

# Basics of Economics of taxation

Any book of Microeconomics can be useful:

- Microeconomics and Behavior, R. H. Frank
- Microeconomic Analysis (H. Varian)

# Basics of the economics of taxation

- Taxation in competitive market
- Commodity taxation
- Income taxation
- Welfare economics and taxation

# Key points

- taxes reduce consumer and producer surplus.
- the meaning and causes of the **deadweight loss** from a tax.
- some taxes have larger deadweight losses than others.
- tax revenue and deadweight loss vary with the size of a tax.

# THE DEADWEIGHT LOSS OF TAXATION

- How do taxes affect the economic well-being of market participants?



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 also the tax that is transferred from the seller to the buyer

## Tax on buyers (on acquired quantity)

Consumers pay at the pump the net price

$$P_G - t = P_N$$

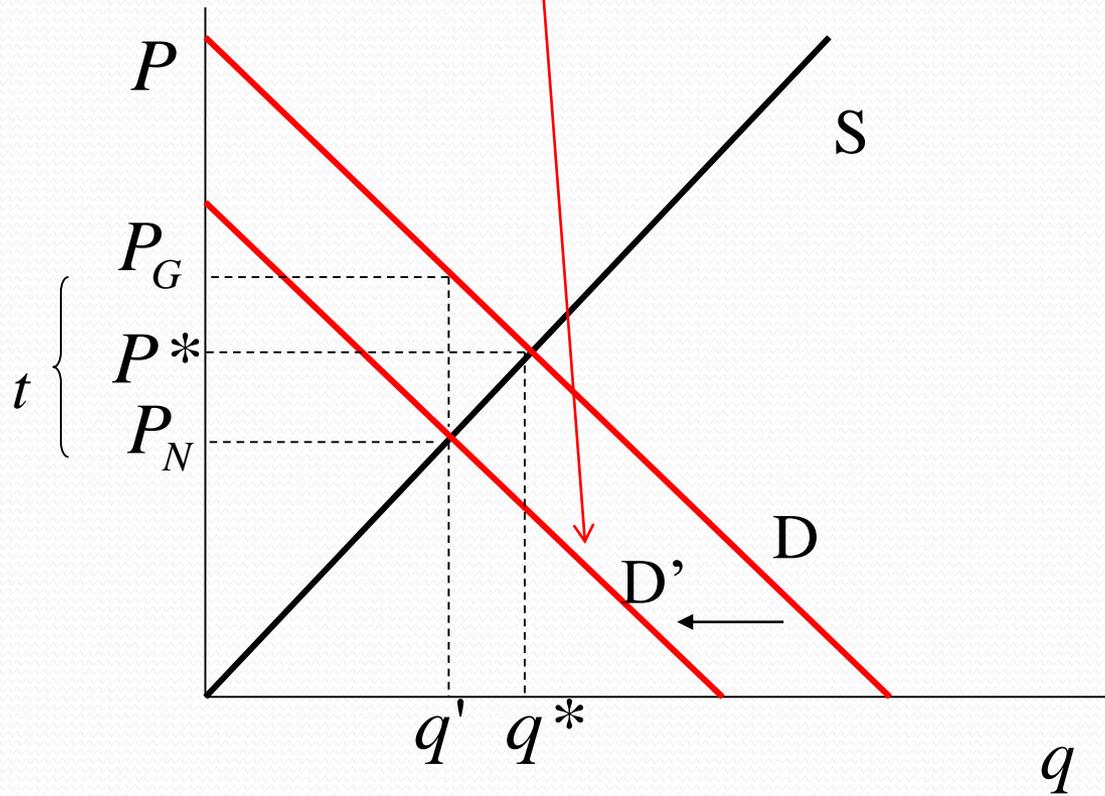
At Equilibrium

New demand  $\rightarrow$   $P_G(q) - t = P_N(q)$

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

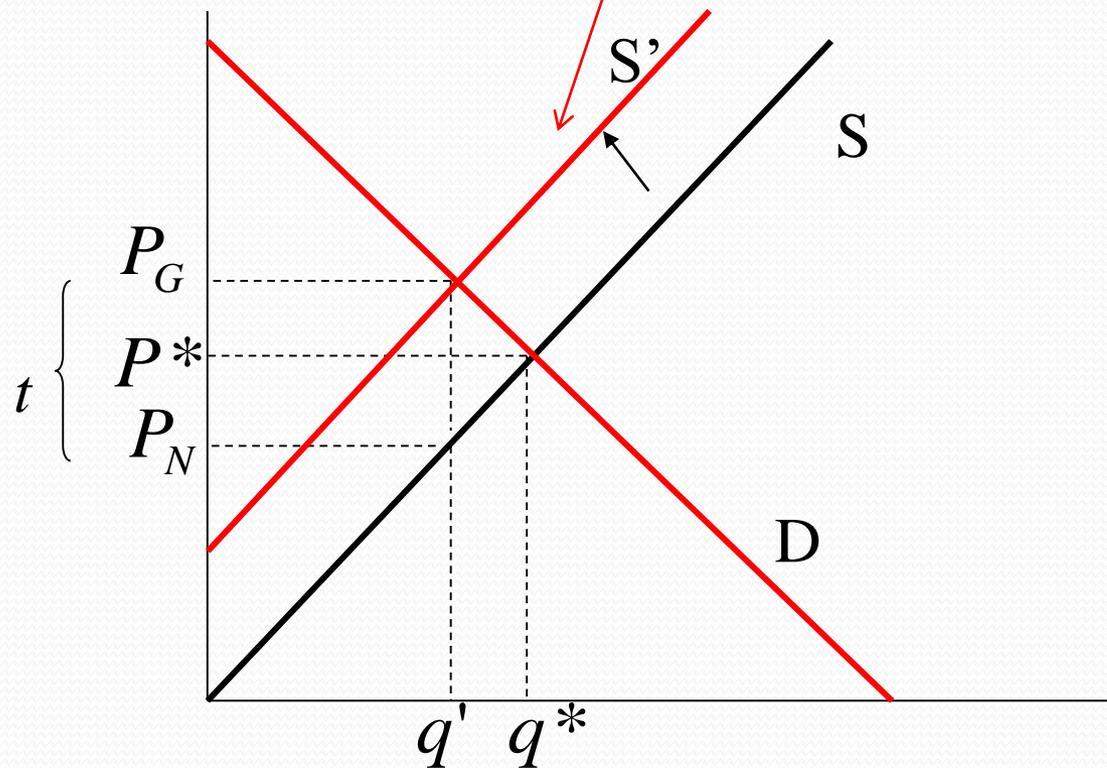
Tax on buyers:

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



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

Tax on sellers:  $P_G(q) = P_N(q) + t$



Example: linear demand and supply

Direct demand curve:  $D(p) = a - bp_G$

Direct supply curve:  $S(p) = c + dp_N$

No-tax equilibrium price is:

$$a - bp_G = c + dp_N \quad \longrightarrow \quad p^* = \frac{a - c}{b + d}$$

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:

