



Module:
Microeconomics

Lecturer:
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Microeconomics

Lecture 3 -
Markets, Efficiency & Welfare

Consumer & Producer Surplus

- Willingness to Pay – a concept that allows us to estimate how much an individual consumer values a particular good
- **Willingness to pay** is the maximum amount that an individual will pay for a particular
- Consumer surplus is the amount a buyer is willing to pay minus the amount the buyer actually pays:
- $CS = WTP - P$
- The amount the buyer actually pays is her opportunity cost for consuming the good

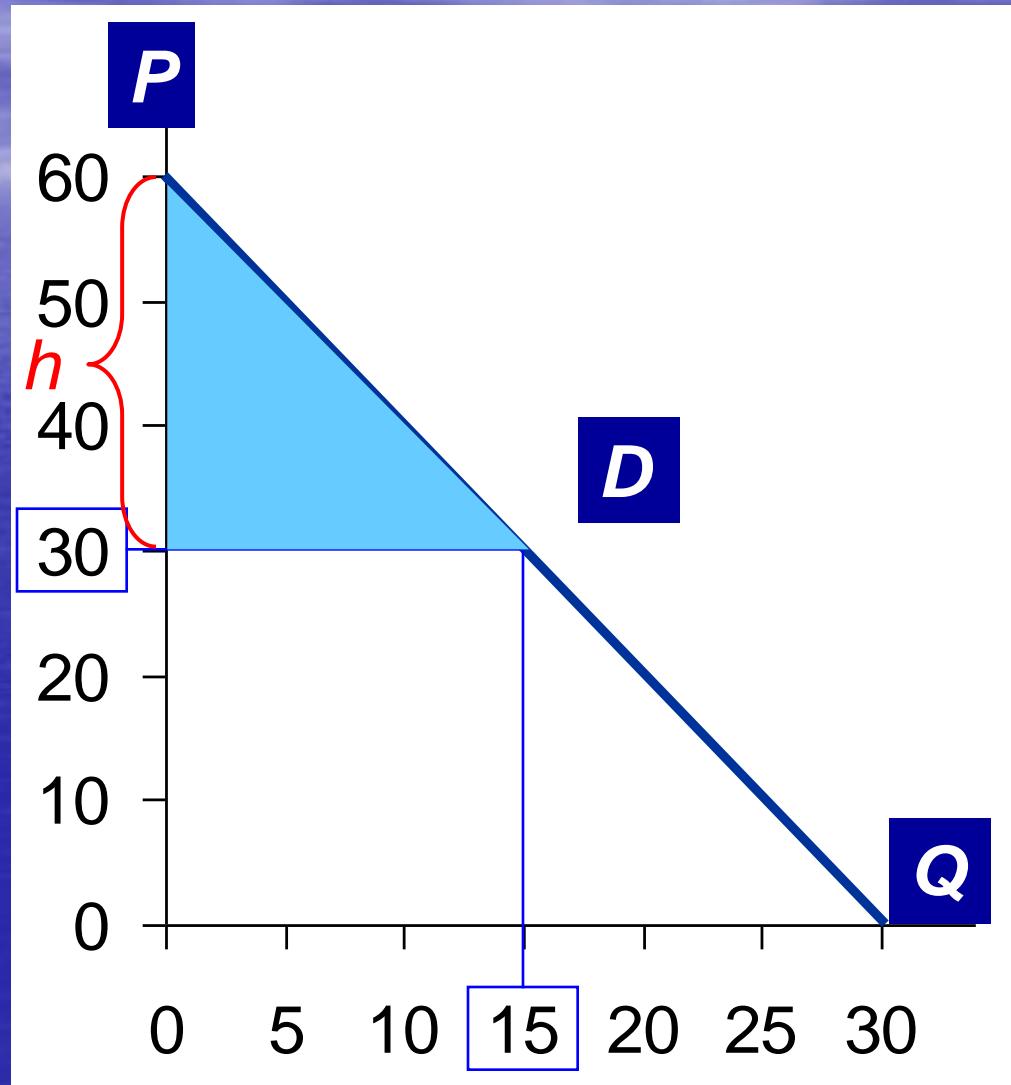
Measuring Consumer Surplus (CS)

Total CS is the area **under** the demand curve **D** between **P** to 0 & from 0 to **Q**.

Recall: area of a triangle equals $\frac{1}{2} \times \text{base} \times \text{height}$

At Price €30 Height = $\text{€}60 - \text{€}30 = \underline{\text{€}30}$

So, CS = $\frac{1}{2} \times b \times h$
= $\frac{1}{2} \times 15 \times \text{€}30 =$
€225.



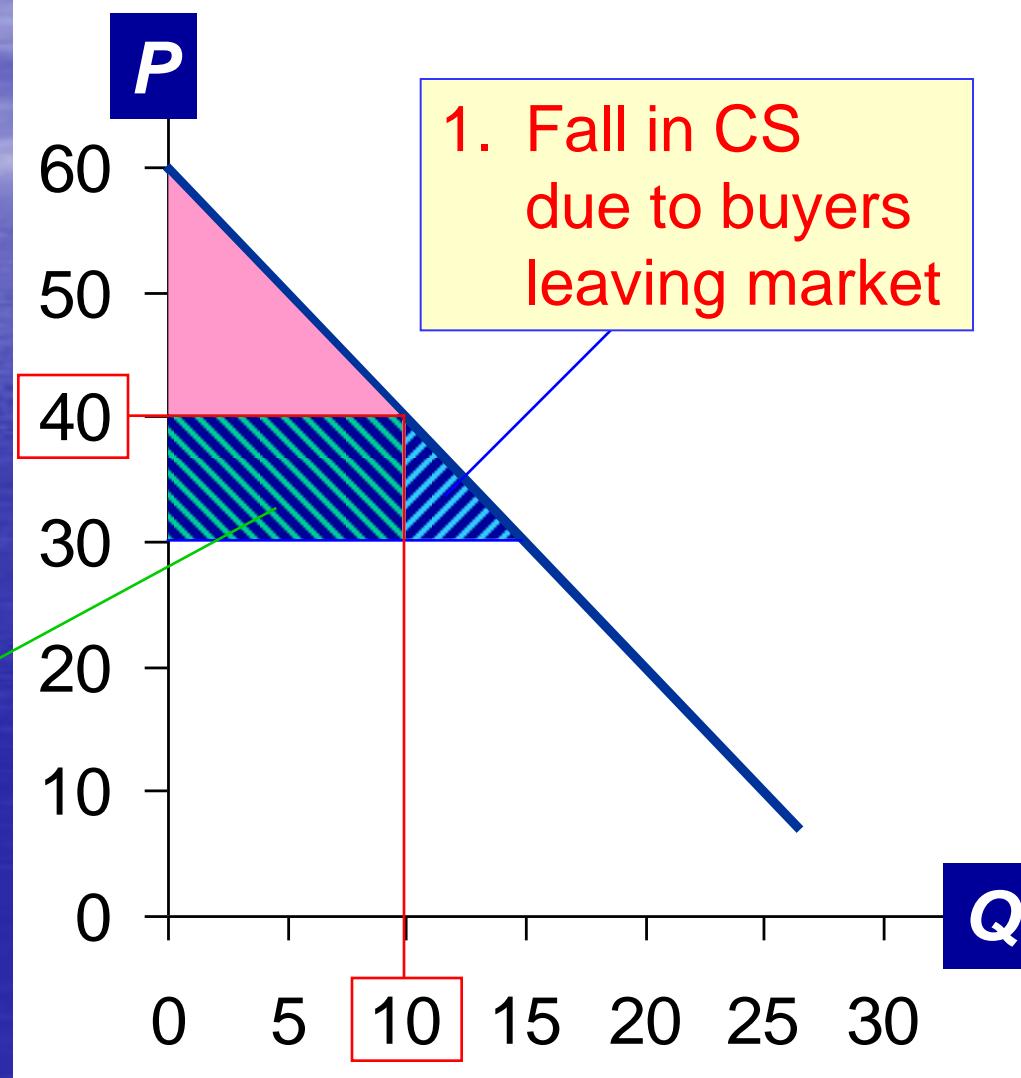
How a Higher Price Reduces CS

If P rises to €40,

$$\begin{aligned}CS &= \frac{1}{2} \times 10 \times €20 \\&= €100.\end{aligned}$$

Two reasons for the fall in CS.

2. Fall in CS due to remaining buyers paying higher P



The Supply Curve & (Opportunity) Cost

- Cost is the value of everything a seller must give up to produce a good (i.e., opportunity cost).
- Includes cost of all resources used to produce the good, including for example the owner's cost of capital & the value of the seller's time
- A seller will produce & sell the good only if there is a reasonable chance that the price exceeds her cost

Producer Surplus

- The Producer's Cost is a measure of **Willingness to Sell**
- **Producer surplus** (PS) is the amount a seller is paid for a good minus the seller's cost
- $PS = P - \text{cost}$

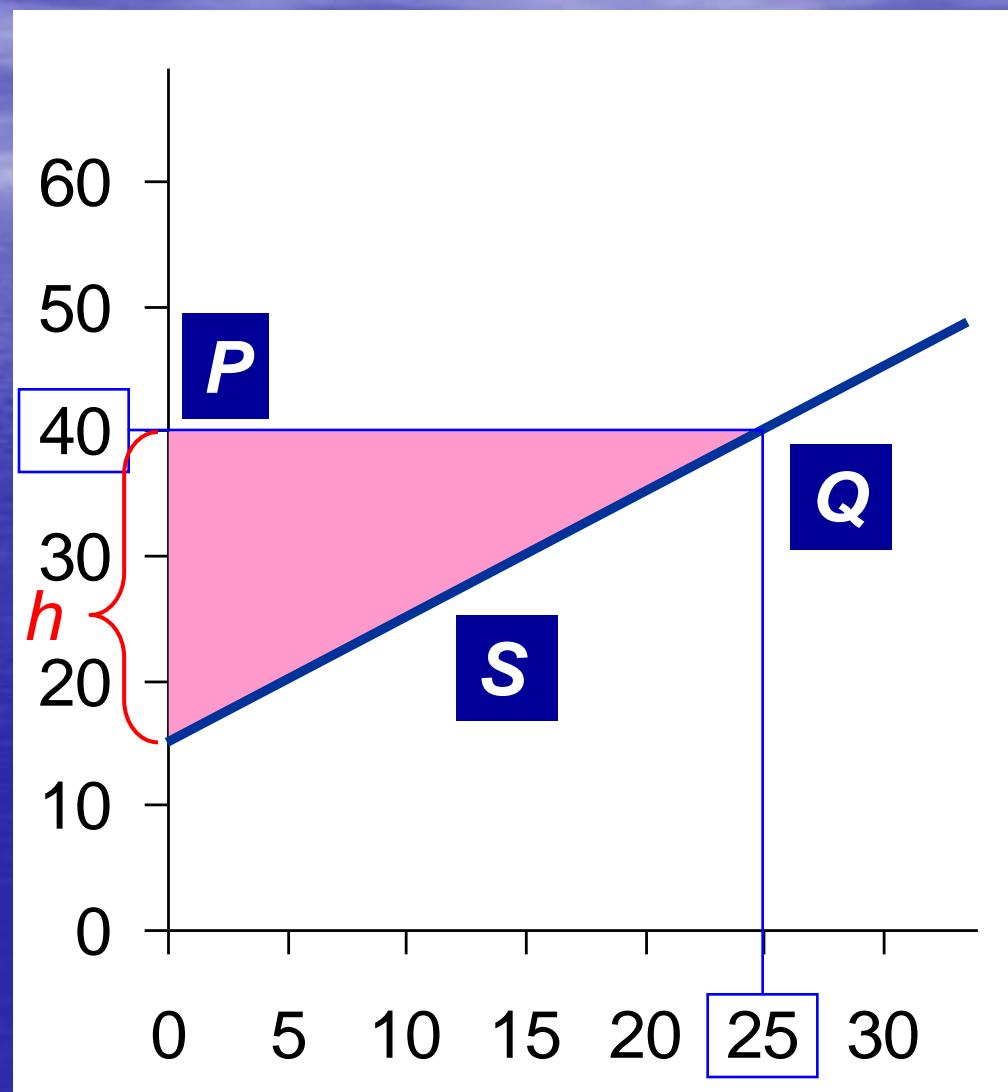
Measuring Producer Surplus

Total PS equals the area **above** the supply

PS is the area above the **S** curve & below the line **P** to **Q**.

