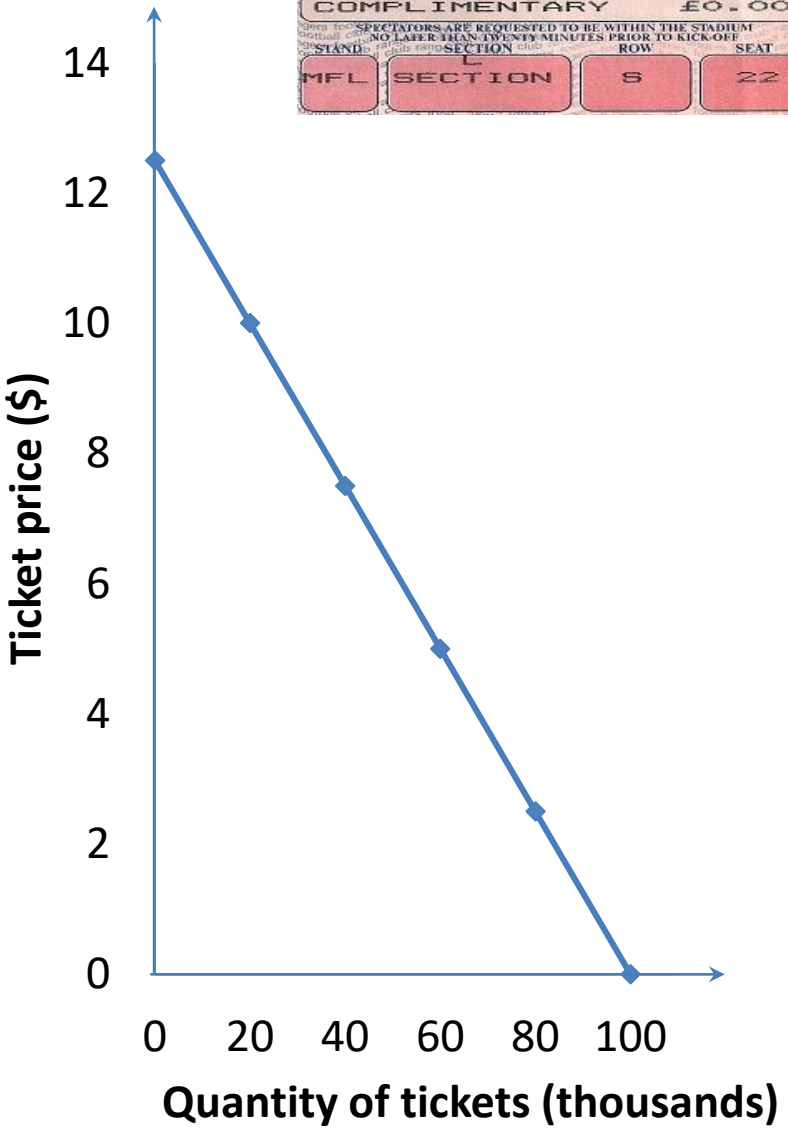
Elasticities of Demand and Supply

MICRO- AND MACROECONOMICS

The demand for football tickets



For given prices of related goods and consumer incomes, higher ticket prices reduce the quantity of tickets demanded.

How can firms **increase** their revenues?

The price elasticity of demand

- The (own-)price elasticity of demand (also: demand elasticity) is the percentage change in the quantity demanded divided by the corresponding percentage change in its price.

$$\varepsilon_D = \frac{\frac{\Delta q}{q}}{\frac{\Delta p}{p}} = \frac{p\Delta q}{q\Delta p}$$

