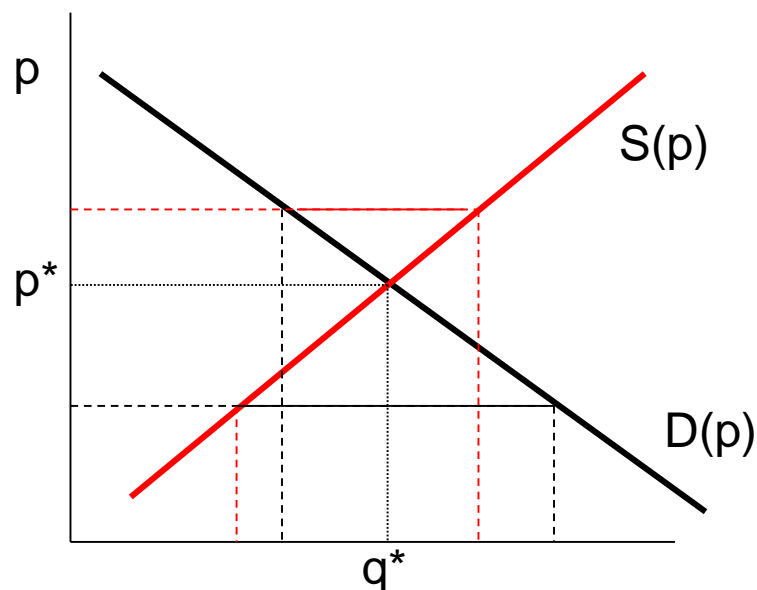


MARKET EQUILIBRIUM

Competitive equilibrium and market clearing condition (mcc):



Equilibrium price is such that:

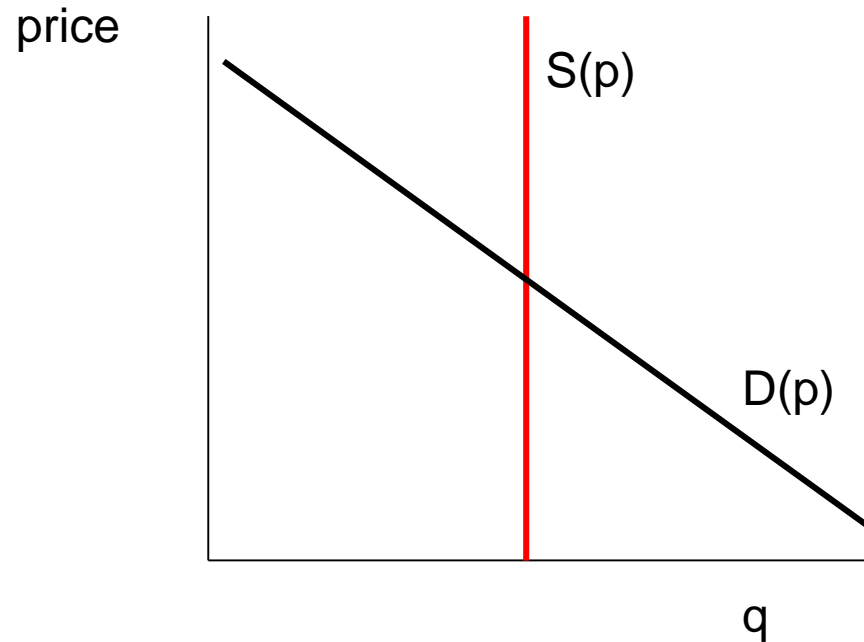
$$D(p^*) = S(p^*)$$

$p > p^*$ Excess supply

$p < p^*$ Excess demand

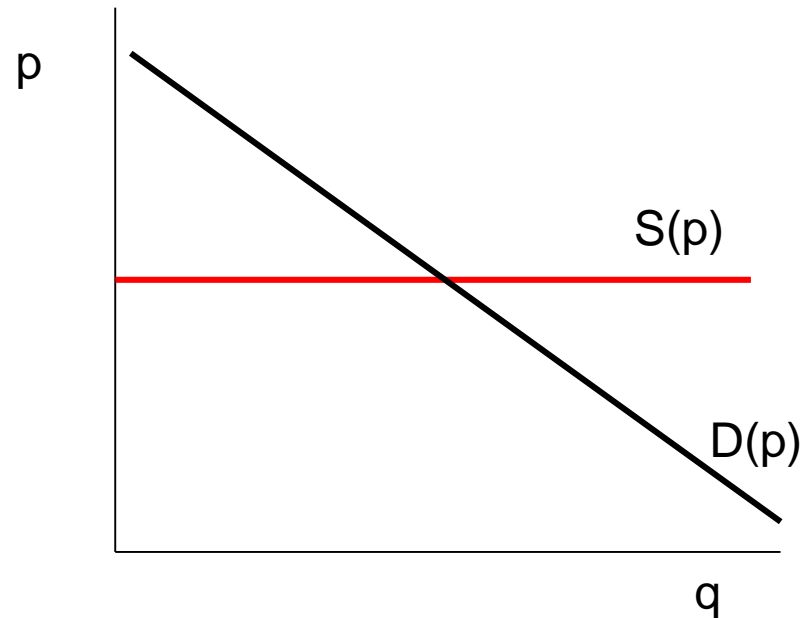
Particular cases

1) Inelastic supply (housing in the short run)



Equilibrium quantity is entirely determined by the supply curve while the equilibrium price by the demand curve

2) Horizontal supply



Any quantity is supplied at a constant price

Equilibrium price is determined by the supply curve while equilibrium quantity by the demand curve

- Inverse supply curve $P_S(q^*)$

Price each seller is willing to receive to sell the good

- Inverse demand curve $P_D(q^*)$

Price each consumer is willing to pay to buy a specific quantity of the good

equilibrium price: consumers are willing to pay for that quantity the same price suppliers are willing to accept to sell the same quantity

$$P_S(q^*) = P_D(q^*)$$

Linear case:

$$D(p) = a - bp$$

$$S(p) = c + dp$$

Equilibrium price:

$$D(p) = S(p) \Rightarrow a - bp = c + dp$$

$$p^* = \frac{a - c}{d + b}$$

Equilibrium quantity

$$D(p^*) = a - bp^* = a - b \left(\frac{a - c}{b + d} \right) = \frac{ad + bc}{b + d}$$

With inverse demand and supply...

$$q = a - bp$$

$$P_D(q) = \frac{a - q}{b} \quad \text{and} \quad P_S(q) = \frac{q - c}{d}$$

Mcc:

$$P_D(q) = P_S(q) = \frac{a - q}{b} = \frac{q - c}{d}$$

$$q^* = \frac{ad + bc}{b + d}$$

Comparative statics (price change)

example: Tax

1. Tax on quantity: applied on each unit sold or bought. Ex. Tax on Fuel
2. Ad valorem: applied on the value of the good. (ex income tax..)

Tax on quantity: is paid on each unit sold or bought. Ex. fuel

Gross price: tax included, the price **effectively payed** by the buyer

Net price: after (not included) the tax, price **effectively received** by the sellers

When a tax is applied the price effectively paid by the buyer is **no more equal** to price effectively received by the seller;

the tax is given by the difference between these two values.

Example

- Tax on quantity: in the US is 12 cents per liter
consumer pays 1-liter gasoline $P_G=1.50$ \$,
supplier receives $P_N=1.50\$-0.12=1.38\$$

Assuming t is the amount of tax for each sold/acquired unit, the gross price is

$$P_G = P_N + t$$

Tax on sellers (on sold quantity)

i.e. Fuel (consumers already paid at the pump the gross price)

The seller receives:

$$P_N + t = P_G$$

At Equilibrium:

$$P_G(q) = P_N(q) + t$$

New supply

Supply-price increases because it includes the tax that is transferred from the seller to the buyer

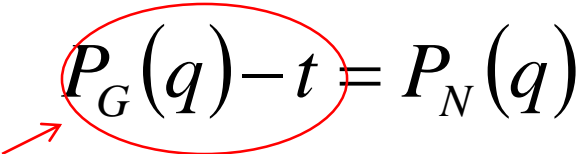
Tax on buyers (on acquired quantity)