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

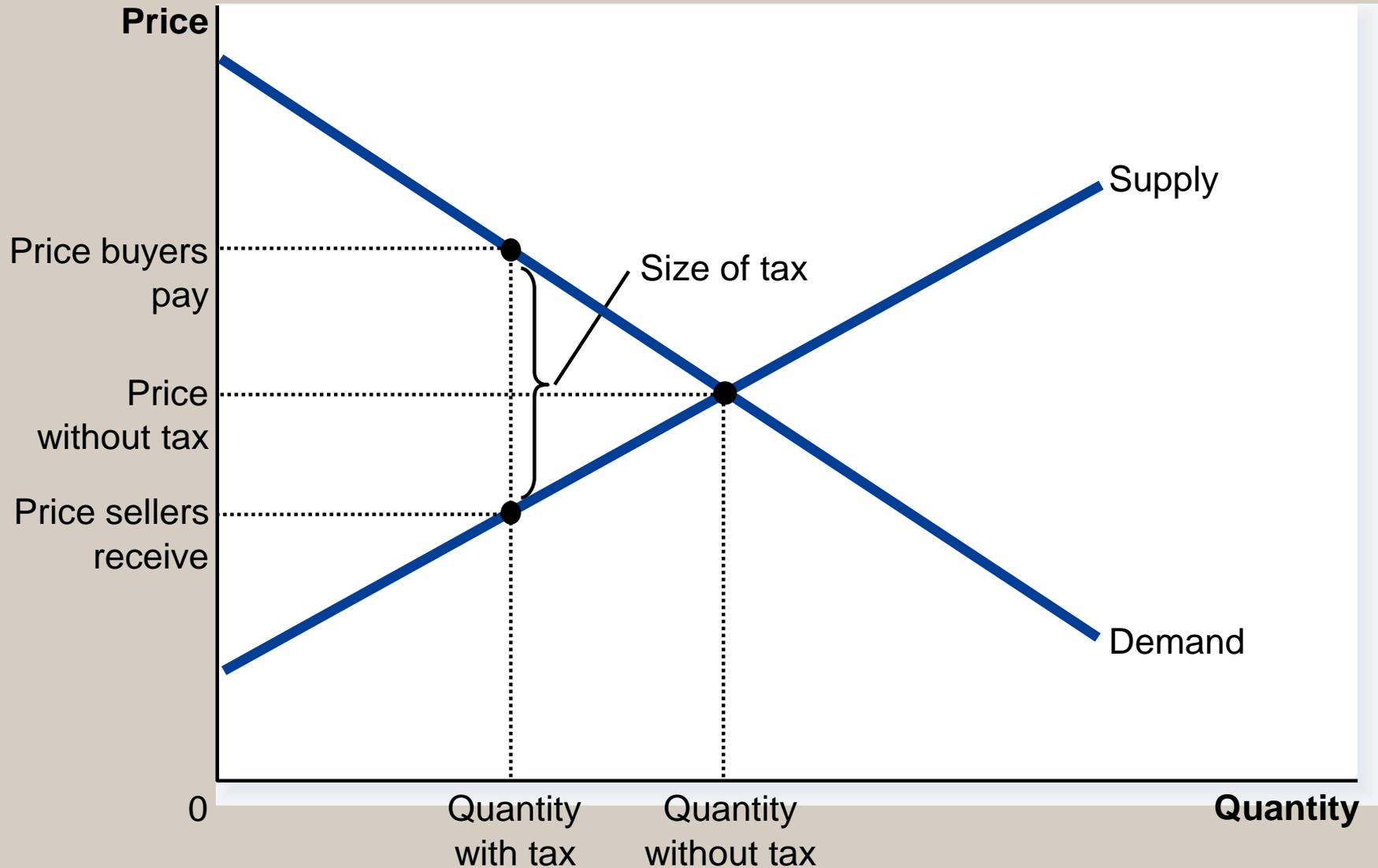
# THE DEADWEIGHT LOSS OF TAXATION

.....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

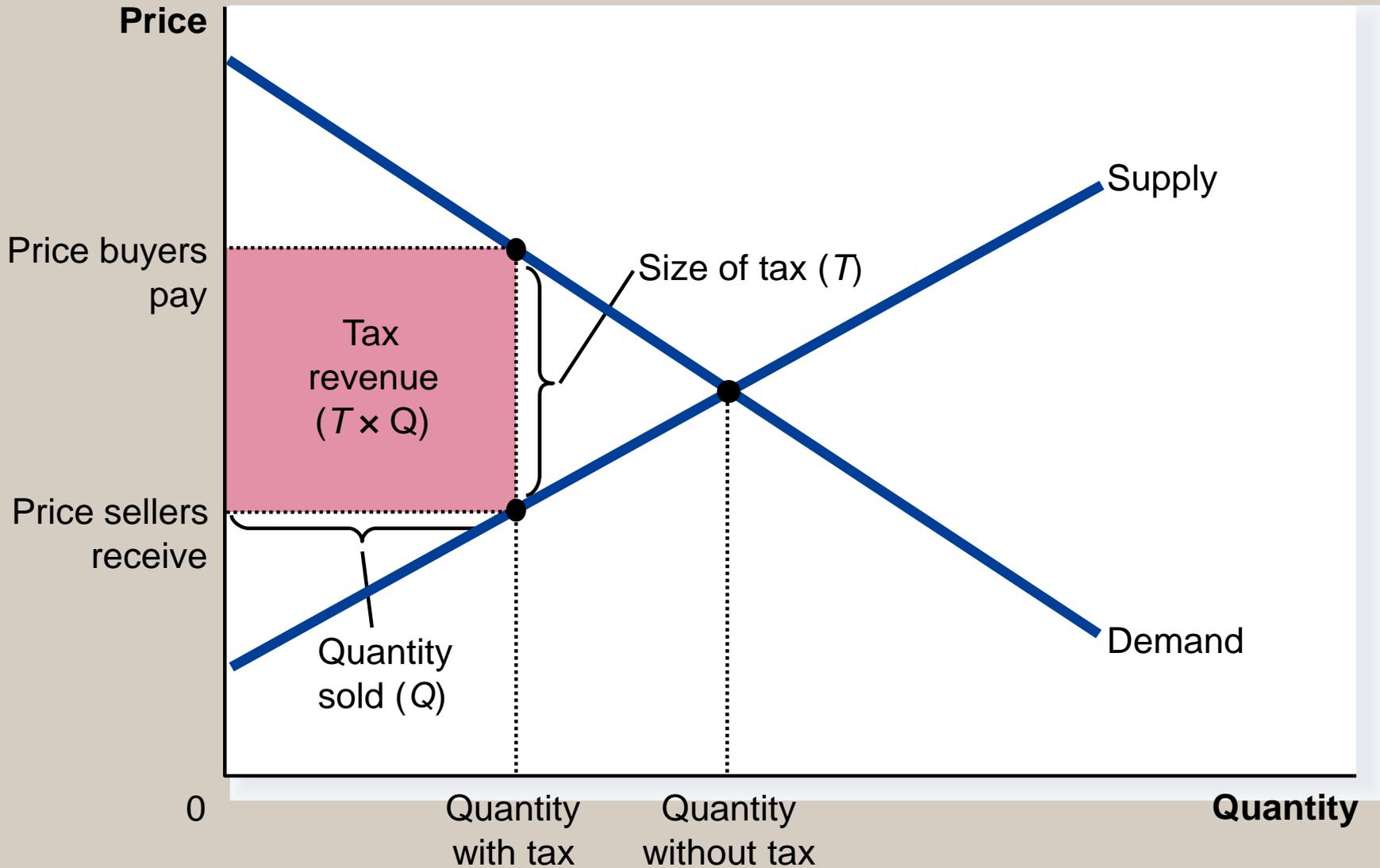
- A tax places a *wedge* between the price buyers pay and the price sellers receive.
- Because of this tax wedge, the quantity sold falls below the level that would be sold without a tax.
- The size of the market for that good shrinks.
- Buyers and sellers share the tax burden.

# How a Tax Affects Market Participants

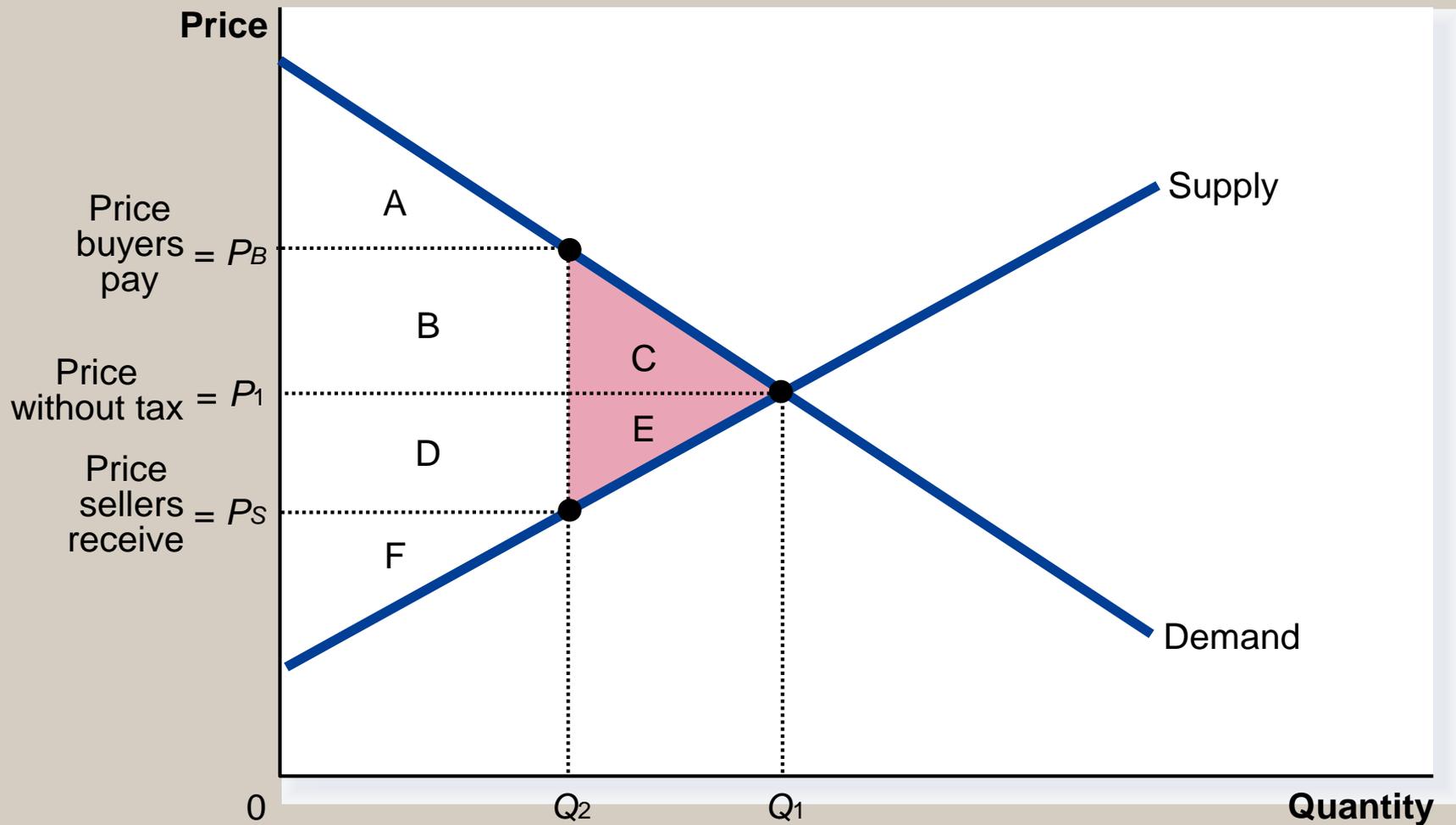
- Tax Revenue
  - $T$  = the size of the tax
  - $Q$  = the quantity of the good sold