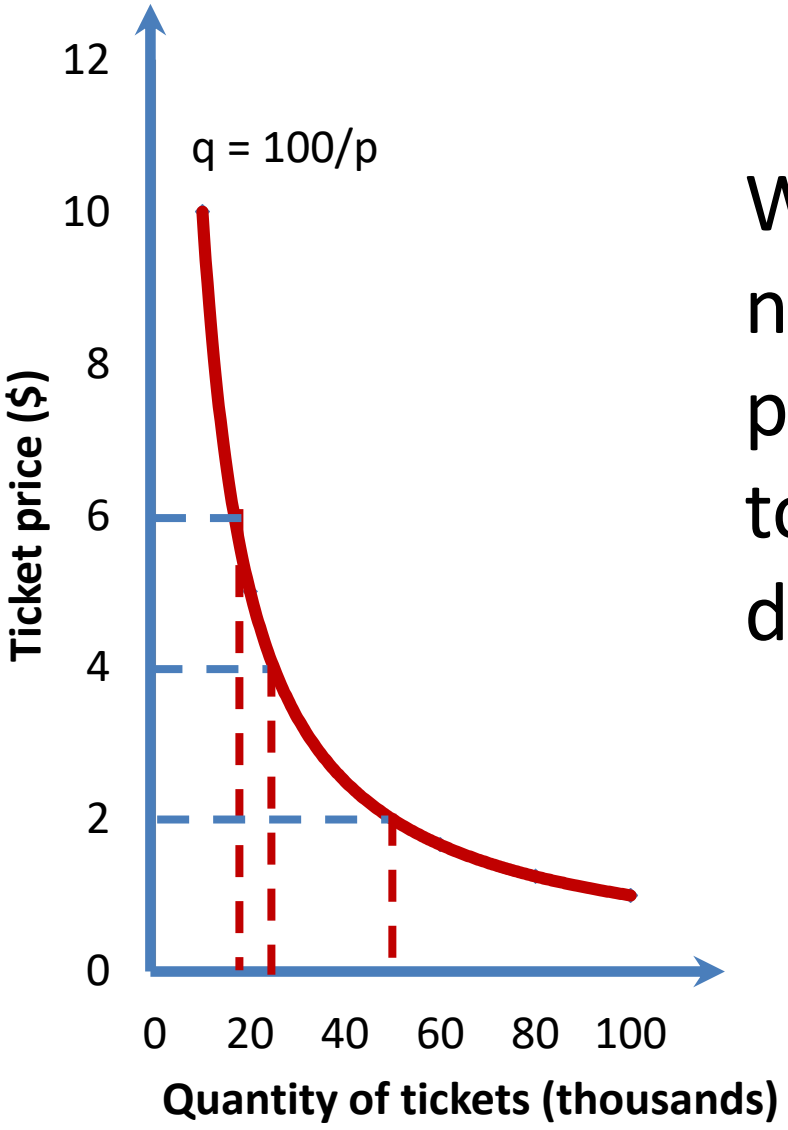
$$\varepsilon_D = \frac{\Delta q\%}{\Delta p\%}$$

It measures the sensitivity of quantity demanded to changes in the own price of a good, holding constant the prices of other goods and income. Demand elasticities are (almost always) negative since demand curves slope down. In general, the demand elasticity changes as we move along a given demand curve. Along a straight-line demand curve, elasticity falls in absolute value as we move down from the vertical intercept.

The demand for football tickets

(1) Price ($/ticket)	(2) Tickets demanded (000s)	(3) Price elasticity of demand
12.50	0	$-\infty$
10.00	20	-4
7.50	40	-1.5
5.00	60	-0.67
2.50	80	-0.25
0	100	0

A nonlinear demand curve



When a demand curve is nonlinear, price rises and price cuts of equal size lead to quantity changes that differ in size.

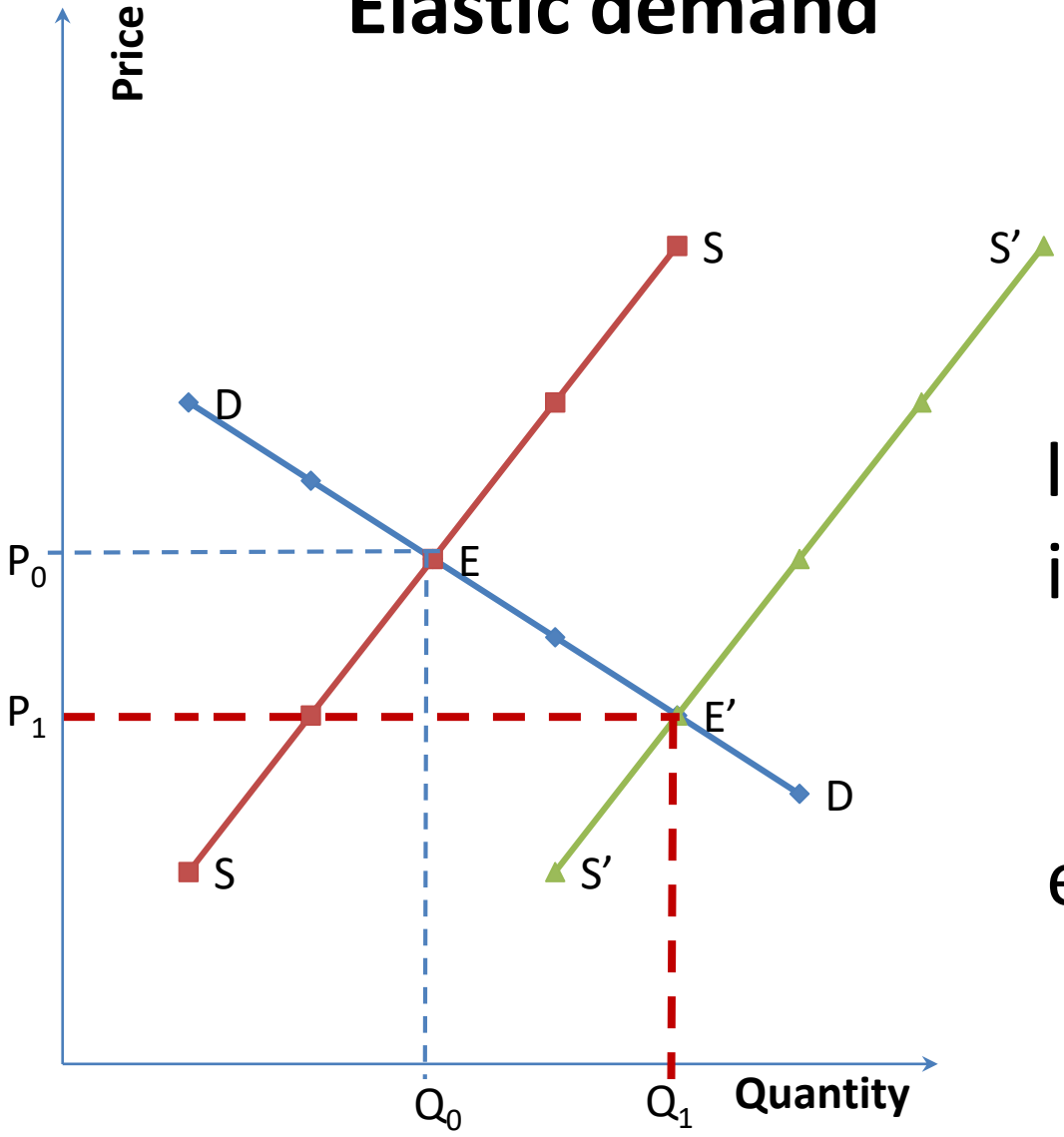
Economists resolve this ambiguity about the definition of elasticities by defining them with respect to very small (infinitesimal) changes:

$$\varepsilon_D = \frac{\partial q}{\partial p}\frac{p}{q} = \frac{\partial \ln(q[p])}{\partial \ln(p)}$$

Elastic and inelastic demand

- Although elasticity typically falls (in absolute value) as we move down the demand curve, an important dividing line occurs at the demand elasticity of **−1**.
- Demand is **elastic** if the price elasticity is more negative than −1.
- Demand is **inelastic** if the price elasticity lies between −1 and 0.
- If the demand elasticity is exactly −1, demand is **unit-elastic**.

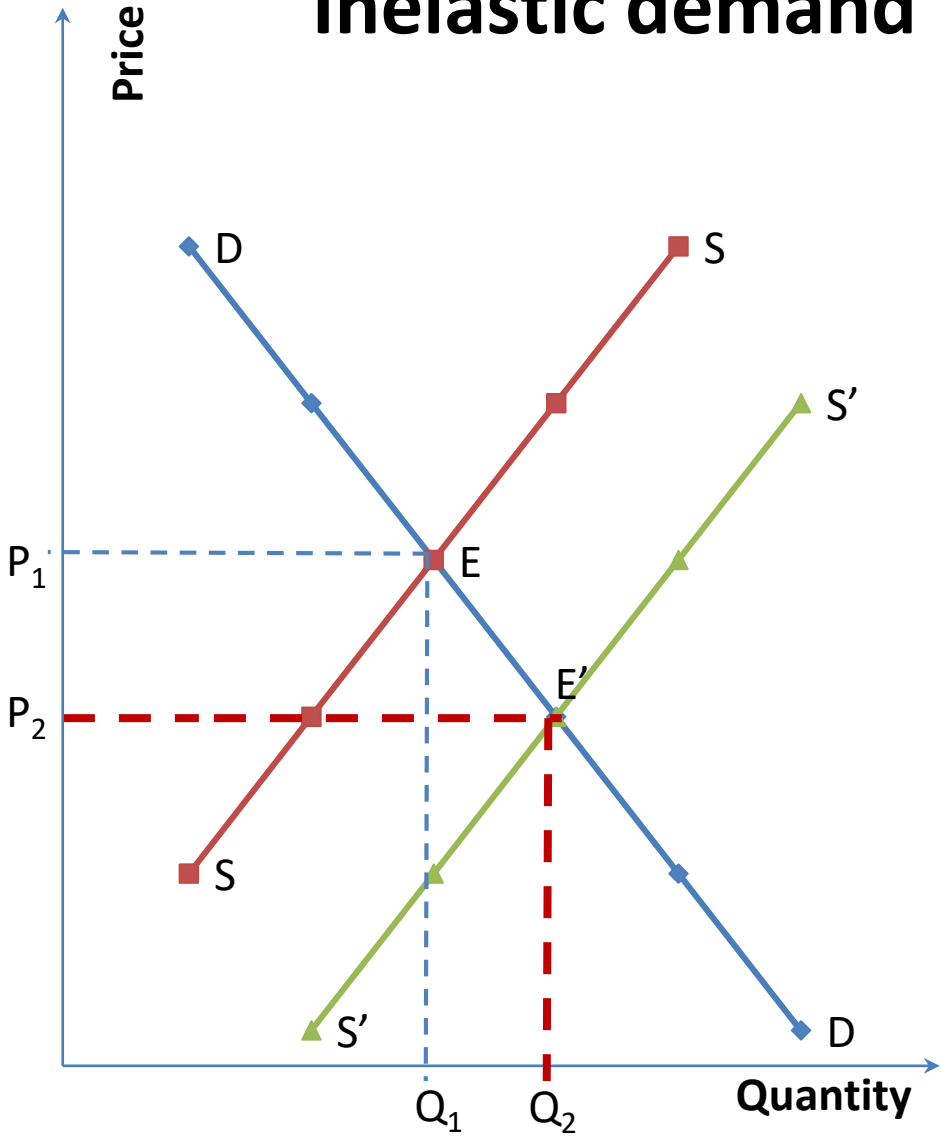
Elastic demand



The supply curve fluctuates between SS and S'S'.

In this case, demand is elastic, and supply shifts lead to large changes in equilibrium quantity but little change in equilibrium price.

