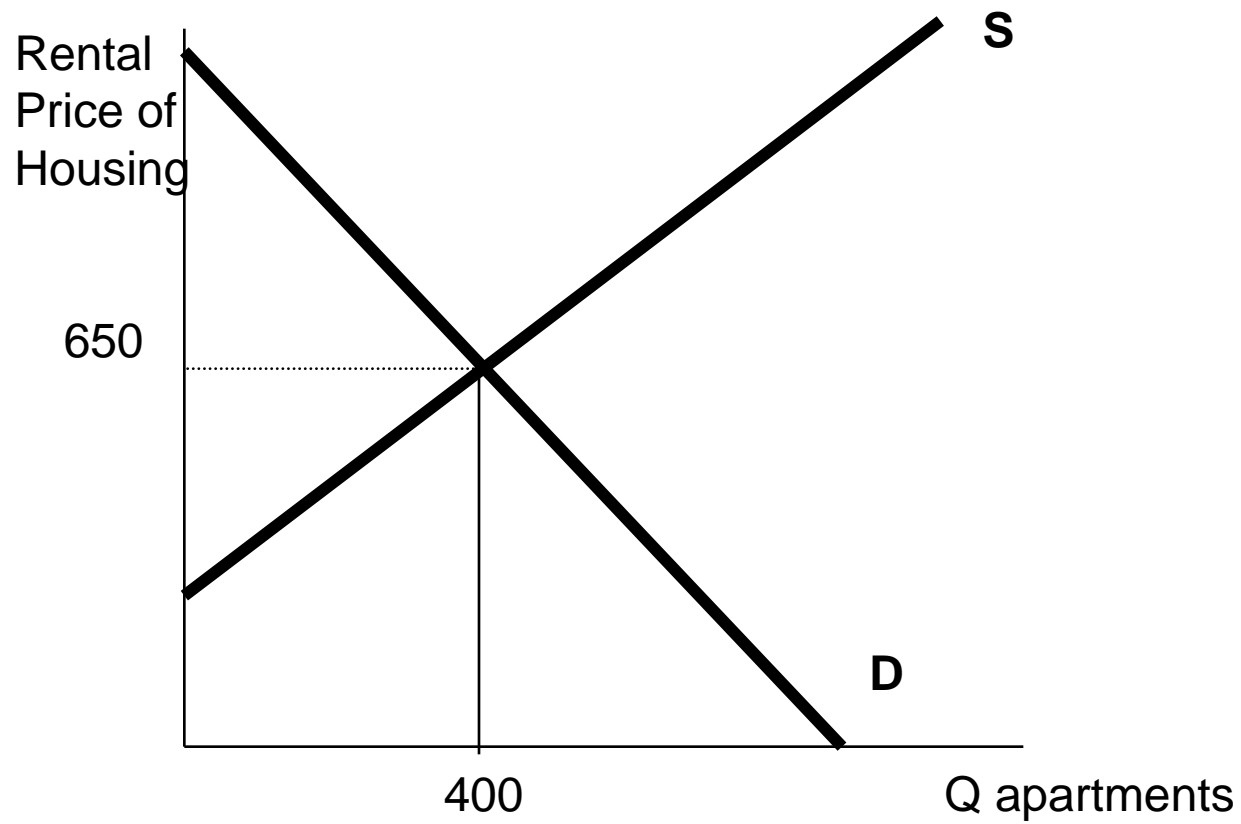
$$P = 650$$

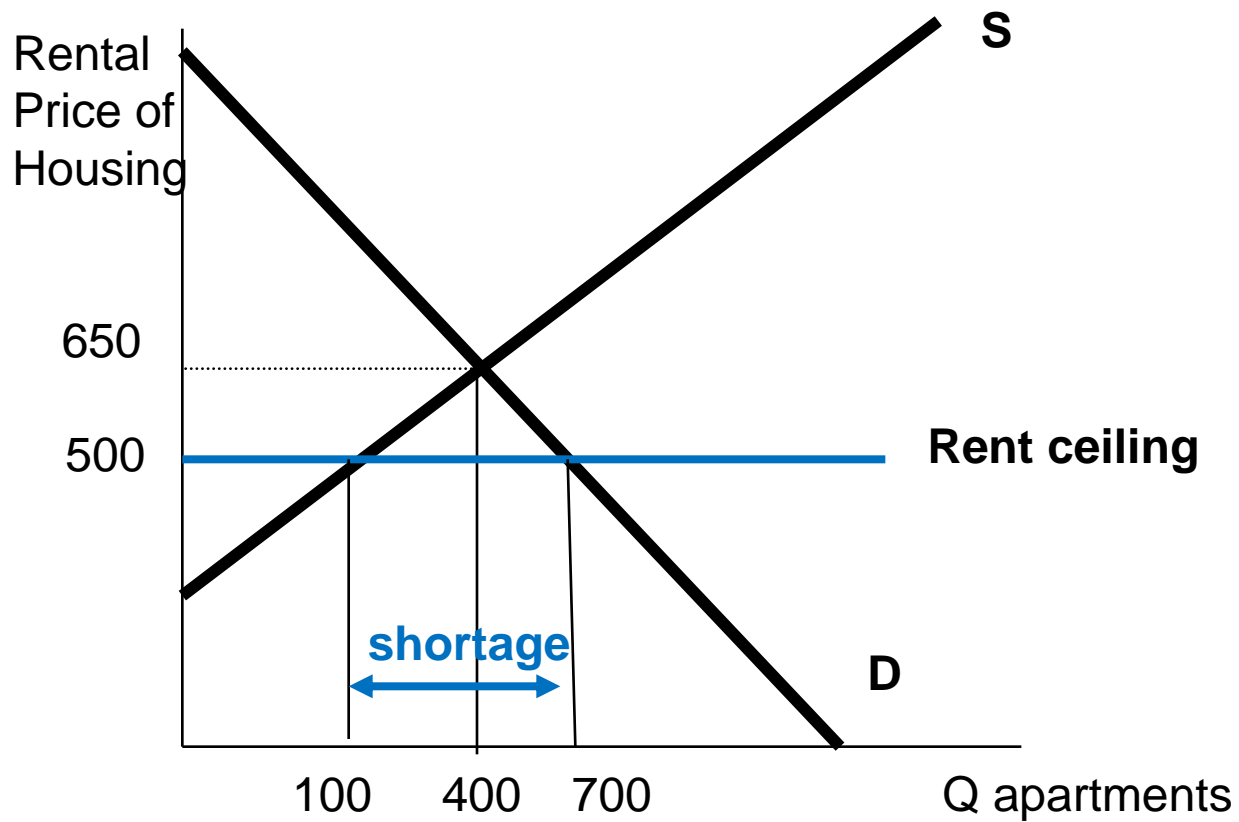
$$Q_d = 1700 - 2(650) = 400 = Q_s = Q^*$$

What if the province imposes a rent ceiling of \$500?

$$\begin{aligned}\text{If } P = 500 \quad Q_d &= 1700 - 2(500) = 700 \\ Q_s &= 2(500) - 900 = 100\end{aligned}$$

$$\text{Shortage} = Q_d - Q_s = 600$$





# Price ceilings can lead to:

Shortages that worsen over time.

Inefficient allocation to consumers.

- People who want the good badly may not get it while those who care less do.

Wasted resources

- You spend a lot of time trying to find an apartment, leave work early...

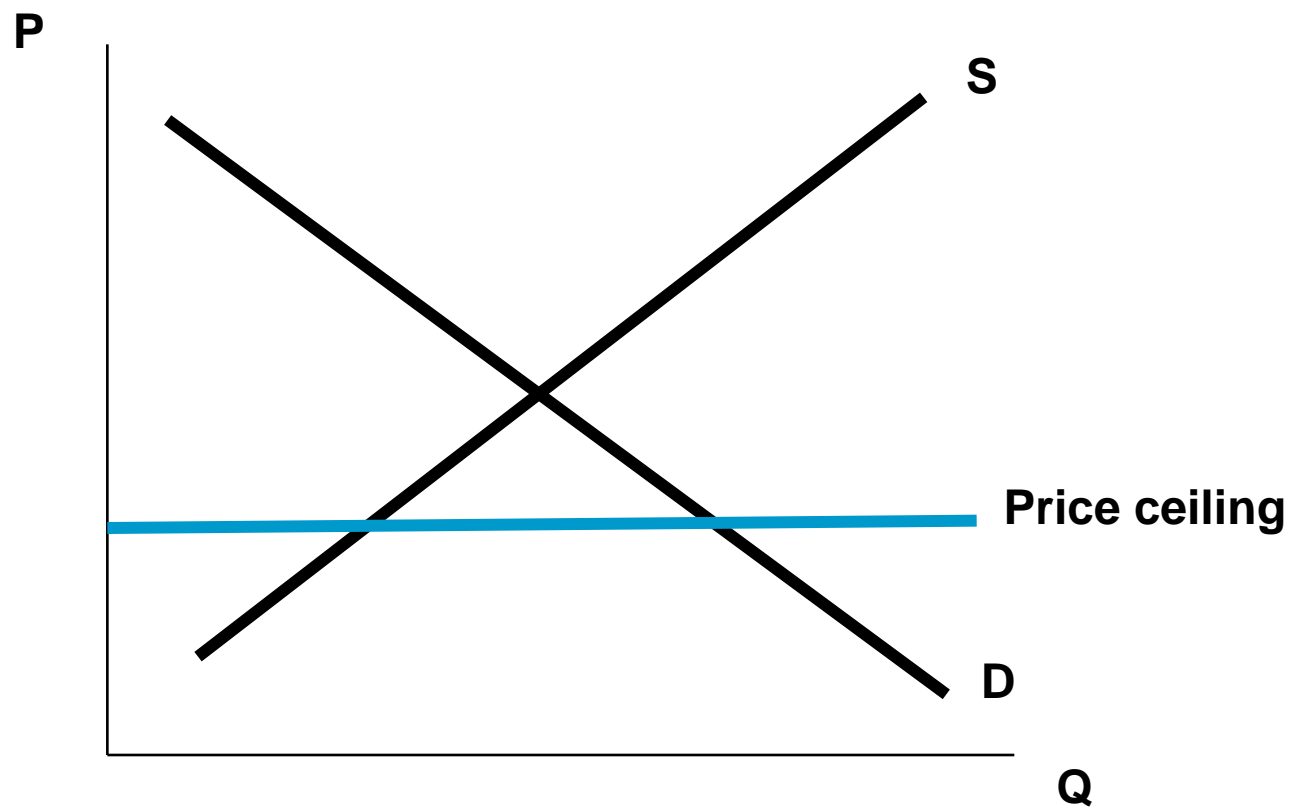
Inefficiently low quality

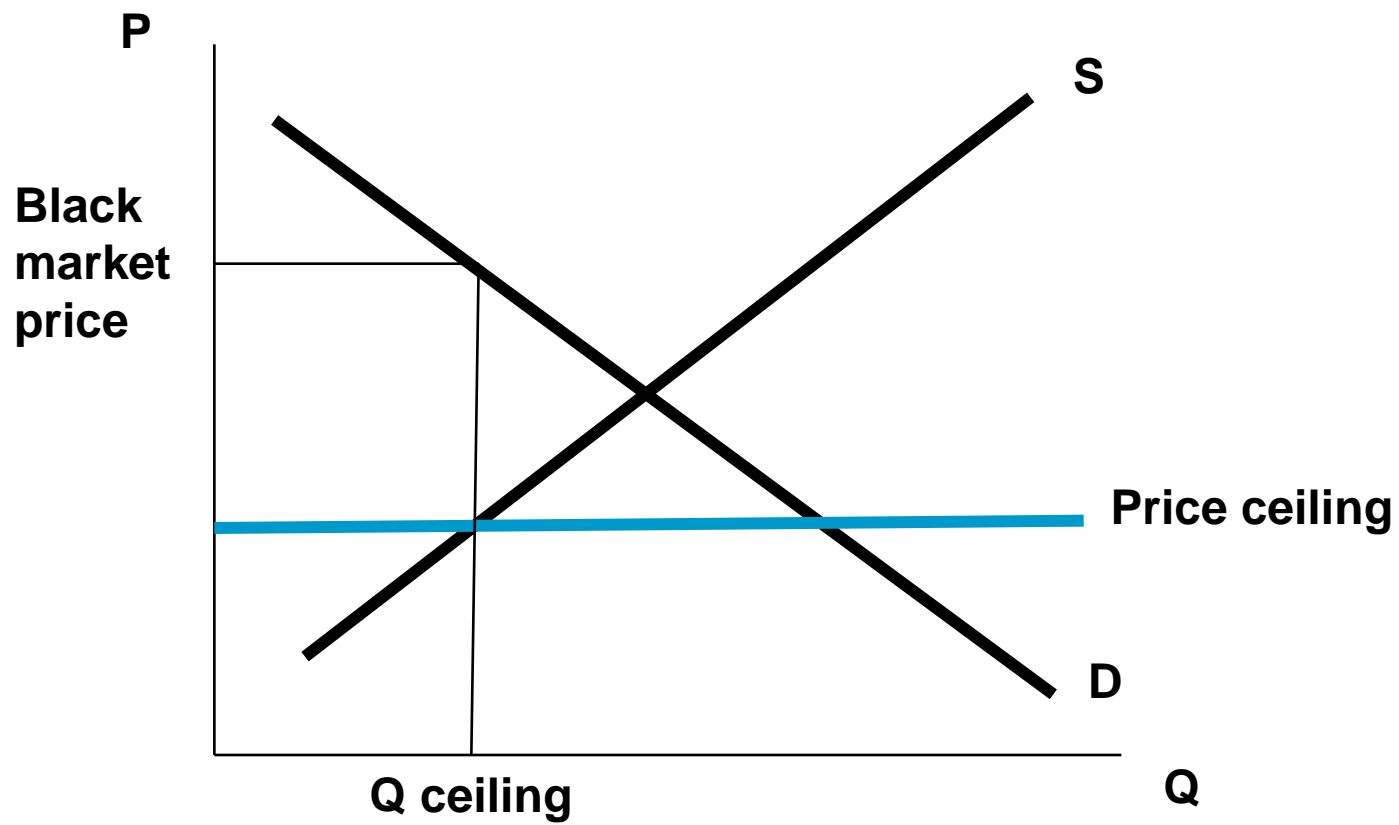
- No incentive for landlords to keep up apartments if they have to rent them cheaply.

## Black Markets

- Example: “I’ll rent you an apartment if you slip me an extra \$500 a month under the table.”
- Illegal, but they often occur.







- At Q ceiling, consumers would be willing to pay up to the black market price for housing.
- The landlord would legally claim rent = rent ceiling and charge the renter the difference under the table.

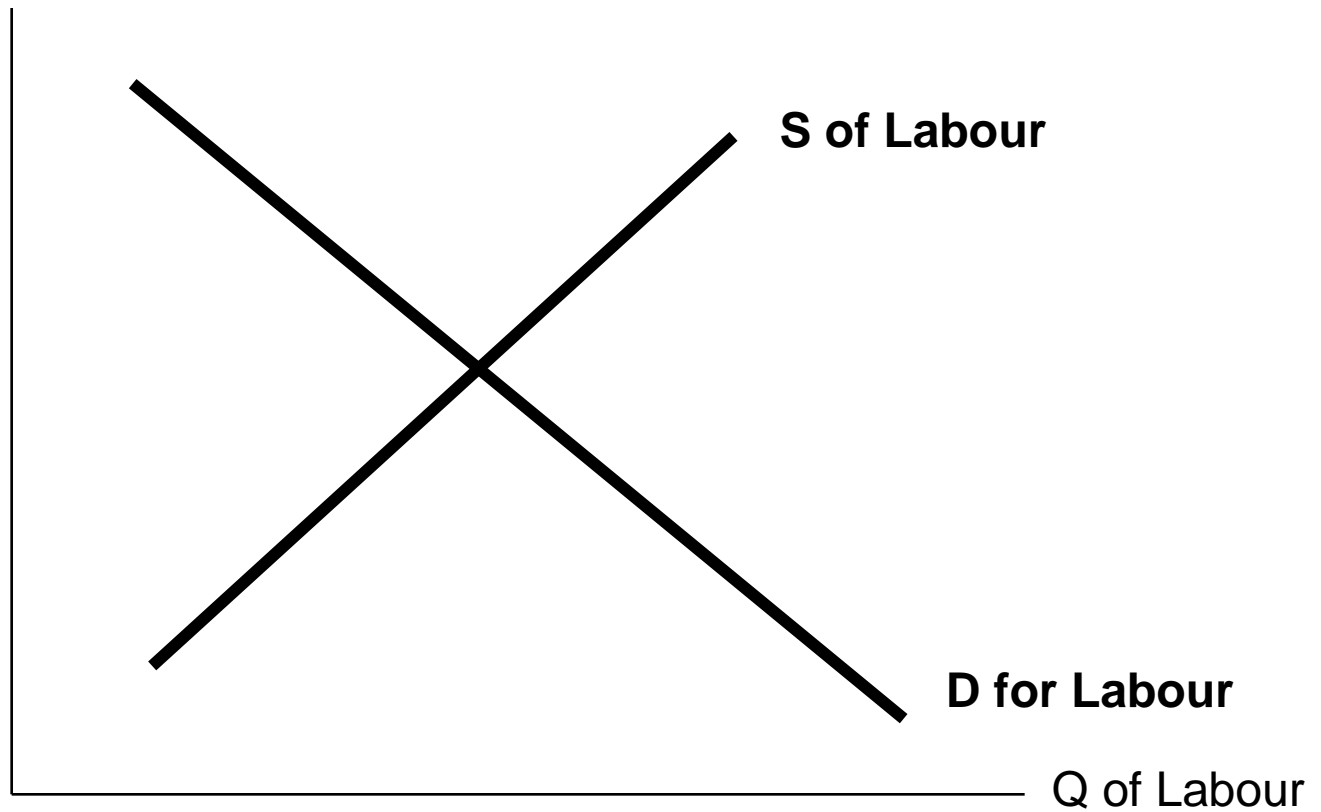
# Price Floors

- A **price floor** is a legal **minimum** on the price at which a good can be sold.
- The price floor is not binding if set below the equilibrium price.
- The price floor is binding if set above the equilibrium price, leading to a **surplus**.

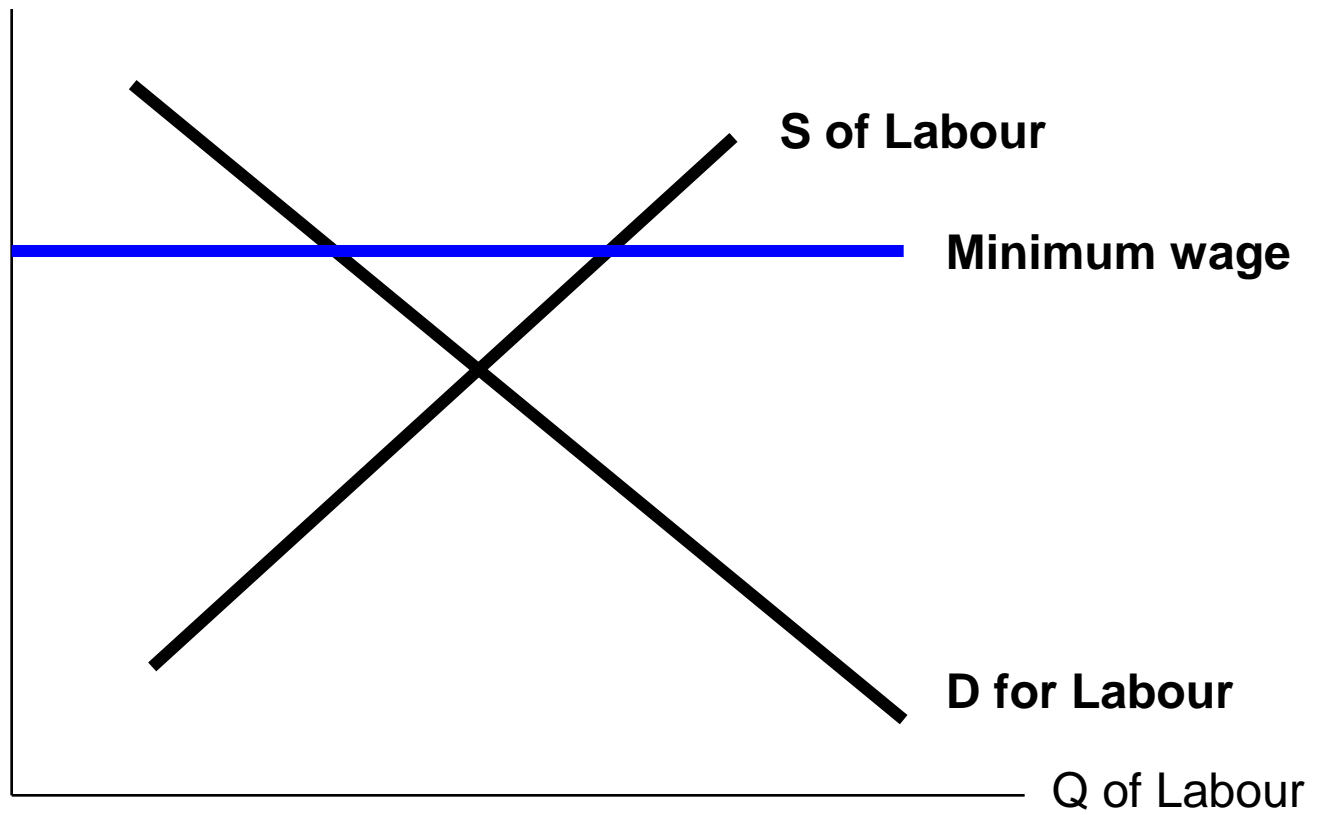
- Example: Minimum Wage
- The government's goal: to ensure at least a certain wage for workers.
- It sets a minimum price of labour (wage) that is above equilibrium wage.
  - usually, only affects low paid workers.