**$T \times Q$  = 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
<b>Consumer Surplus</b>	$A + B + C$	$A$	$-(B + C)$
<b>Producer Surplus</b>	$D + E + F$	$F$	$-(D + E)$
<b>Tax Revenue</b>	None	$B + D$	$+(B + D)$
<b>Total Surplus</b>	$A + B + C + D + E + F$	$A + B + D + F$	$-(C + E)$

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

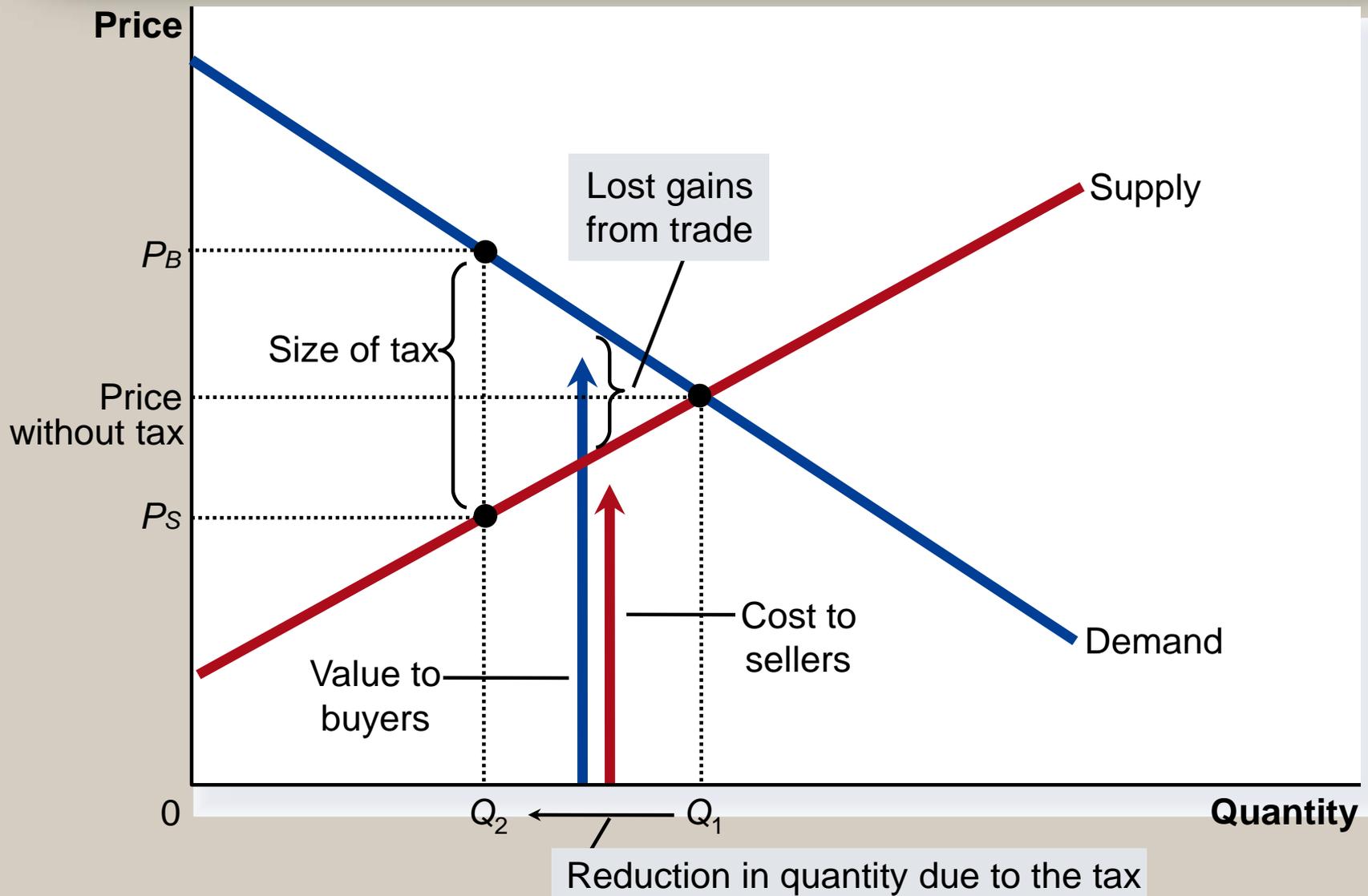
## How a Tax Affects Market Participants