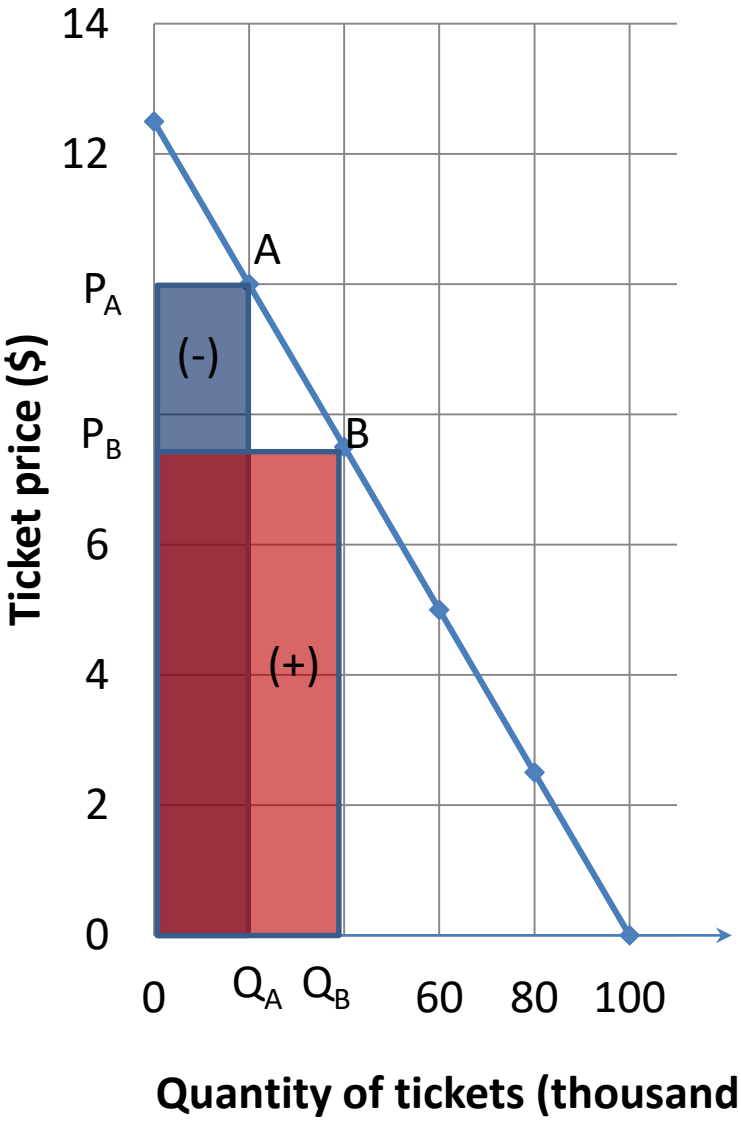
Inelastic demand

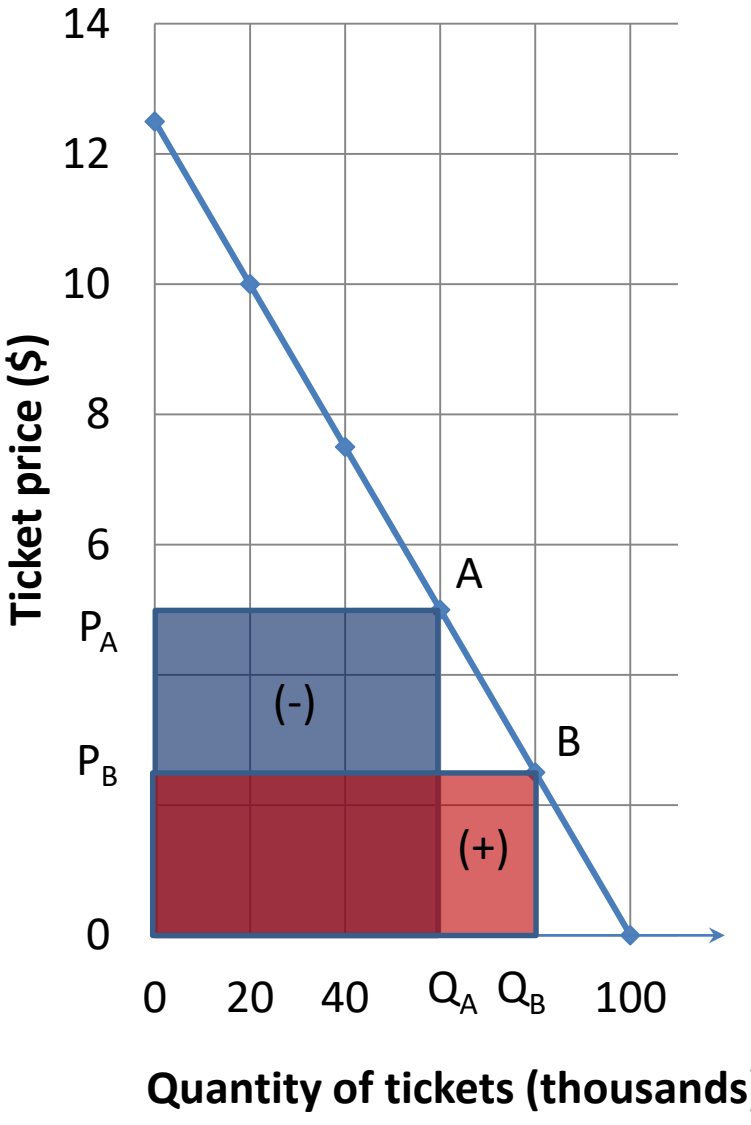


In this case, demand is less elastic, and supply shifts lead to larger