# Minimum Wage

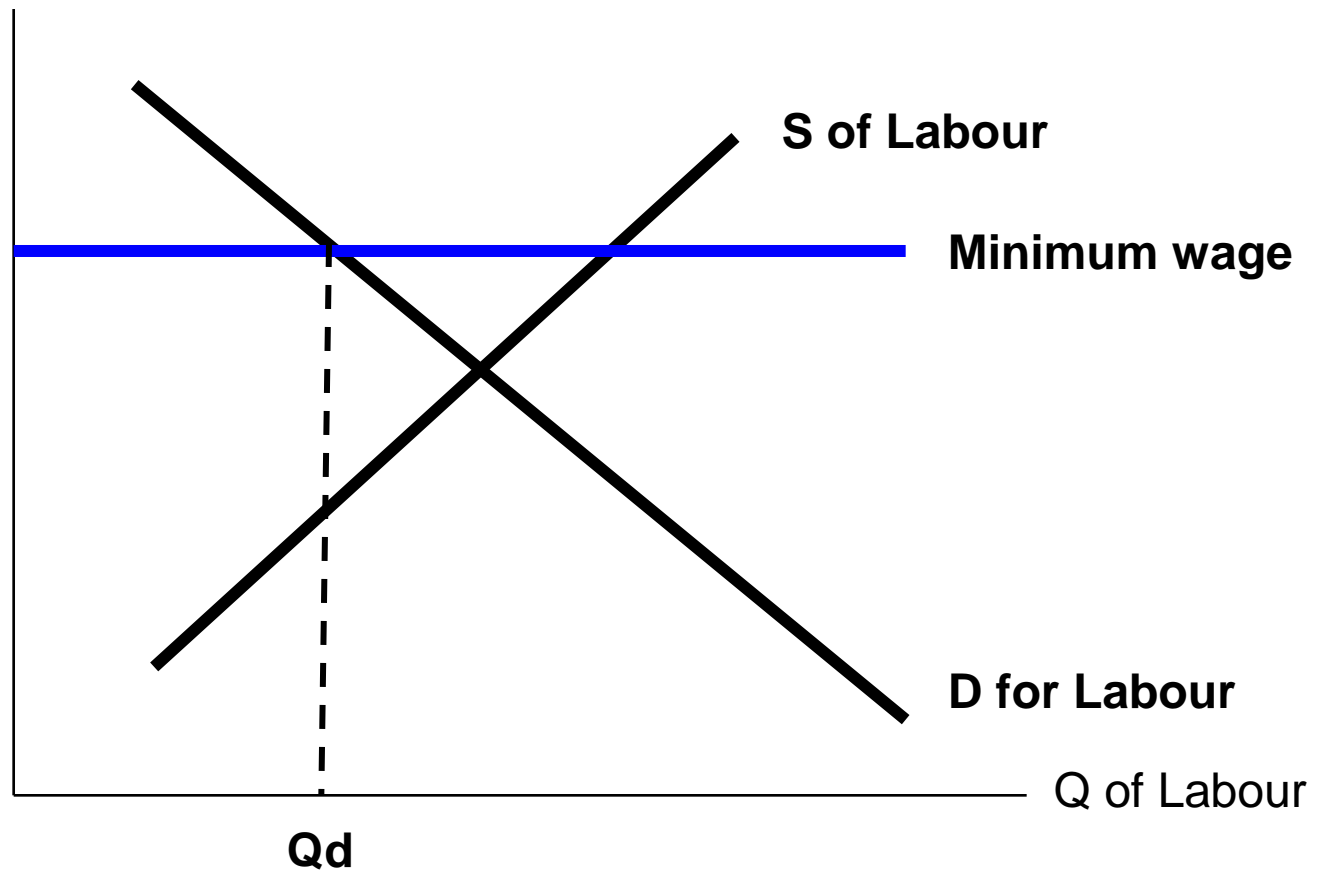
P of  
Labour =  
Wage



P of  
Labour =  
Wage

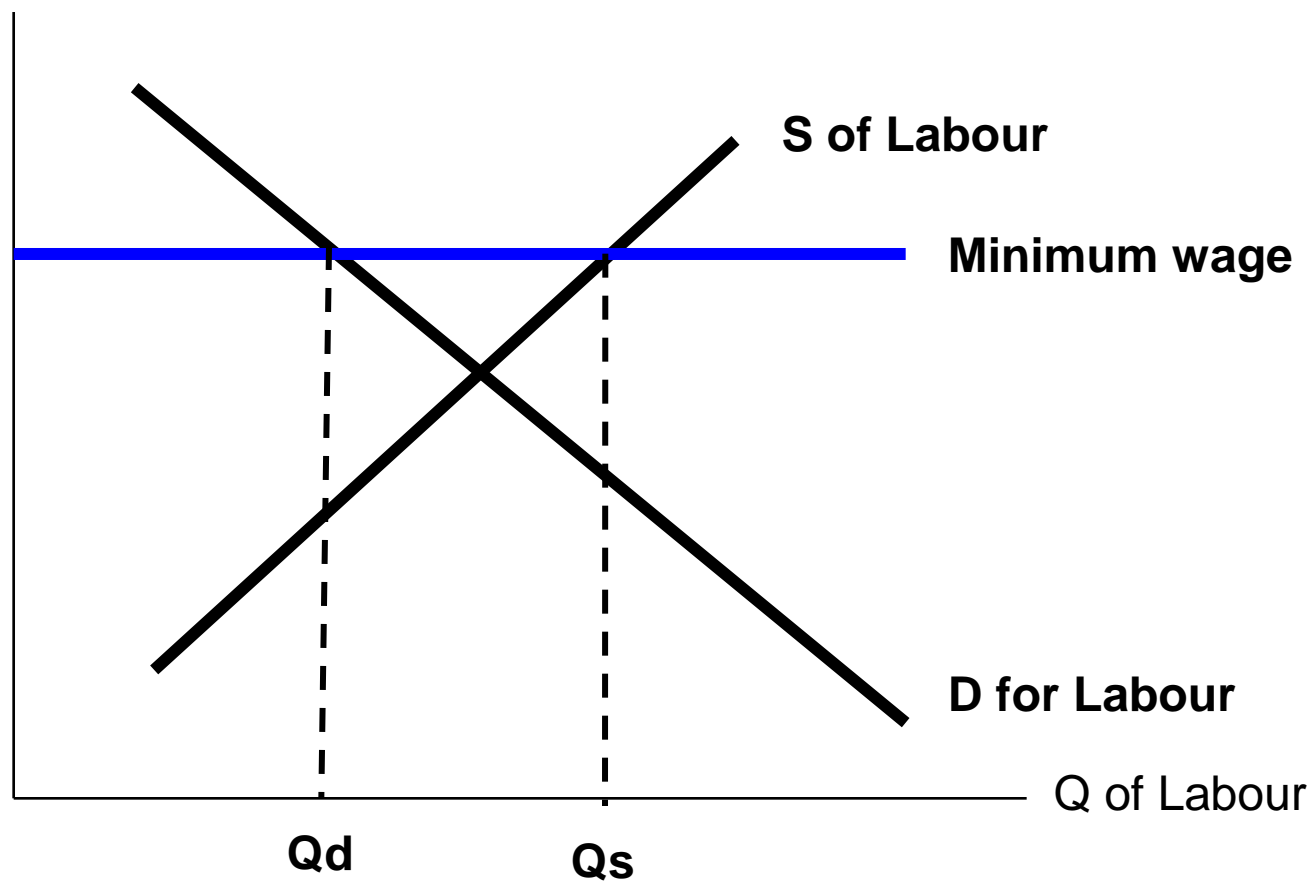


P of  
Labour =  
Wage

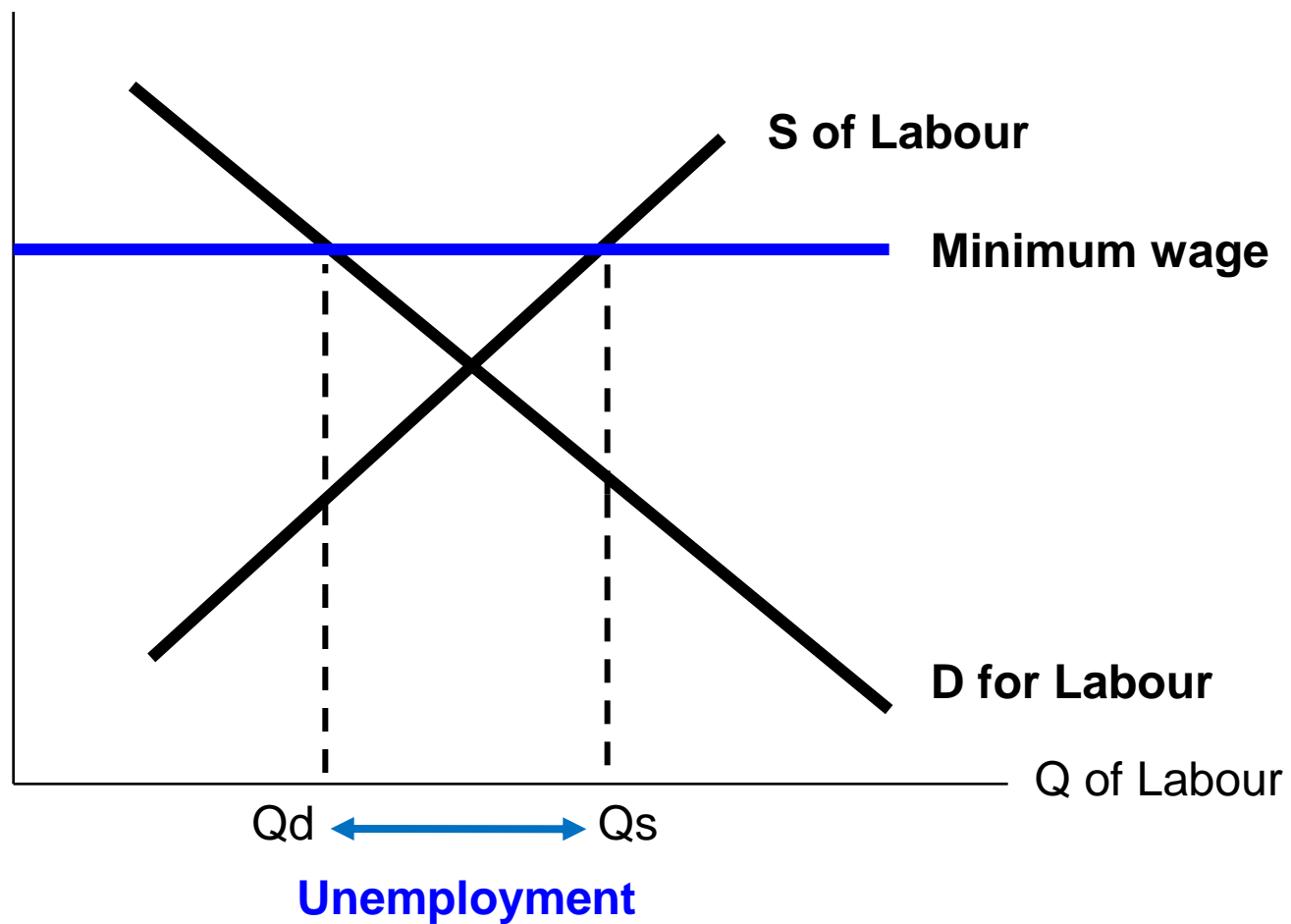




P of  
Labour =  
Wage



P of  
Labour =  
Wage



- At a wage above equilibrium wage,  $S$  of labour  $>$   $D$  for labour
- There's an excess supply of labour, a surplus  
i.e., unemployment
- Excess supply =  $Q_s - Q_d$

Critics of minimum wages argue that it causes

- Unemployment to increase
- Encourages teens to drop out of school
- Prevents unskilled workers from getting on-the-job training
- It isn't high enough to really relieve poverty for the working poor

The minimum wage in Ontario is \$10.25 per hour, \$8.90 for servers.

# Numerical Example

- The equations for demand and supply in the labour market are:

- $Q_d = 22 - 2W$

- $Q_s = 3W - 18$

$W$  = wage, the price of labour

Labour is measured in '000s of hours

- What is equilibrium wage and employment?

In eqm.,  $Q_d = Q_s$

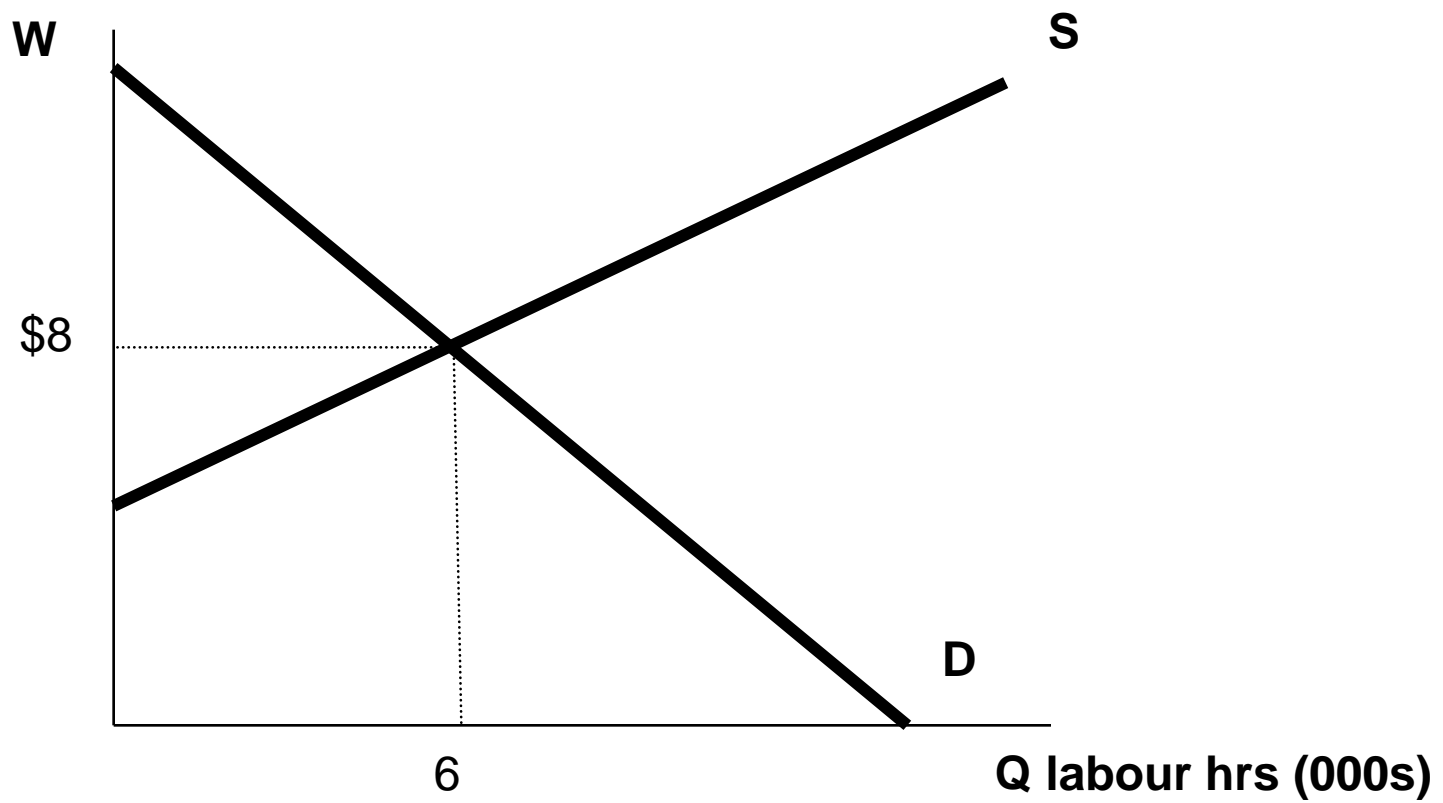
$$22 - 2W = 3W - 18$$

$$40 = 5W$$

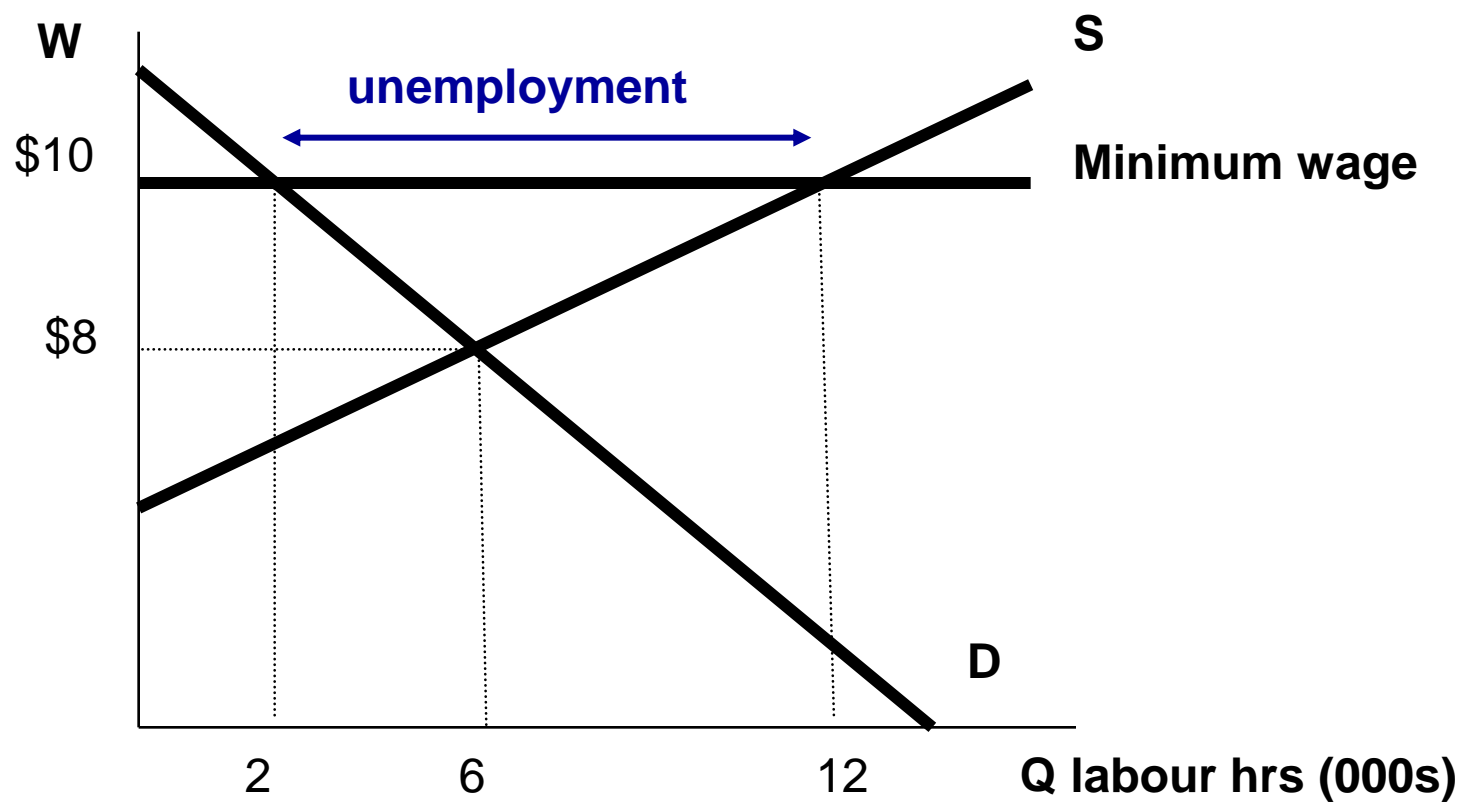
$$W = 8$$

$$Q_d = 22 - 2(8) = 6 = Q_s = Q^* \text{ (6,000 hours)}$$

- What if the province imposes a minimum wage of \$10 per hour?
- If  $W = 10$ ,  
 $Q_d = 22 - 2(10) = 2,000$  hrs.  
 $Q_s = 3(10) - 18 = 12,000$  hrs.
- The surplus of labour hours =  $Q_s - Q_d$   
 $= 12 - 2$   
 $= 10,000$  hrs  
unemployment = 10,000 hrs







# Price floors can lead to:

## Surplus production

- Producers will want to supply more at the higher price.
- Surpluses may be stored, destroyed, exported, given away.
- Can't sell surpluses on the domestic market or selling price will fall below the floor level.