- 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

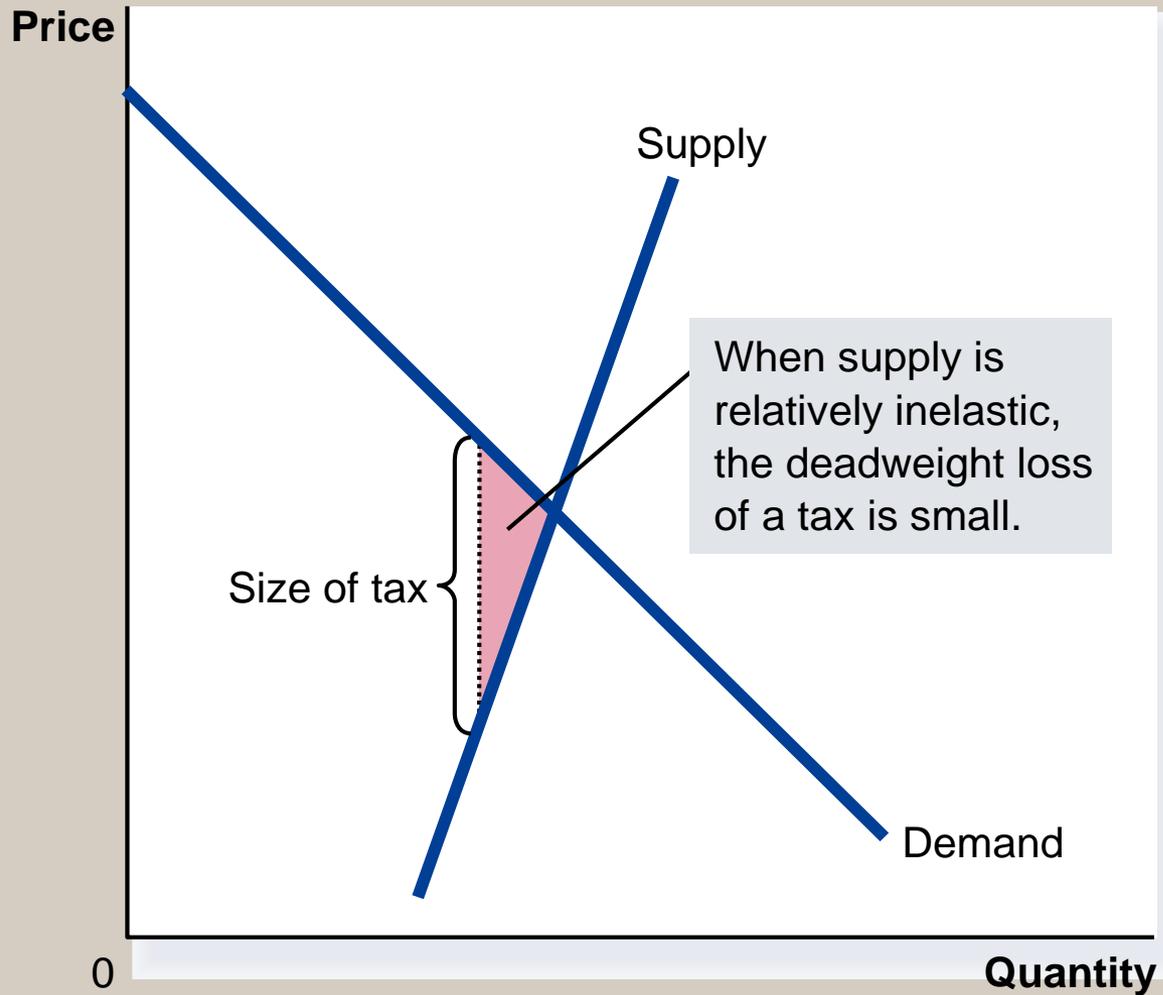


# DETERMINANTS OF THE DEADWEIGHT LOSS

- 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.