changes in equilibrium price but smaller changes in equilibrium quantity.

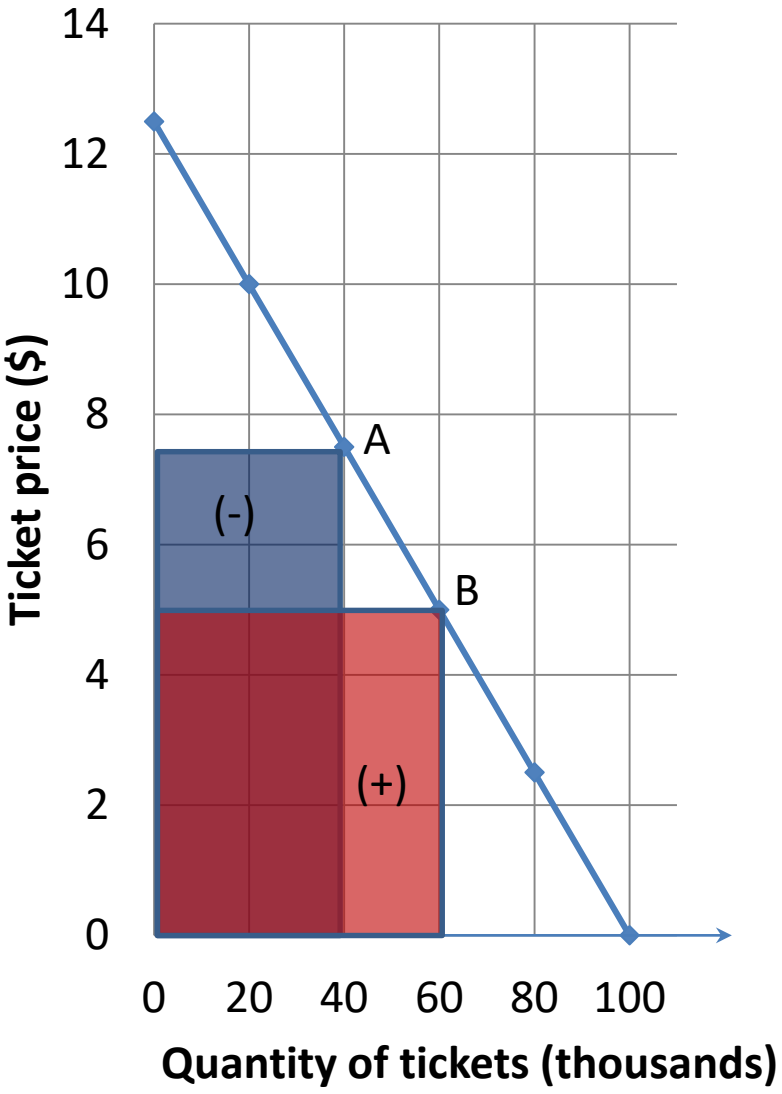
If demand is unit-elastic $\Delta p\% = -\Delta q\%$.