Consumers pay the seller the net price

$$P_G - t = P_N$$

At Equilibrium

New demand

$$P_G(q) - t = P_N(q)$$


Equilibrium price and quantity do not change according to who pays the tax

The equilibrium with the inverse demand and supply

Tax on consumers

No tax equilibrium

$$P_D = P_S$$

Equilibrium with tax

$$P_D - t = P_S$$

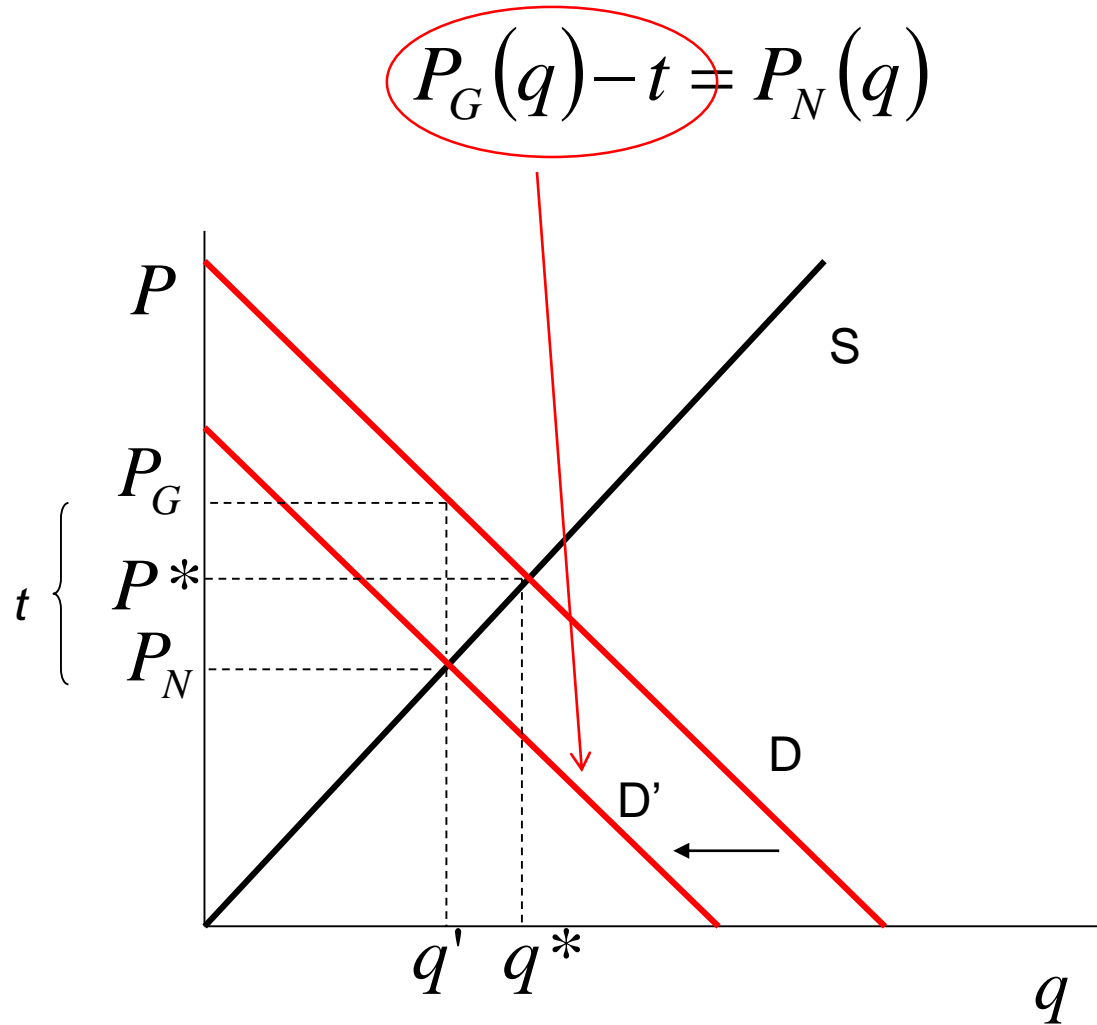
$$P_D(q^*) - t = P_S(q^*)$$

Tax on sellers

$$P_D(q^*) = P_S(q^*) + t$$

Same
results

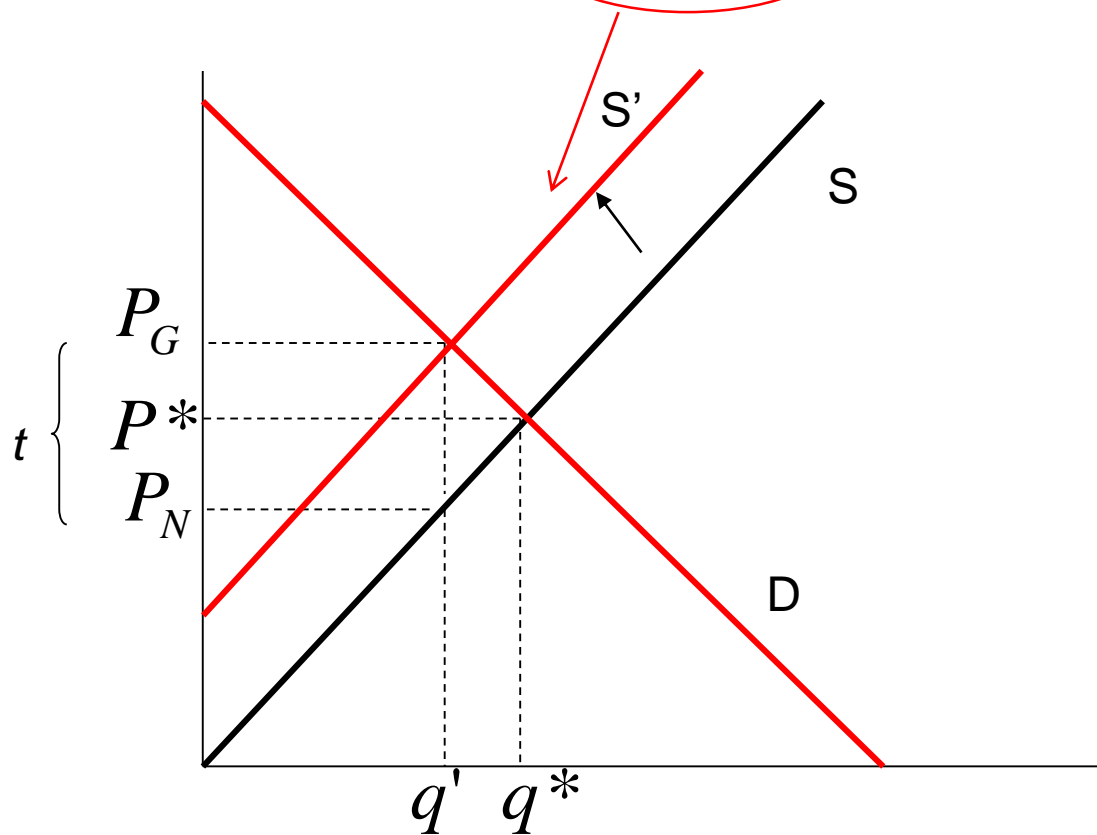
Tax on buyers



Tax on sellers

Supply curve represents the cost (the lowest price the seller is willing to accept).
Tax works just as an increase in cost

$$P_G(q) = P_N(q) + t$$



Tax effect on equilibrium

1. Quantity reduction
2. Increase in the price effectively paid by the consumers
3. Reduction in the price effectively received by the sellers
4. Both consumers and sellers share the tax burden

$$D(p) = a - bp$$

$$S(p) = c + dp$$

With a tax on sellers:

$$p_N + t = p_G$$

By substituting in the equilibrium condition:

$$a - b(p_N + t) = c + dp_N$$

The price that the seller will receive in equilibrium is:

$$p_N^* = \frac{a - c - bt}{d + b} < p^*$$

The price paid by the buyer:

$$p_G^* = \frac{a - c - bt}{d + b} + t = \frac{a - c + dt}{d + b} > p^*$$

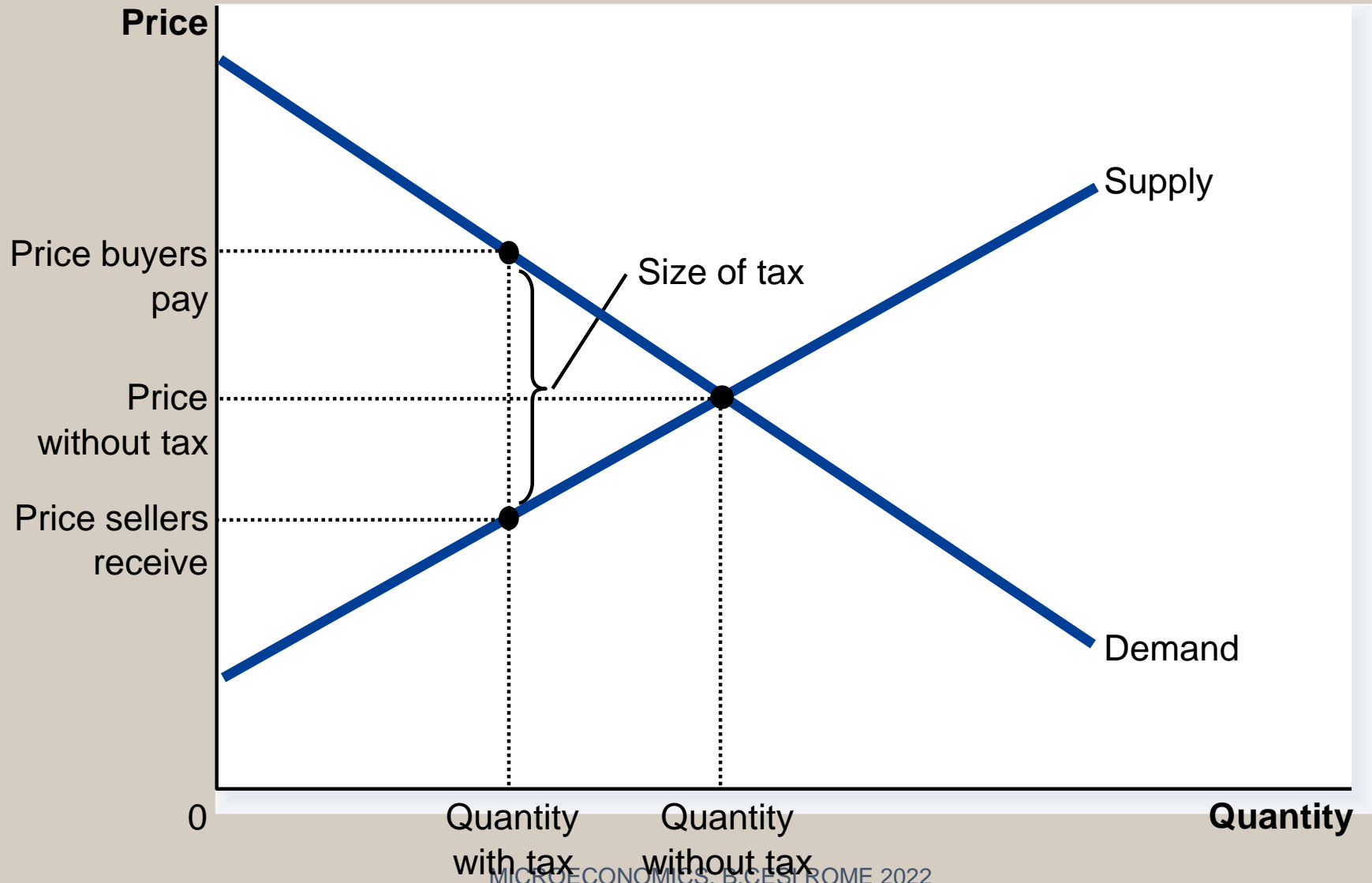
THE DEADWEIGHT LOSS OF TAXATION

.....Remember

- It does not matter whether a tax on a good is on buyers or sellers...
... the price paid by buyers rises and the price received by sellers falls.