## Inefficient allocation of sales

- those willing to sell the good at a lower price aren't always the ones that manage to sell it.
- eg. You're willing to work below min wage but don't get hired while a student has a job she doesn't really care about but thinks the wage is worth it.

## Wasted resources

- You may spend a lot of time looking for work.

## Inefficiently high quality

- Fancy packaging, added bells and whistles to make the good really attractive to consumers who'd be happy to pay less for lower quality merchandise.

## Illegal activities

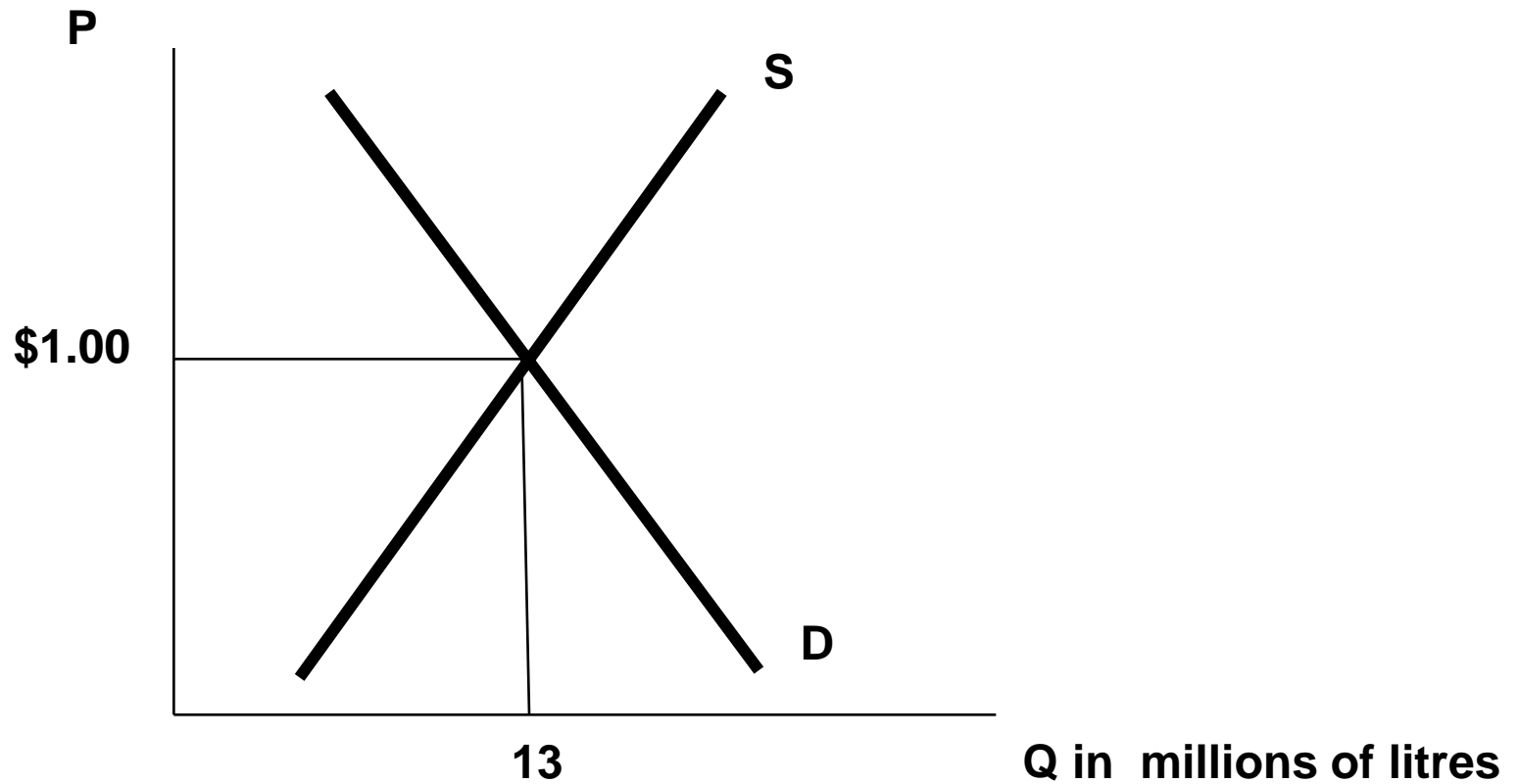
- “I’ll work under the table for less than minimum wage if you hire me.”

# Quotas

A **quota** is a quantity control.

- An upper limit on the quantity of a good that can be sold.
- The government usually issues quota licences that give producers the right to produce a specified amount of a good.
- Examples : the number of taxis in a city  
amount of fish you can catch and sell  
(often seen with agricultural and dairy products)

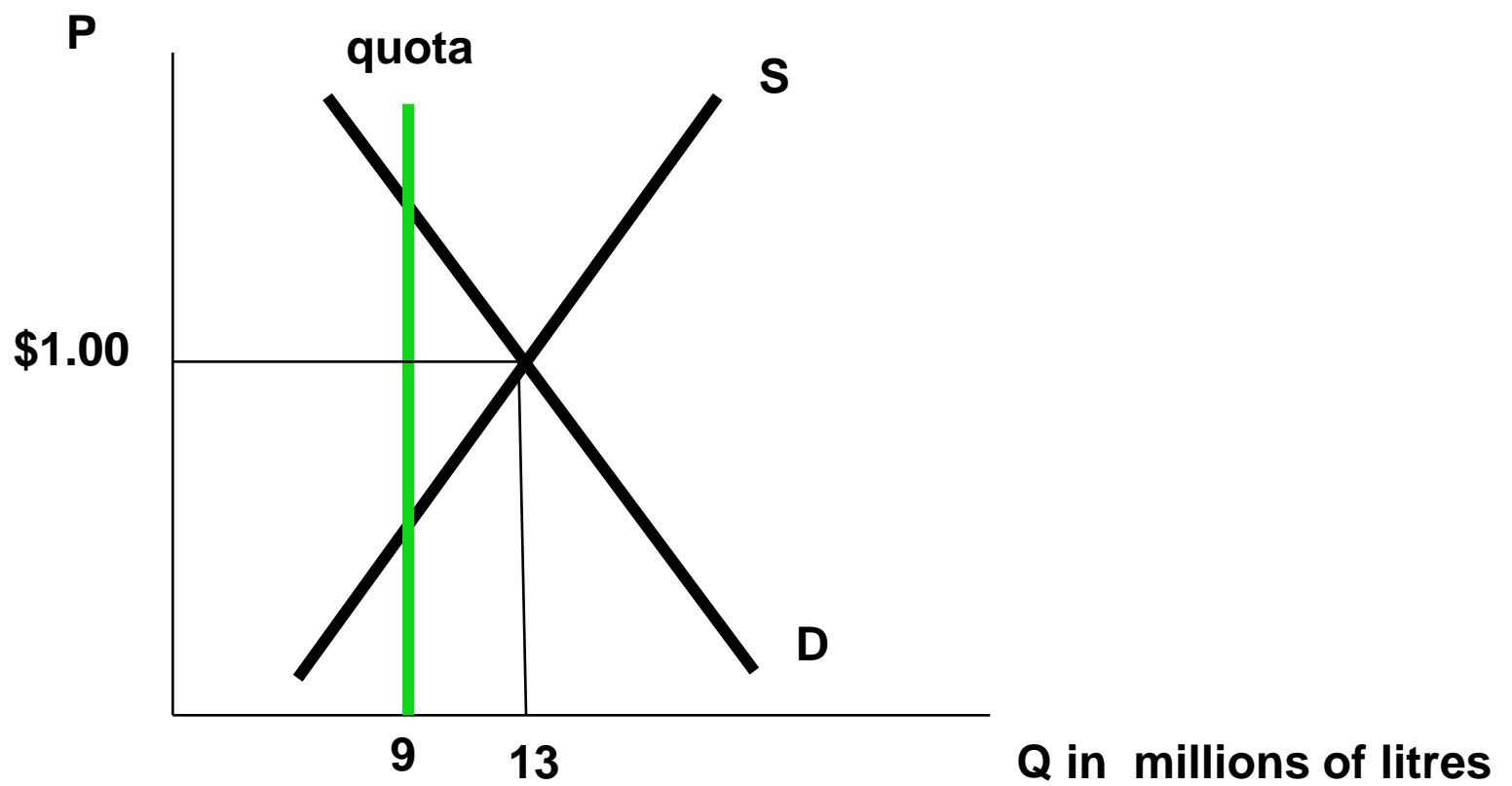
- Example: The Market for Milk

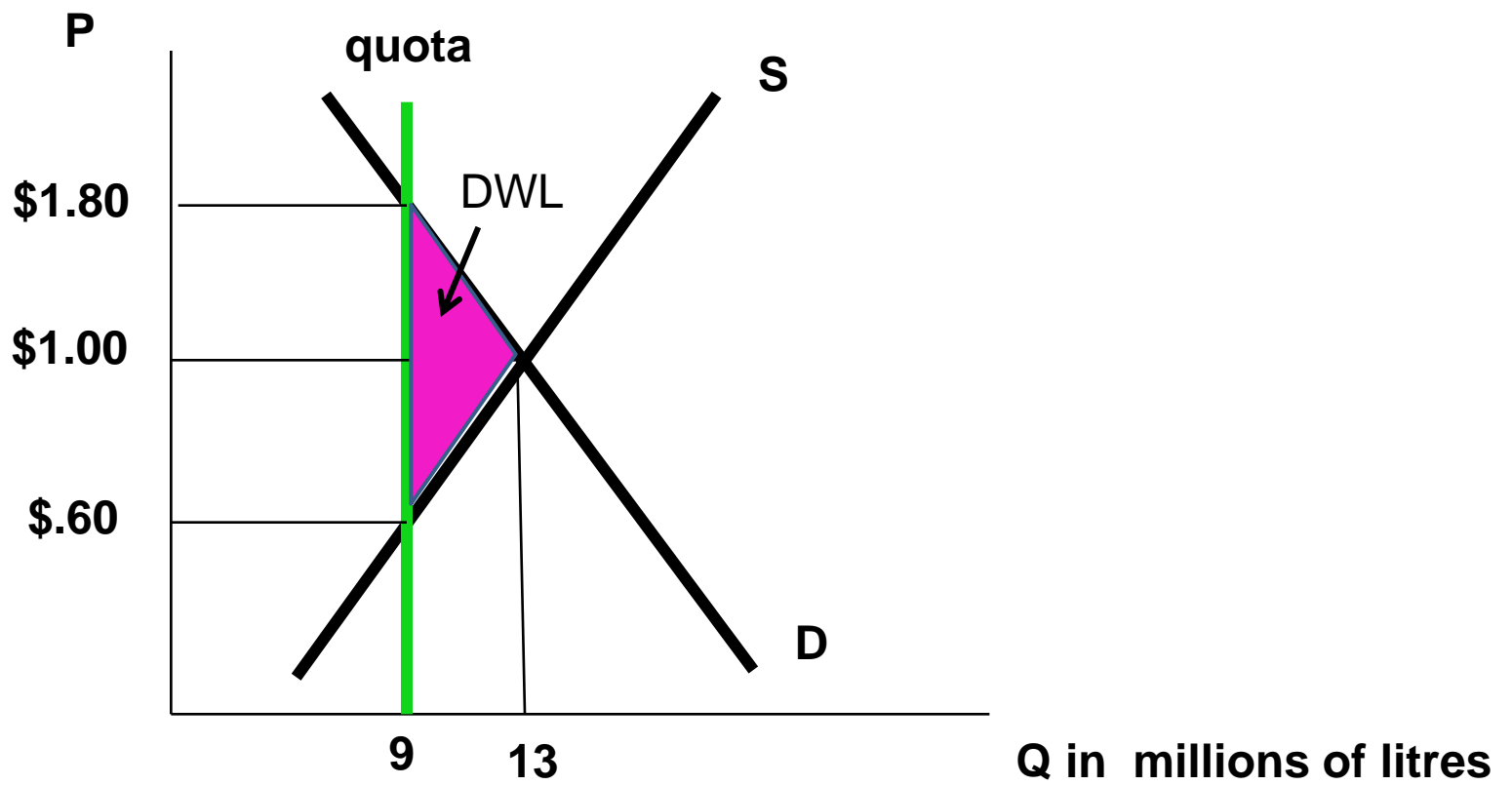


- In an unregulated market, eqm  $P = \$1$  and  $Q = 13$  million litres per week.
- The Canadian Dairy Association decides to limit output to increase prices received by producers and avoid surplus production.
- It makes sure the gov't backs it up by imposing tariffs on imports of milk from the US. This will make milk expensive enough so that consumers won't buy US milk.

- The quota is set at 9 million litres per week.
- At  $Q = 9$  million, consumers are willing to pay \$1.80 per litre (this is the demand price).
- But, at that  $Q$ , producers would normally be happy to receive \$ .60 per litre.







- The difference between these 2 prices is the **quota rent**: quota owners receive an additional \$1.20 per litre per week.

This is also the value of the quota.

- Someone who wanted to produce milk would be willing to pay up to \$1.20 per litre per week to acquire the rights to produce milk, sell it at \$1.80 and net \$.60 per litre per week.

# Taxes

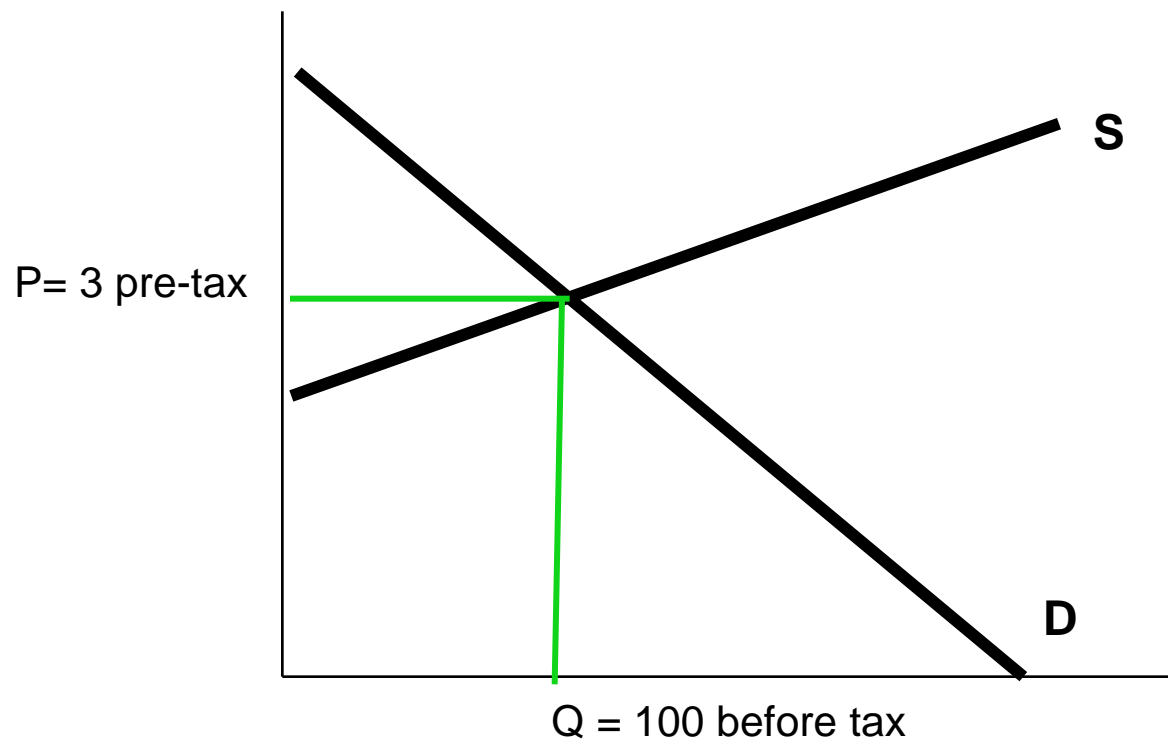
- Governments levy taxes to raise revenue for public projects.
- **Tax incidence** is the distribution of a tax burden.
- Do buyers or sellers bear the burden when the government imposes a tax?

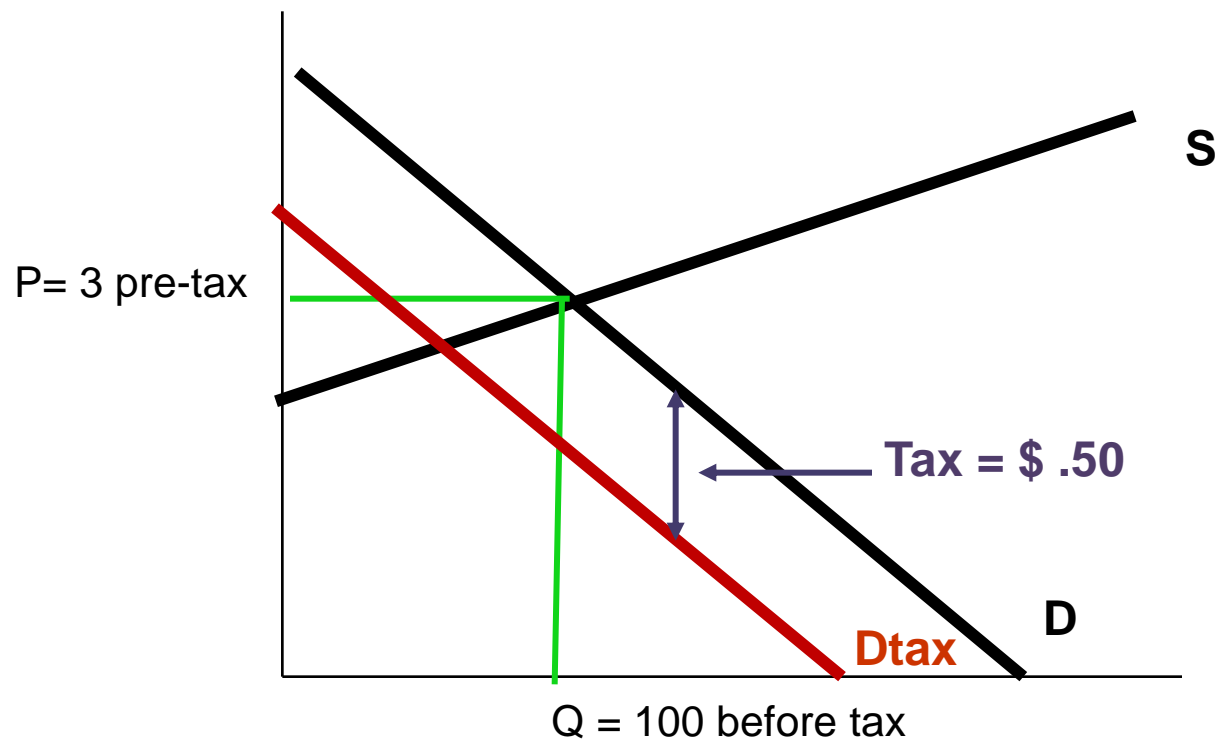
# A Tax on Consumers

- Example: The Market for Beer
- $P$  is the price per bottle.
- $Q$  is the number of bottles sold per week at a very small bar in a farming community.
- In equilibrium,  $P = \$3.00$  and  $Q = 100$

- Now, suppose the government imposes a tax of \$ .50 per bottle on consumers of beer.
- Consumers will demand less beer.
- The gov't doesn't care what the eqm price is, and the \$ .50 tax will apply no matter what the price of beer happens to be.
- Consumers will want less beer at any price.
- This means the demand curve will shift down by the amount of the tax.