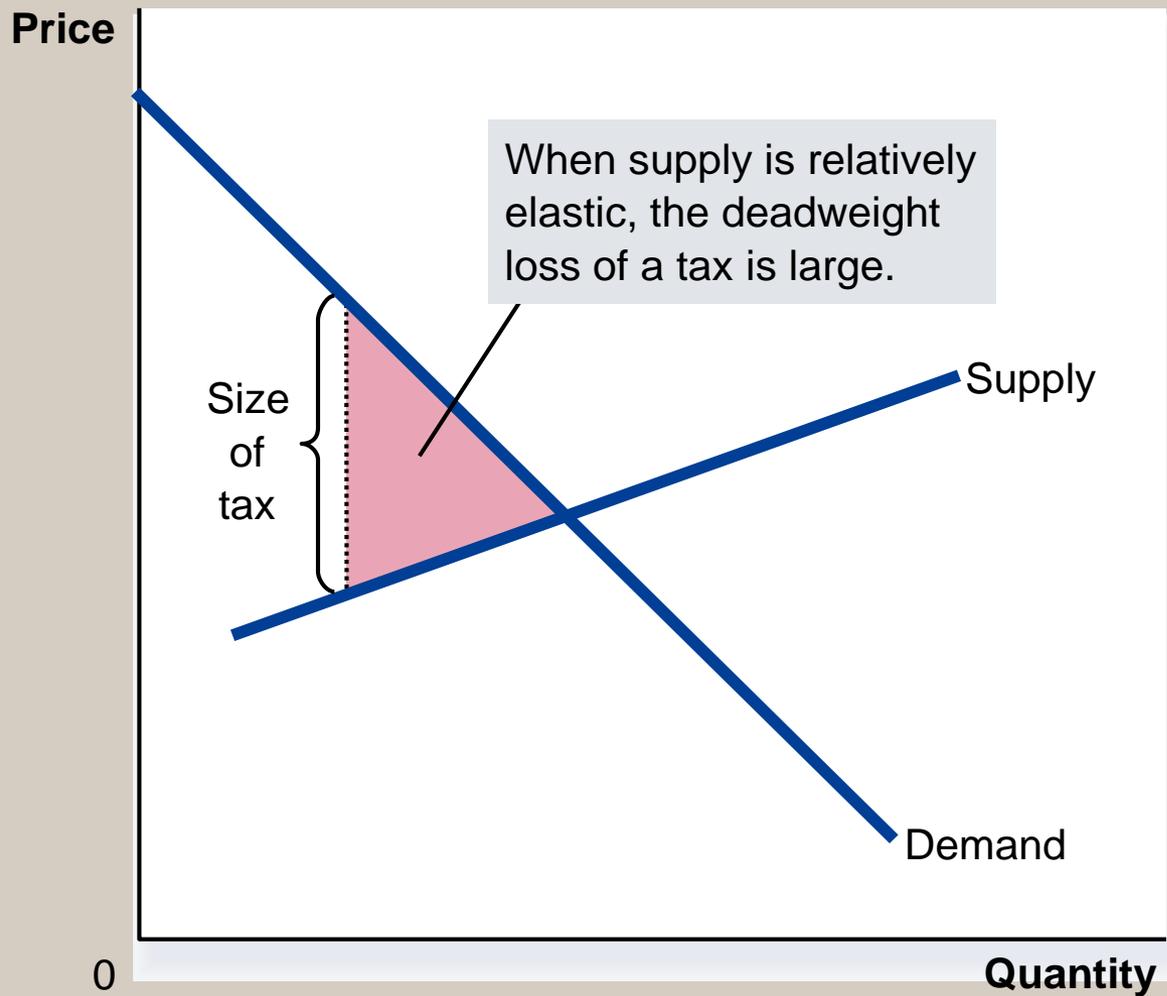
# Tax Distortions and Elasticities

(a) Inelastic Supply



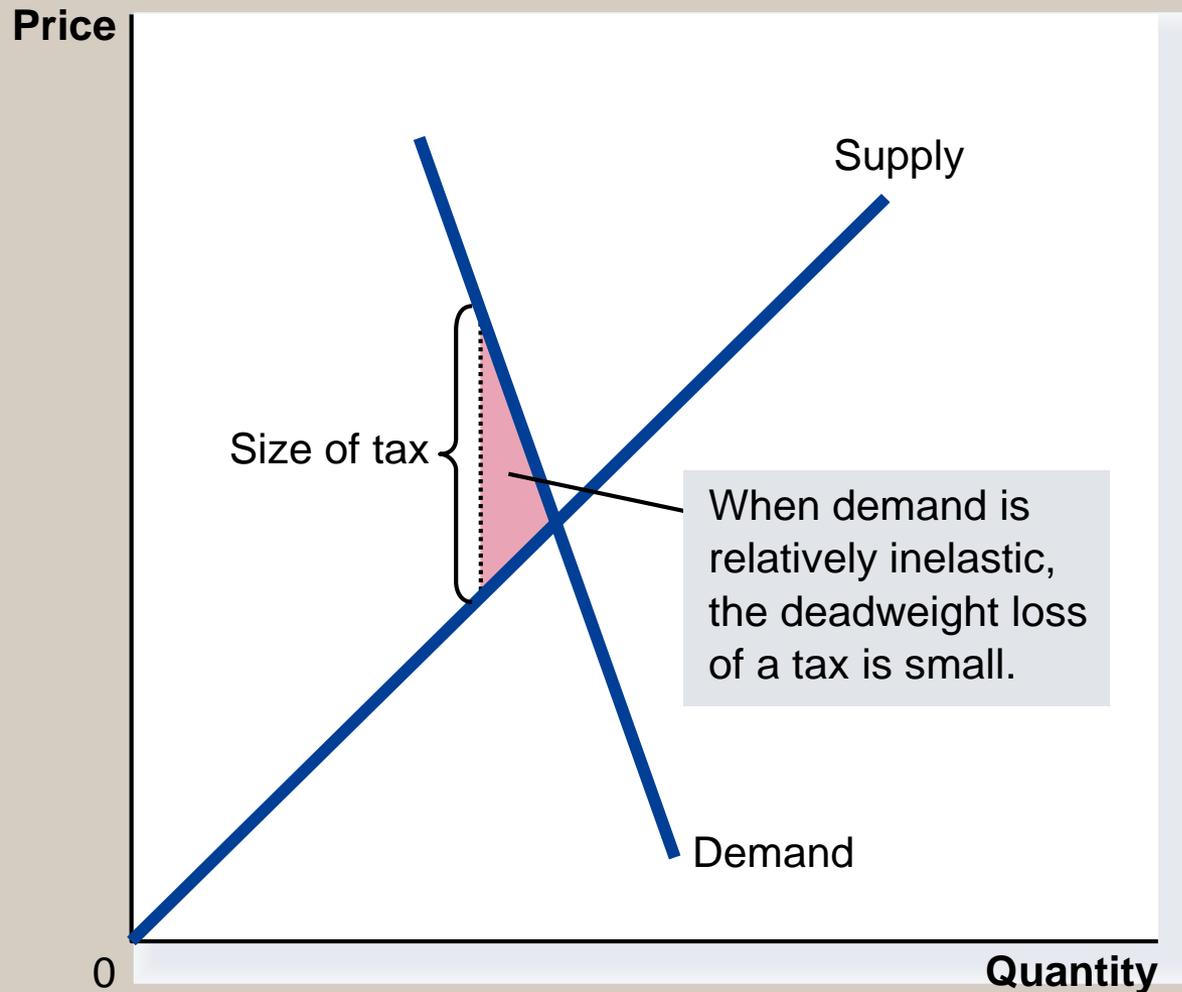
# Tax Distortions and Elasticities

## (b) Elastic Supply



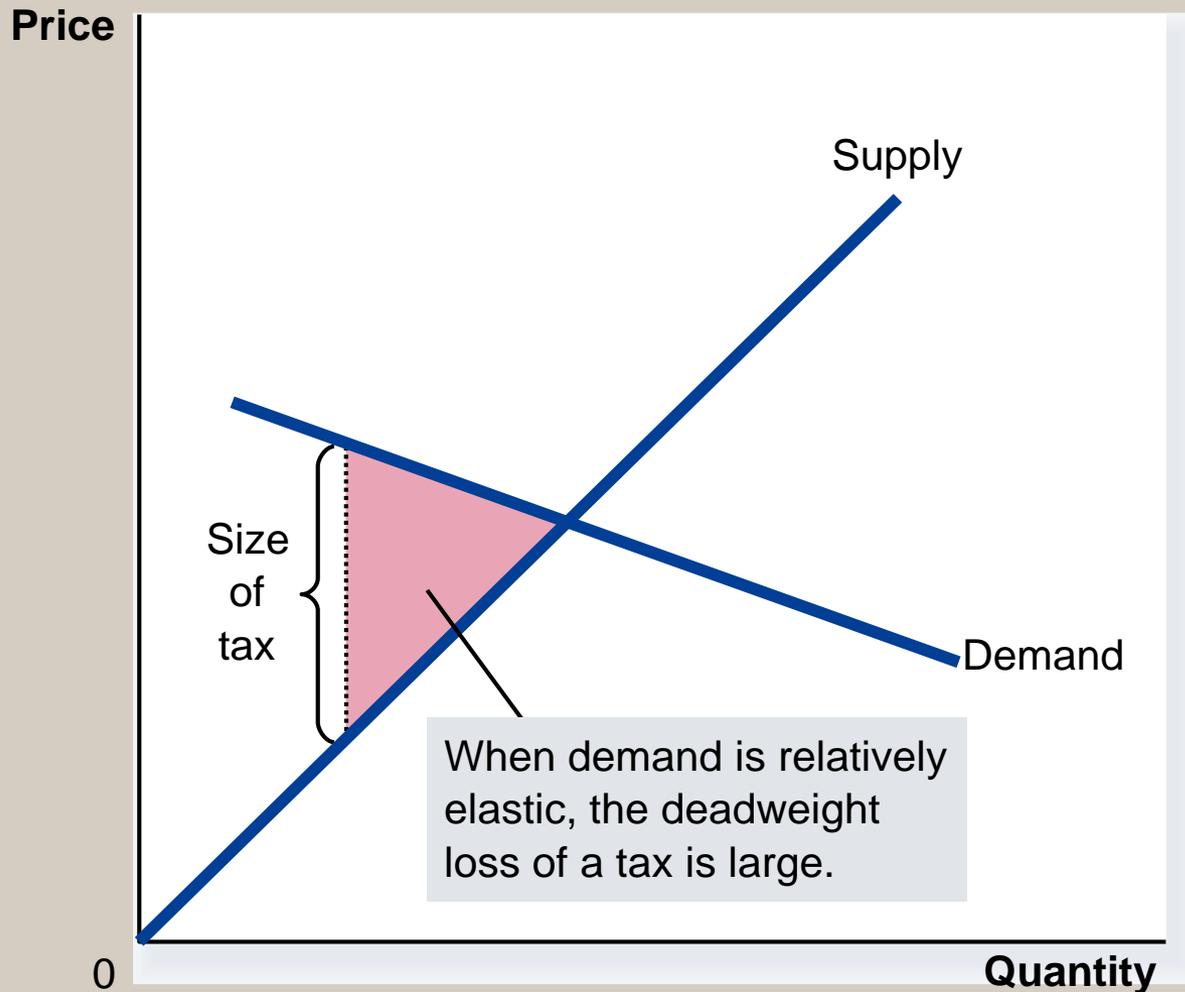
# Tax Distortions and Elasticities

## (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

- The Deadweight Loss Debate

- Some economists argue that labor taxes are highly distorting and believe that labor supply is more elastic.

- Some examples of workers who may respond more to incentives:

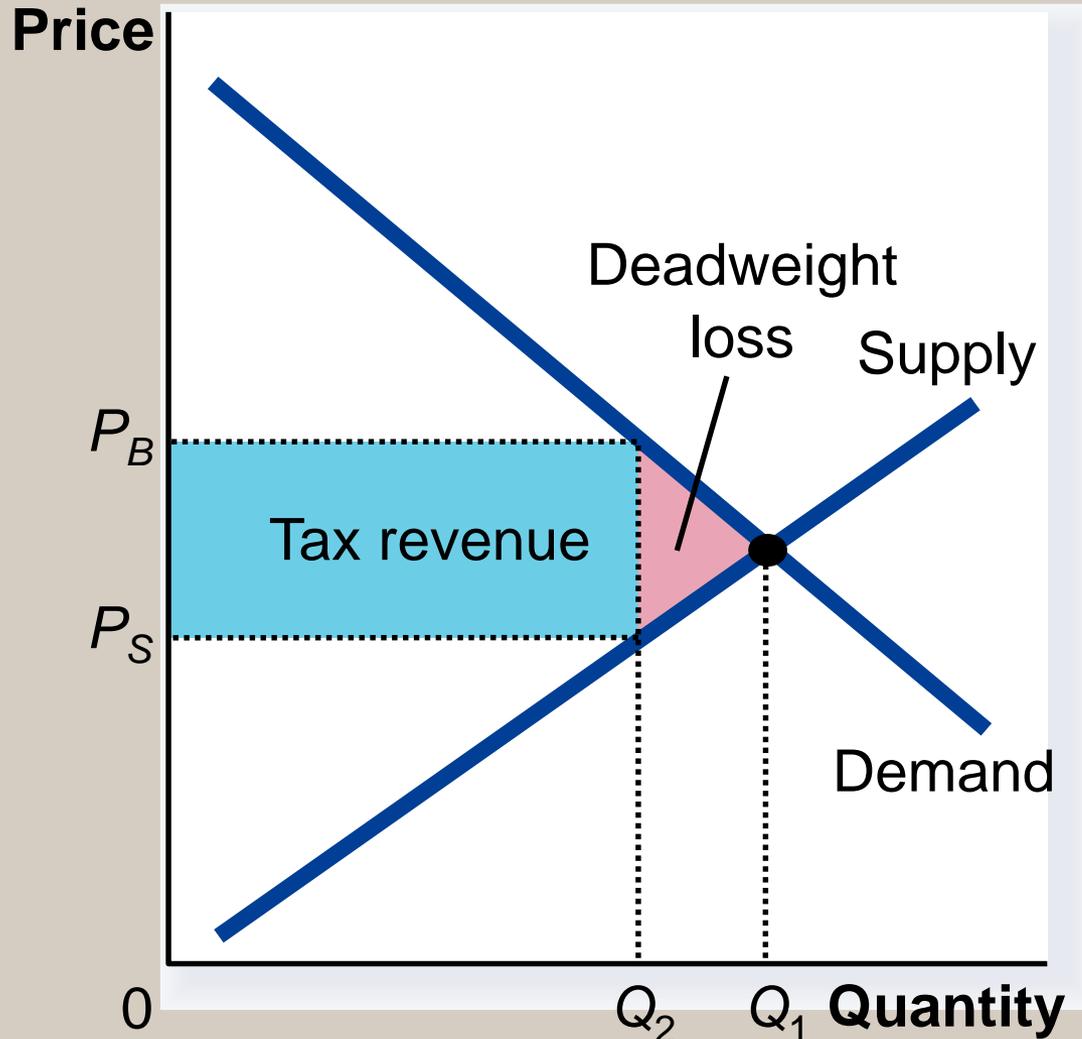
- Workers who can adjust the number of hours they work
    - Families with second earners
    - Elderly who can choose when to retire
    - Workers in the underground economy (i.e., those engaging in illegal activity)