The Effects of a Tax



How a Tax Affects Market Participants

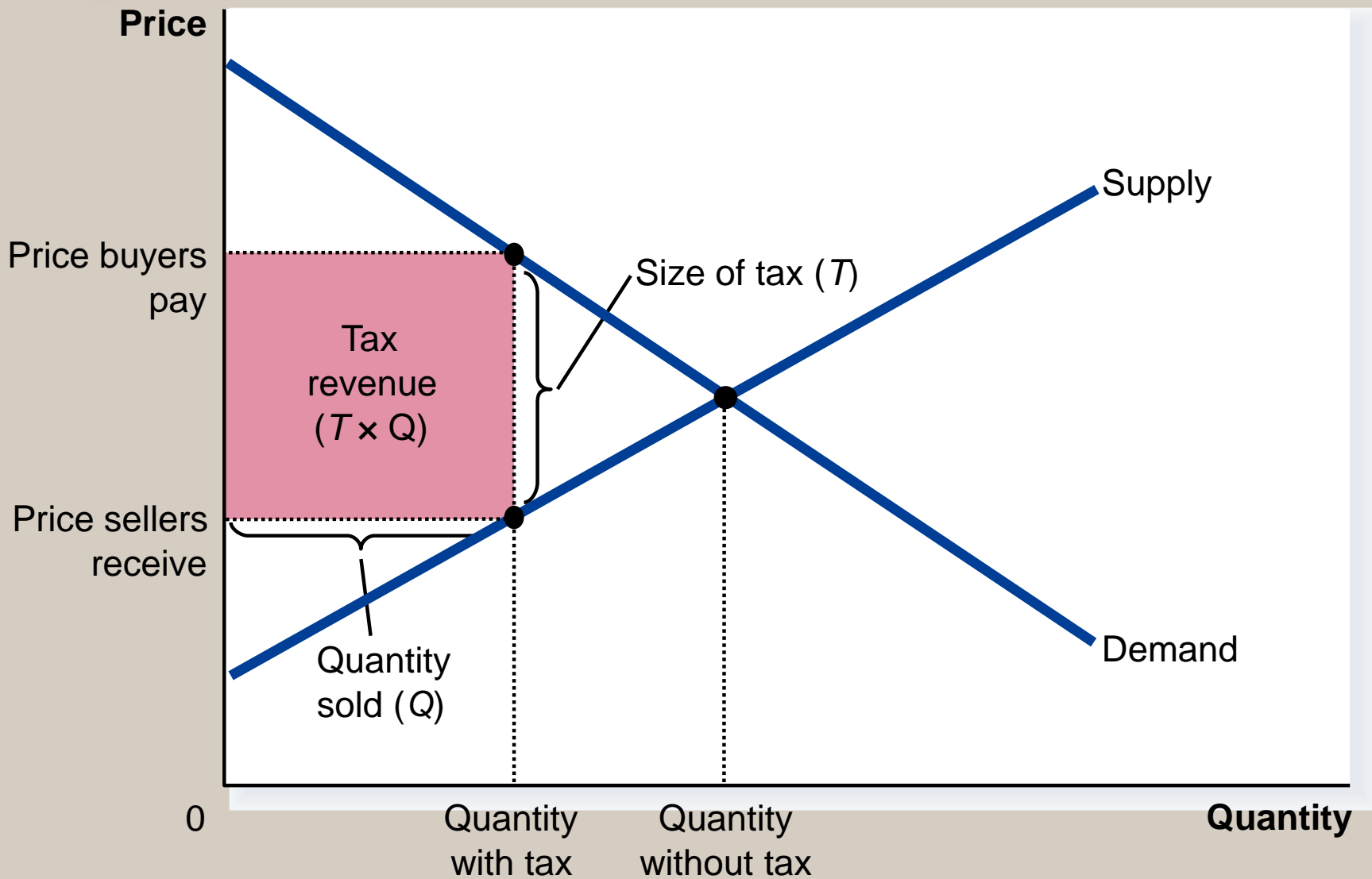
- A tax places a *wedge* between the price buyers pay and the price sellers receive.
- Because of this tax wedge, the quantity sold *falls* below the level that would be sold *without* a tax.
- The size of the market for that good shrinks.
- Buyers and sellers *share* the tax burden.

How a Tax Affects Market Participants

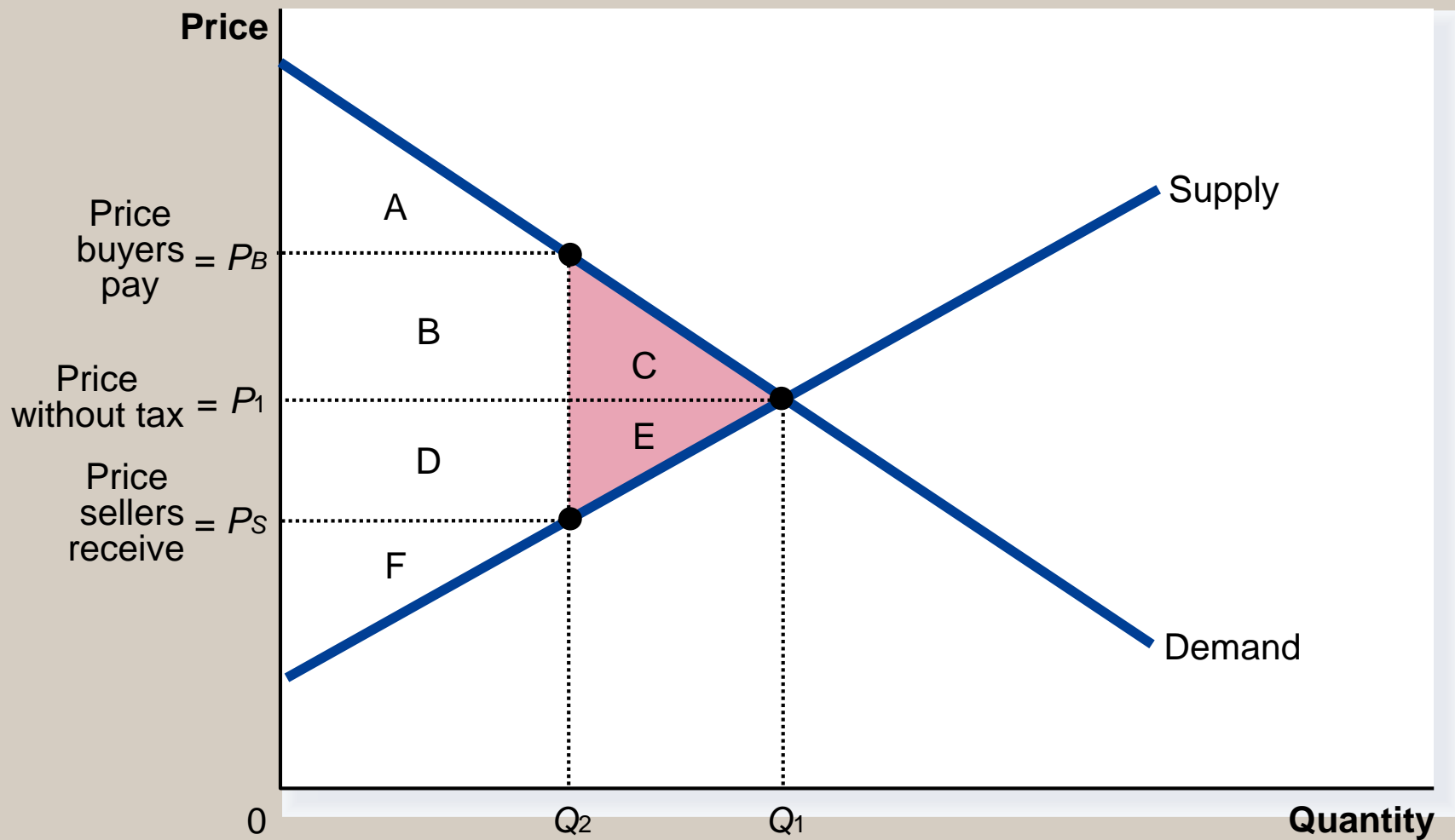
- Tax Revenue
 - **T = the size of the tax**
 - **Q = the quantity of the good sold**

$T \times Q$ = the government's tax revenue

Tax Revenue



How a Tax Effects Welfare



How a Tax Affects Market Participants

- Changes in Welfare
 - A *deadweight loss* is the fall in total surplus that results from a market distortion, such as a tax.

How a Tax Affects Welfare

	Without Tax	With Tax	Change
Consumer Surplus	$A + B + C$	A	$-(B + C)$
Producer Surplus	$D + E + F$	F	$-(D + E)$
Tax Revenue	None	$B + D$	$+(B + D)$
Total Surplus	$A + B + C + D + E + F$	$A + B + D + F$	$-(C + E)$

The area $C + E$ shows the fall in total surplus and is the deadweight loss of the tax.