The height of this triangle is
 $\text{€}40 - \text{€}15 = \text{€}25$

$$\begin{aligned}\text{So, PS} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 25 \times \text{€}25 \\ &= \underline{\text{€}312.50}\end{aligned}$$



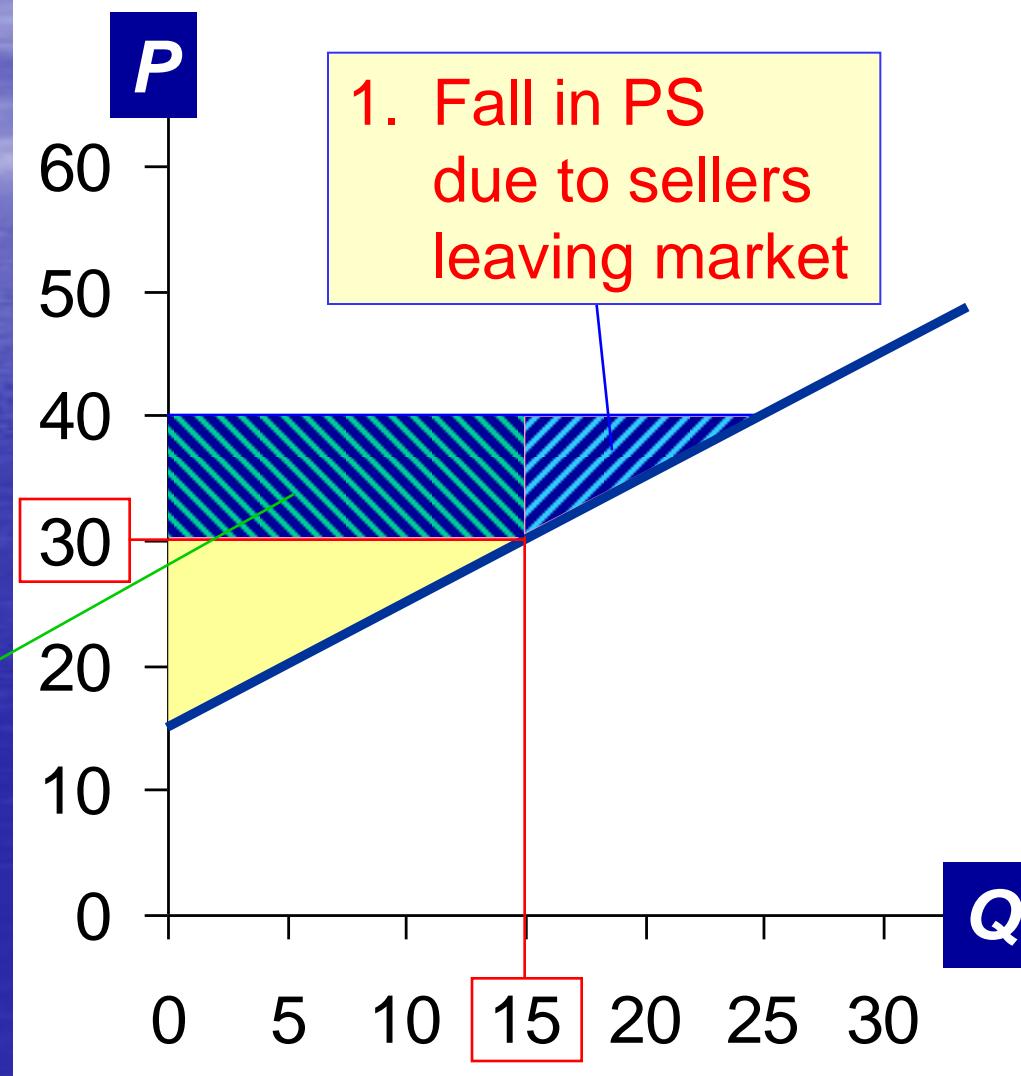
How a Lower Price Reduces PS

If P falls to €30,

$$\begin{aligned} \text{PS} &= \frac{1}{2} \times 15 \times \text{€}15 \\ &= \underline{\text{€}112.50} \end{aligned}$$

Two reasons for the fall in PS.

2. Fall in PS due to remaining sellers getting lower P



Total Surplus

CS = (value to buyers) – (amount paid by buyers)
= buyers' gains from participating in the market

PS = (amount received by sellers) – (cost to sellers)
= sellers' gains from participating in the market

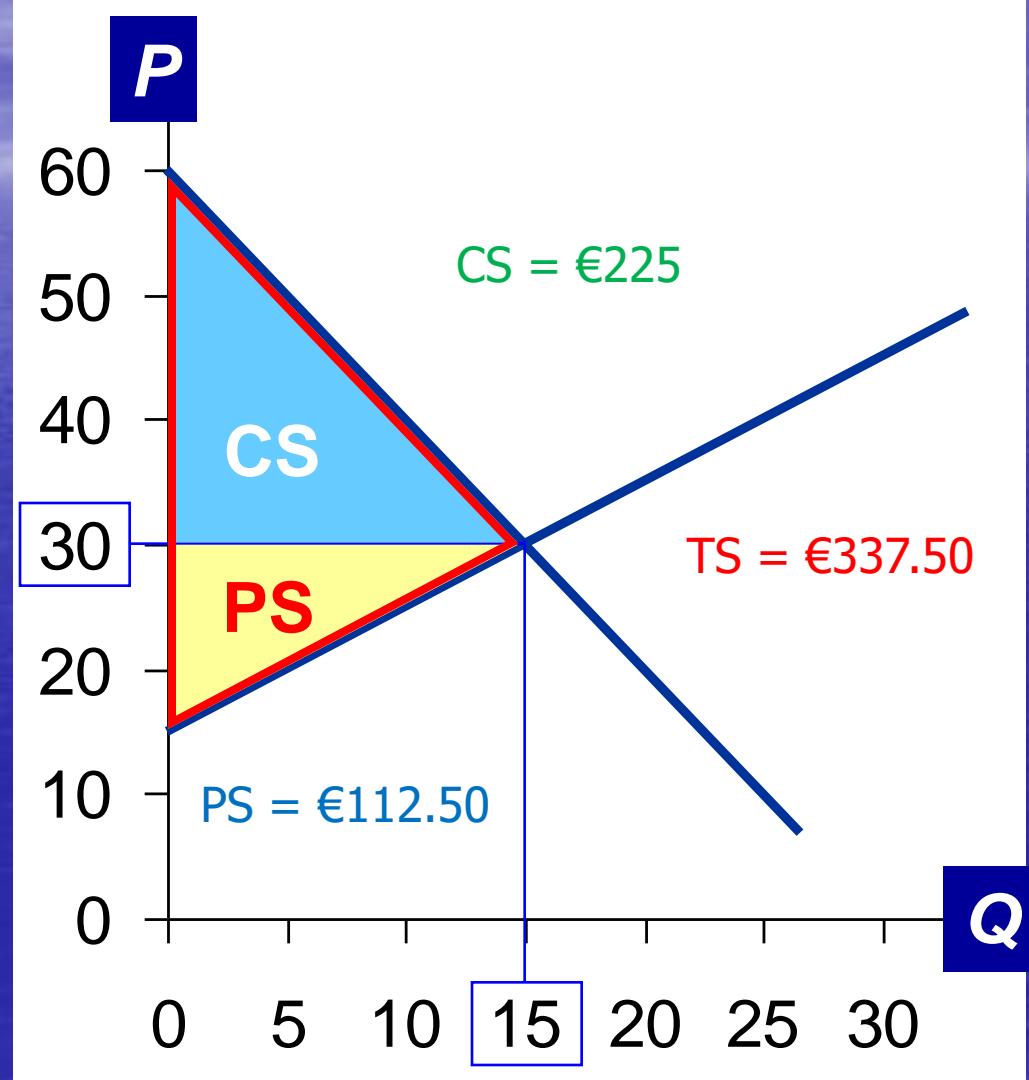
Total surplus = CS + PS
= total gains from trade in a market
= (value to buyers) – (cost to sellers)

Total Surplus

$$\begin{aligned}CS &= \frac{1}{2} \times b \times h \\&= \frac{1}{2} \times 15 \times €30 \\&= \underline{\text{€225}}\end{aligned}$$

$$\begin{aligned}PS &= \frac{1}{2} \times b \times h \\&= \frac{1}{2} \times 15 \times €15 \\&= \underline{\text{€112.50}}\end{aligned}$$

$$\begin{aligned}\text{TS} &= CS + PS \\&= €225 + €112.50 \\&= \underline{\text{€337.50}}\end{aligned}$$



The Market's Allocation of Resources

- In the markets in an economy, the allocation of resources is decentralized, determined by the interactions of many self-interested buyers and sellers.
- Is the market's allocation of resources desirable? Or would a different allocation of resources make society better off?
- To answer this, we use ***total surplus*** as a measure of society's well-being, and we consider whether the market's allocation is ***efficient***.
(Policymakers also care about ***equality***, though our focus here is on efficiency.)