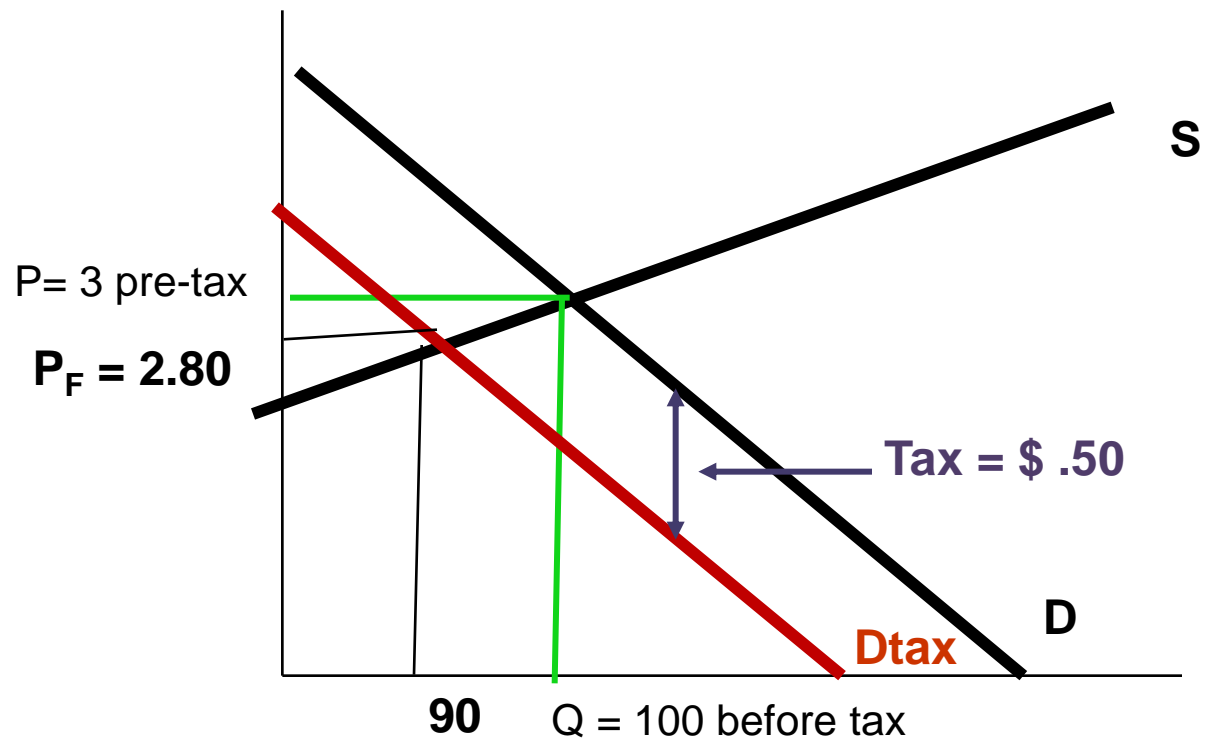
# Tax on Consumers

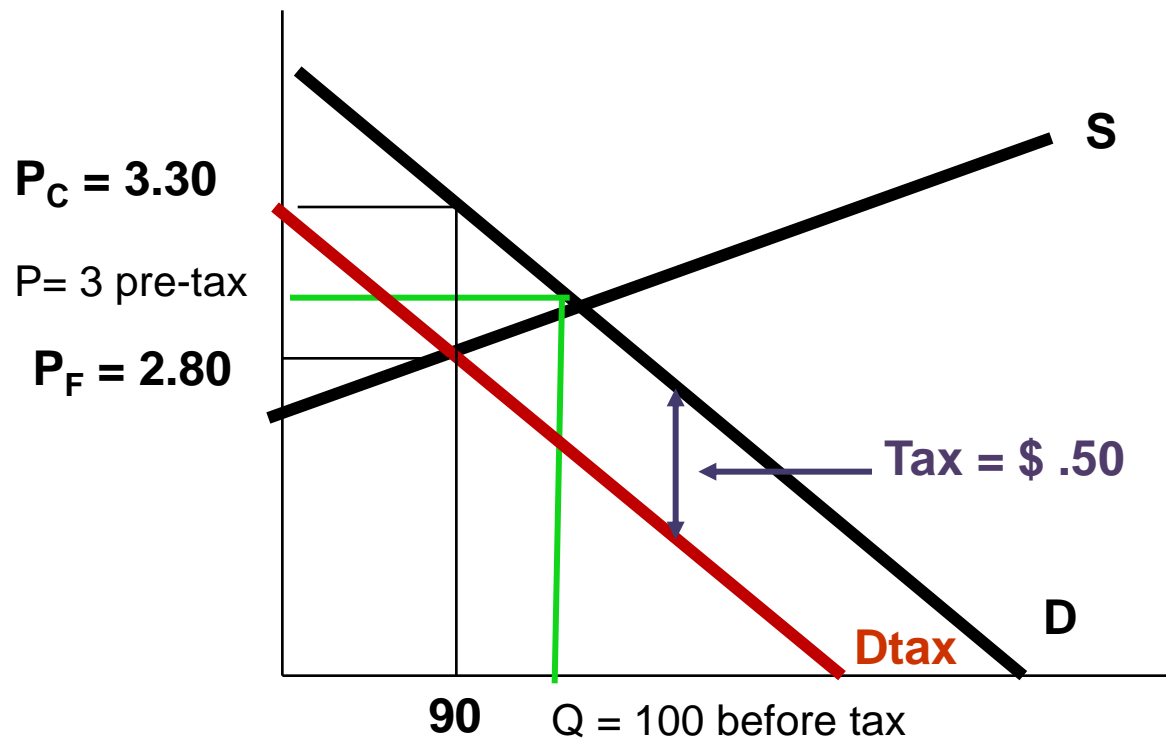


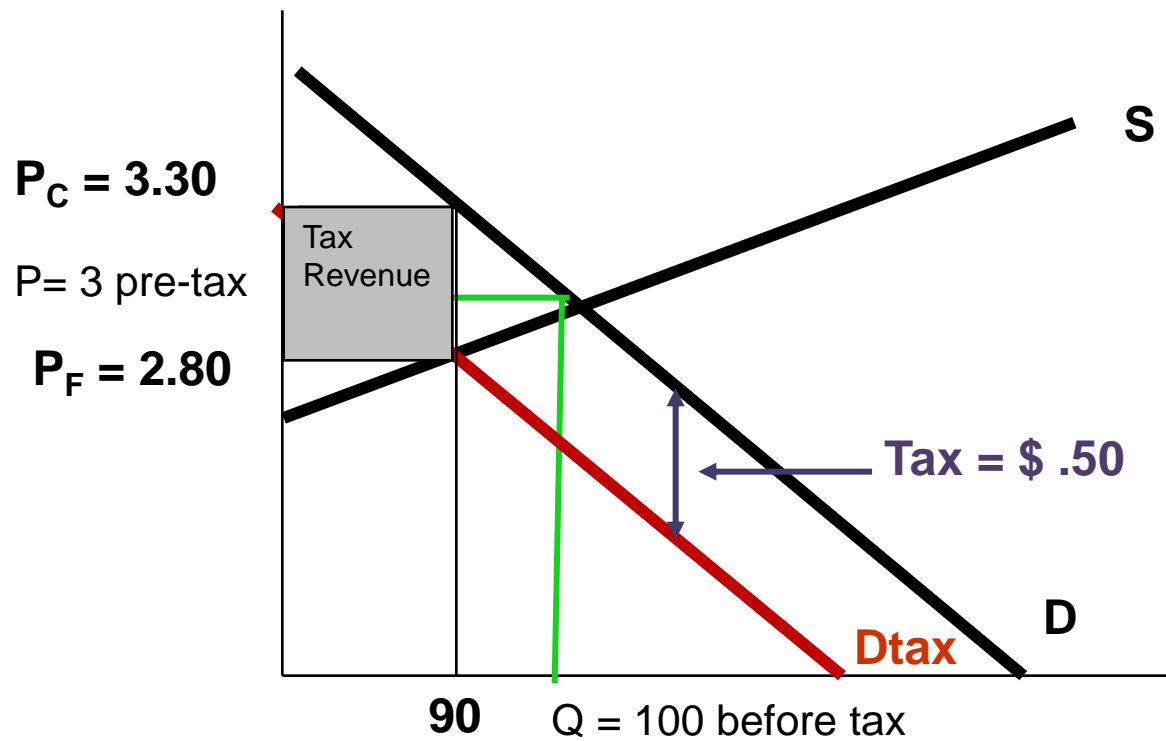




- Now there's a new eqm at  $P = \$2.80$  and  $Q = 90$ .
- But, the consumers must pay the \$ .50 tax.
- They end up paying a price  $P_C = \$3.30$ , while the firm (the bar) receives  $P_F = \$2.80$ .
- The government receives  $\$.50 \times 90 = \$45.00$  in tax revenue.







- Notice that the burden of the tax doesn't fall equally on consumers and sellers.
- Before the tax, the consumers paid \$3.00 and sellers received \$3.00 per bottle.

After the tax,

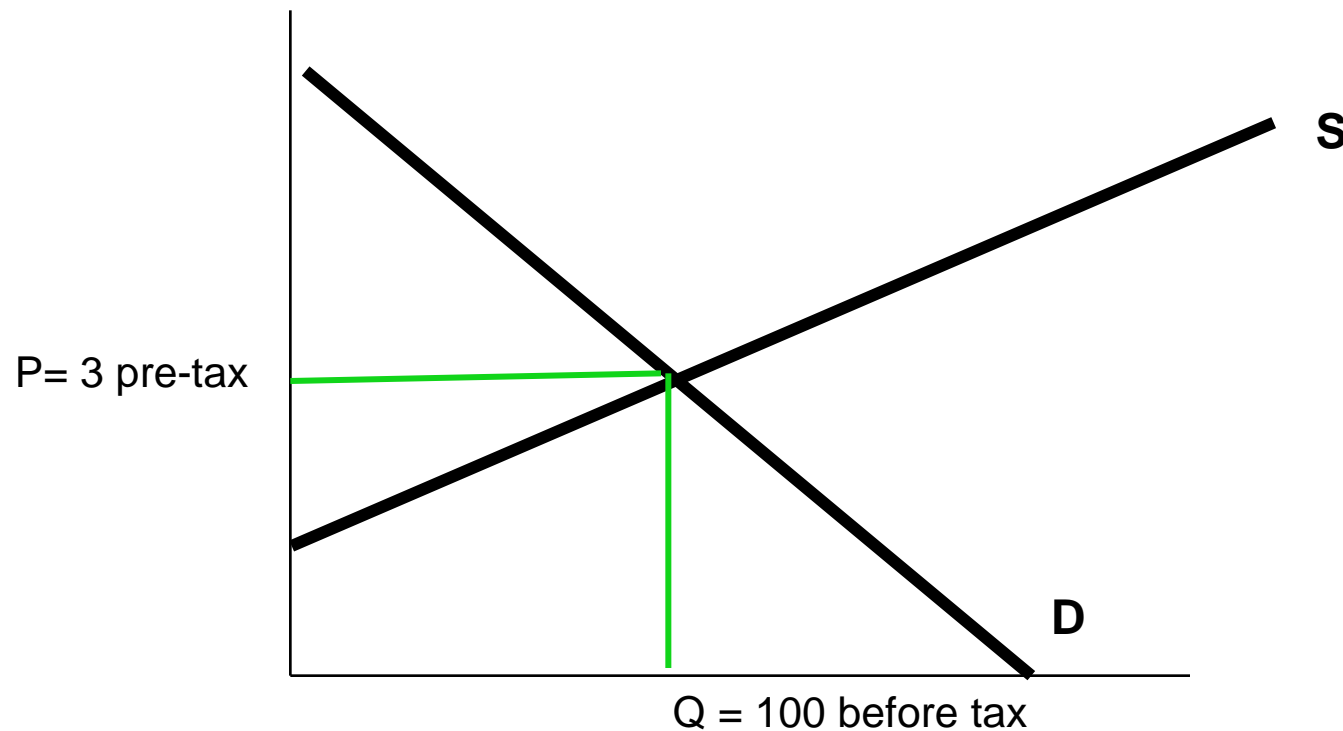
- Consumers pay \$ .30 more per bottle.
- Sellers receive \$ .20 less per bottle.
- In this case, the consumers bear the larger burden of the tax: \$.30 versus \$.20.

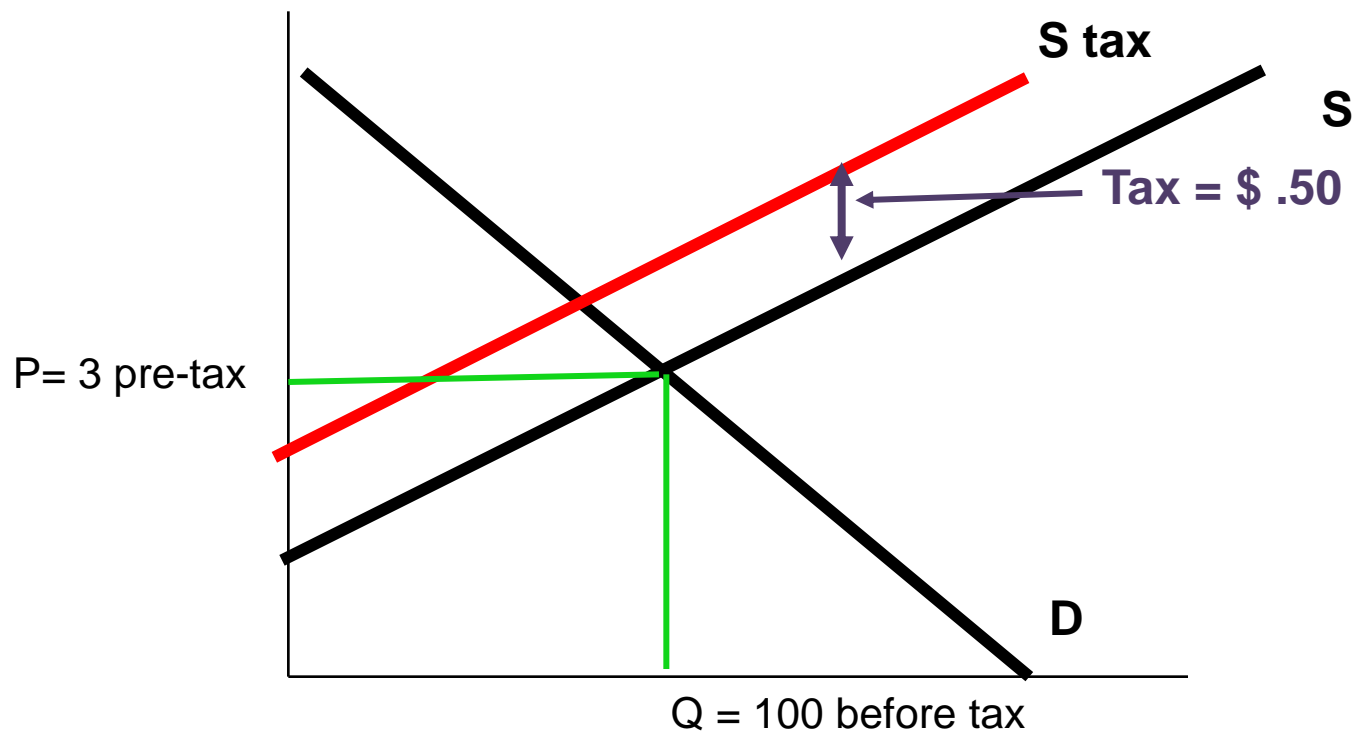
# A Tax on Suppliers

Now, suppose instead that the government levies the tax on bar owners.

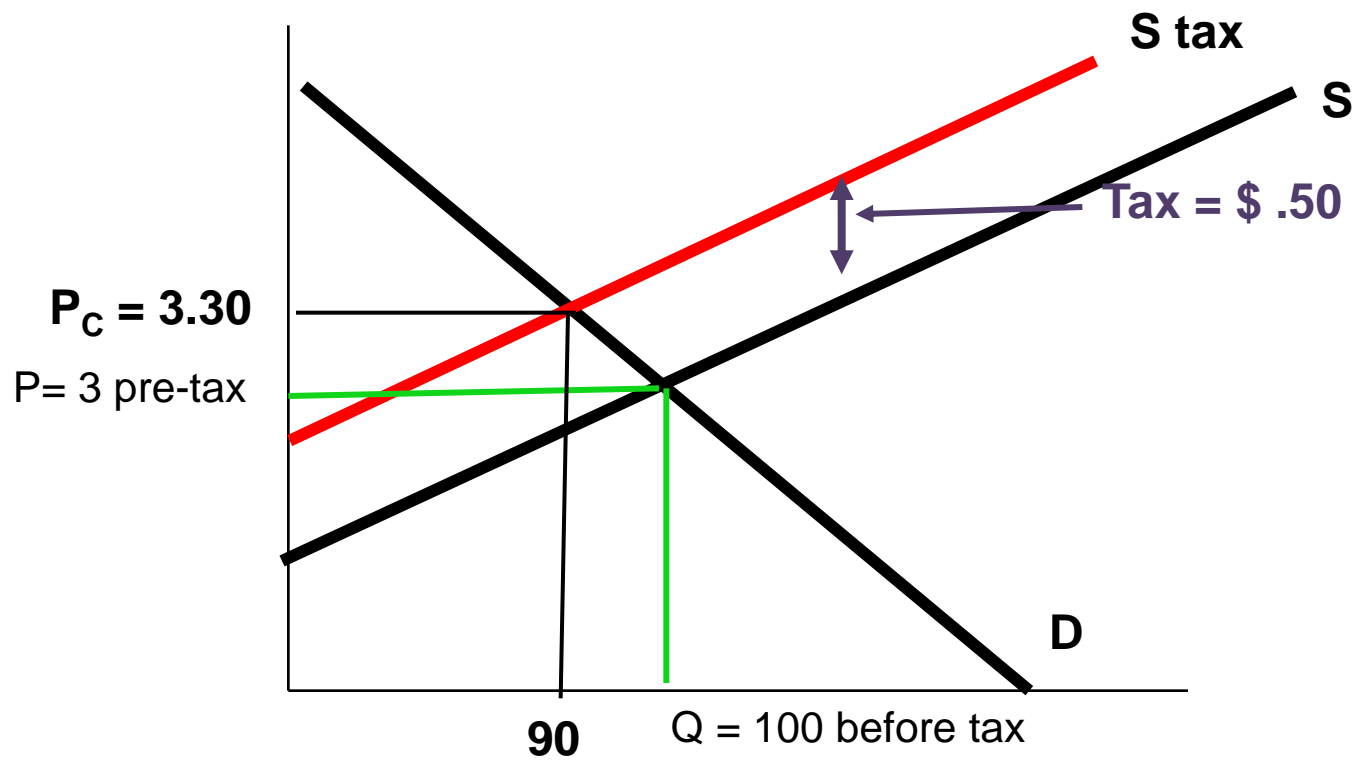
- Sellers react by supplying less beer at every price.
- The supply curve will shift up by the amount of the tax.