# 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

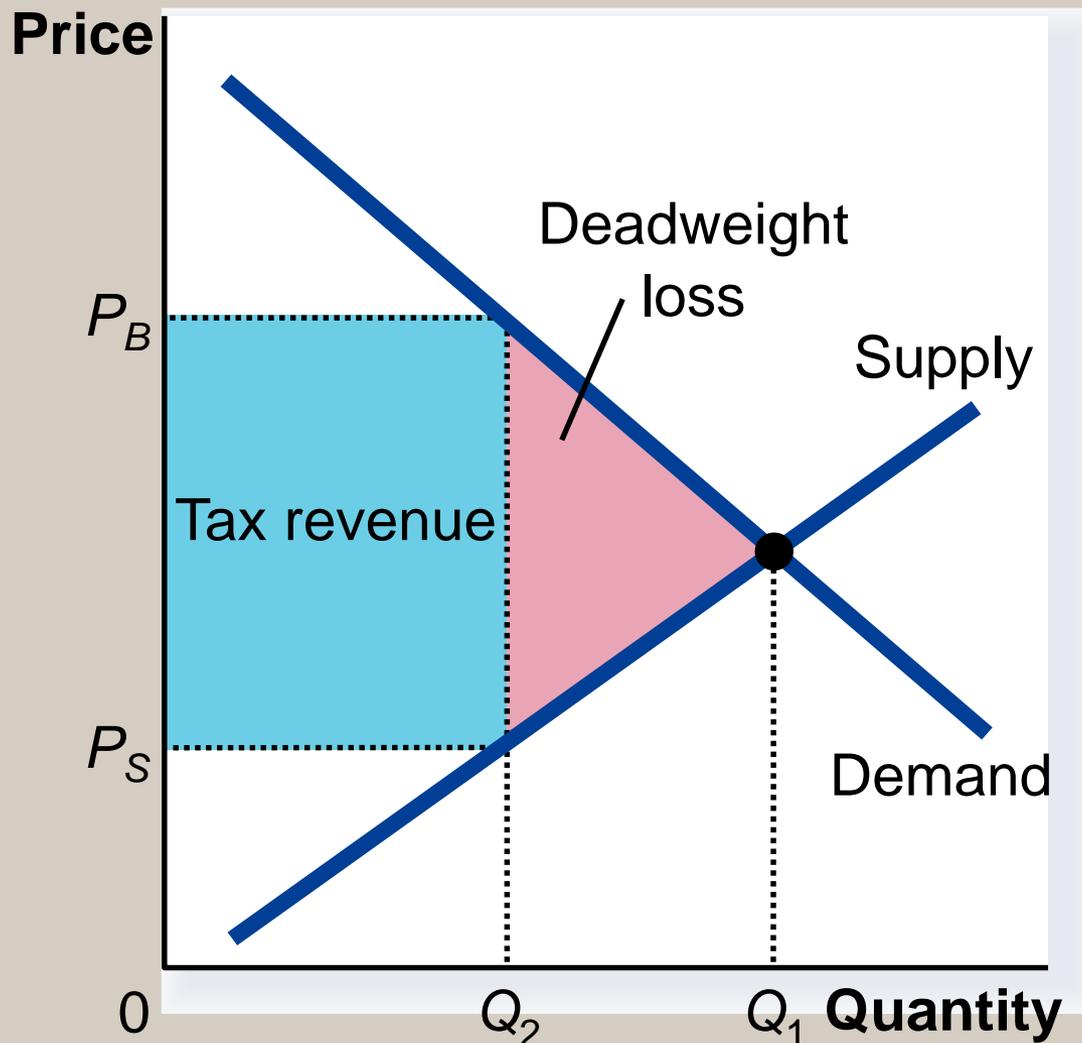
# Deadweight Loss and Tax Revenue from Three Taxes of Different Sizes

(a) Small Tax



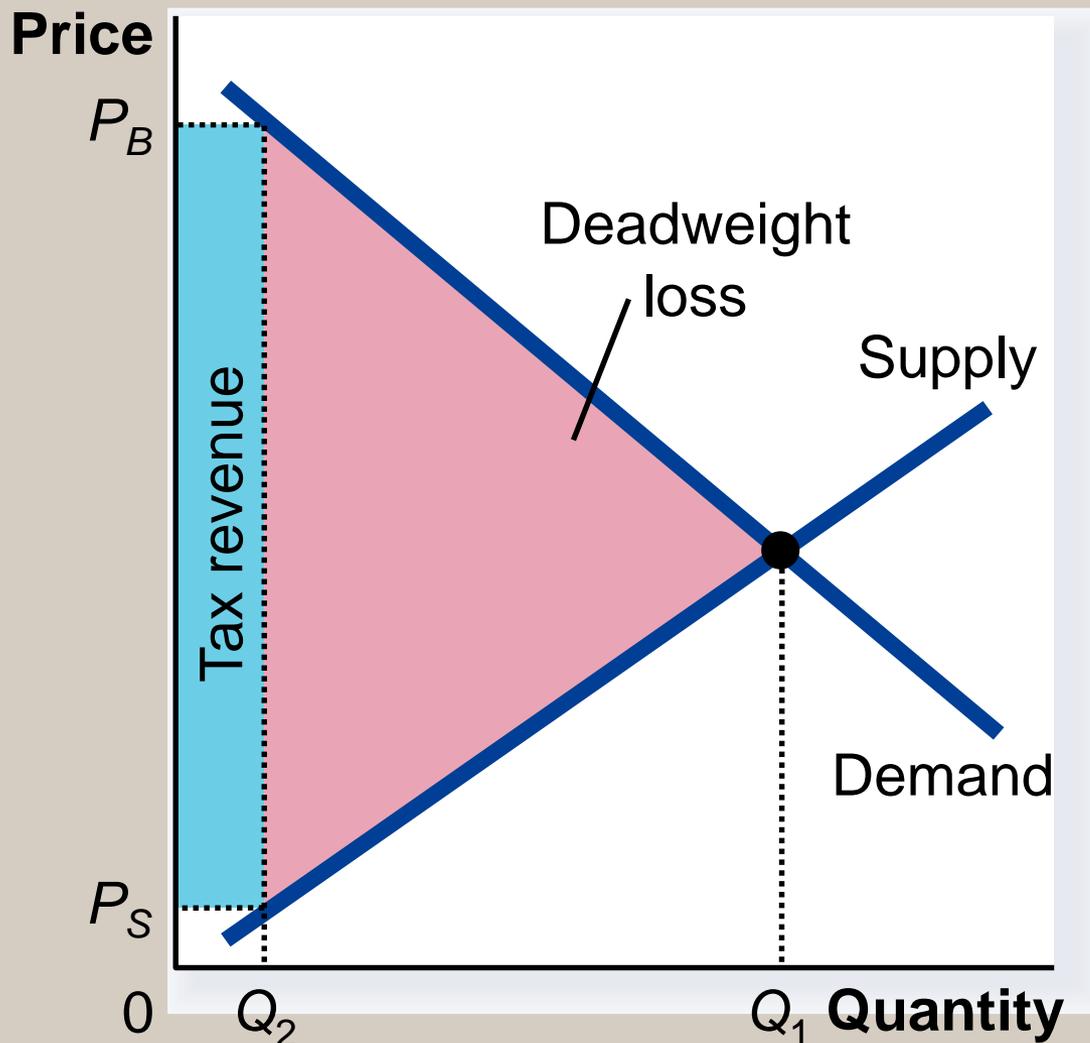
# Figure 6 Deadweight Loss and Tax Revenue from Three Taxes of Different Sizes