Efficiency

An allocation of resources is **efficient** if it maximizes total surplus (welfare/utility). Efficiency means:

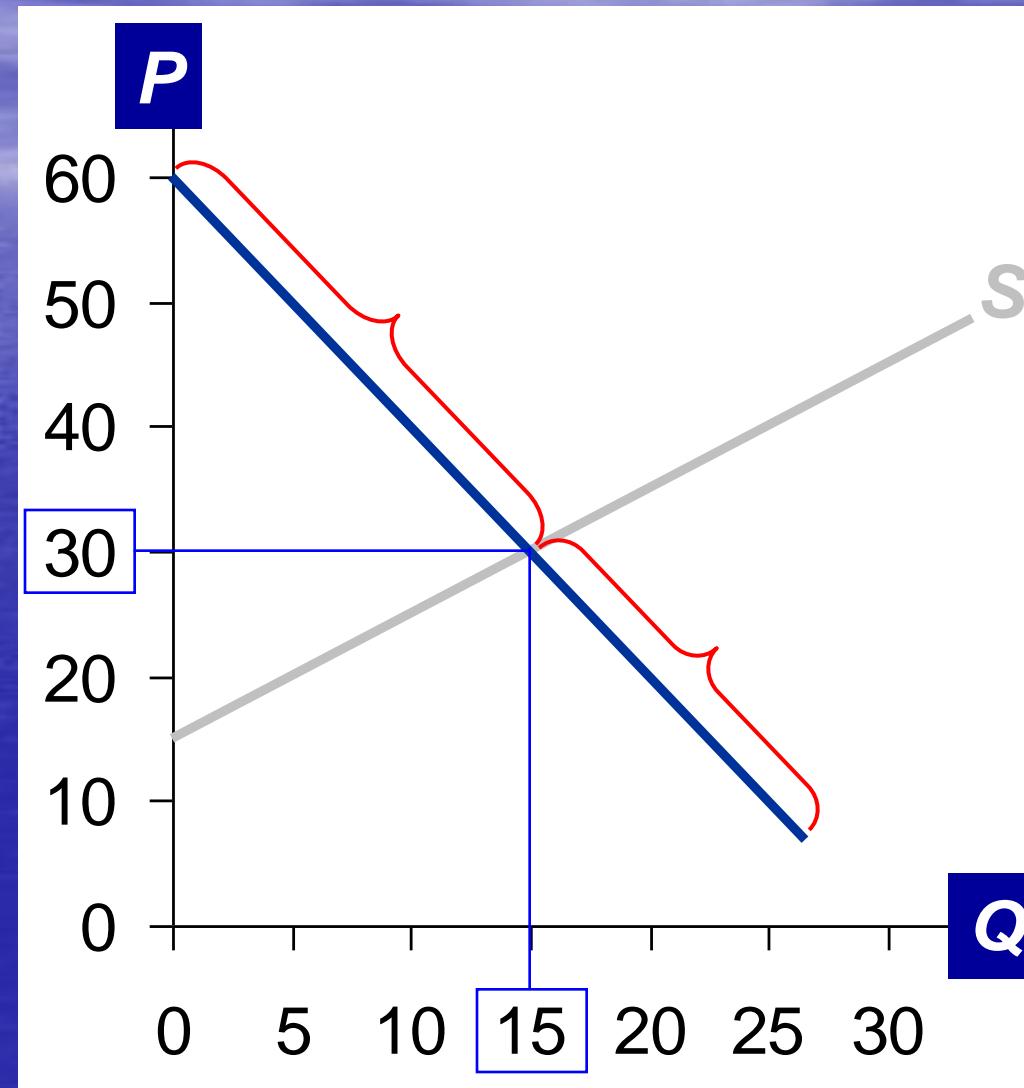
- The goods are consumed by the buyers who value them most highly.
- The goods are produced by the producers with the lowest costs.
- Raising or lowering the quantity of a good would not increase total surplus.

Which Buyers Consume the Good?

Every buyer whose WTP is \geq €30 will buy.

Every buyer whose WTP is $<$ €30 will not.

So, ***the buyers who value the good most highly are the ones who consume it.***

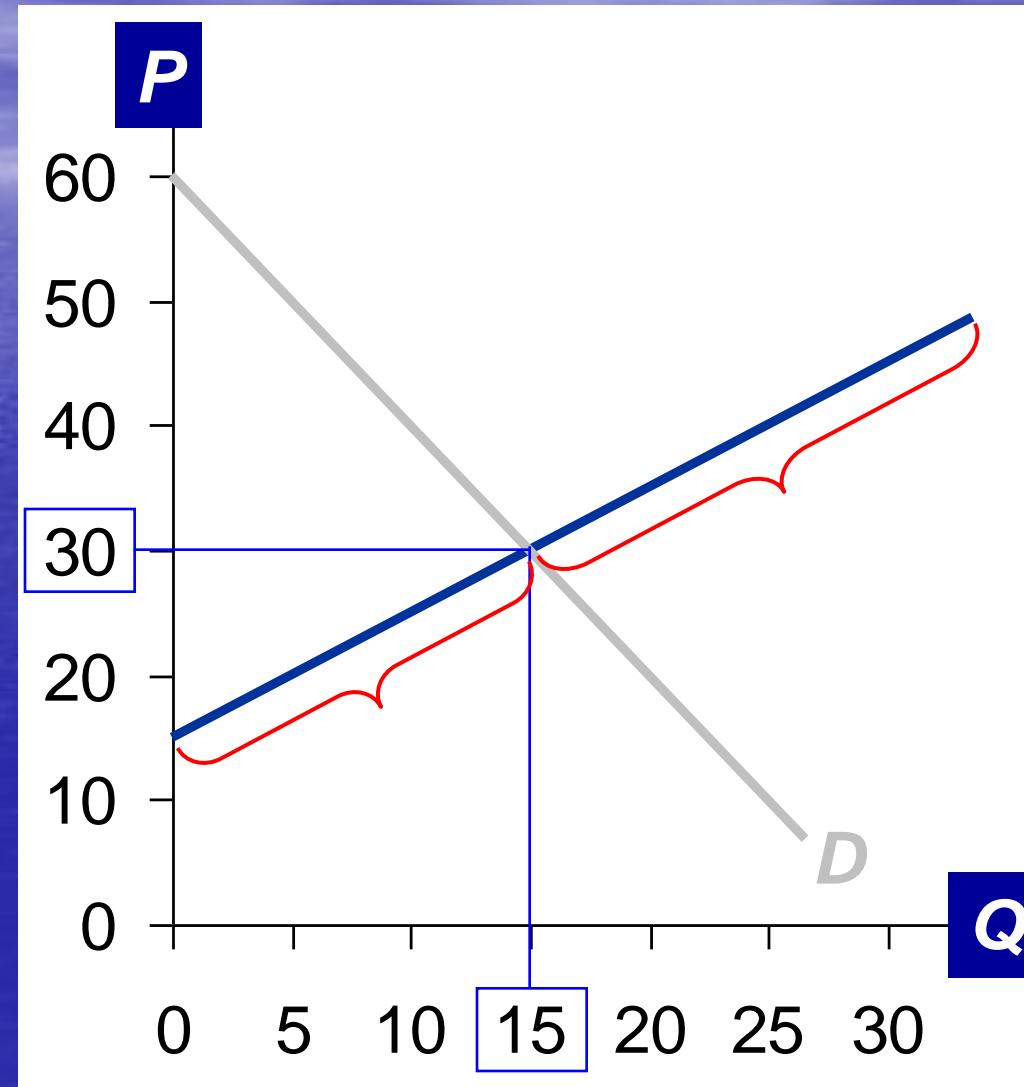


Which Sellers Produce the Good?

Every seller whose cost is \leq €30 will produce the good.

Every seller whose cost is $>$ €30 will not.

So, ***the sellers with the lowest cost produce the good.***



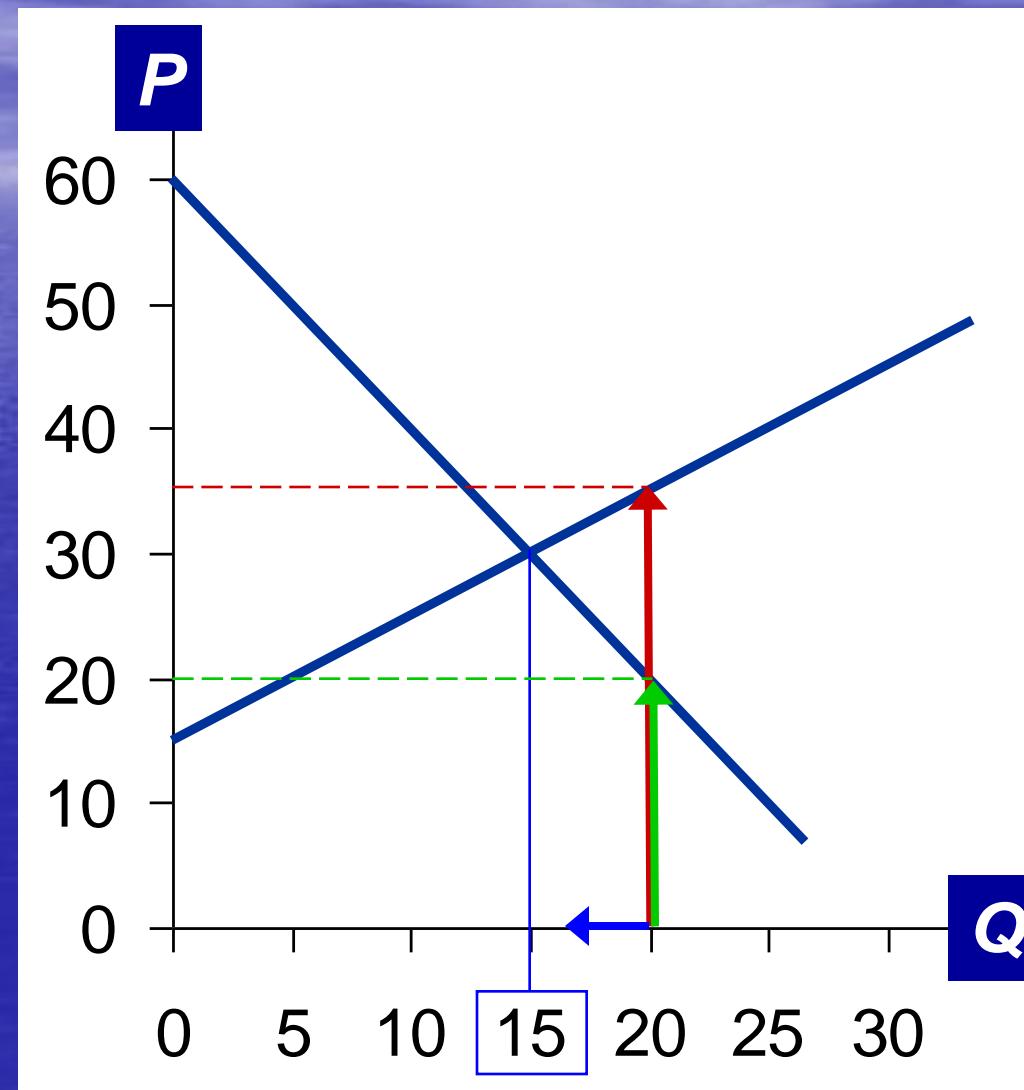
Does Equilibrium Maximize Total Surplus?

At $Q = 20$, cost of producing the marginal unit is €35

Consumers value the marginal unit at only €20

Hence, total surplus can increase by reducing **quantity**.

This is true at any Q greater than 15.