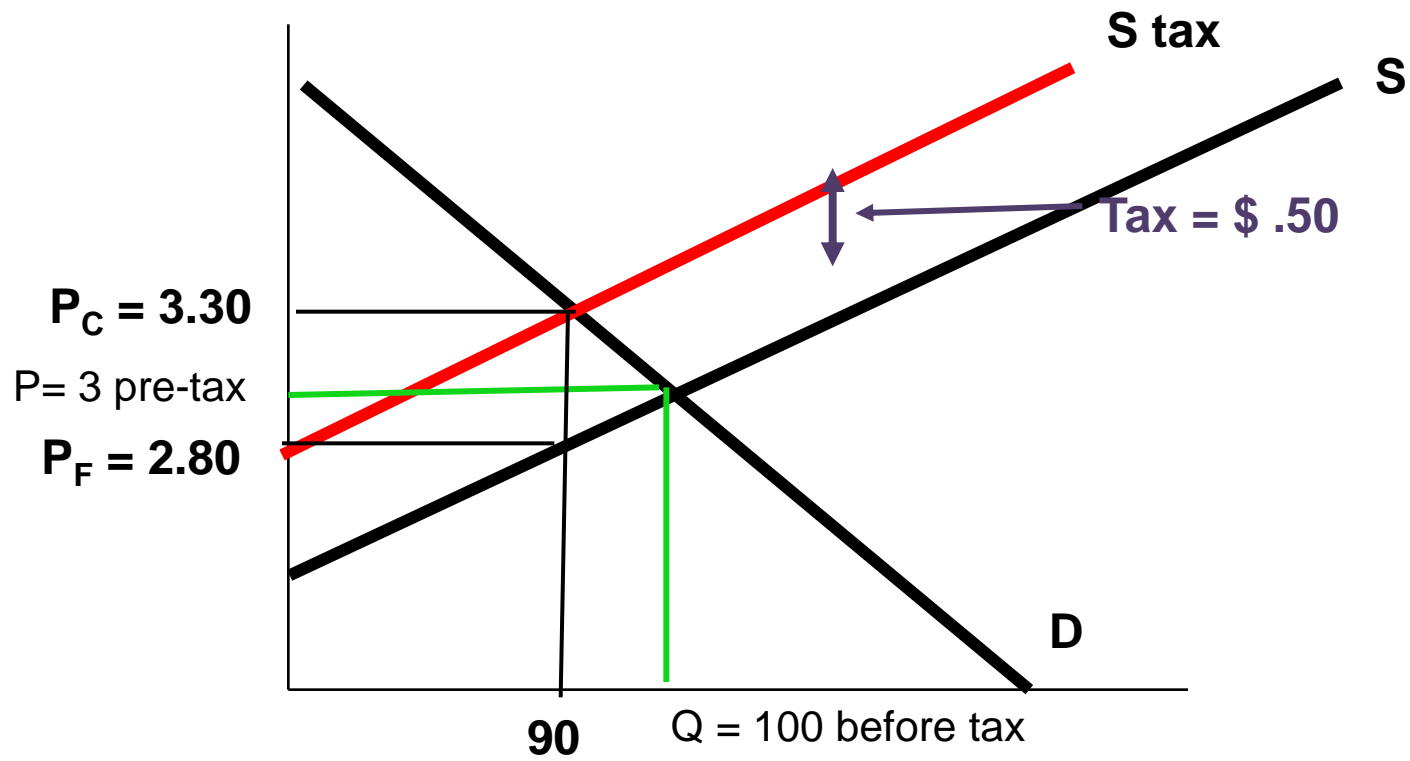
# Tax on Sellers (Firms, Producers, Suppliers)

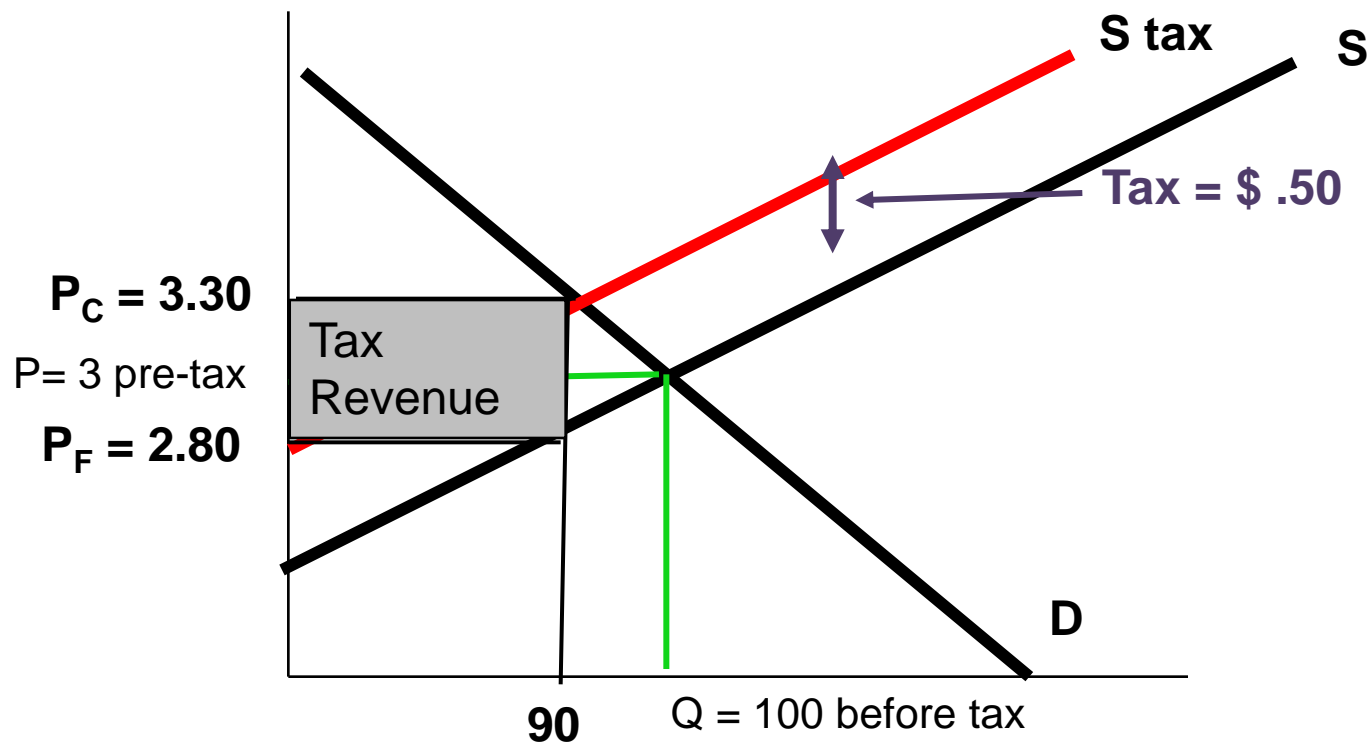












- Again, there's a new eqm  $P = \$3.30$  and  $Q = 90$ .
- Consumers pay  $P_C = \$3.30$
- Sellers receive  $P_F = \$2.80$  (they get  $\$3.30$  from the consumer and remit  $\$ .50$  to the government for a net take of  $\$2.80$ )
- The gov't receives  $\$ .50 \times 90 = \$45.00$  in tax revenue.

- The burden of the tax is the same.
- Consumers pay \$ .30 more than before.
- Sellers receive \$ .20 less than before.
- The consumer bears the larger burden of the tax.

To summarize,

- Taxes on consumers and taxes on suppliers are equivalent – the end result doesn't matter on whom the tax is levied.
- Taxes reduce the quantity traded, increase the price consumers pay and lower the price suppliers receive.

- In our example, the consumers bore the larger burden of the tax.
- That's because the demand curve is actually steeper than the supply curve.
- This turns out to be a general rule:

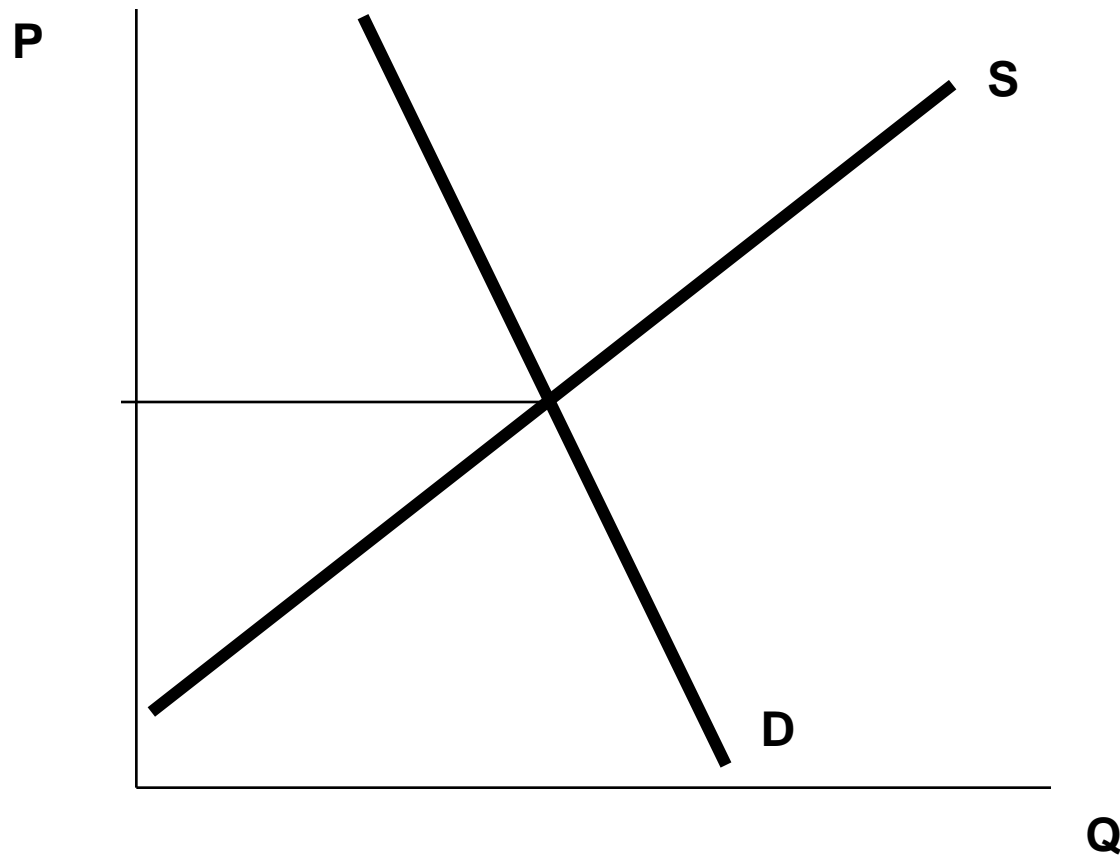
The side of the market which is more inelastic (steeper curve) bears a larger burden of the tax.

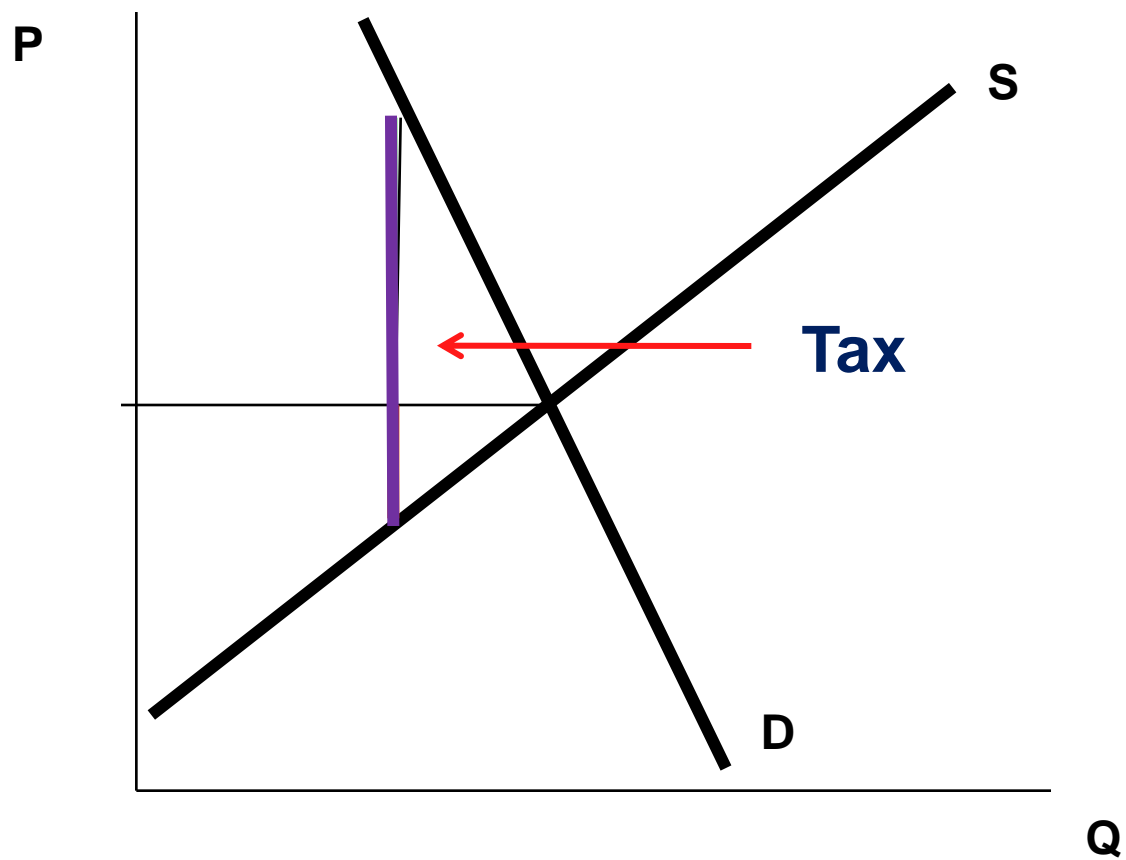
Why inelastic?

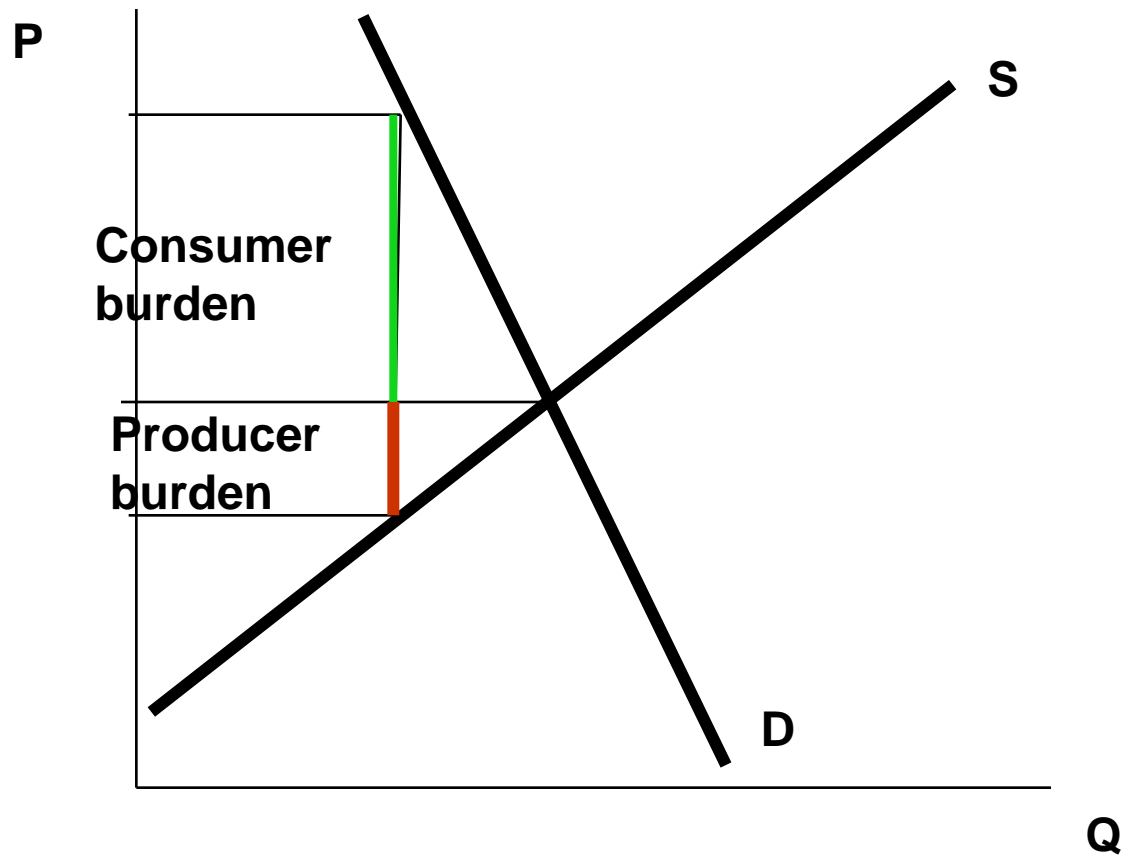
- Less responsive to change
- Can't adjust to compensate to any great extent
- You get stuck with a larger share of the tax