## (b) Medium Tax



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

## (c) Large Tax

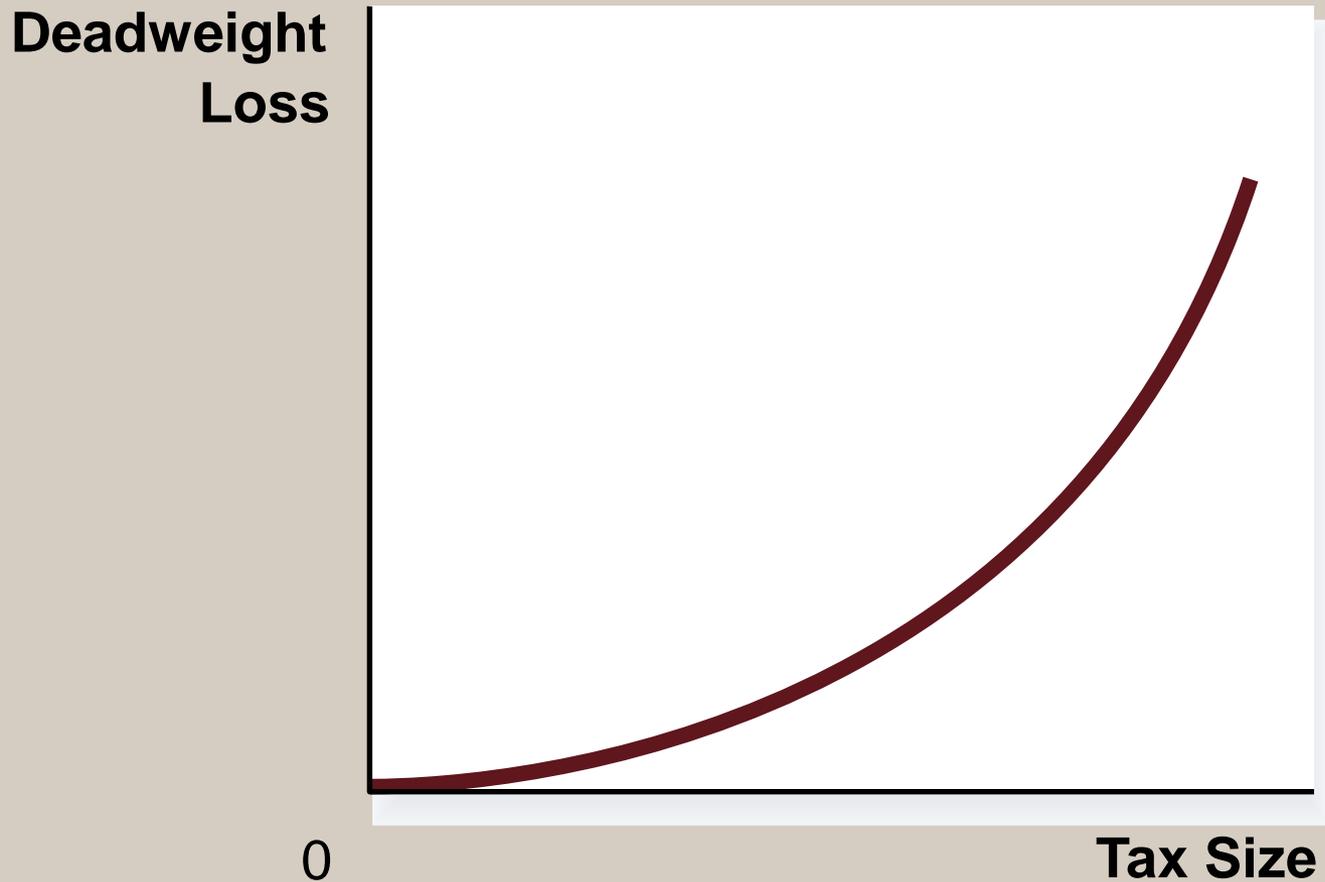


# DEADWEIGHT LOSS AND TAX REVENUE AS TAXES VARY

- 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.

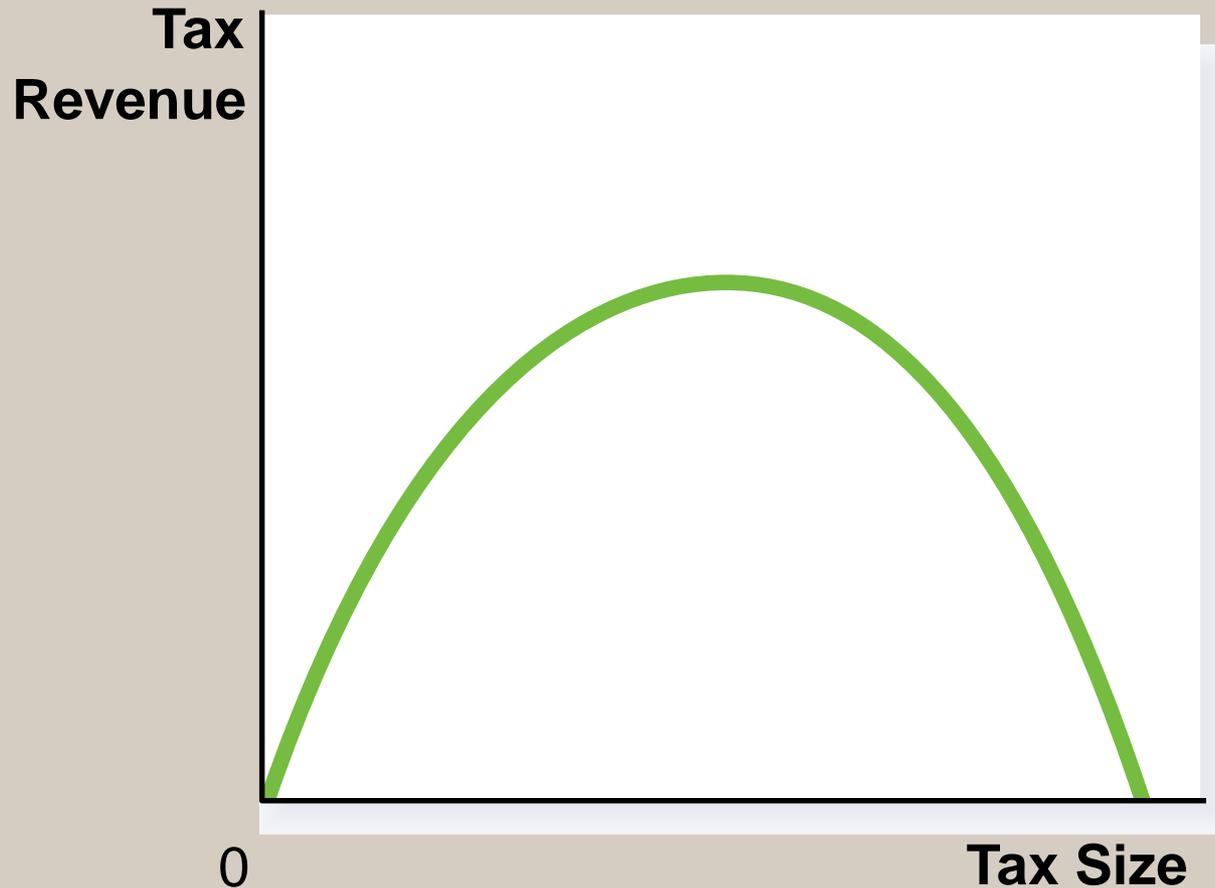
# How Deadweight Loss and Tax Revenue Vary with the Size of a Tax

## (a) Deadweight Loss



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

## (b) Revenue (the Laffer curve)



# DEADWEIGHT LOSS AND TAX REVENUE AS TAXES VARY

- As the size of a tax increases, its deadweight loss quickly gets larger.
- By contrast, tax revenue first rises with the size of a tax, but then, as the tax gets larger, the market shrinks so much that tax revenue starts to fall.

# CASE STUDY: The Laffer Curve and Supply-side Economics

- The *Laffer curve* depicts the relationship between tax rates and tax revenue.