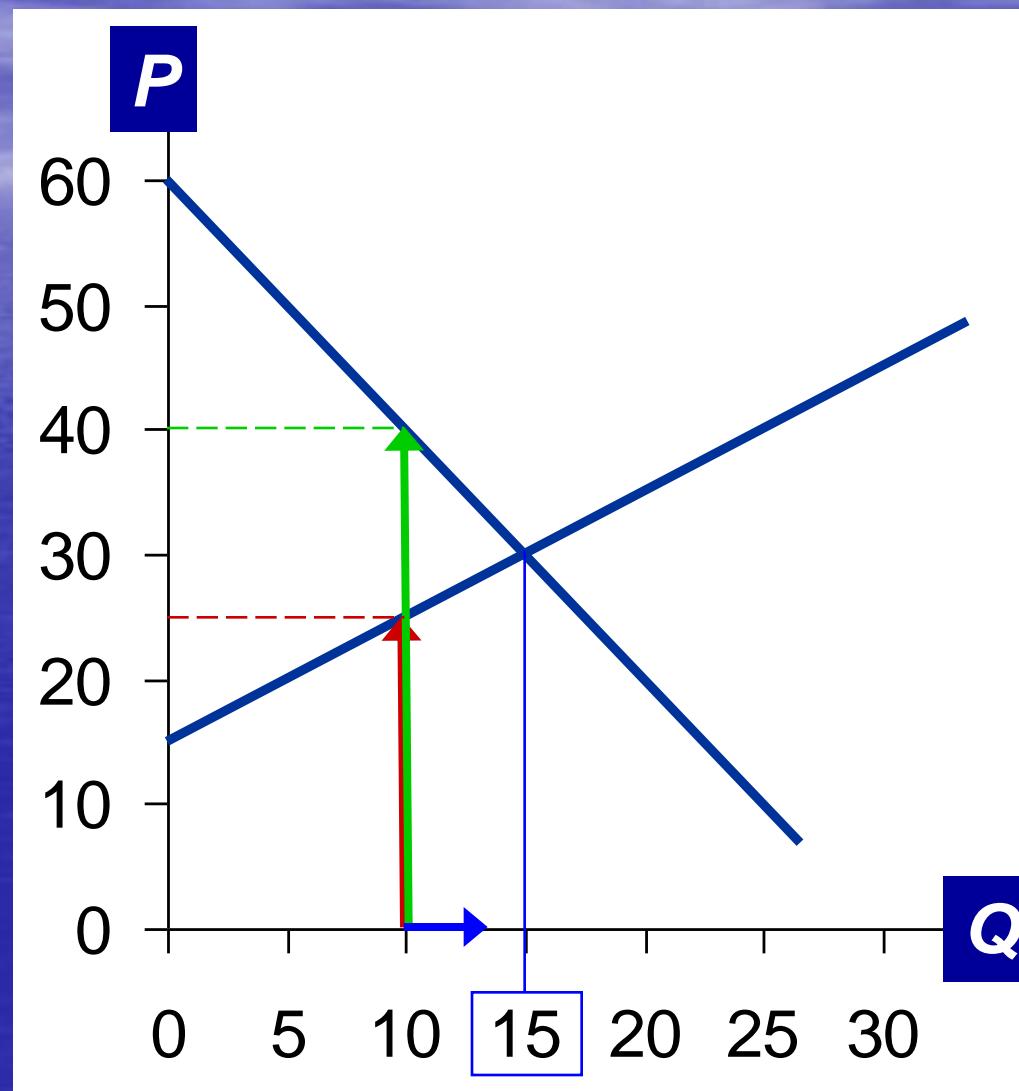
Does Equilibrium Maximize Total Surplus?

At $Q = 10$, the cost of producing the marginal unit is €25

Consumers value the marginal unit €40

Hence, total surplus increase by increasing Q .

This is true at any Q less than 15.

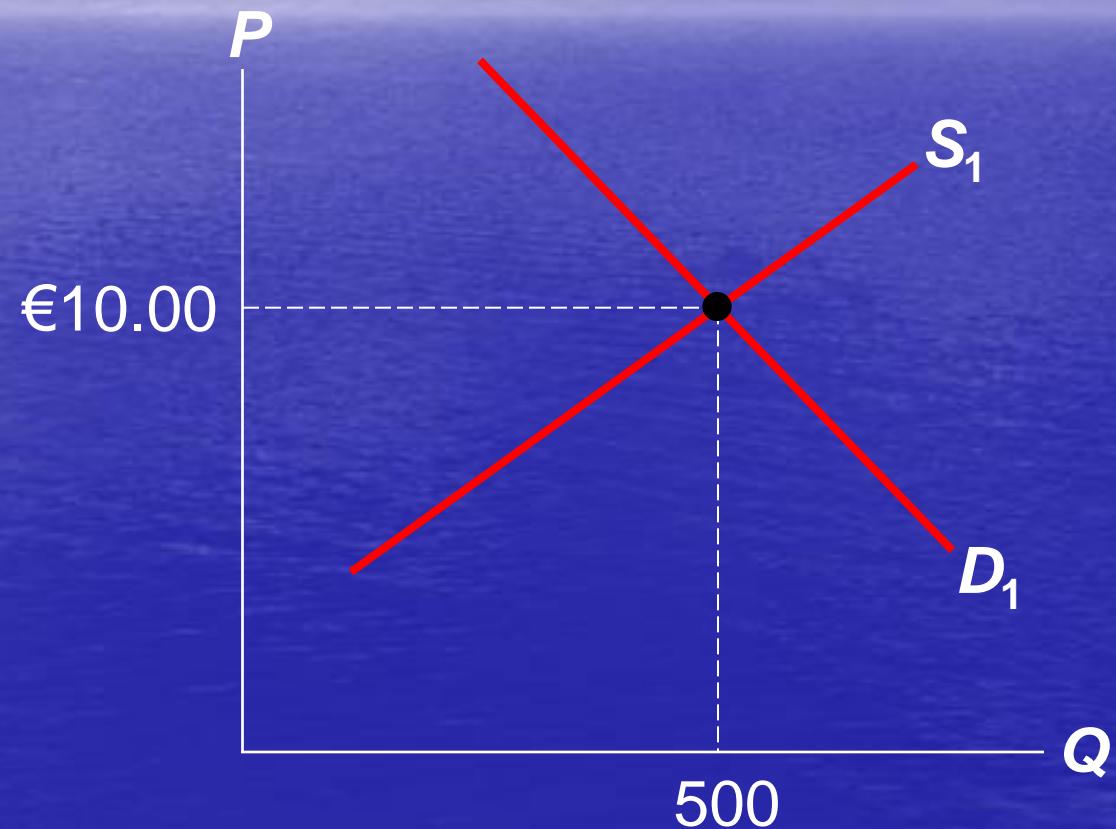


Taxation

- The government levies taxes on a broad range of goods & services to raise revenue to pay for national defense, public schools, etc.
- The government can make buyers or sellers pay the tax.

A Pizza Market

Equilibrium
before tax



A tax on buyers shifts the D curve down by the amount of the tax.

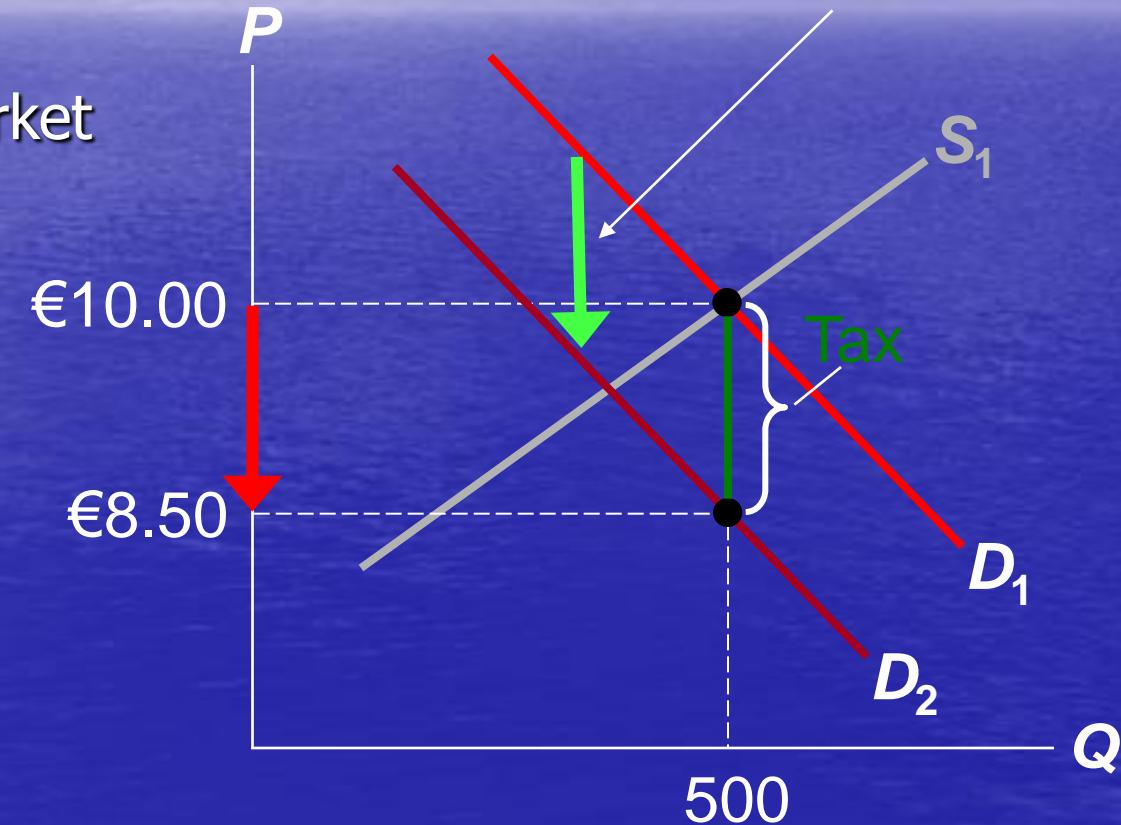
The price buyers pay is now €1.50 higher than the market price P .

P would have to fall by €1.50 to make buyers willing to buy same Q as before.

E.g., if P falls from €10.00 to €8.50, buyers still willing to purchase 500 pizzas.

Taxing Buyers

Effects of a €1.50 per unit tax on buyers



Taxing Buyers

New equilibrium:

$$Q = 450$$

Sellers
receive

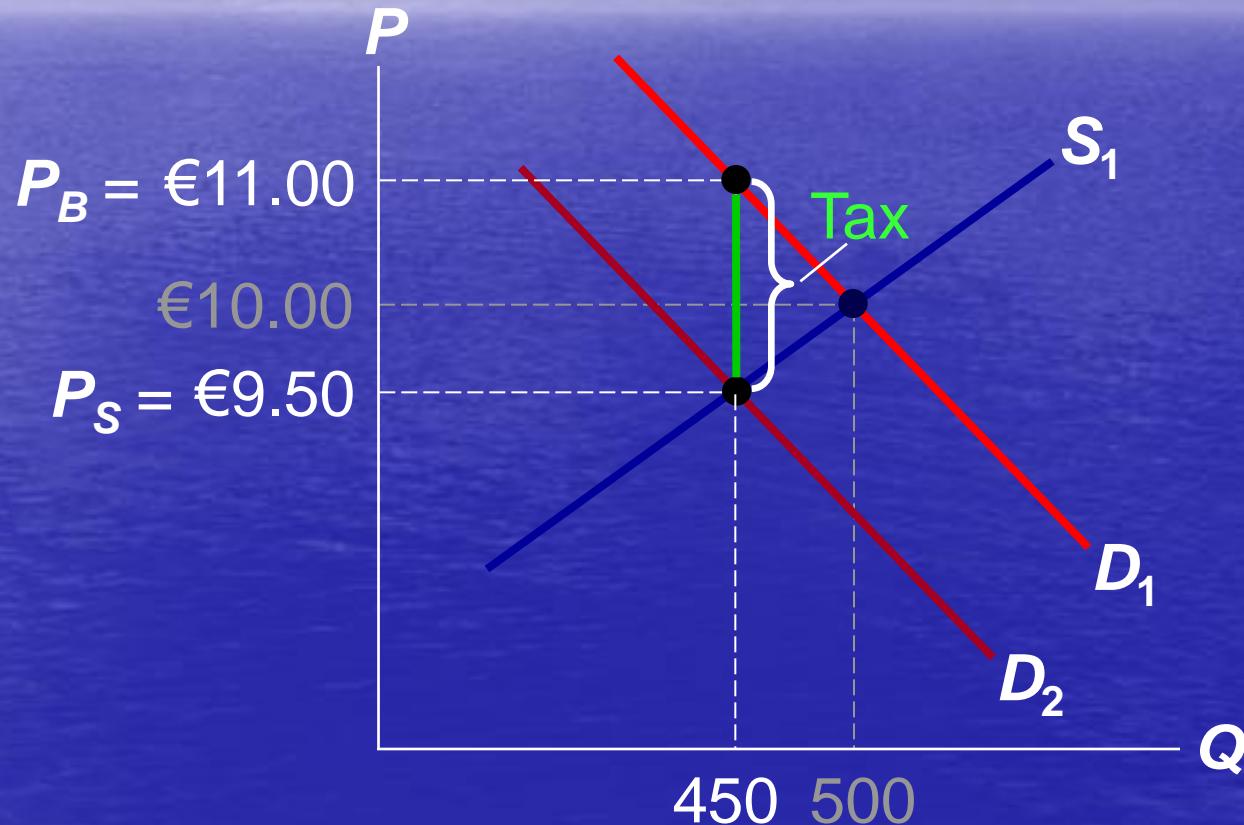
$$P_s = €9.50$$

Buyers pay

$$P_b = €11.00$$

Difference
between them
 $= €1.50 = \text{tax}$

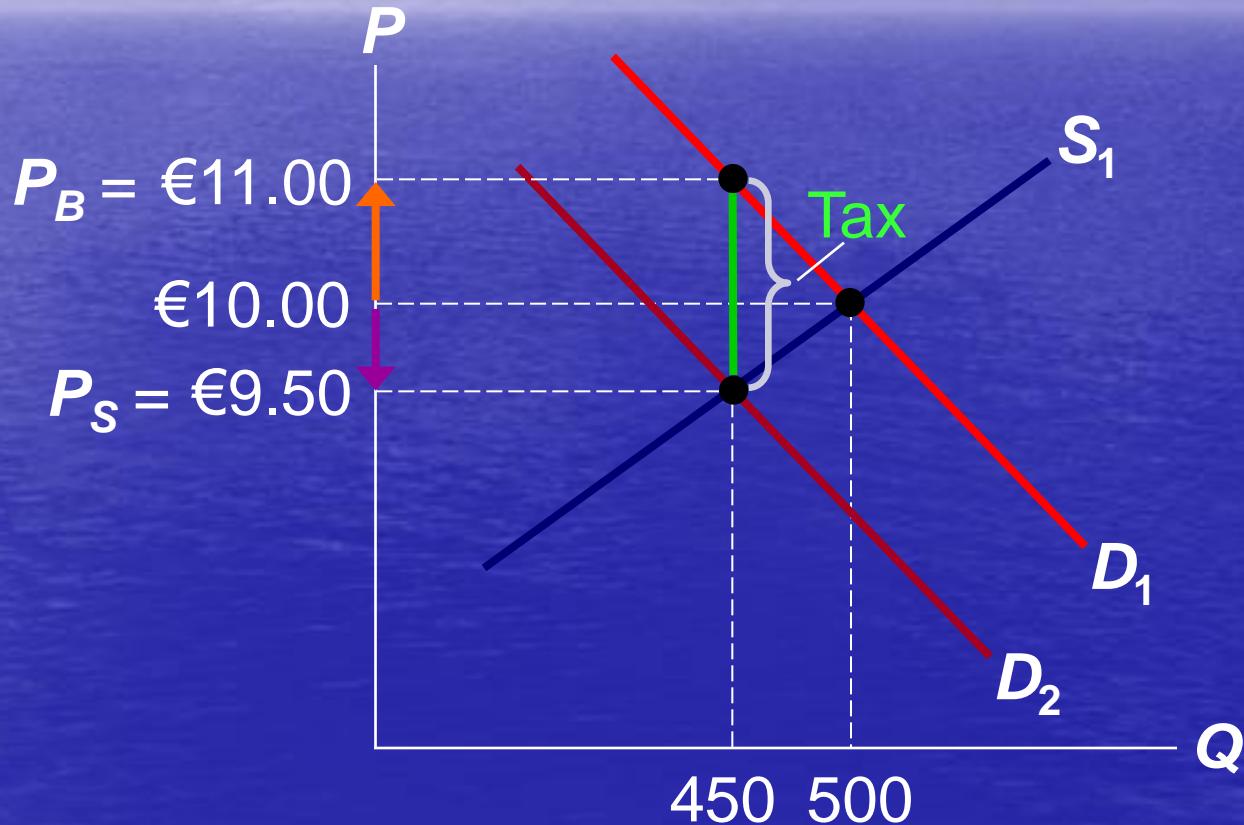
Effects of a €1.50 per
unit tax on buyers



The **Incidence** of a Tax:

How the burden of a tax is shared among market participants

In our example, buyers pay €1.00 more, sellers get €0.50 less.



Taxing Sellers

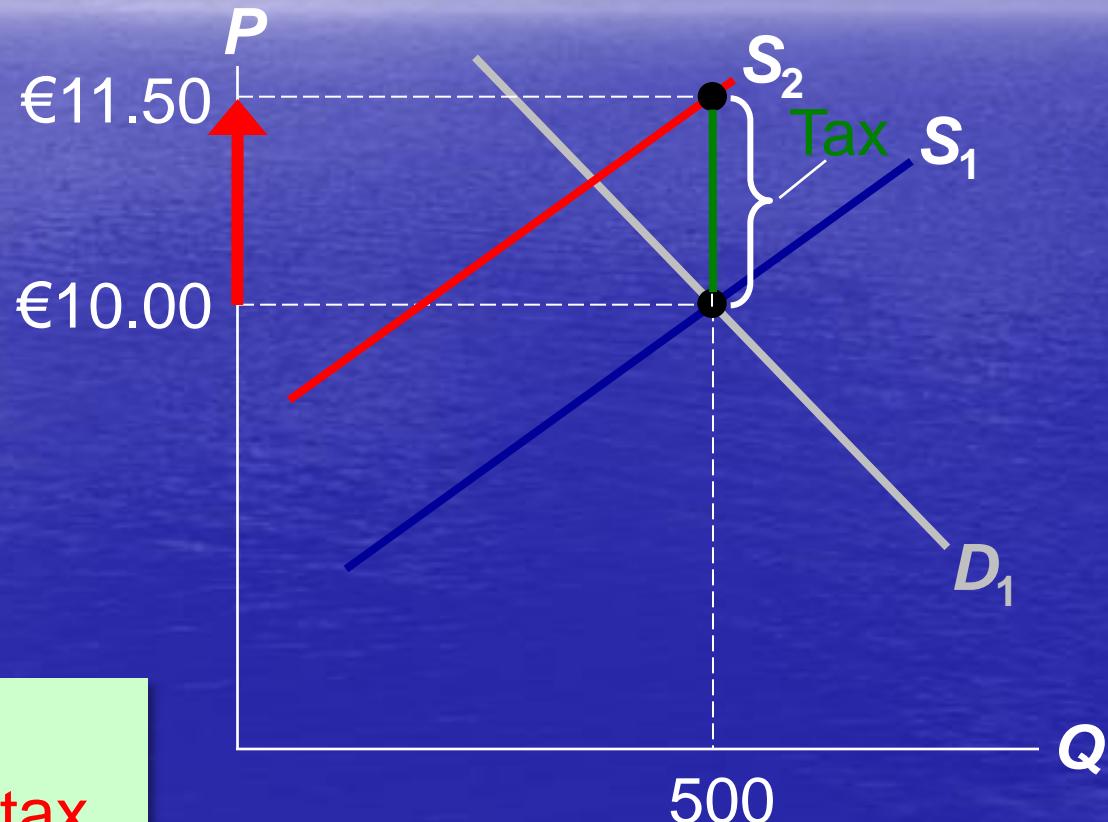
The tax effectively raises sellers' costs by €1.50 per pizza.

Sellers will supply 500 pizzas only if

P rises to €11.50, to compensate for this cost increase.

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

Effects of a €1.50 per unit tax on sellers



Taxing Sellers

New equilibrium:

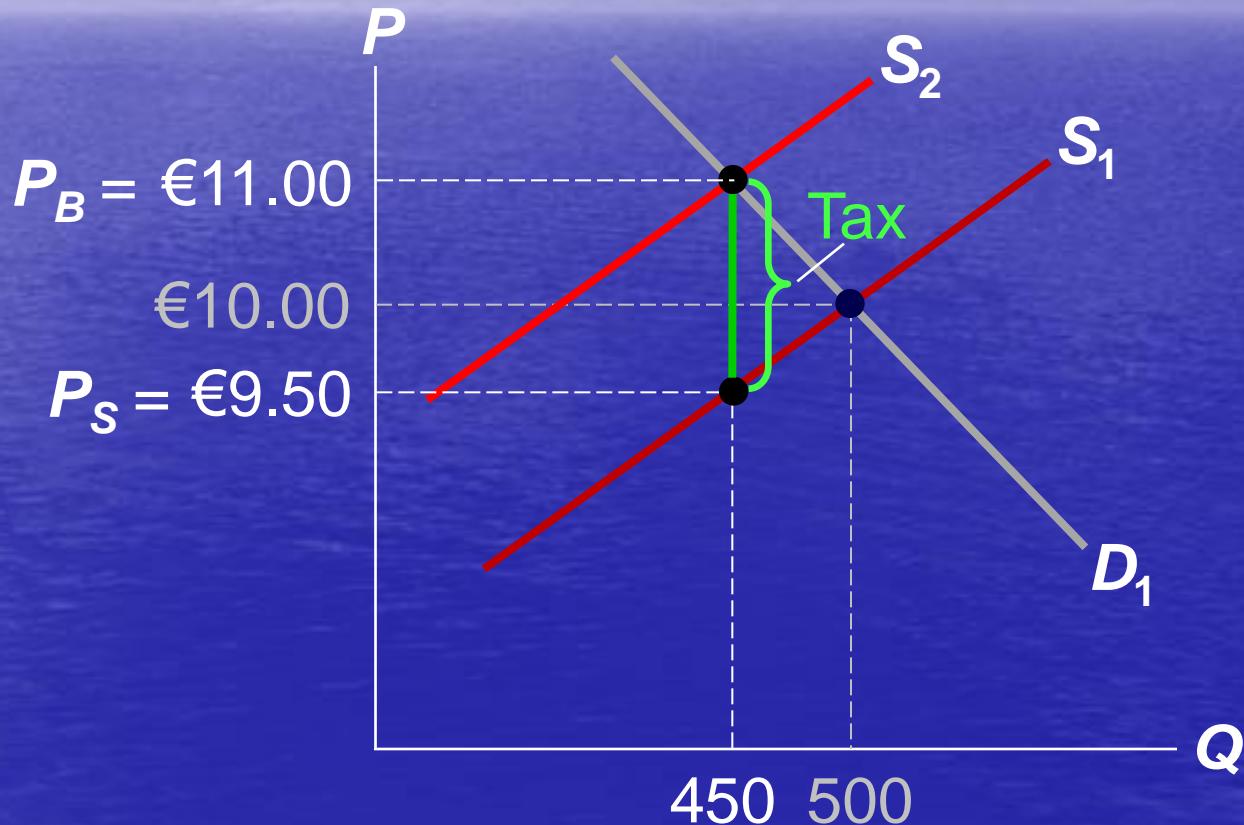
$$Q = 450$$

Buyers pay
 $P_B = €11.00$

Sellers receive
 $P_s = €9.50$

Difference
between them
 $= €1.50 = \text{tax}$

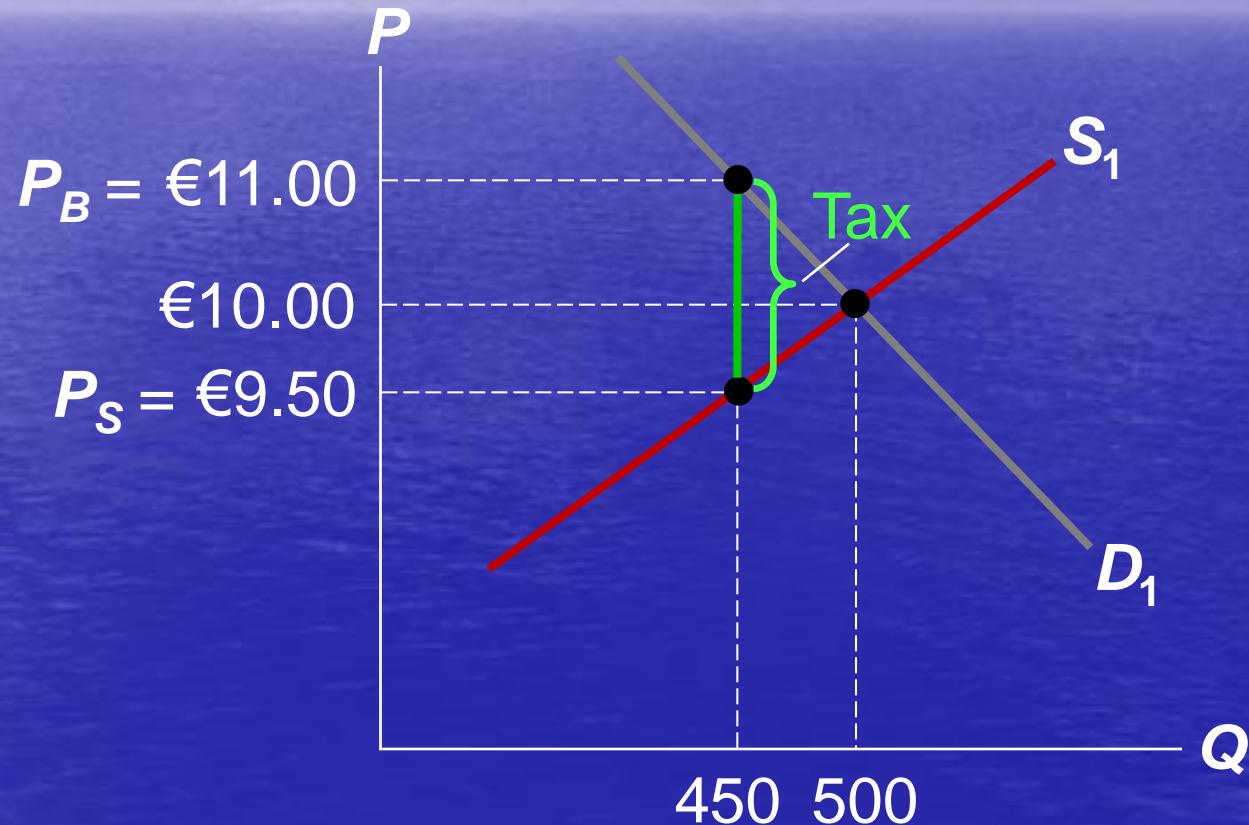
Effects of a €1.50 per unit tax on sellers



The Outcome Is the Same in Both Cases!

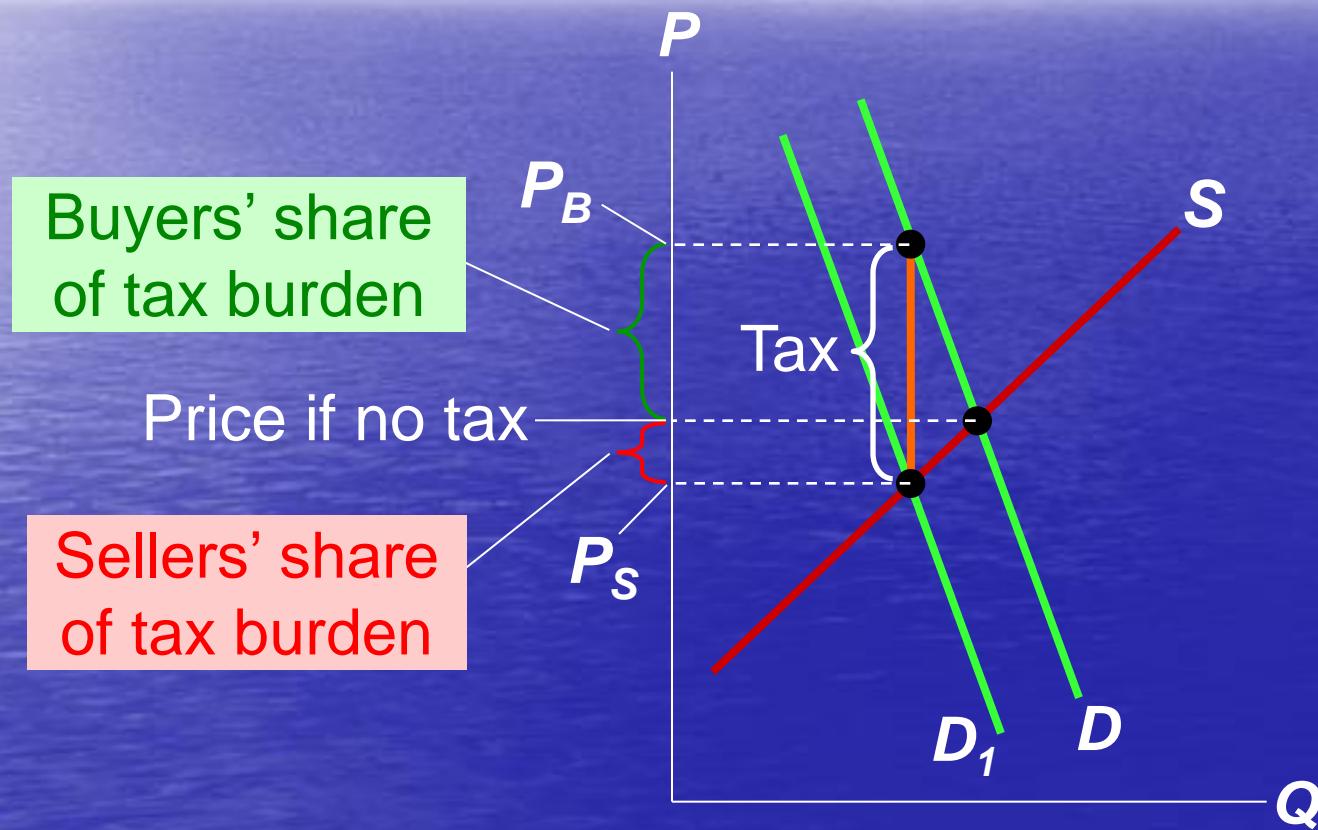
The effects on P and Q , and the tax incidence are the same whether the tax is imposed on buyers or sellers!

What matters
is this:
**A tax drives
a wedge
between the
price buyers
pay & the
price sellers
receive.**



Elasticity & Tax Incidence

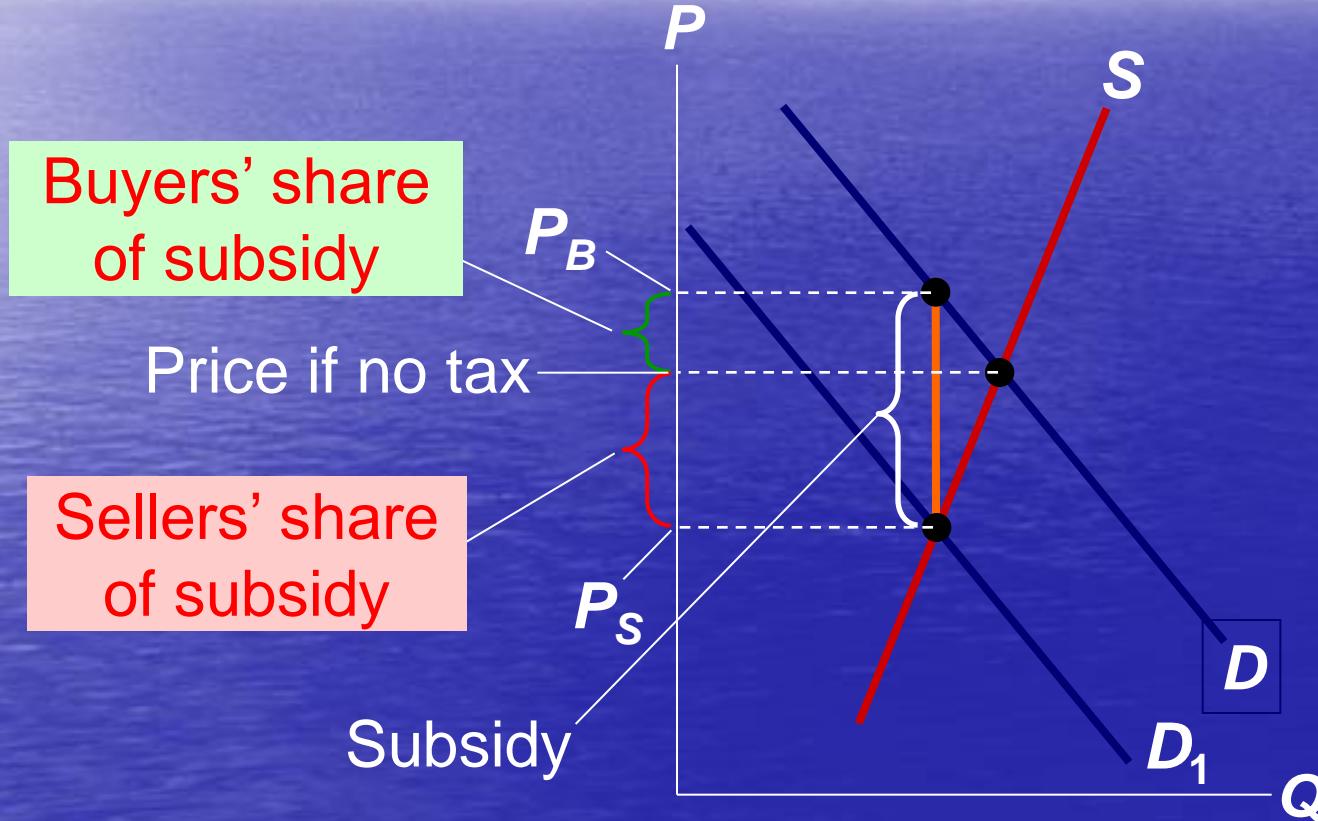
Demand is inelastic supply is elastic



For example, the demand for the good is inelastic because it has few substitutes e.g. food, alcohol, tobacco, pharmaceuticals, etc.