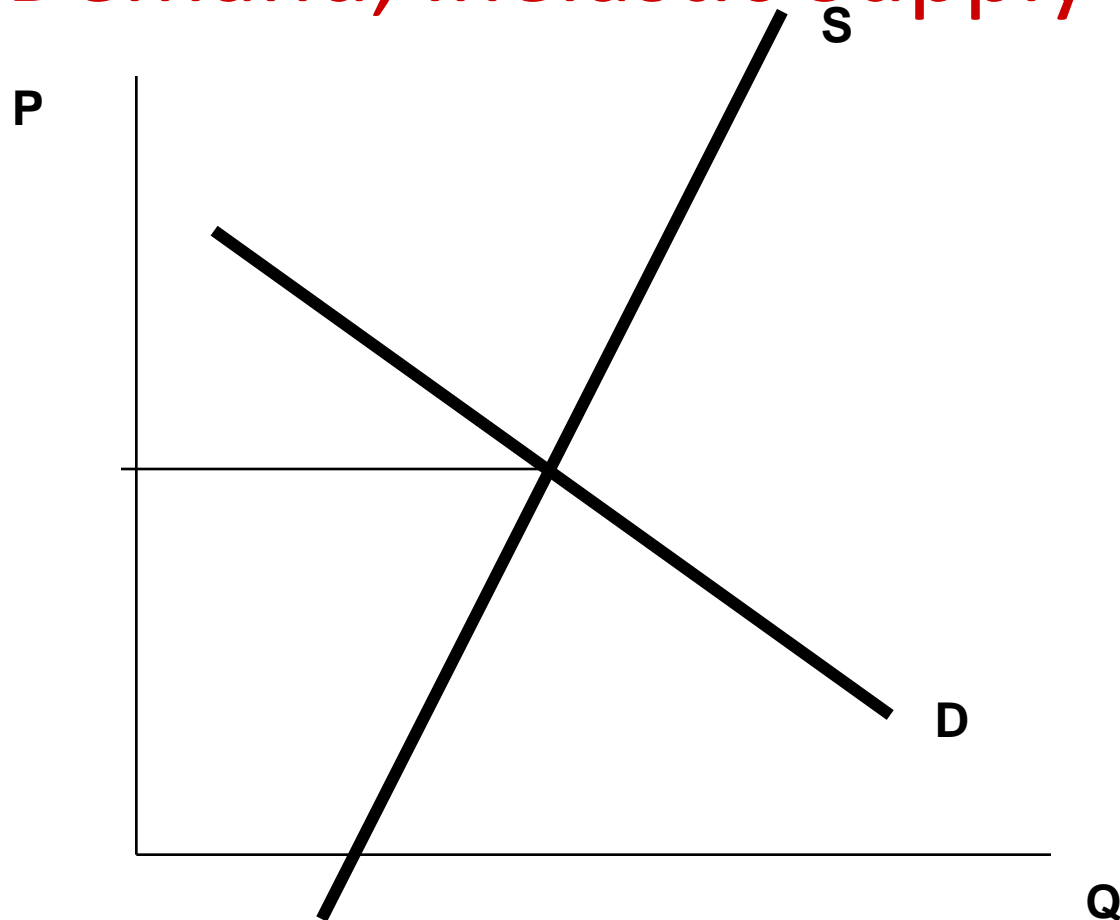
# Elastic Supply, Inelastic Demand

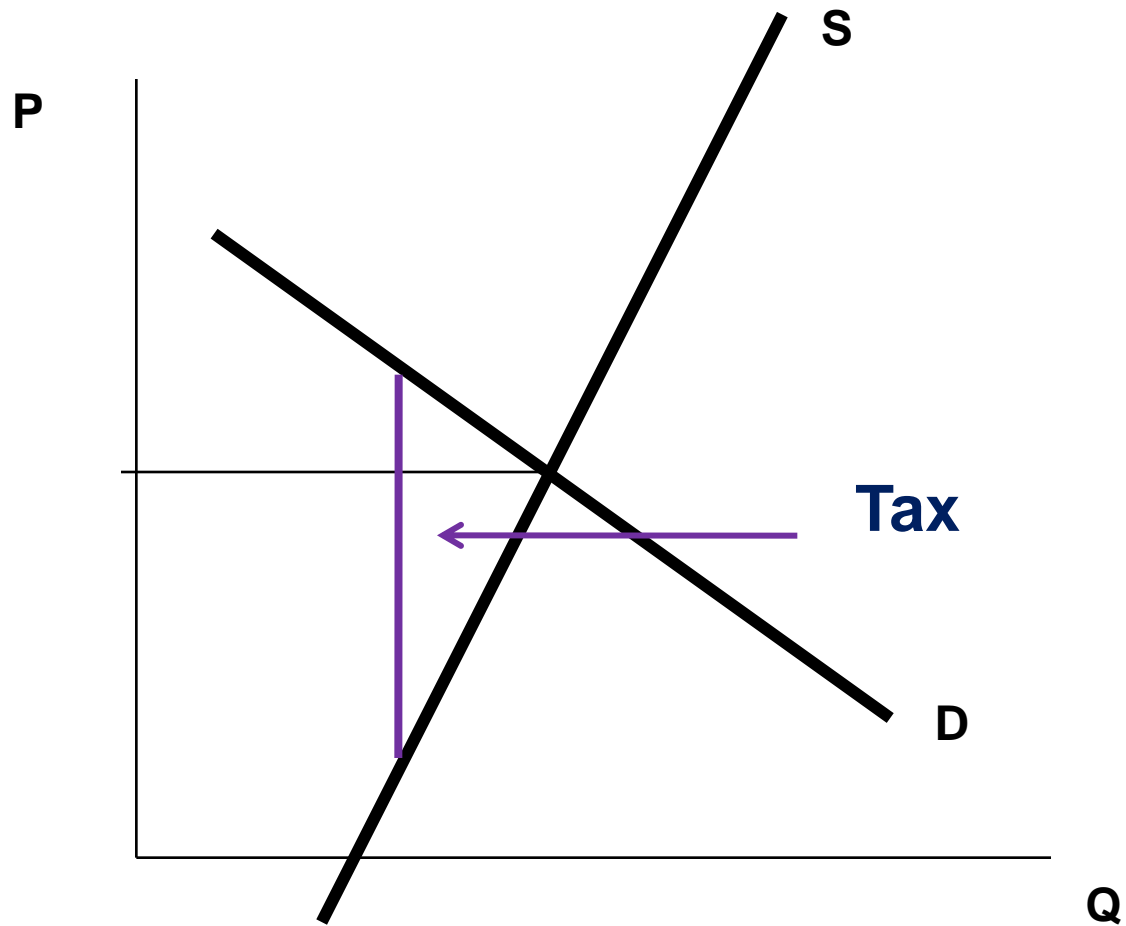


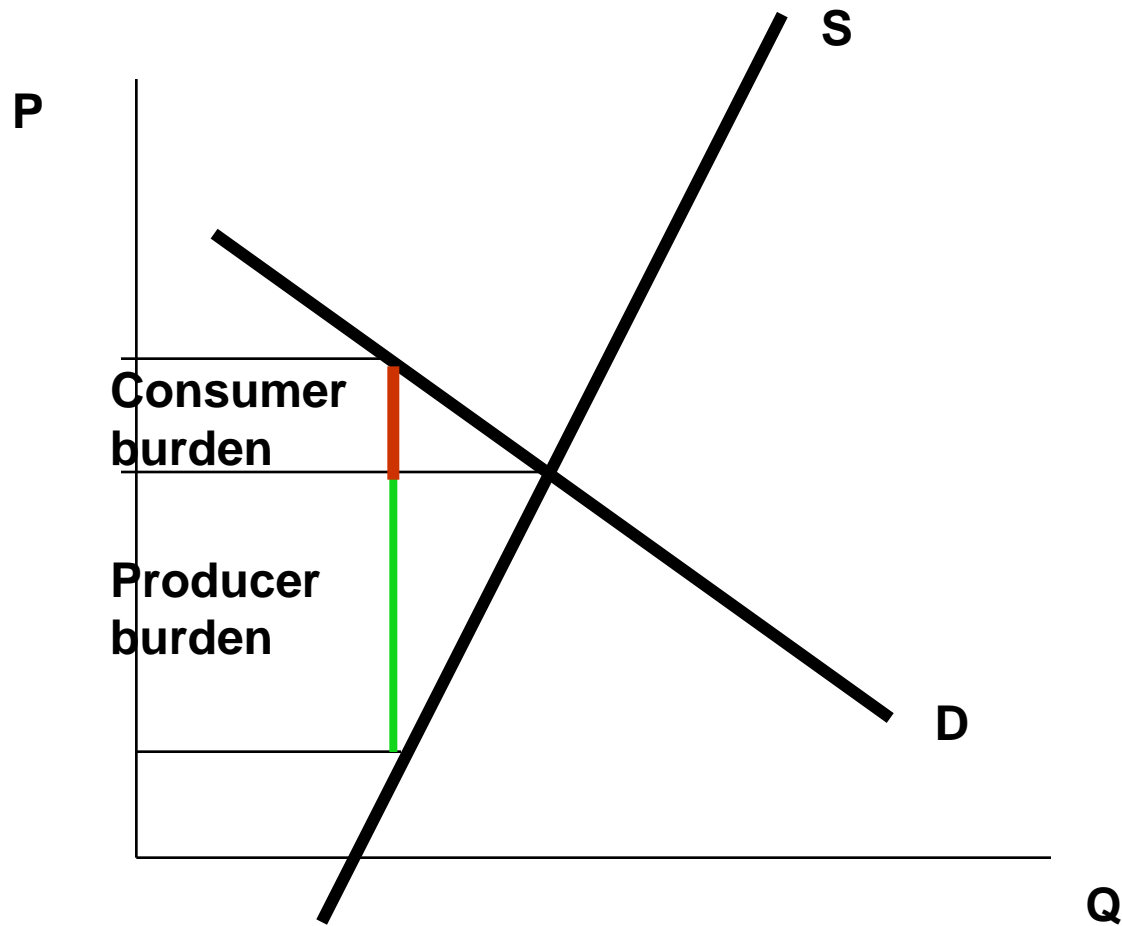




# Elastic Demand, Inelastic Supply







# The Deadweight Loss of Taxation Ch. 8

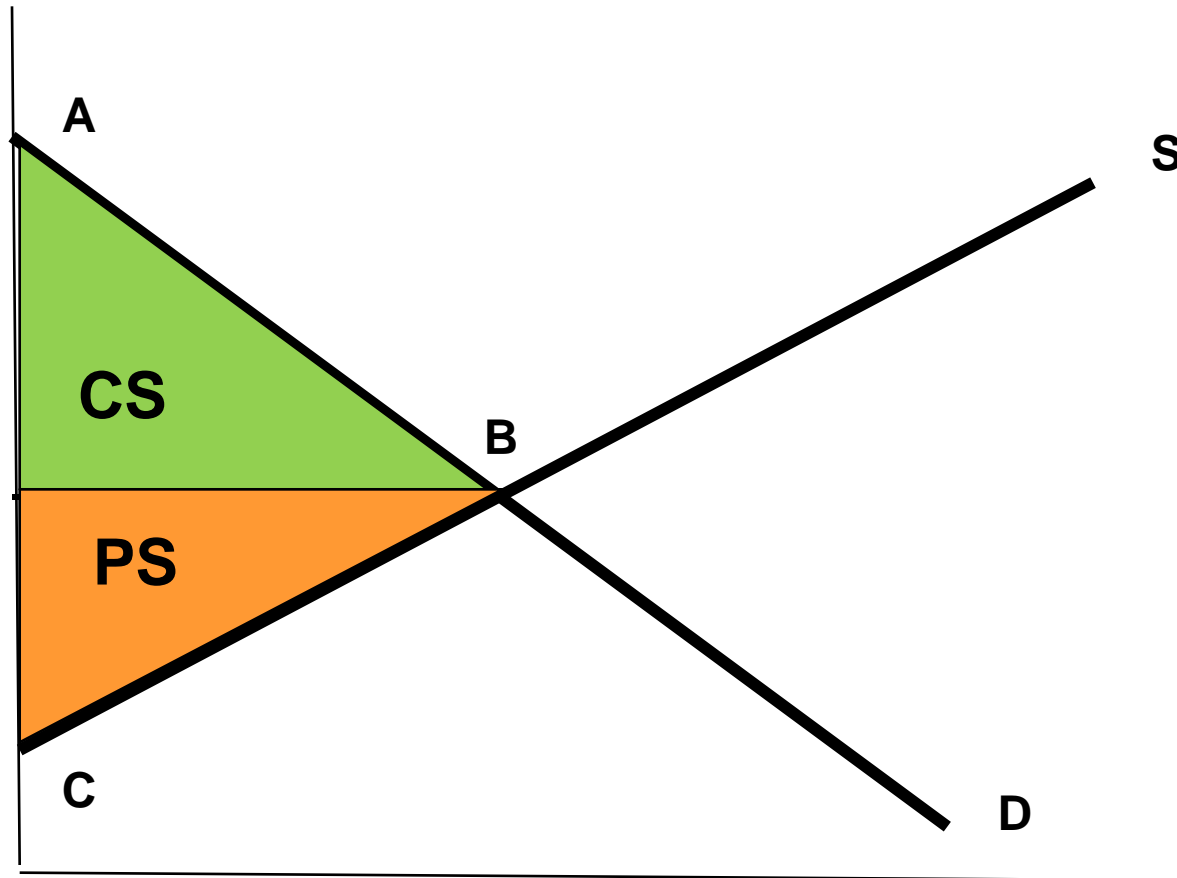
- Since a tax places a burden on consumers and suppliers and reduces the quantity traded in the market compared to the non-tax equilibrium quantity, we know there will be a deadweight loss.
- The government's tax revenues are a benefit for them and a benefit for the recipients when the gov't spends that revenue on social programs.
- But ultimately, consumers and producers lose out.

# Changes in Welfare

- A tax on a good reduces consumer surplus and producer surplus.
- On the following diagram, total surplus is the area of  $\triangle ABC$ .

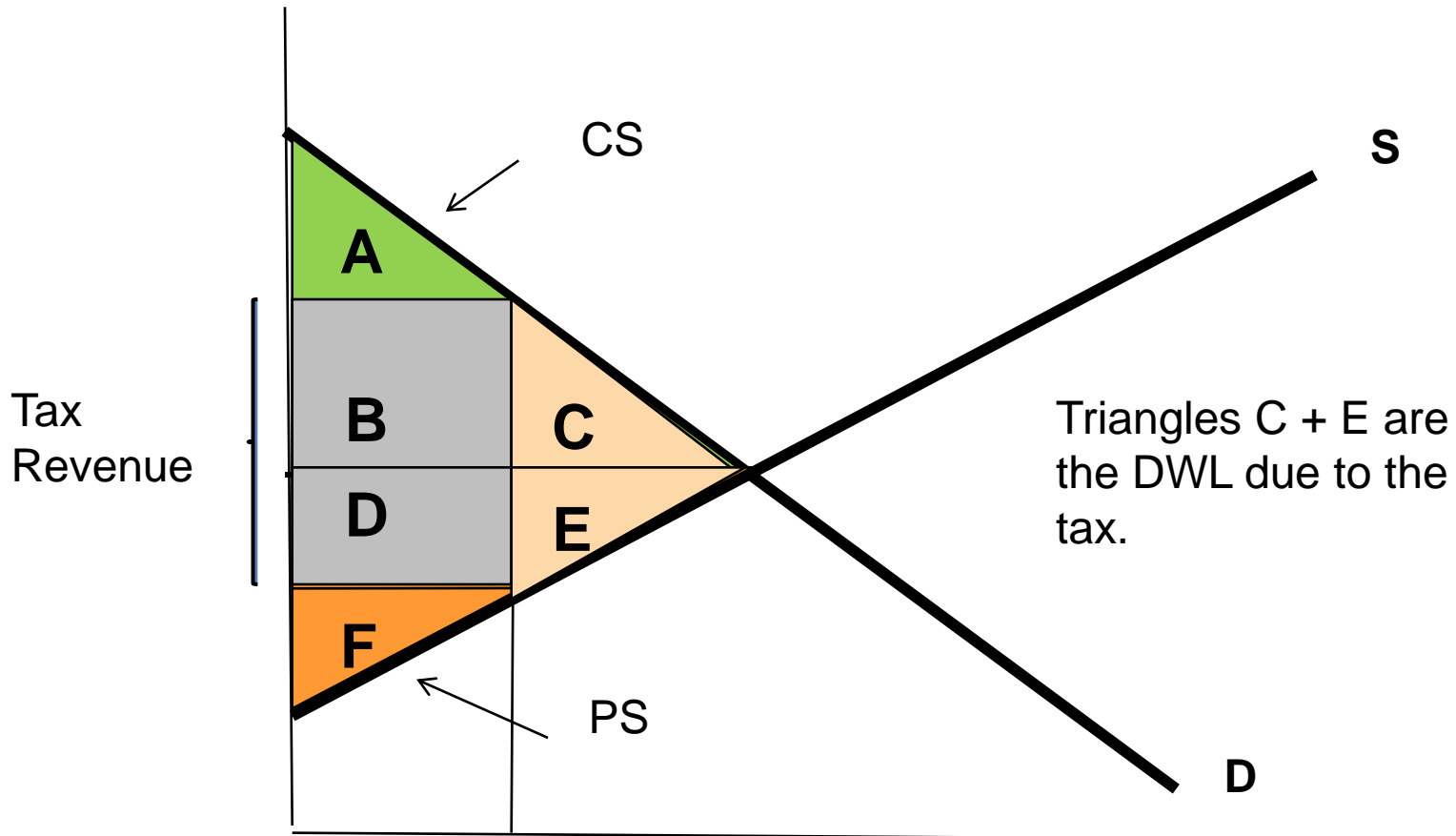


# CS and PS Before the Tax



- A tax reduces the quantity traded, increases the price consumers pay and decreases the price suppliers receive.
- The new CS is  $\triangle A$  on the following diagram.
- The new PS is  $\triangle F$ .
- The tax revenue is the sum of rectangle B (lost CS) and rectangle D (lost PS)


# CS and PS After the Tax



# Determinants of the DWL due to Tax

What determines the size of the deadweight loss from a tax?

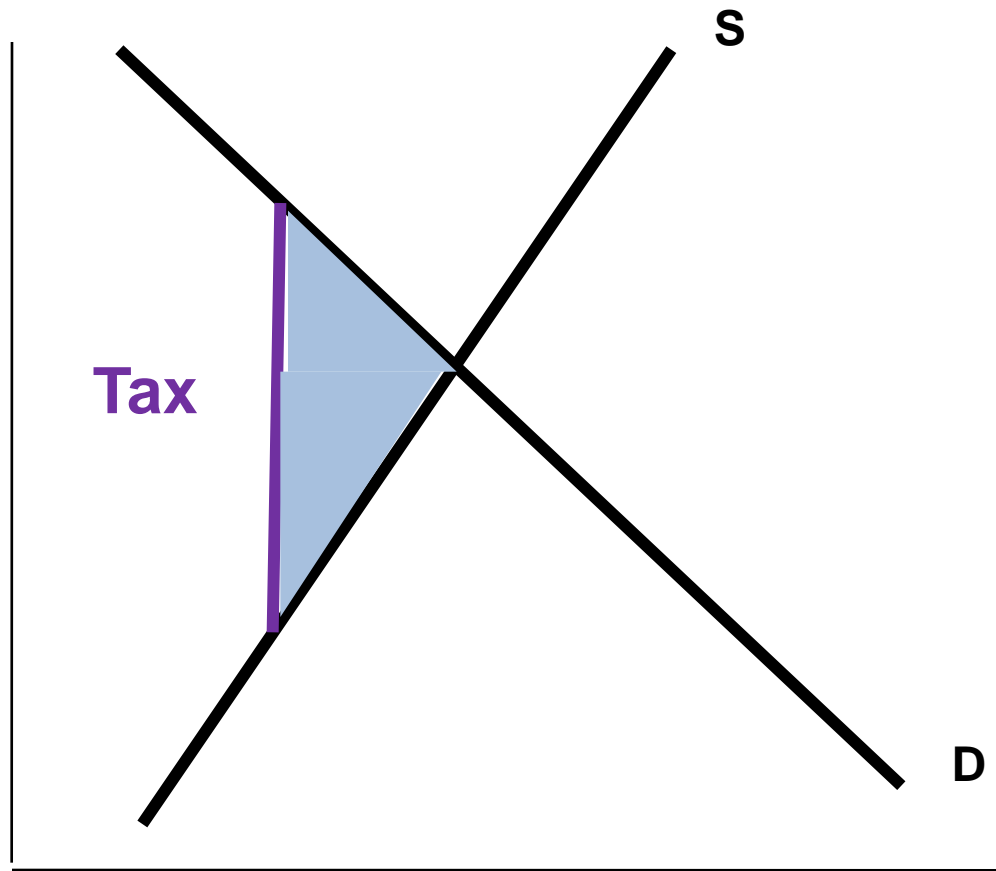
- It depends on how much the quantity supplied and quantity demanded respond to changes in the price.
- This depends on the price elasticities of supply and demand.



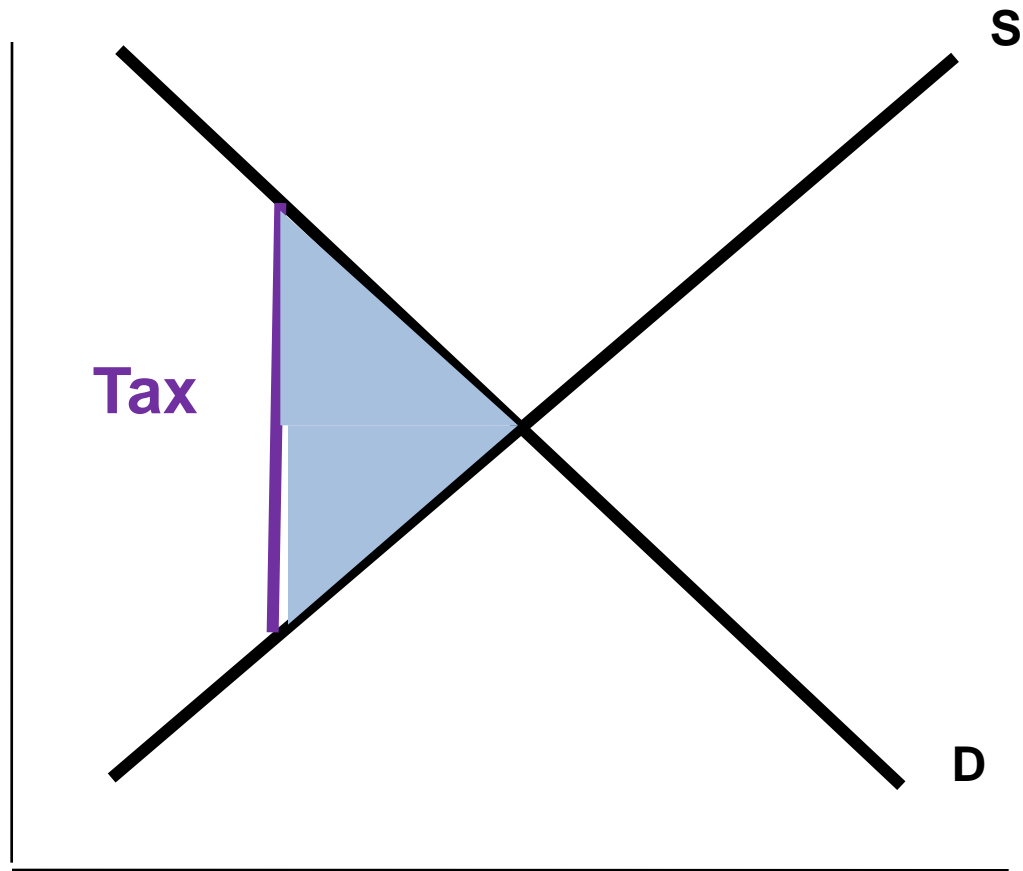
The following examples show what happens to deadweight loss when the size of the tax remains the same and the

- demand curve is the same but supply elasticity changes.
- supply curve is the same but demand elasticity changes.