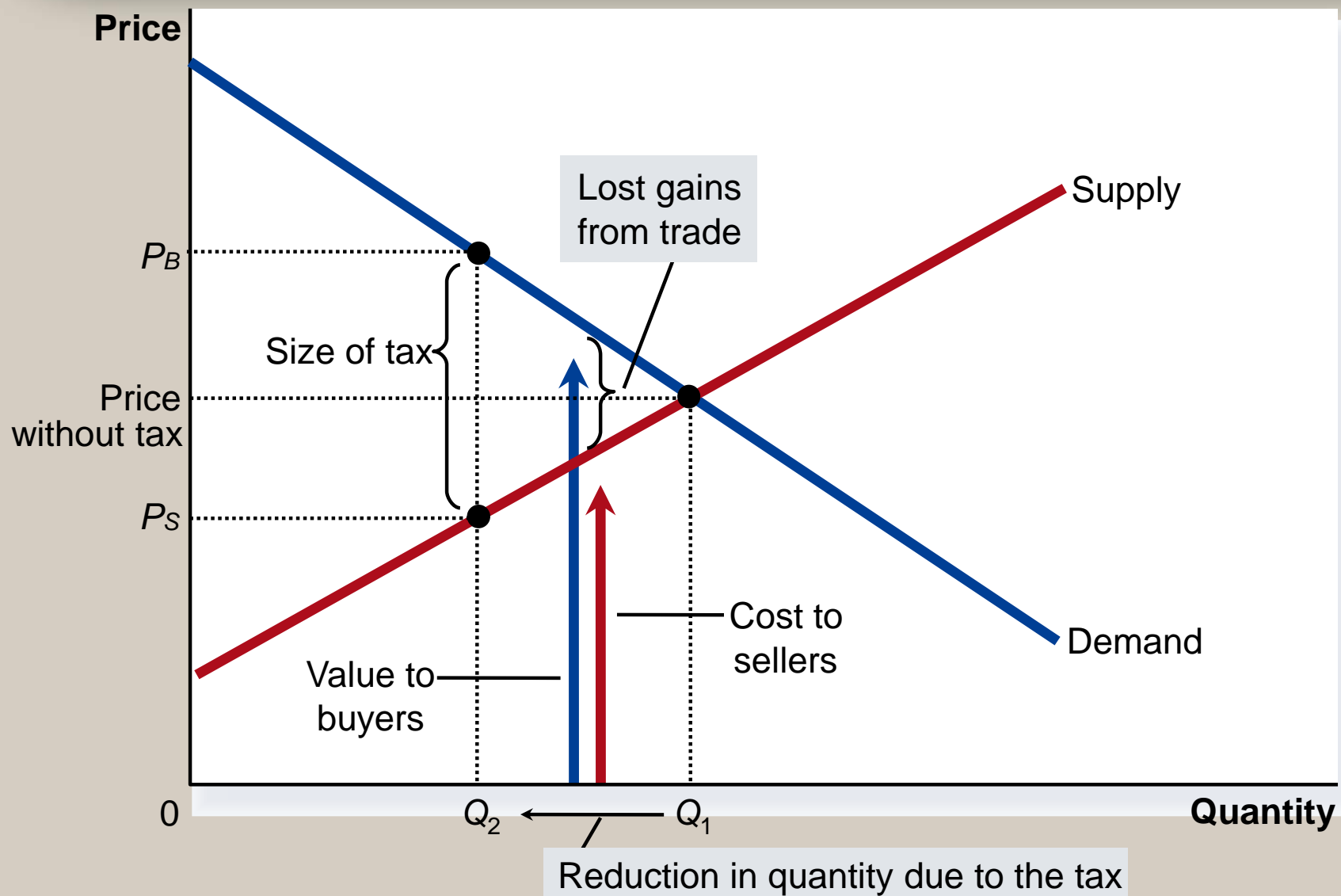
How a Tax Affects Market Participants

- The change in total welfare includes:
 - The change in consumer surplus,
 - The change in producer surplus, and
 - The change in tax revenue.
- The **losses** to buyers and sellers **exceed** the **revenue** raised by the **government**.
- This fall in total surplus is called the *deadweight loss*.

Deadweight Losses and the Gains from Trade

- Taxes cause deadweight losses because they **prevent** buyers and sellers from realizing some of the gains from **trade**.

The Deadweight Loss

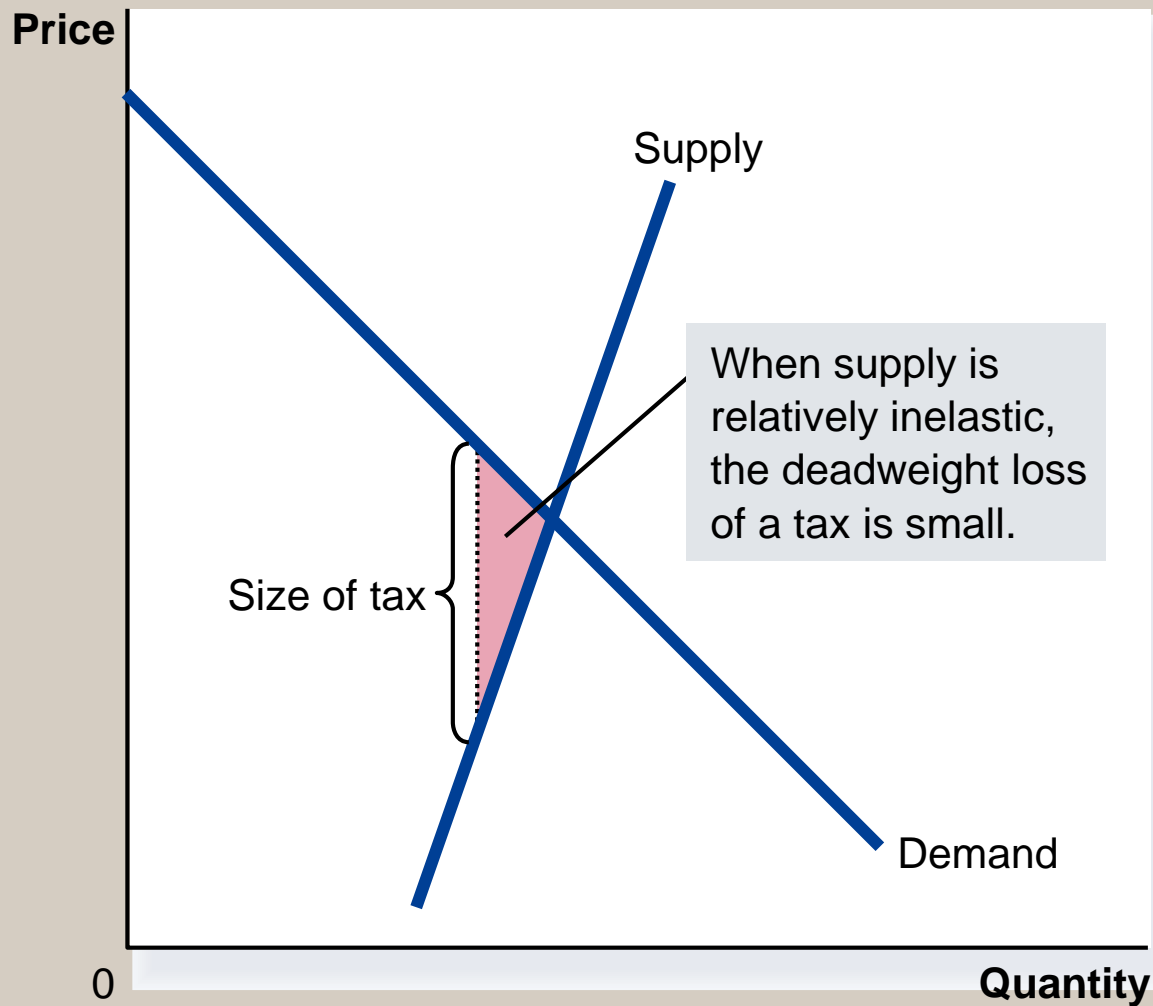


DETERMINANTS OF THE DEADWEIGHT LOSS

- What determines whether the deadweight loss from a tax is large or small...
 - The magnitude of the deadweight loss depends how the supplied and demanded quantity **respond** to changes in the price.
 -in turn, it depends on the **price elasticities** of supply and demand.