Elasticity and Tax Incidence

CASE 2: Supply is inelastic Demand is elastic



Housing supply is inelastic. A grant to buyers will push the price up with most of the subsidy going to the builder

The Effects of a Tax

Equilibrium with no tax:

Price = P_E

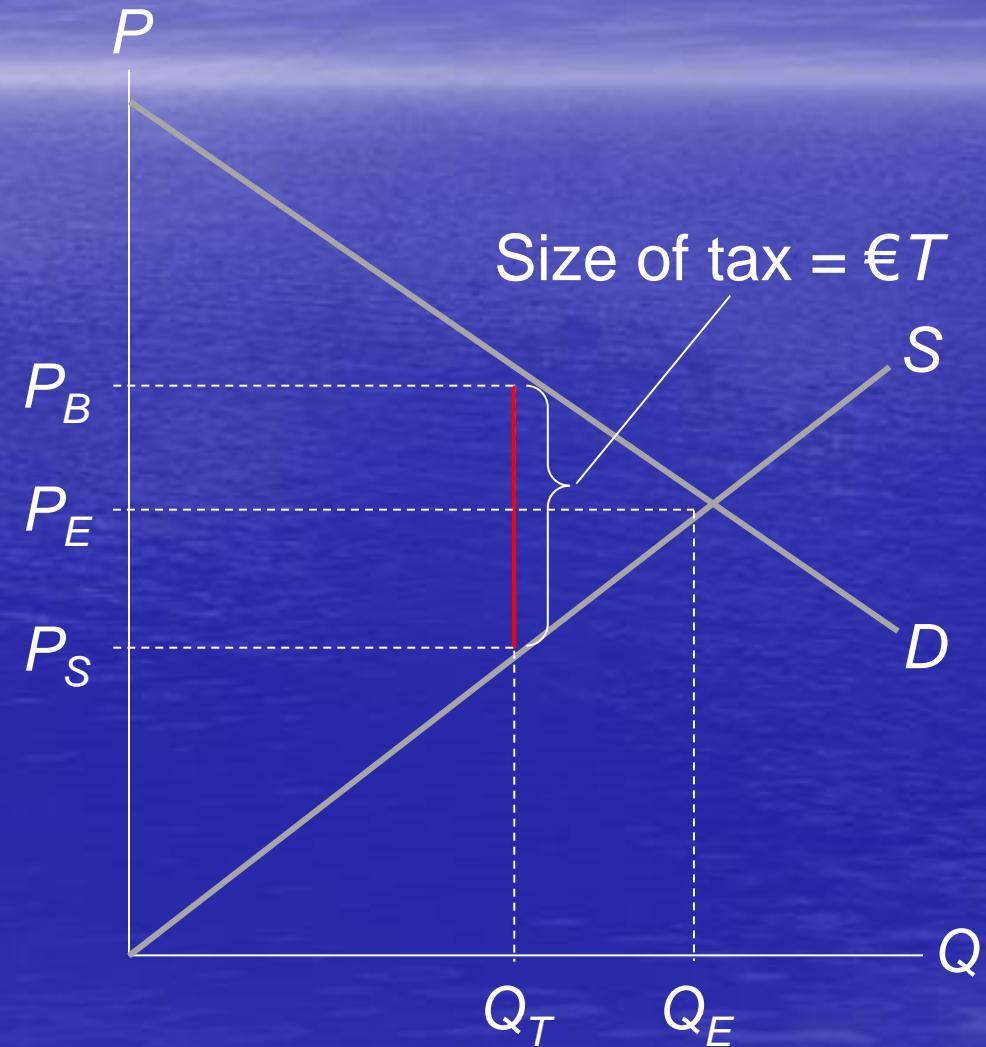
Quantity = Q_E

Equilibrium with
tax = ϵT per unit:

Buyers pay P_B

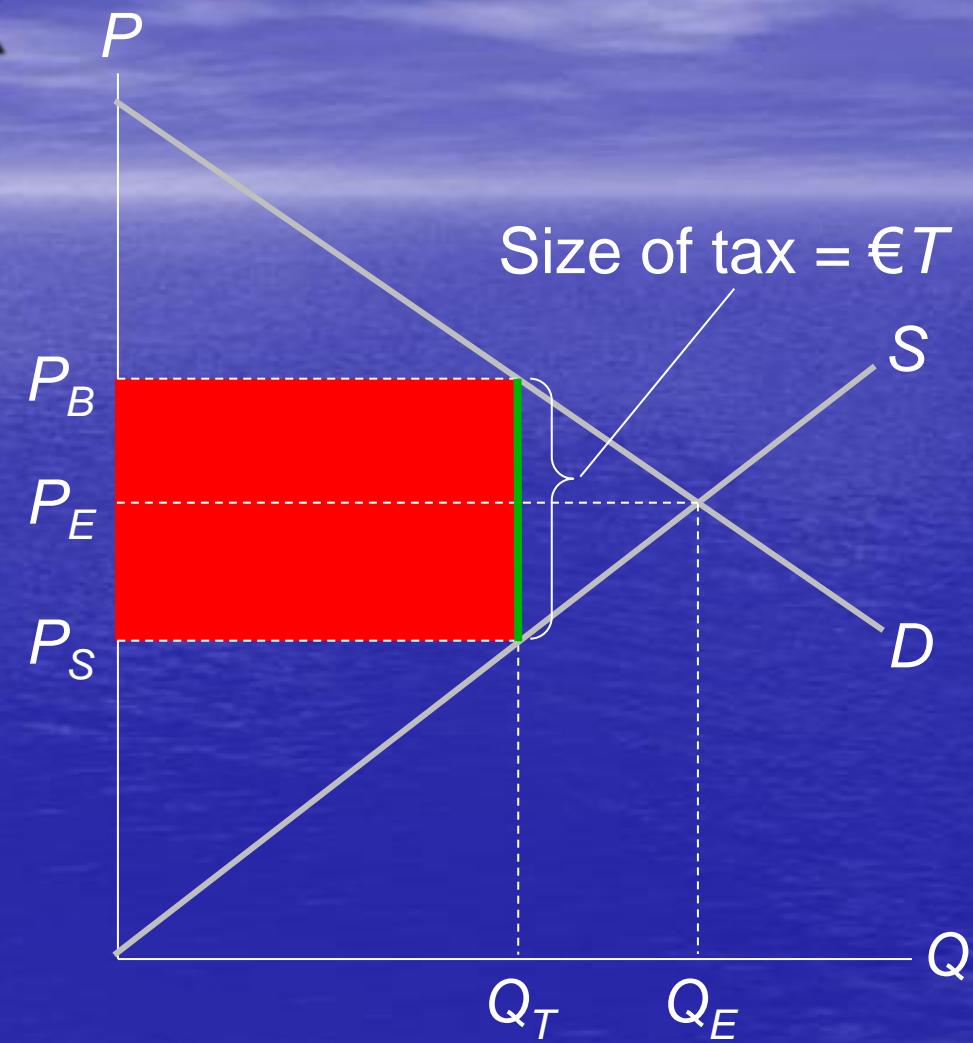
Sellers receive P_S

Quantity = Q_T



The Effects of a Tax

Revenue from tax:
 $\epsilon T \times Q_T$



The Effects of a Tax

- Applying welfare economics we measure the gains & losses from a tax.
- We determine consumer surplus (CS), producer surplus (PS), tax revenue, & total surplus with & without the tax.
- Tax revenue fund public services & transfers (e.g., education, roads, old-age pensions), so we include it in total surplus.

The Effects of a Tax

Without a tax:

$$CS = A + B + C$$

$$PS = D + E + F$$

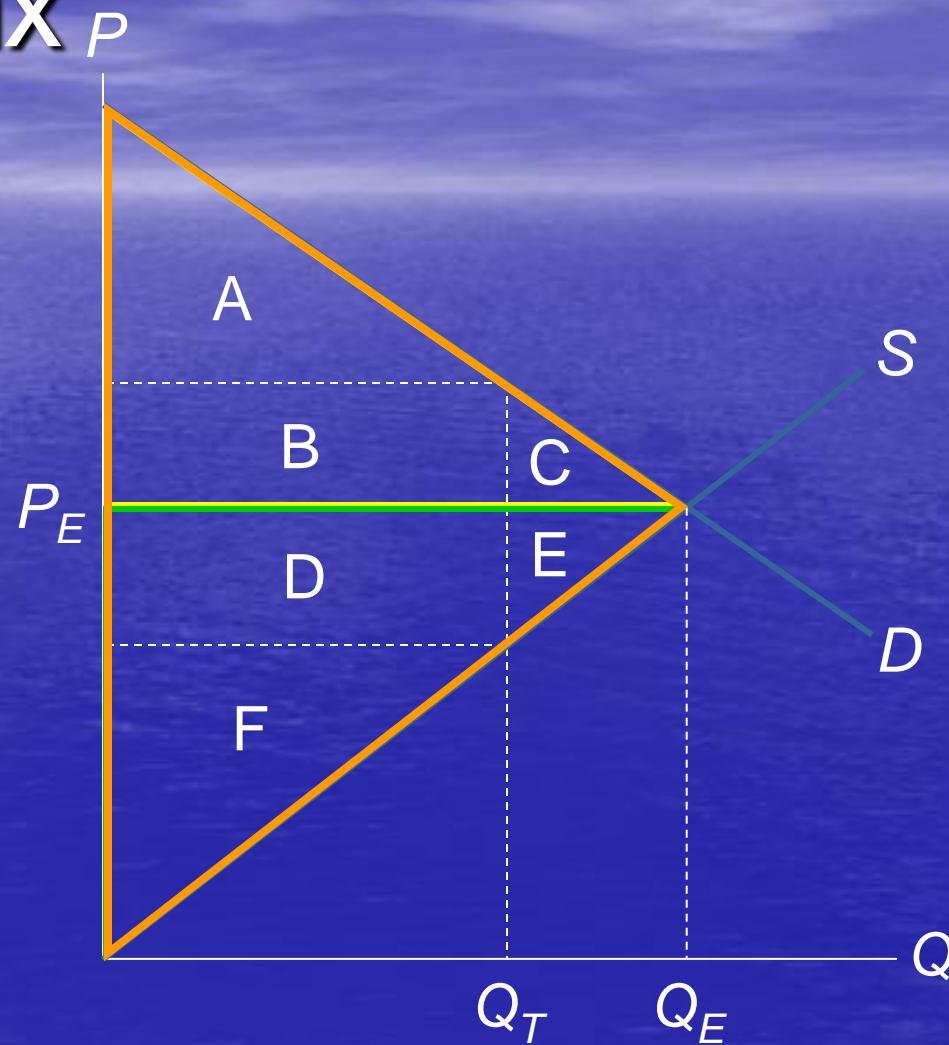
$$\text{Tax revenue} = 0$$

Total surplus

$$= CS + PS$$

$$= A + B + C$$

$$+ D + E + F$$



The Effects of a Tax

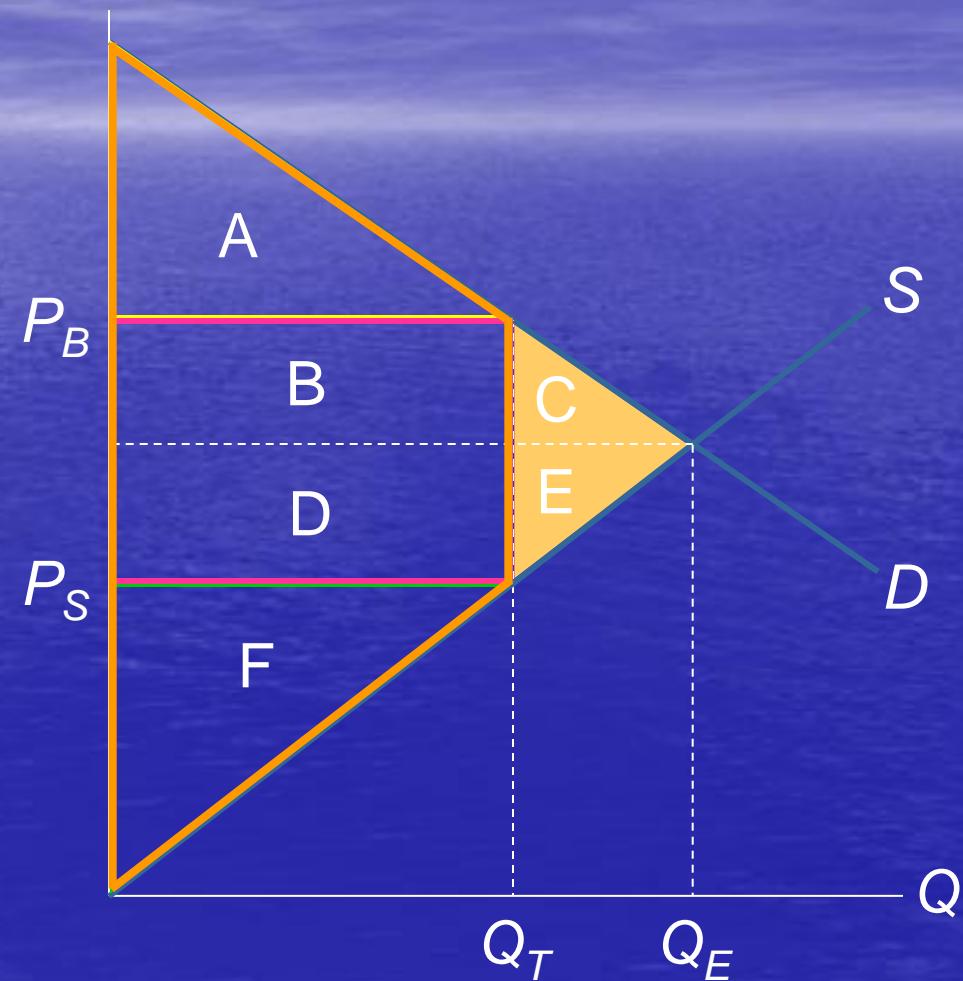
With the tax:

$$CS = A \text{ & } PS = F$$

Tax revenue = B + D
(The tax burden)

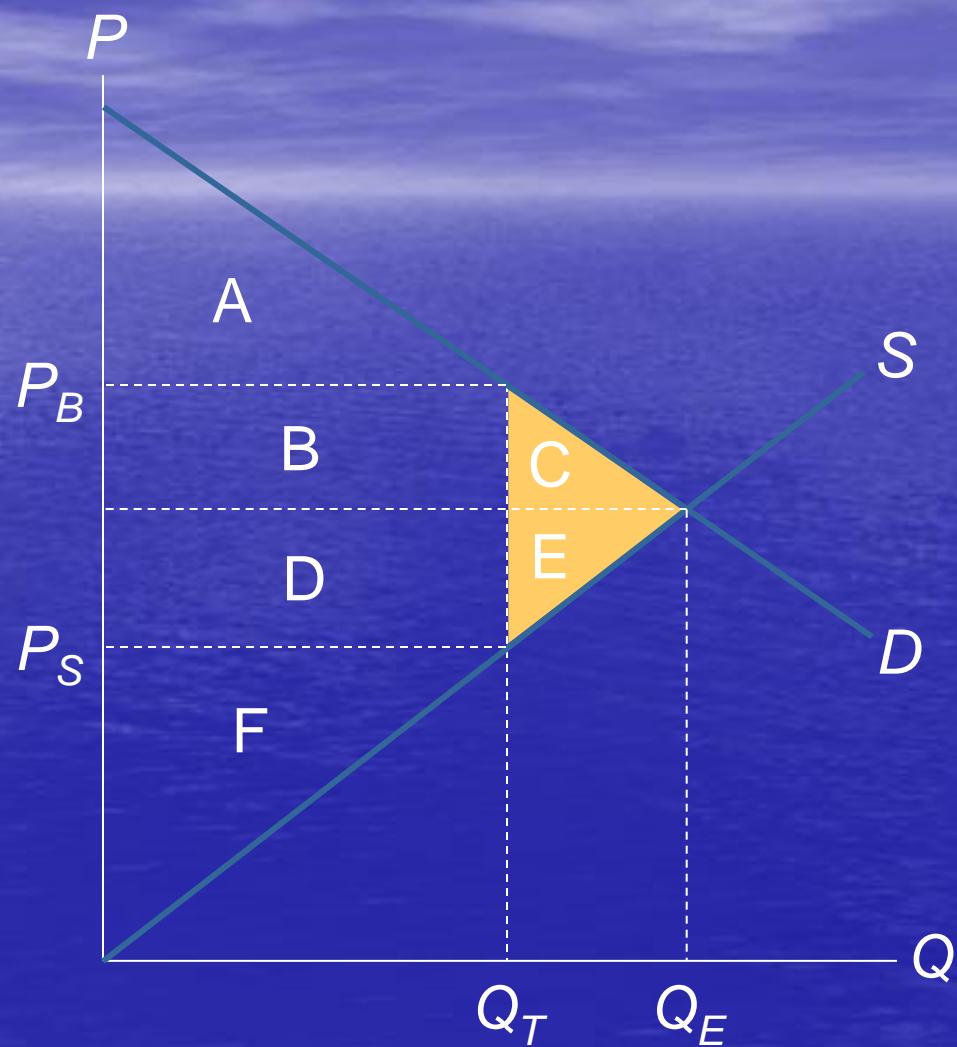
Total surplus
 $= A + B + D + F$

The tax reduces total
surplus by C + E (The
excess burden)



Deadweight Loss

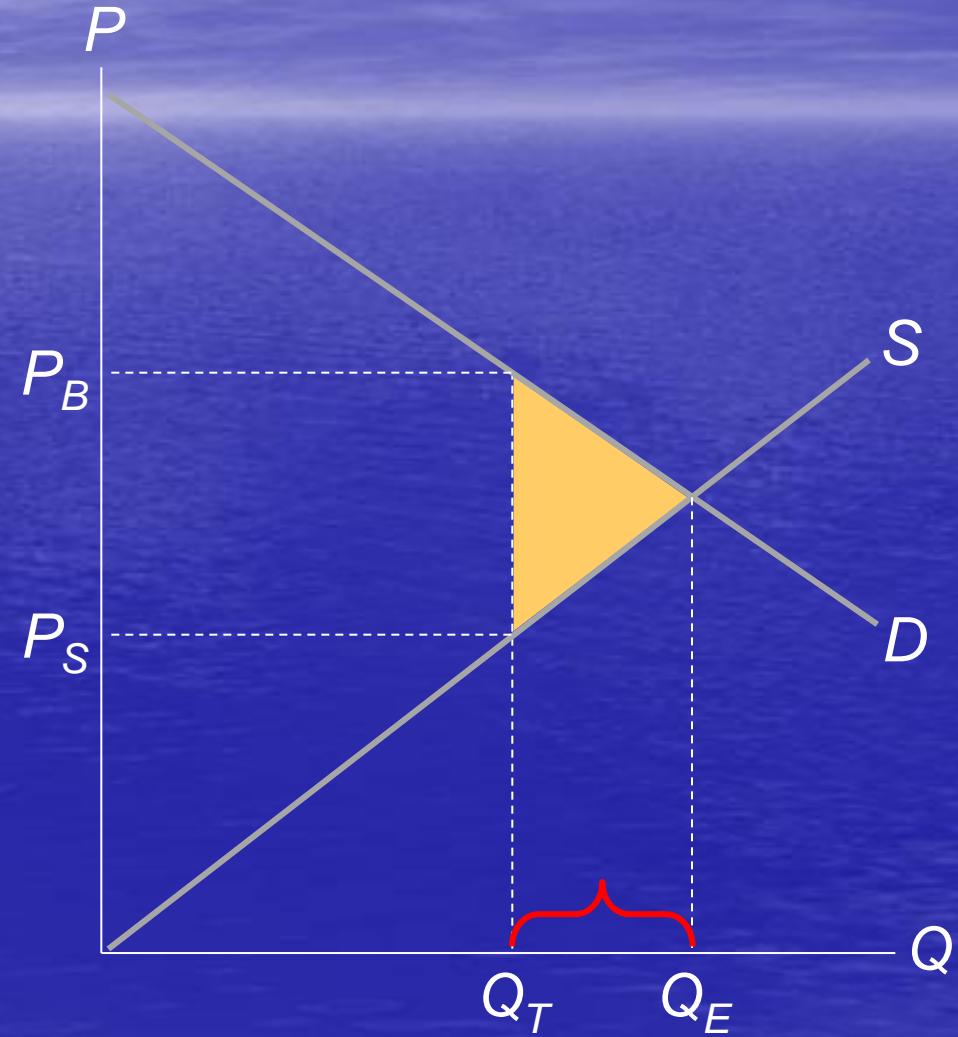
$C + E$ is called the **deadweight loss** (DWL) or **excess burden** of the tax. It is the fall in total surplus that results from intervening in the market



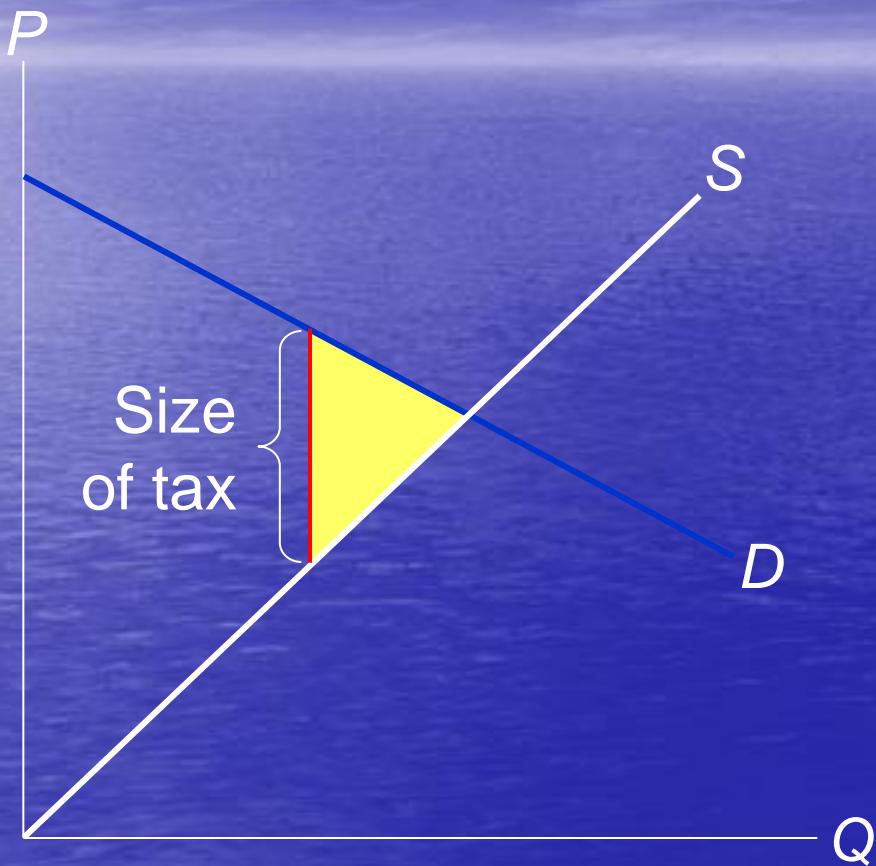
About the Deadweight Loss

Due to the imposition of the tax, the units between Q_T & Q_E are not sold.

The value of these units to buyers is greater than the cost of producing them, consequently, the tax prevents some mutually beneficial trades from occurring



Deadweight Loss & Elasticity



The more elastic, the demand or supply, the greater the DWL.