The effect of price changes on expenditure





The effect of price changes on expenditure



When the price is reduced from P_A to P_B, expenditure changes from $Q_A \cdot P_A$ to $Q_B \cdot P_B$. Spending rises when demand is elastic (first case), falls when demand is inelastic (second case), and is unchanged when demand is unit-elastic (see the figure to the left).

Demand elasticities and changes in spending

	Price elasticity of demand		
Change in total spending caused by	**Elastic (e.g. –5)**	**Unit-elastic (–1)**	**Inelastic (e.g. –0.2)**
Price rise	Fall	Unchanged	Rise
Price cut	Rise	Unchanged	Fall

(1) Ticket price ($)	(2) Quantity demanded (000s)	(3) Price elasticity of demand	(4) Total spending ($000s)
12.5	0	-∞	0
10	20	-4	200
7.5	40	-1.5	300
6.25	50	-1	312.5
5	60	-0.67	300
2.5	80	-0.25	200
0	100	0	0

Short run and long run

- The demand elasticity depends on how long customers have to adjust to a price change. In the short run, substitution possibilities may be limited.
- Demand elasticities will typically rise (become more negative) with the length of time allowed for adjustment. The time required for complete adjustment (→ long run) varies from good to good.

The cross-price elasticity of demand

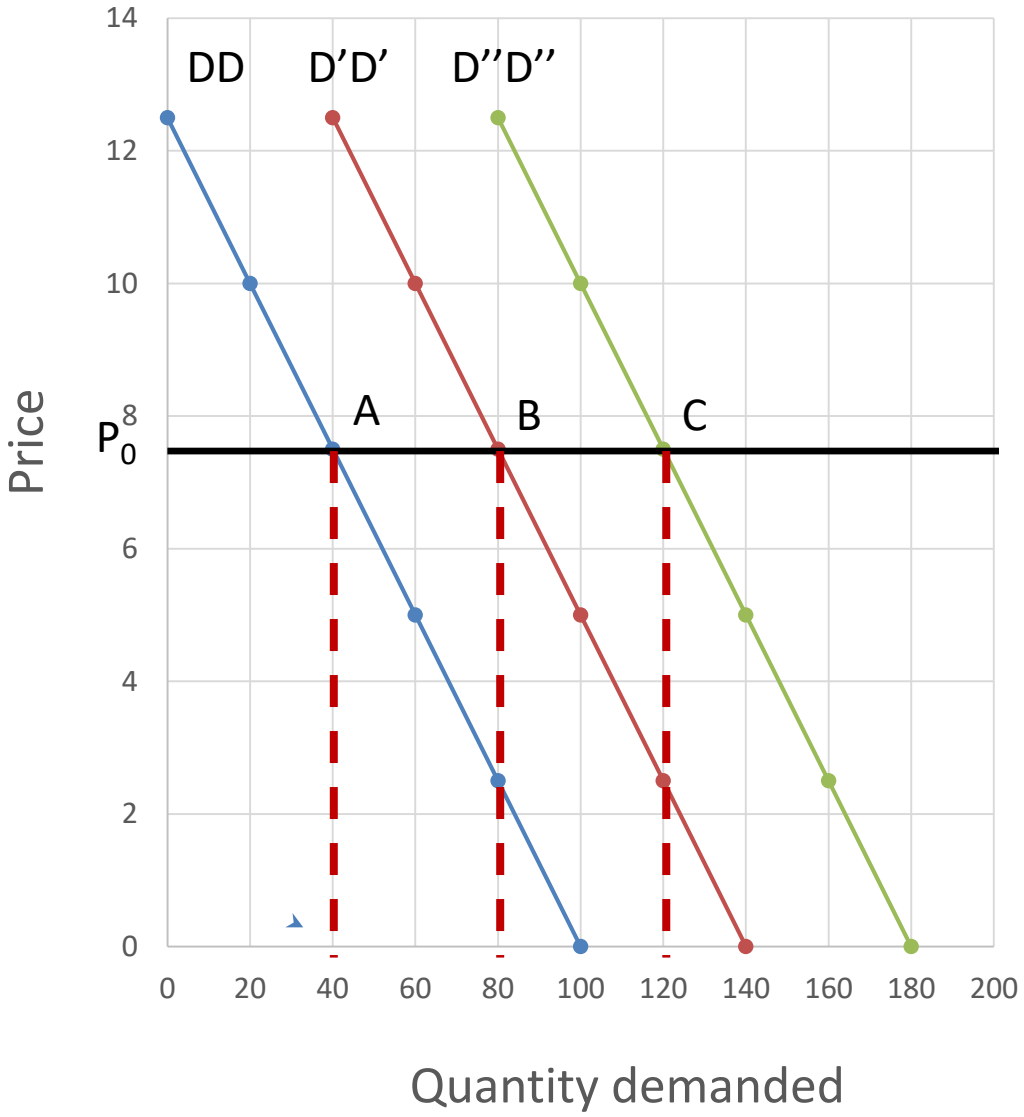
- The cross-price elasticity of demand for good i with respect to changes in the price of good j is the percentage change in the quantity of good i demanded, divided by the corresponding percentage change in the price of good j.