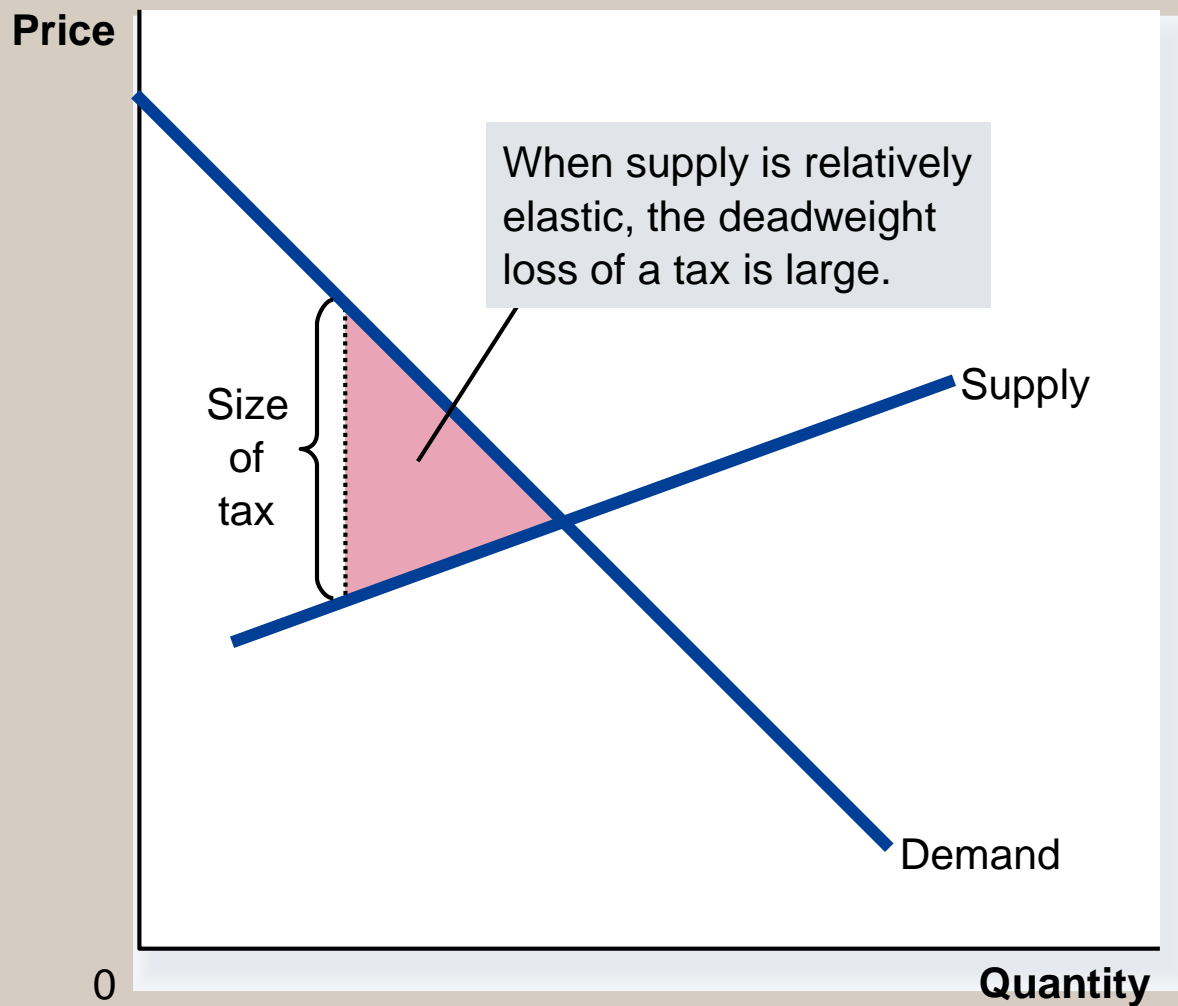
Tax Distortions and Elasticities

(a) Inelastic Supply



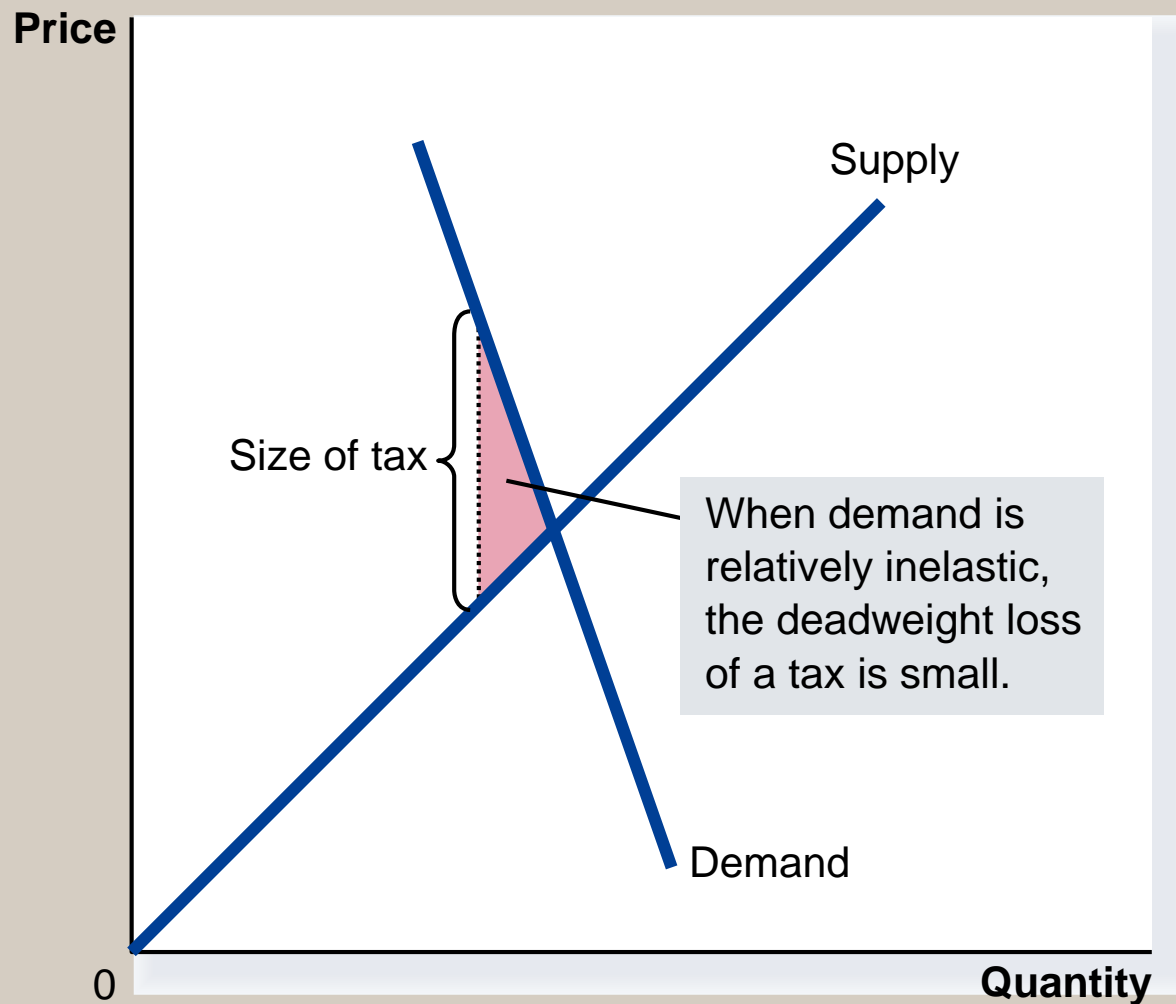
Tax Distortions and Elasticities

(b) Elastic Supply



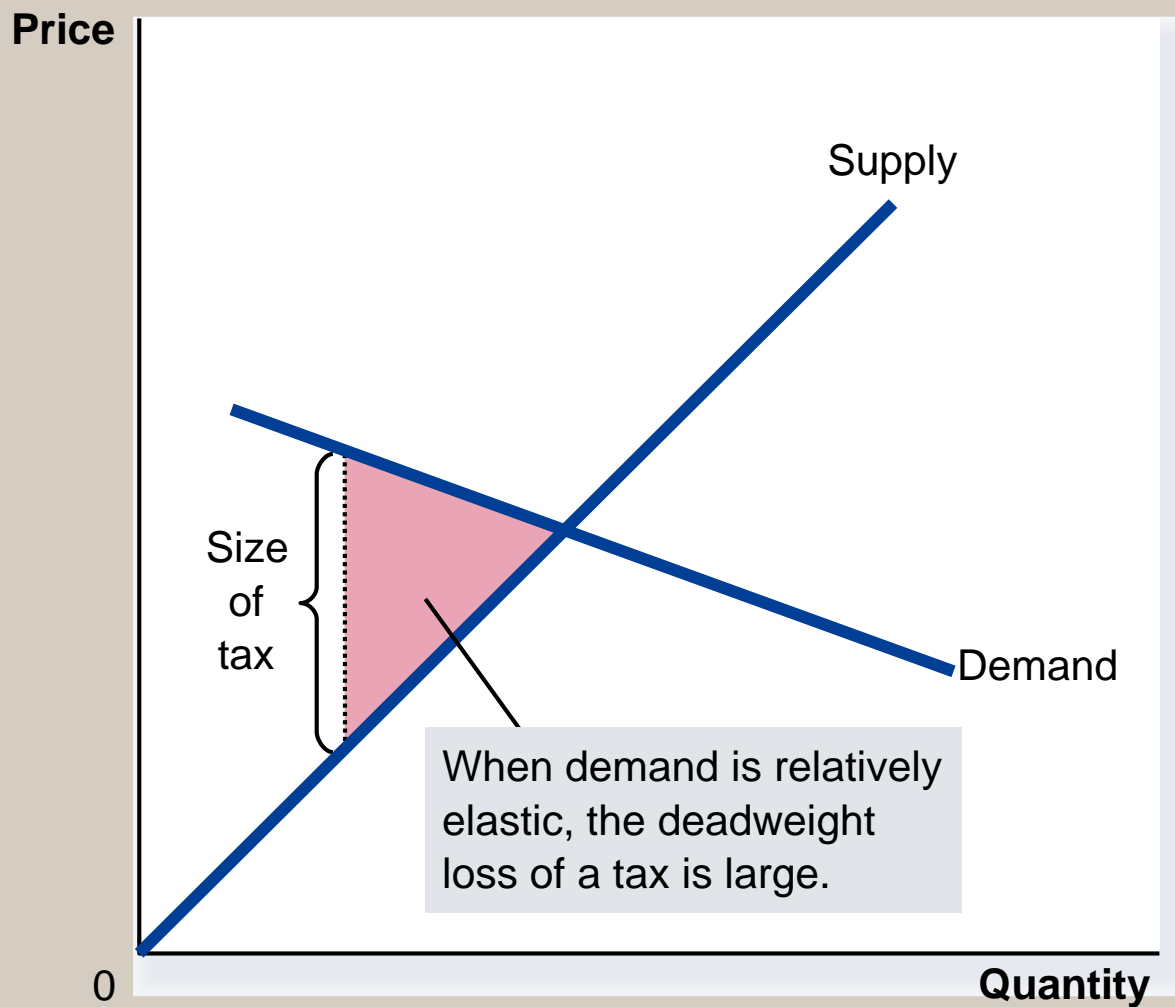
Tax Distortions and Elasticities

(c) Inelastic Demand



Tax Distortions and Elasticities

(d) Elastic Demand



DETERMINANTS OF THE DEADWEIGHT LOSS

- The **greater** the elasticity of demand and supply:
 - the **larger** will be the decline in equilibrium quantity
 - the **greater** the deadweight loss of a tax.

DEADWEIGHT LOSS AND TAX REVENUE AS TAXES VARY

- When the tax rate increases, the deadweight loss rises even more rapidly than the size of the tax
- More technically... **DWL** is a **convex** function of the tax rate