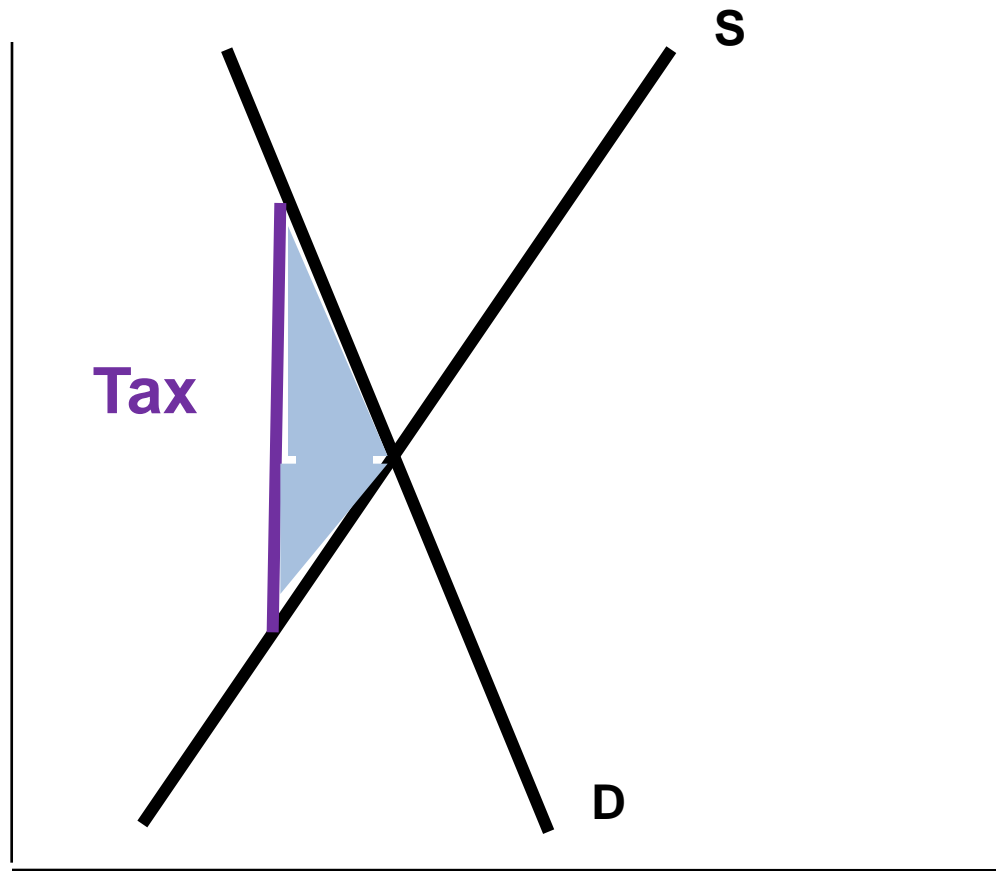
# Inelastic Supply



# Elastic Supply

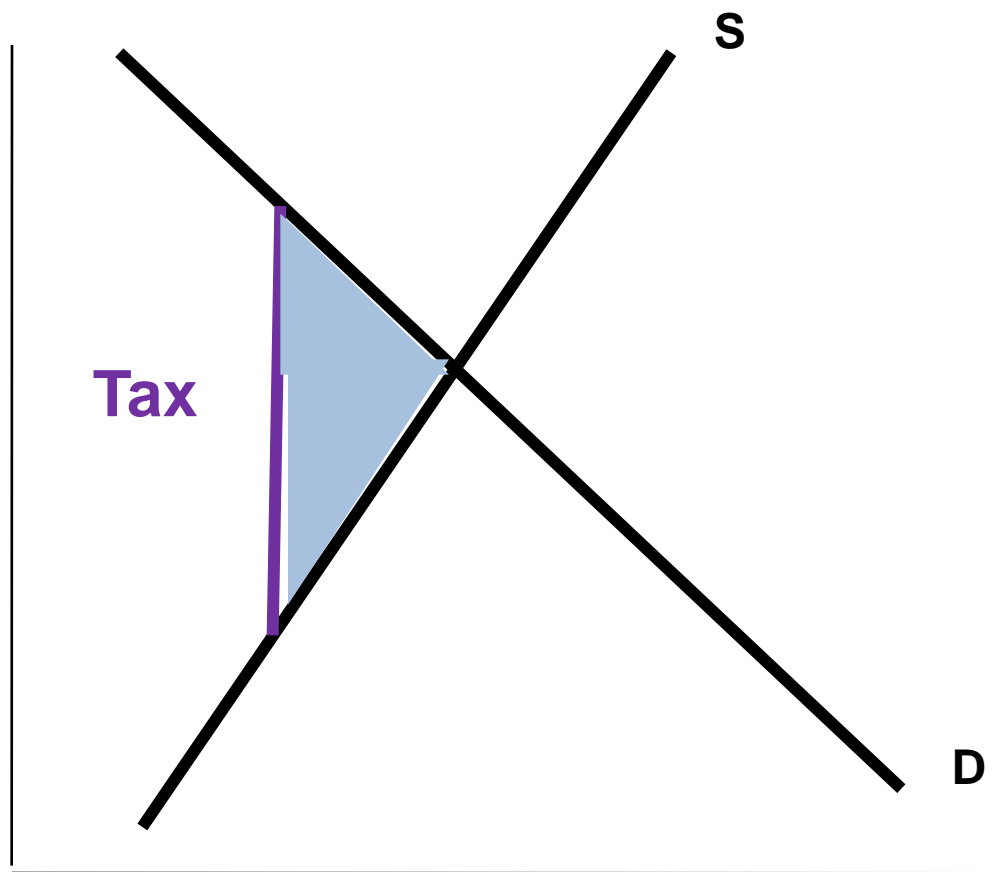


# Inelastic Demand





# Elastic Demand

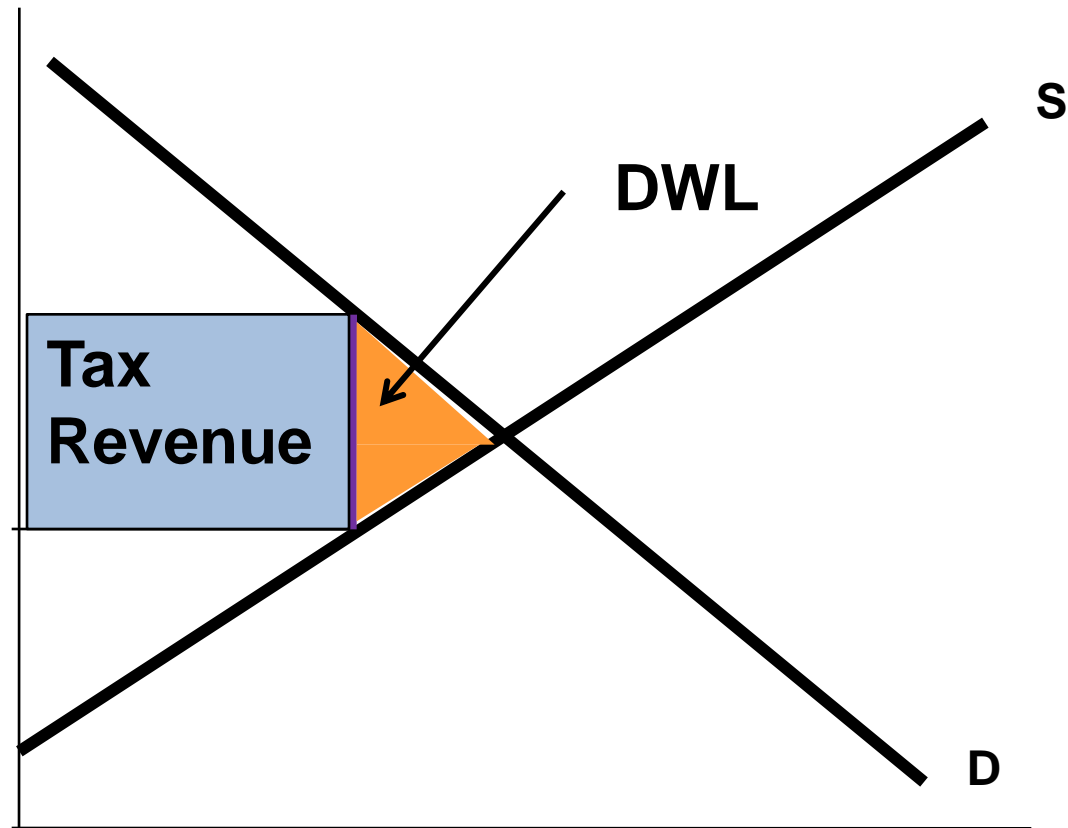


The **greater** the elasticities of demand and supply:

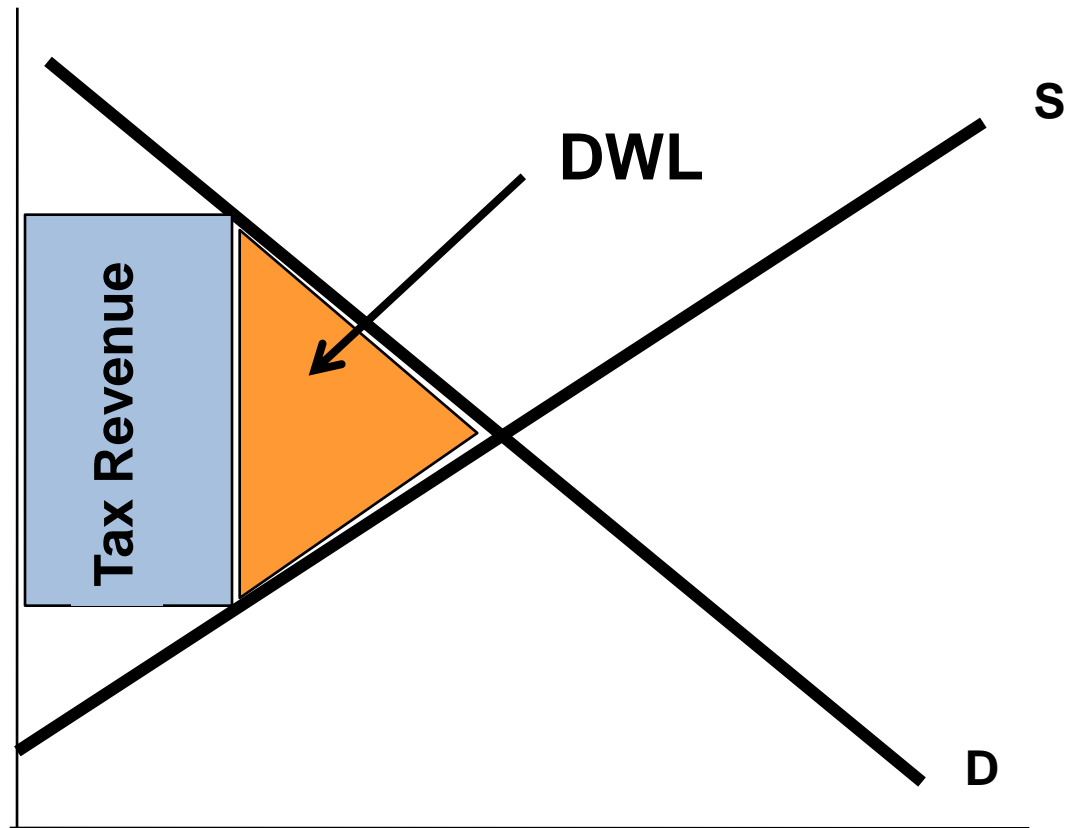
- the larger the decline in equilibrium quantity and
- the **greater** the deadweight loss of a tax.

- With each increase in the tax rate, the deadweight loss of the tax rises even more rapidly than the size of the tax.
- Consider the following 3 diagrams:

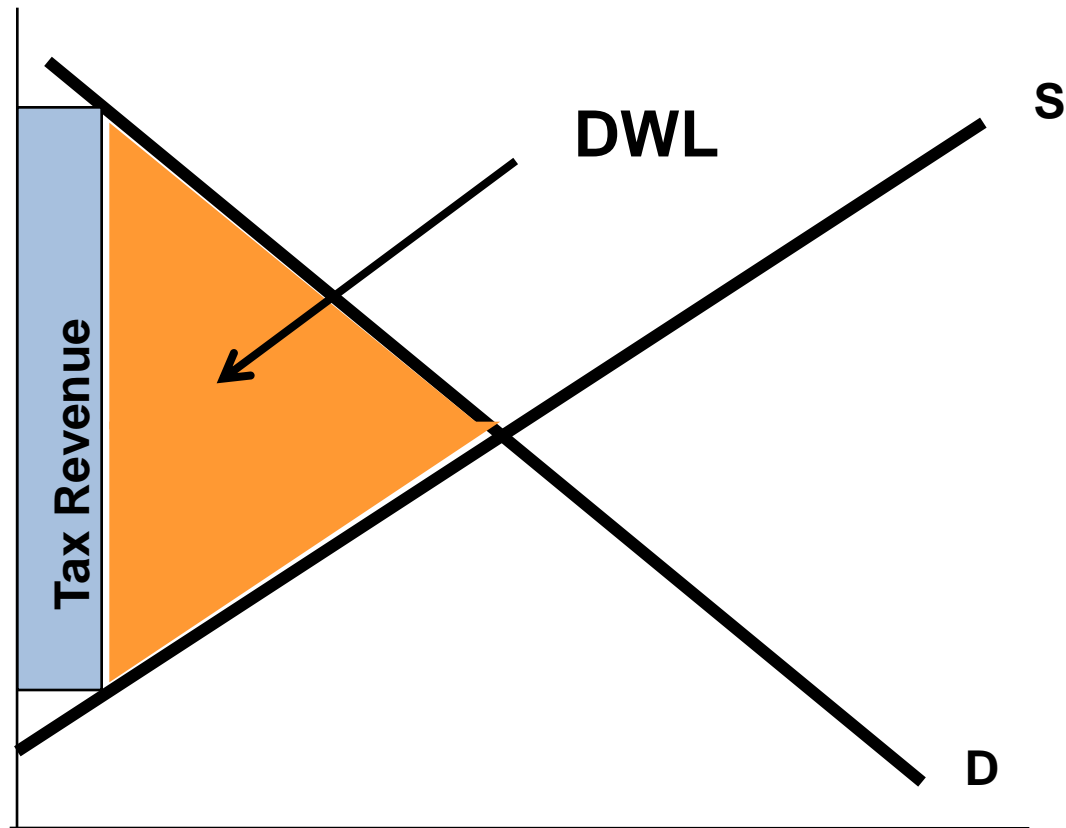
# A Smaller Tax



## A Larger Tax



## An Even Larger Tax



- For the small tax, tax revenue is small.
- As the size of the tax rises, tax revenue grows.
- But as the size of the tax continues to rise, tax revenue falls because the higher tax reduces the size of the market.

# Working with Equations

The market for pizzas is represented by the following equations for demand and supply:

$$Q_d = 20 - 2P$$

$$Q_s = P - 1$$

In eqm,  $Q_d = Q_s$

$$20 - 2P = P - 1$$

$$P = \$7$$

$$Q = 6$$



- Now suppose a tax on trans fats results in a \$3 tax per pizza for pizza firms.
- The new supply curve is
$$Q_s = P - 4$$
- For consumers,  $P_c$  is determined where the new  $Q_s = Q_d$ 
$$P - 4 = 20 - 2P$$
$$P = \$8$$

- For pizza firms, we need to know what the new  $Q$  will be first, and then we can solve for the price they receive.
- To find  $Q$ , substitute  $P = 8$  into either the new  $Q_s$  or  $Q_d$ : (I'll use the new  $Q_s$ )
- $$Q_s = P - 4$$
$$Q_s = 4$$

So, with the tax, only 4 pizzas are traded in the market.

- Now, substitute  $Q = 4$  into the old  $Q_s$  to get the price firms receive:

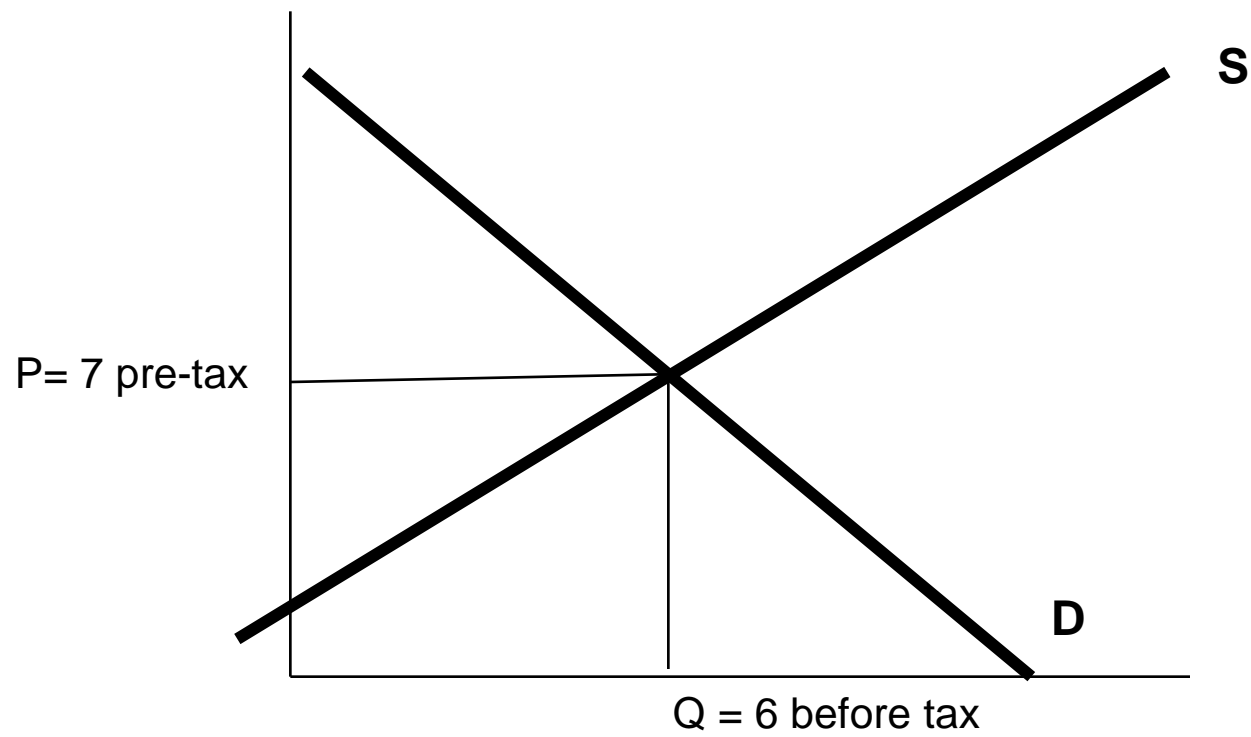
$$Q_s = P - 1$$

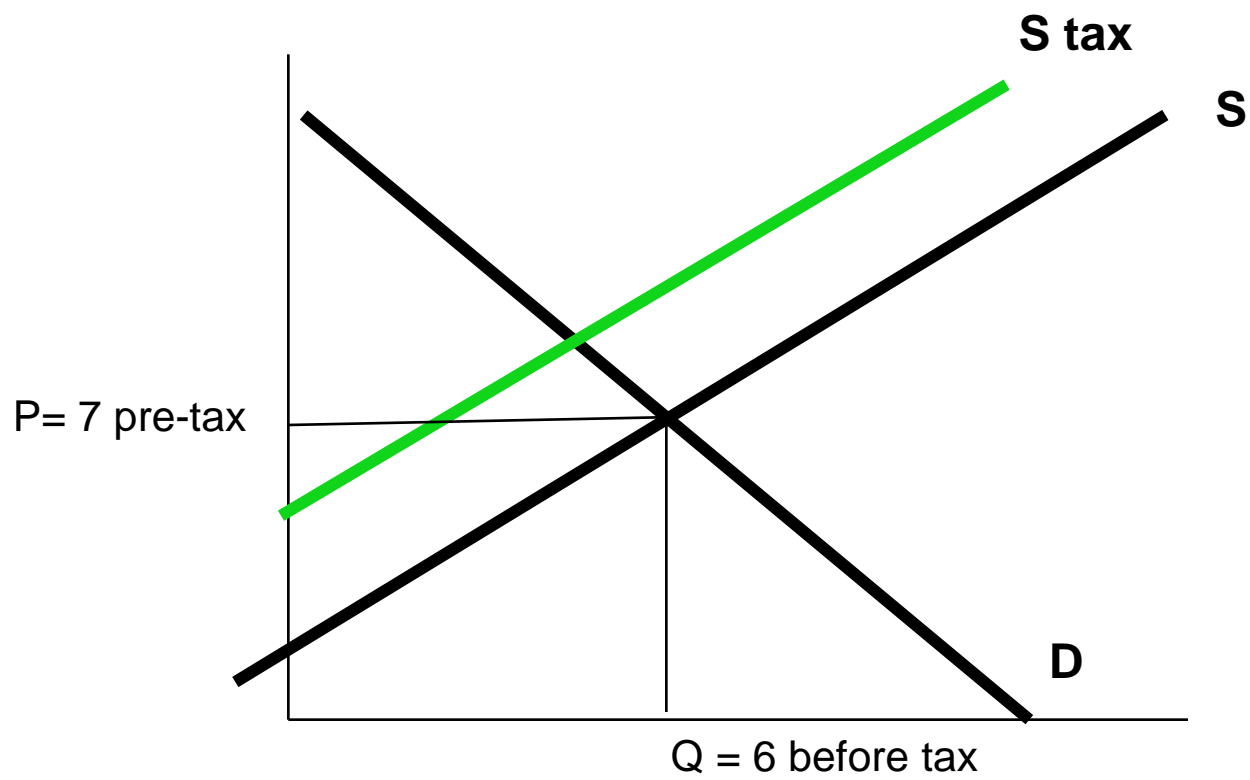
$$4 = P - 1$$

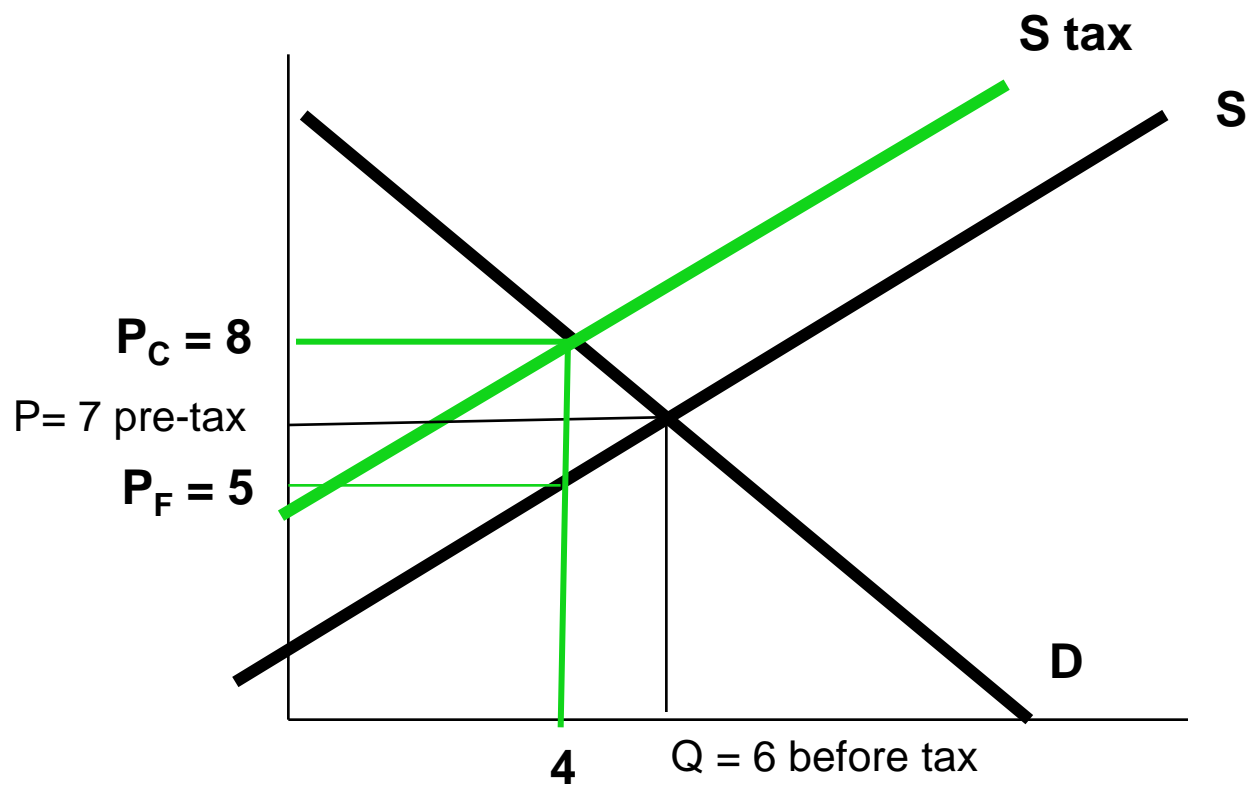
$$P_F = \$5$$

- So, consumers pay \$8 and firms receive \$5.

- The government's tax revenue is  $\$3 \times 4 = \$12$
- Let's graph our results:







Suppose we wanted to compare CS before and after the tax.

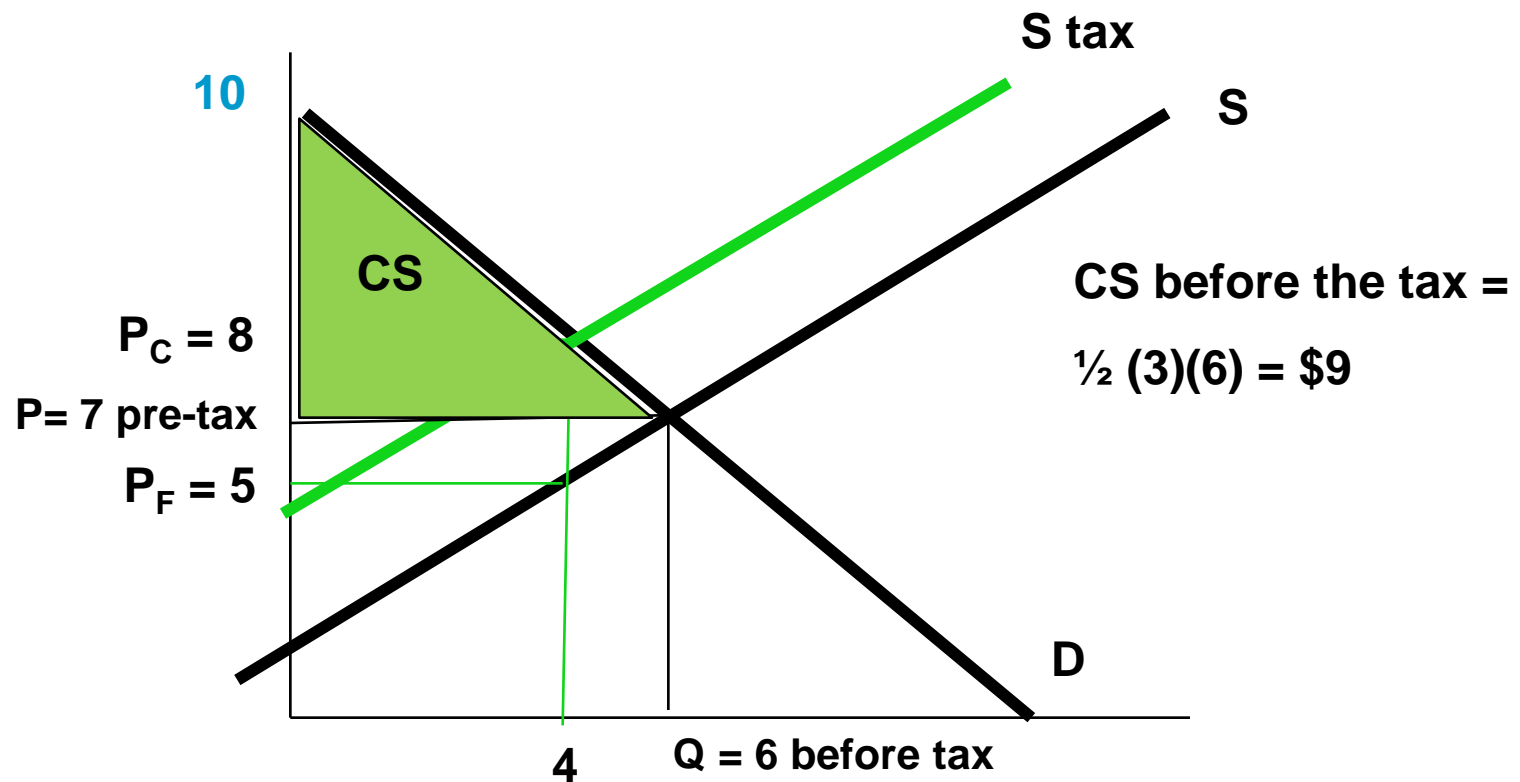
- We need the P-intercept for the demand curve.
- Set  $Q_d = 0$  in eqn for demand:

$$0 = 20 - 2P$$

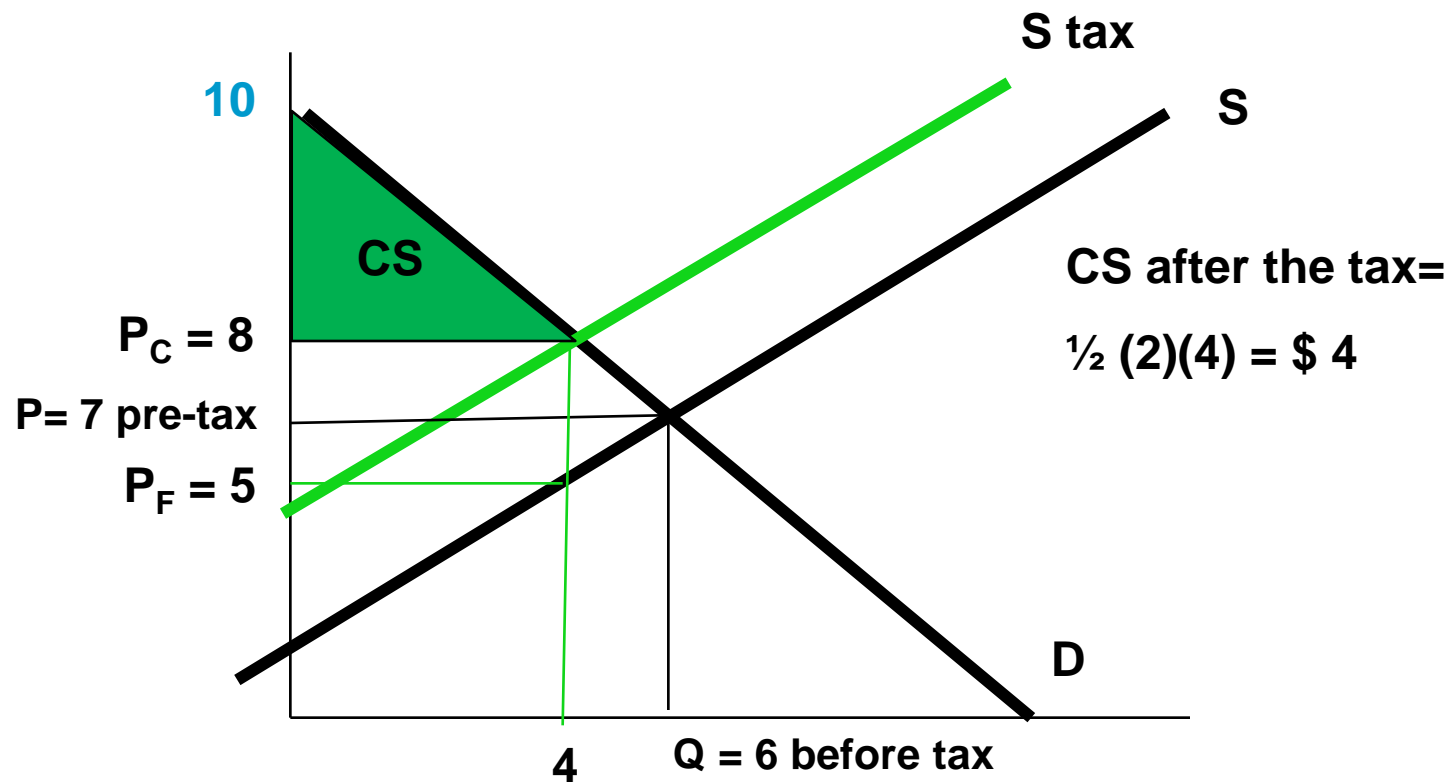
$$P = 10$$



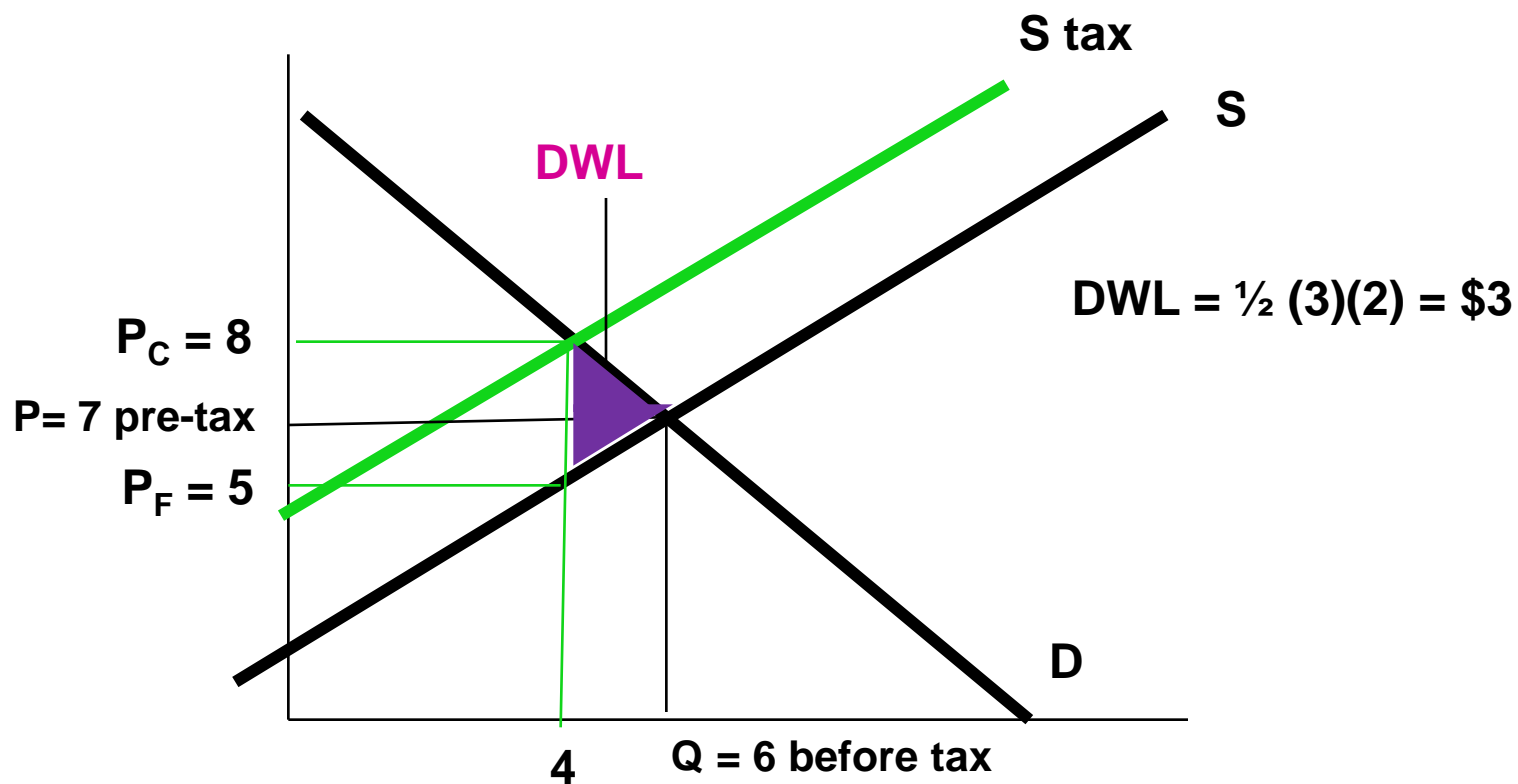
# CS Before the Tax



# CS After the Tax



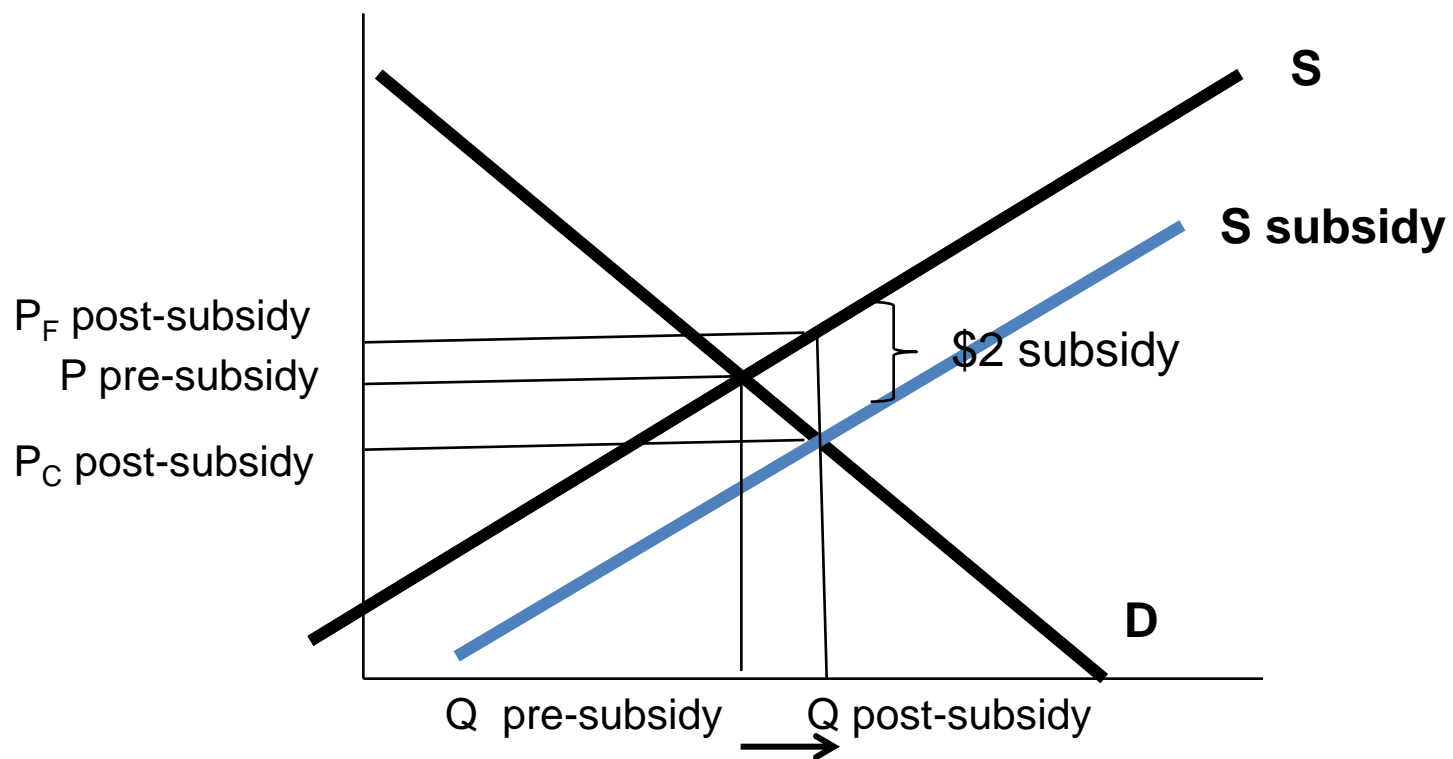
# DWL Due to Taxation



# Subsidies

- **Subsidies** are payments given to producers in order to increase market output and/or reduce prices paid by consumers.
- Think of subsidies as the opposite of taxes levied on producers.
- Subsidies shift the supply curve to the right, resulting in a new equilibrium with more output and lower equilibrium price.

- Consider the market for environmentally friendly weed killer sprays.
- The government wants more consumers to use these safer weed sprays and offers to subsidize producers.
- It offers firms \$2 towards every gallon of spray it produces.
- This increases the price received by producers of the spray at any price level and shifts the supply curve to the right by the amount of the subsidy.



- Consumers gain by paying a lower price.
- Firms gain by receiving a higher price.
- However, there is a deadweight loss due to the subsidy.
- The government has to spend money on the subsidy which comes out of what it would spend on social programs.