$$\varepsilon = \frac{\partial q_i}{\partial p_j} \cdot \frac{p_j}{q_i} = \frac{\partial \ln(q_i[p_i,p_j])}{\partial \ln(p_j)}$$

Positive cross-elasticities tend to imply that goods are substitutes.

Negative cross-price elasticities suggest that goods are complements.

Income elasticity and shifts in the demand curve



Beginning at A on the demand curve DD, the income elasticity measures the horizontal shift in the demand curve when income rises 1 per cent.

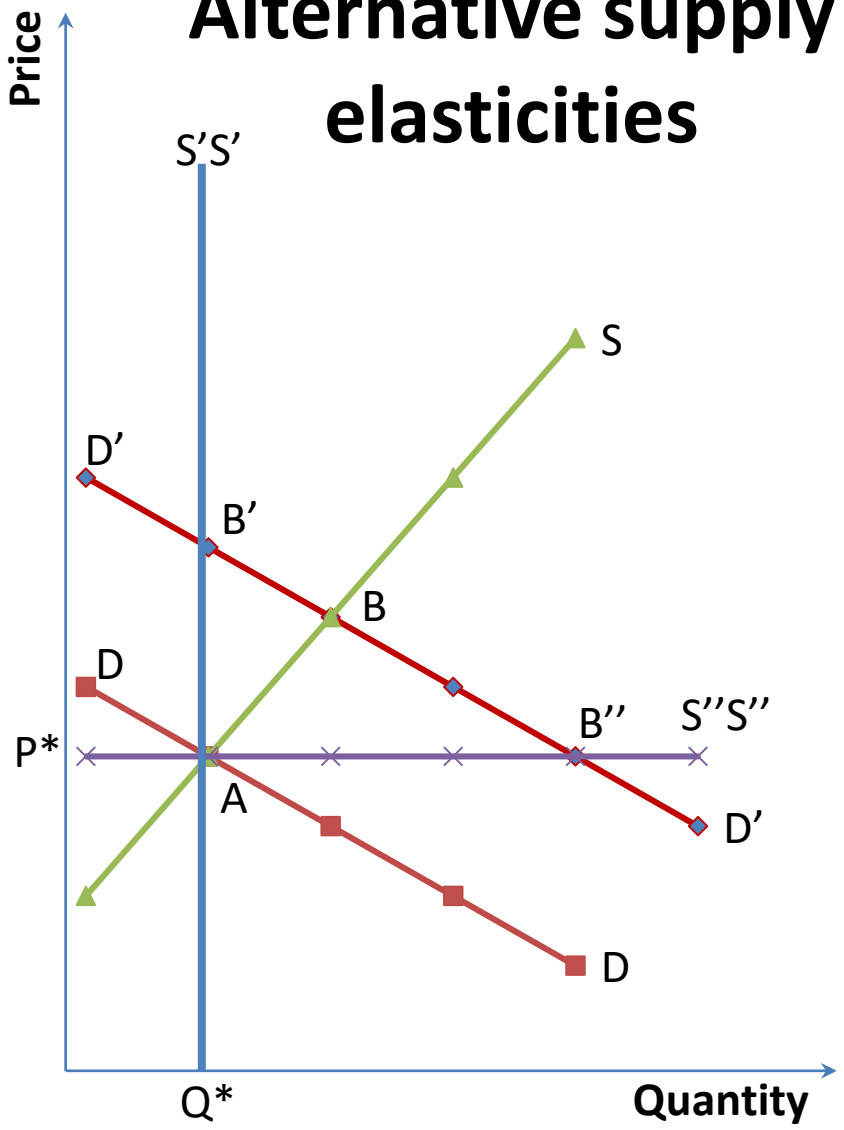
At the given price P_0, a shift to B on the demand curve D'D' reflects a lower income elasticity than a shift to C on the demand curve D''D''. Leftward shifts in the demand curve when income rises indicate a negative income elasticity.