# 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

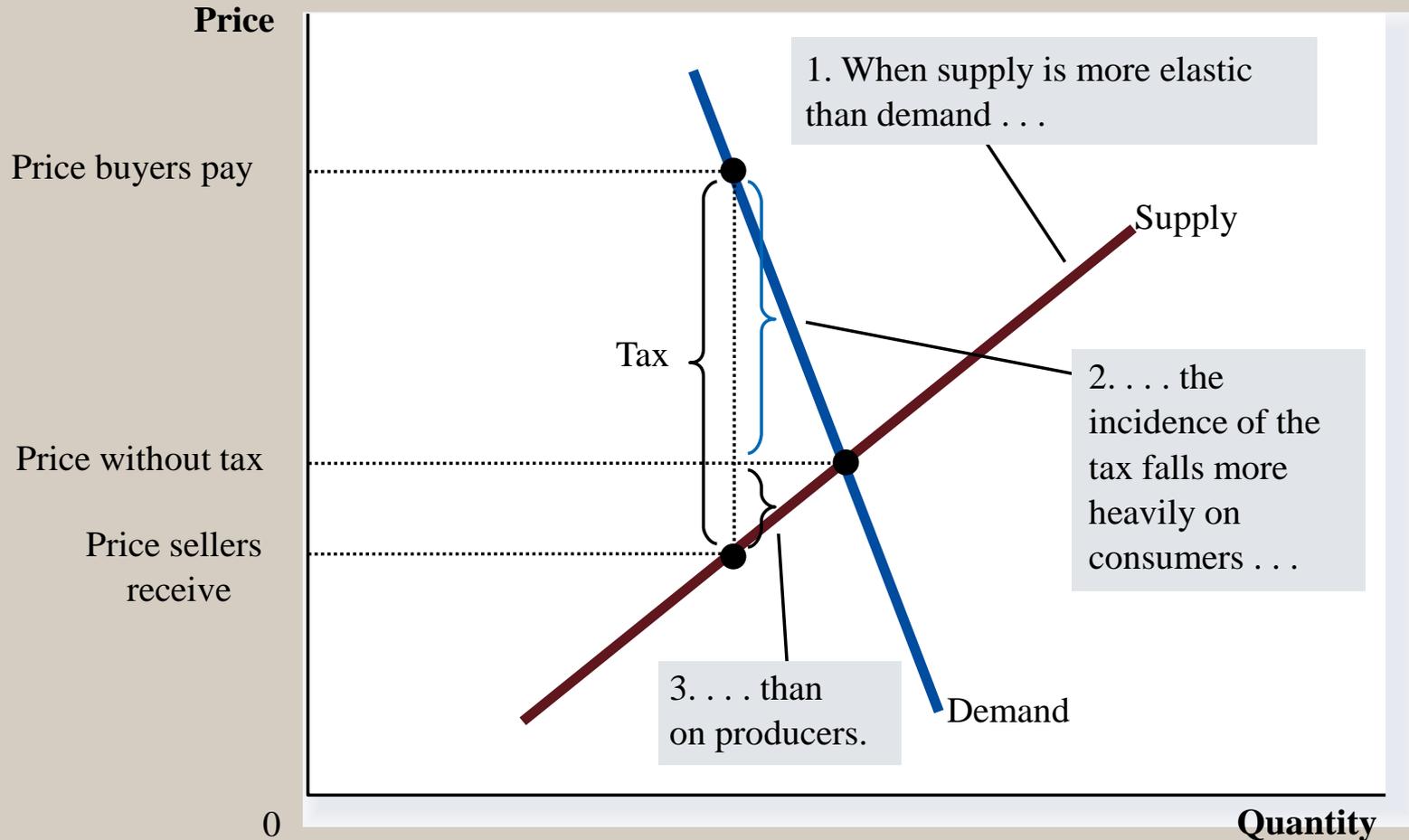
- Tax incidence is the study of **who bears the burden** of a tax.
- Taxes result in a change in market equilibrium.
- Buyers pay more and sellers receive less, regardless of whom the tax is levied on.

# 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.

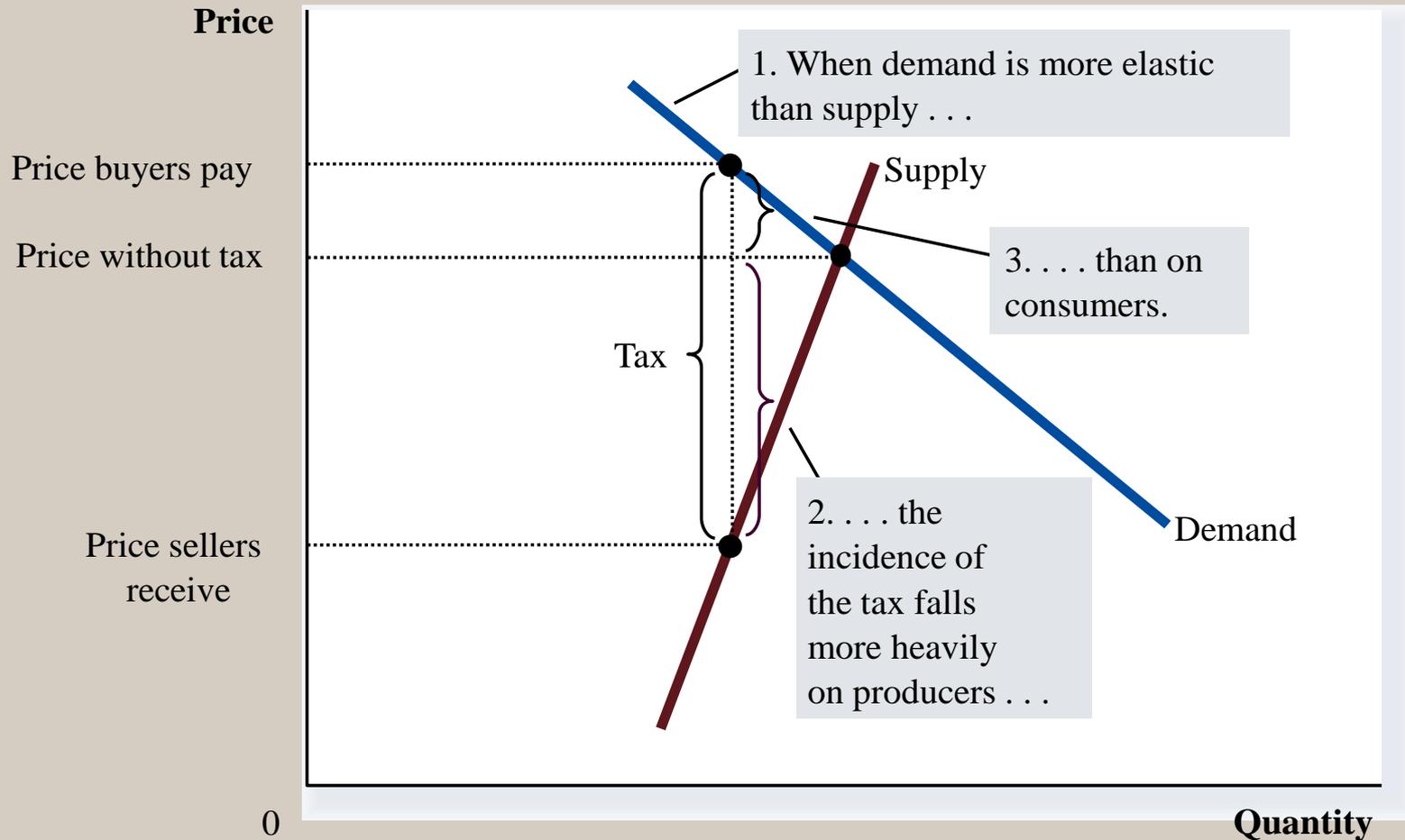
# How the Burden of a Tax Is Divided

(a) Elastic Supply, Inelastic Demand



# How the Burden of a Tax Is Divided

## (b) Inelastic Supply, Elastic Demand

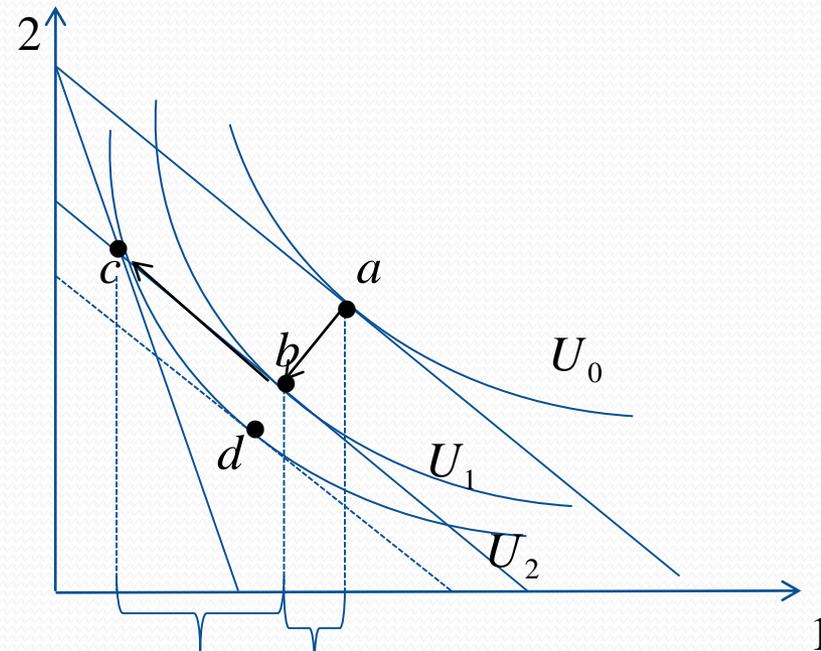


# ELASTICITY AND TAX INCIDENCE

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**.

# Basics of Income and substitution effect



**Slutsky** Substitution effect

Income effect

# Normal and Inferior Goods

- Normal goods:
  - For a normal good, and a price increase, **the income effect is negative.**
    - As purchasing power falls, you buy less of a good.
- Inferior goods:
  - For an inferior good, and a price increase, the **income effect is positive.**
    - As income falls, you buy more of the good.

# Giffen Good

- When a good is so **strongly inferior** that the income effect outweighs the substitution effect, it is called a Giffen good.
  - How likely is this?
    - Not very. (Any examples?)
  - Giffen goods imply an upward sloping demand curve.
  - No substitute goods
  - Irish potatoes (standard example, famine '800)