Deadweight Loss and Tax Revenue from Three Taxes of Different Sizes

(a) Small Tax

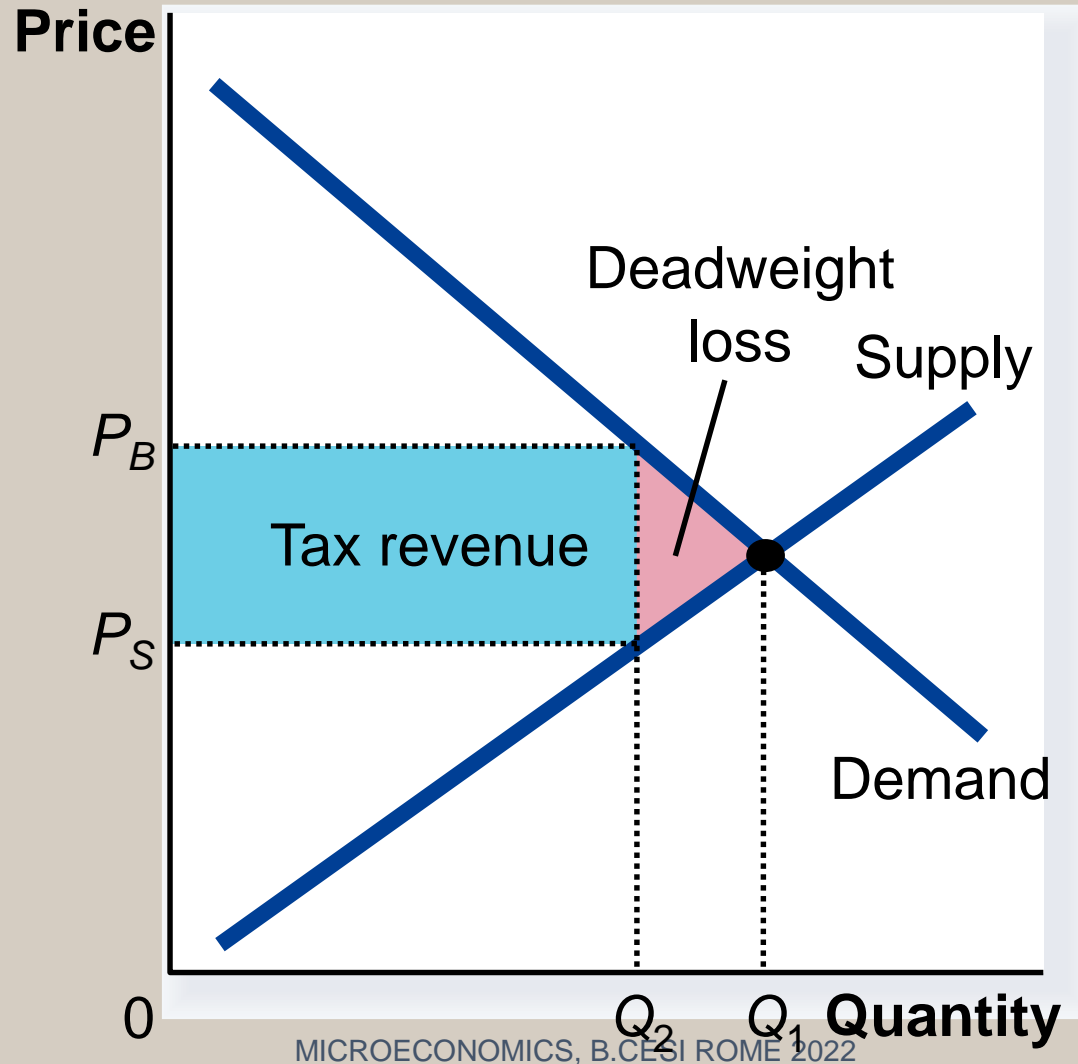


Figure 6 Deadweight Loss and Tax Revenue from Three Taxes of Different Sizes

(b) Medium Tax

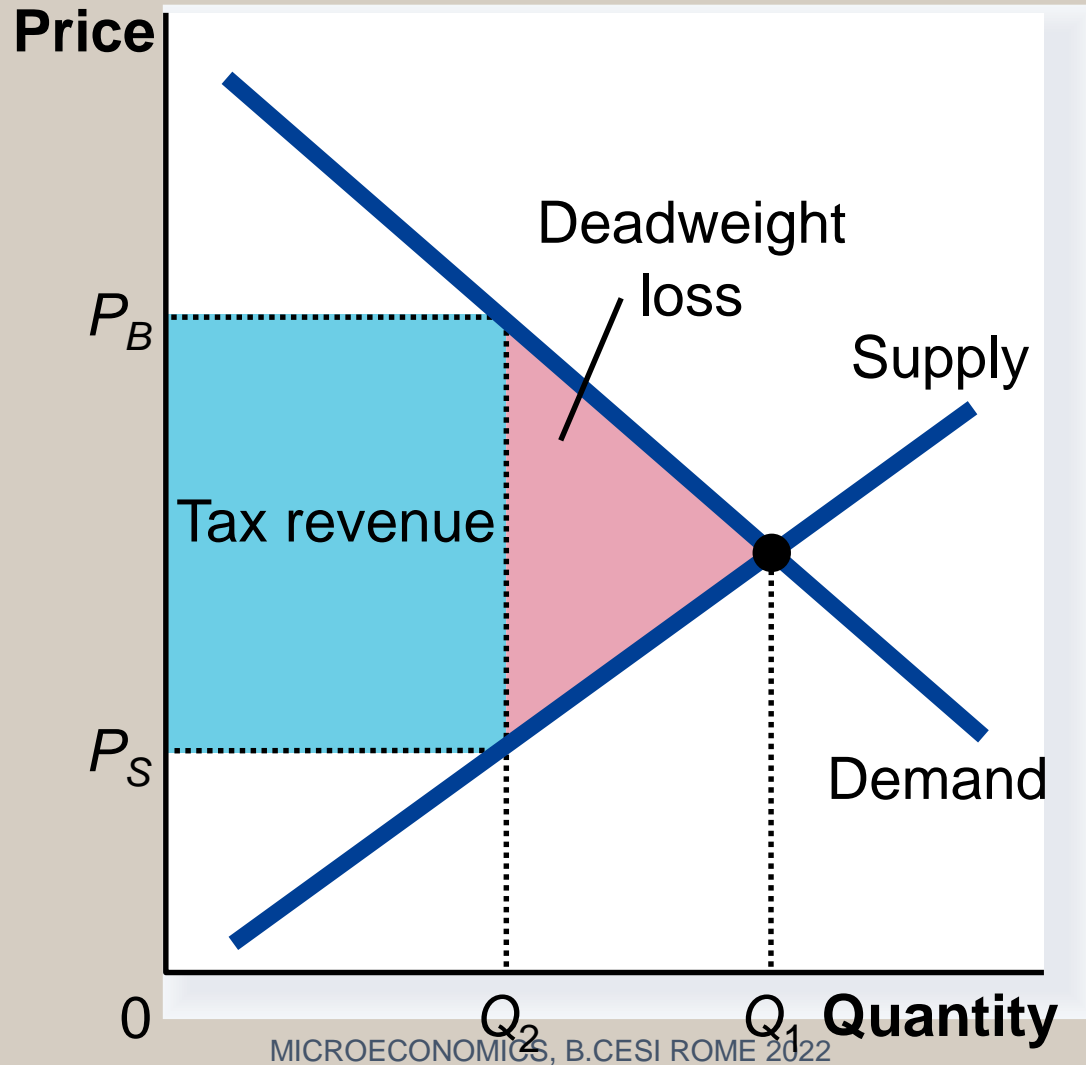
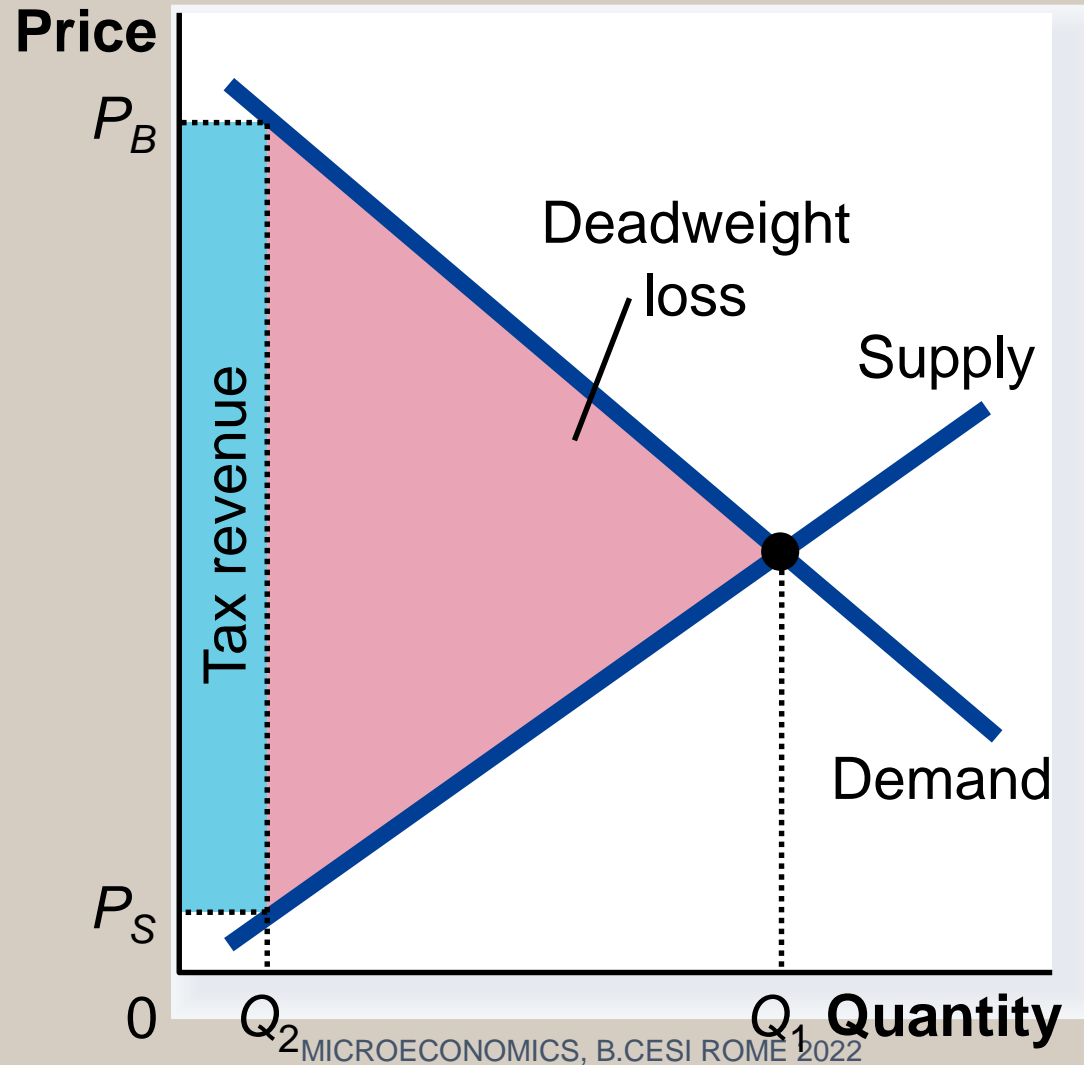