Demand responses to a 1% rise in income

Good	Income elasticity	Quantity demanded	Budget share	Example
Normal	Positive	Rises		
Luxury	Above 1	Rises more than 1%	Rises	BMW
Necessity	Between 0 and 1	Rises less than 1%	Falls	Food
Inferior	Negative	Falls	Falls	Bread

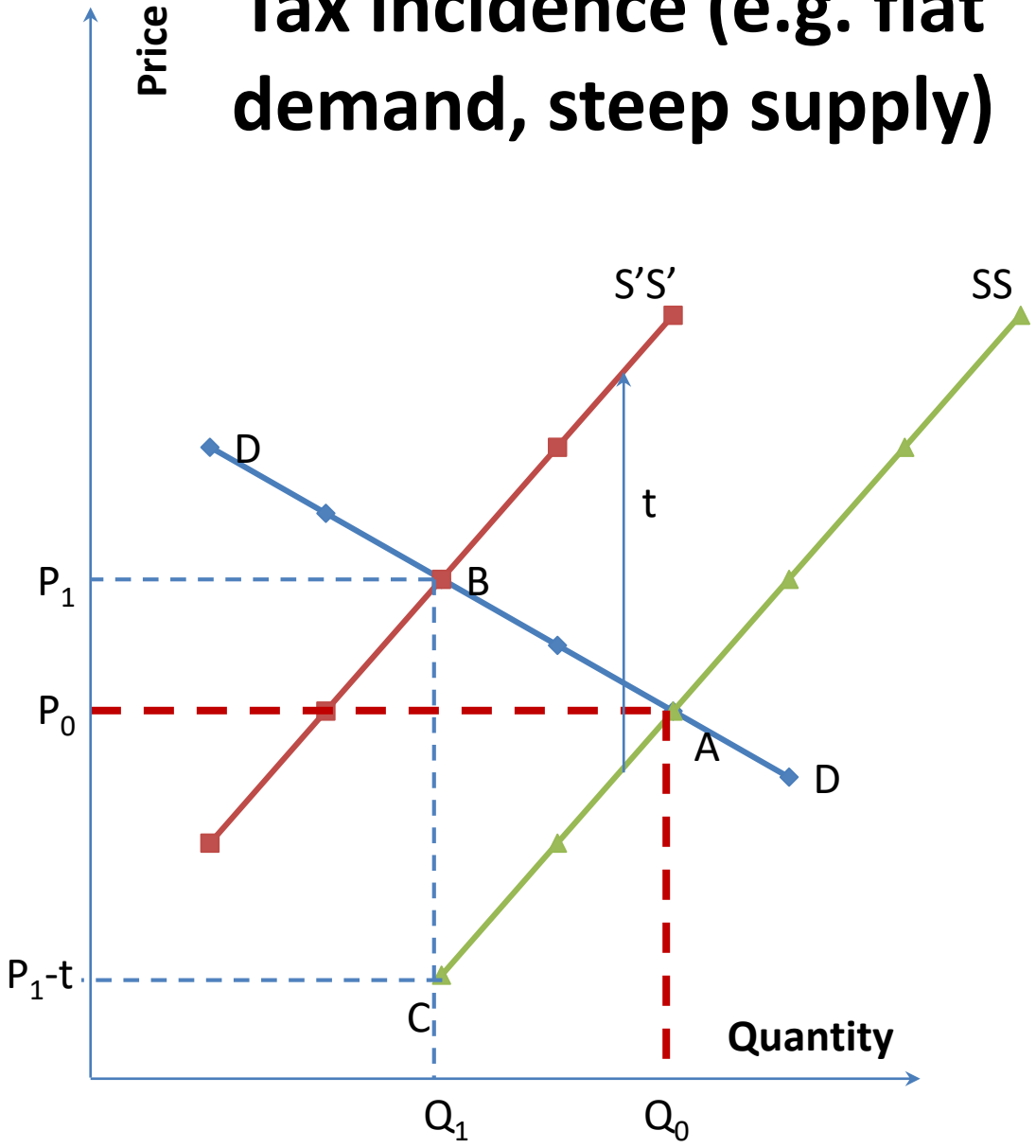
The **budget share** of a good is its price times the quantity demanded, divided by total consumer spending or income.

Alternative supply elasticities



The supply elasticity measures the percentage response of quantity supplied to a 1 per cent increase in the price of a commodity. Since supply curves slope up, supply elasticity is positive (or at least non-negative).

Tax incidence (e.g. flat demand, steep supply)



Tax incidence measures who really pays the tax. Since tax changes induce changes in the equilibrium prices and quantities, this can be very different from the people from whom the government appears to collect the money.

Specific and ad valorem taxes

- For **specific** taxes (t per unit; $T=t \cdot q$), slopes of supply and demand curves are relevant.
- For **ad valorem** taxes (these are measured as a percentage of the commodity's value*), elasticities of supply and demand are relevant.
- In either case, it is the relatively more price insensitive side of the market that bears more of the burden of a tax.

*Common example: value added taxes;

Tax revenue for ad valorem taxes = $\tau \cdot p \cdot q$