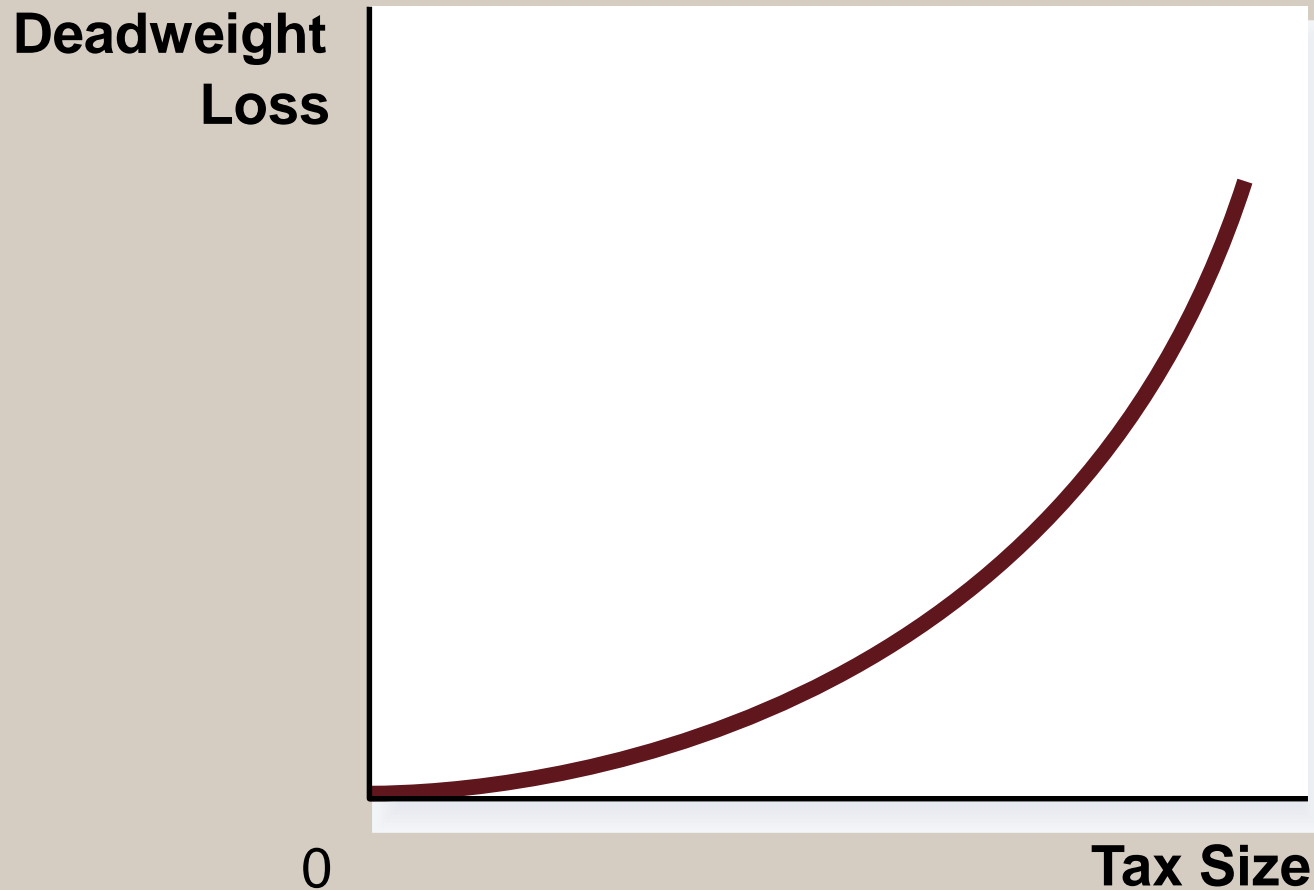
Figure 6 Deadweight Loss and Tax Revenue from Three Taxes of Different Sizes

(c) Large Tax



How Deadweight Loss and Tax Revenue Vary with the Size of a Tax

(a) Deadweight Loss

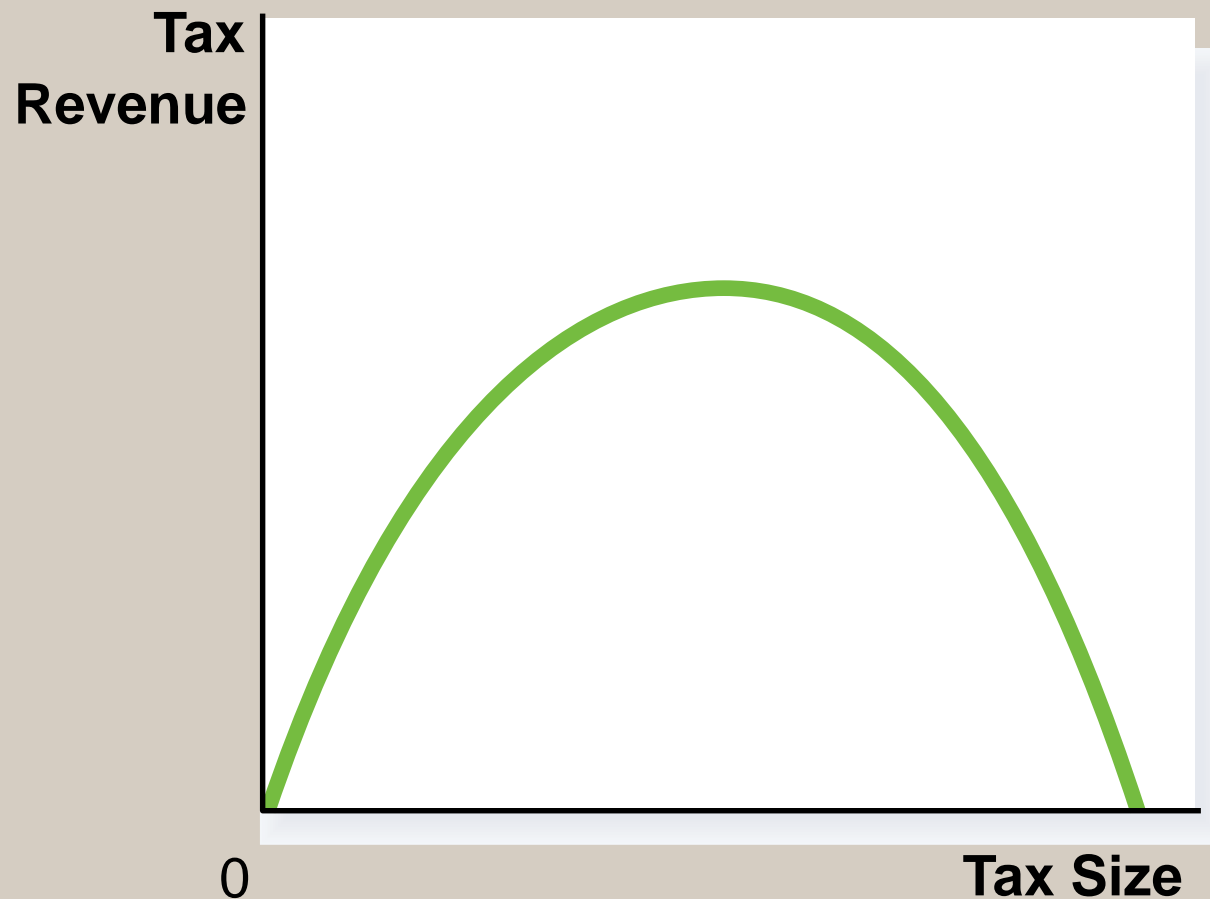


DEADWEIGHT LOSS AND TAX REVENUE AS TAXES VARY

- 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.

How Deadweight Loss and Tax Revenue Vary with the Size of a Tax

(b) Revenue (the Laffer curve)



CASE STUDY: The Laffer Curve and Supply-side Economics

- The *Laffer curve* depicts the relationship between tax rates and tax revenue.
- *Supply-side economics* refers to the views of right-wing parties who proposed that a **tax cut** would induce more people to work and thereby have the potential to increase tax revenues
- It works at micro level, but it has proved to be unreliable at macro level, witness **the large budget deficit** left by these administrations (see the Reagan-Bush I administrations)

Elasticity and Tax Incidence

- *Tax incidence* is the manner in which the **burden** of a tax is **shared** among participants in a market.

Elasticity and Tax Incidence

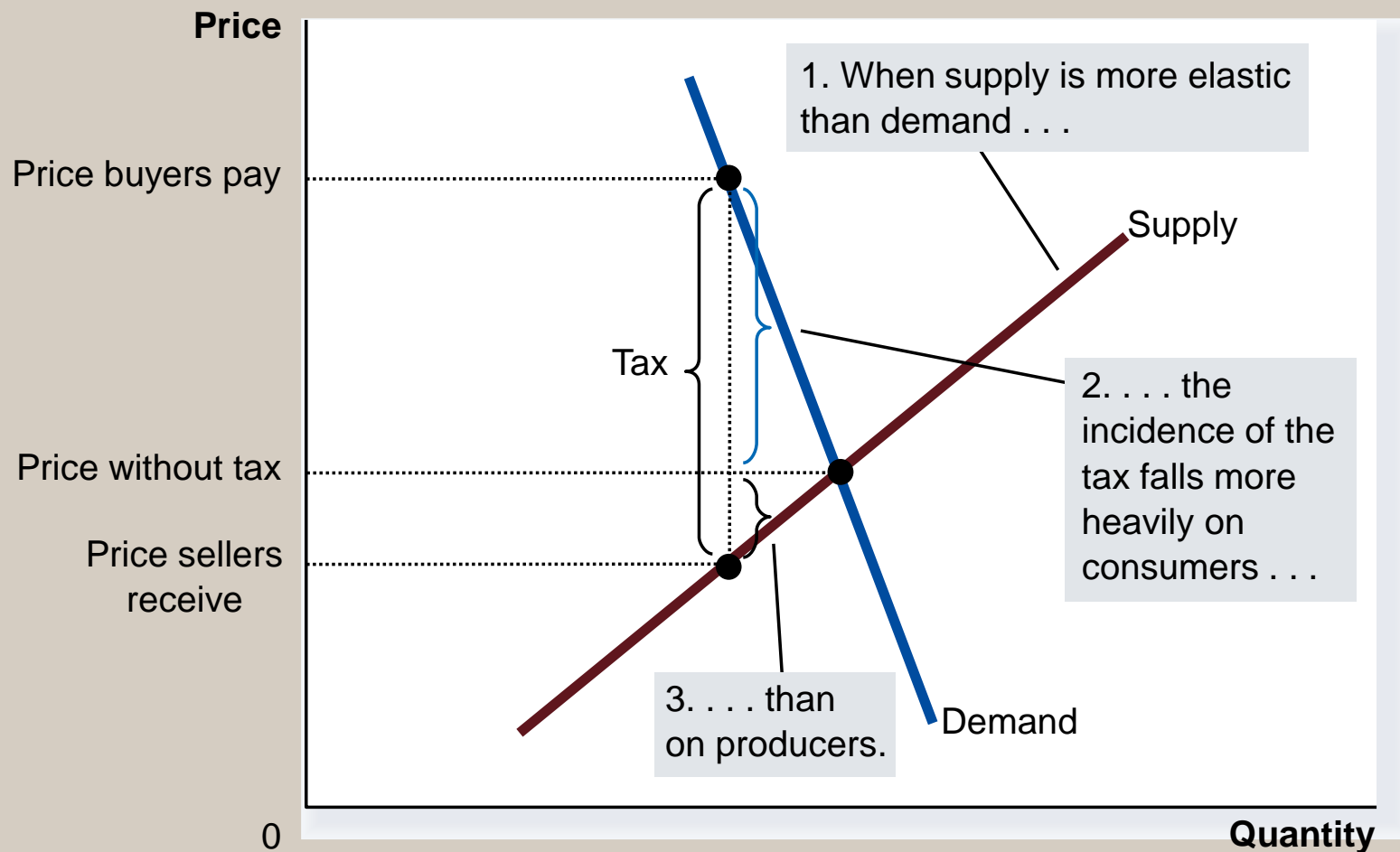
- Tax incidence is the study of who bears the burden of a tax.
- Taxes result in a change in market equilibrium.
- Buyers pay more and sellers receive less, regardless of whom the tax is levied on.

Elasticity and Tax Incidence

- In what proportions is the burden of the tax divided
- How do the effects of taxes on sellers compare to those levied on buyers?
- The answers to these questions **depend on the elasticity** of demand and the elasticity of supply.

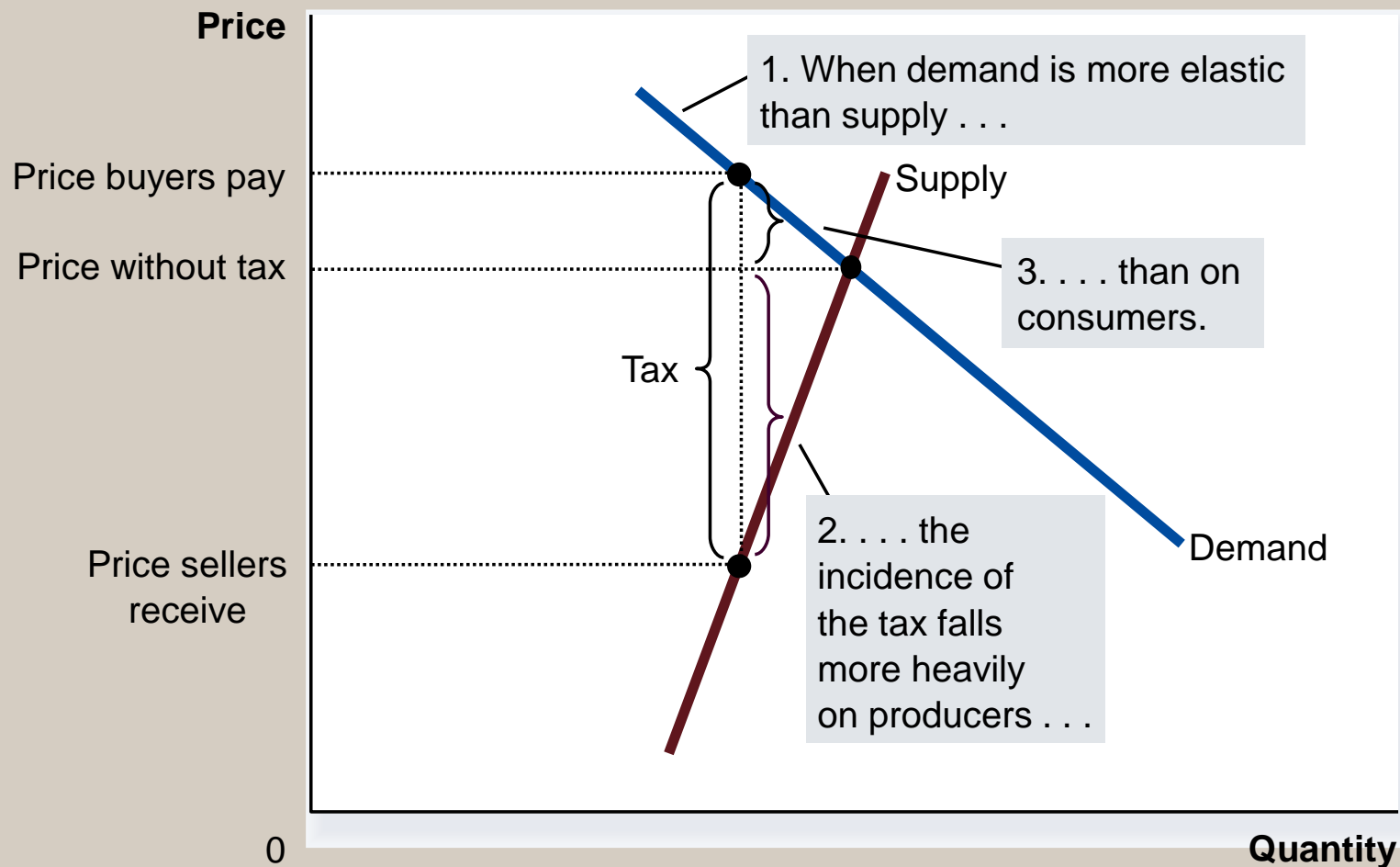
How the Burden of a Tax Is Divided

(a) Elastic Supply, Inelastic Demand



How the Burden of a Tax Is Divided

(b) Inelastic Supply, Elastic Demand



ELASTICITY AND TAX INCIDENCE

So, how is the burden of the tax divided?

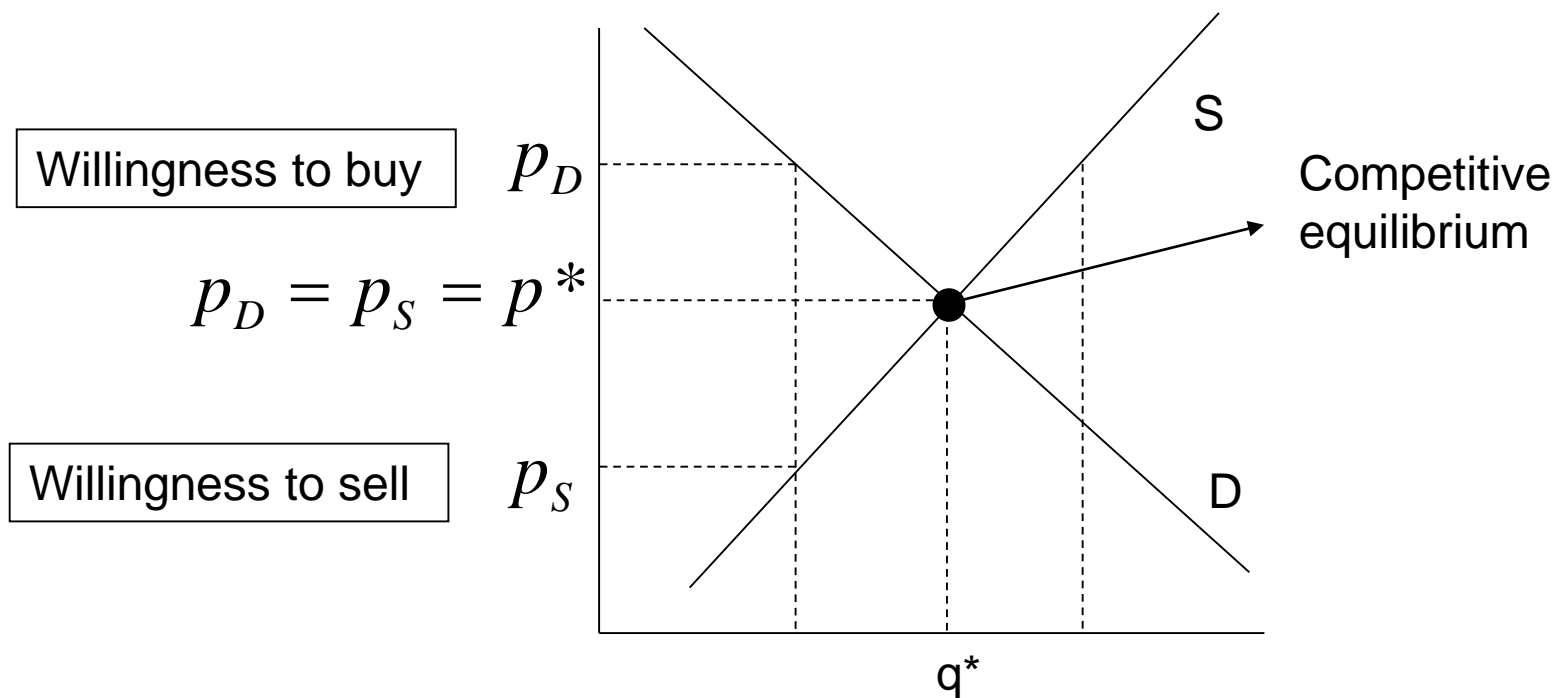
- The burden of a tax falls more heavily on the side of the market that is **less elastic**.

Pareto efficiency

Comparing the outcomes of different economic institutions

- If we can find a way to make some people better off without making anybody else worse off, we have a Pareto improvement
- If an allocation allows for a Pareto improvement, it is called Pareto inefficient
- If an allocation is such that no Pareto improvements are possible, it is called Pareto efficient.

Is the competitive equilibrium pareto-efficient?



if $q < q^*$ then $p_D > p_S$: sellers are willing to sell an additional unit at a price lower than the price consumers are willing to pay for that unit



If these individuals exchanged this good at a price between p_D and p_S both would benefit



Then $q < q^*$ is not pareto-efficient

se $q > q^*$ then $p_D < p_S$: price consumers are willing to pay is lower than the lowest price accepted

if $q=q^*$ then $p_D = p_S = p^*$: the price consumers are willing to pay is equal to the lowest acceptable price

The competitive equilibrium is **Pareto efficient**

- All outcomes **different** from $p=p^*$ are **no pareto-efficient**
- when $p=p^*$ there is no way to make someone better *off* without making someone else worse *off*