Price Elasticity of Demand

Ped measures the **responsiveness of demand** following <u>a change in its own price</u>. The formula for calculating the co-efficient of elasticity of demand is:

Percentage change in quantity demanded divided by the percentage change in price

Since changes in price and quantity usually move in opposite directions, usually we do not bother to put in the minus sign. We are more concerned with the **co-efficient** of elasticity of demand.

Values for price elasticity of demand

1. **If Ped = 0** demand is **perfectly inelastic** - demand does not change at all when the price changes – the demand curve will be drawn as vertical.

2. **If Ped is between 0 and 1** (i.e. the percentage change in demand from A to B is smaller than the percentage change in price), then **demand is inelastic**.

3. **If Ped = 1** (i.e. the percentage change in demand is exactly the same as the percentage change in price), then demand is **unit elastic**. A 15% rise in price would lead to a 15% contraction in demand leaving total spending by the same at each price level.

4. **If Ped > 1**, then demand responds more than proportionately to a change in price i.e. **demand is elastic**. For example a 10% increase in the price of a good might lead to a 30% drop in demand. The price elasticity of demand for this price change is –3

> **Demand for rail services**
> At peak times, the demand for rail transport becomes inelastic – and higher prices are charged by rail companies who can then achieve higher revenues and profits

Factors affecting price elasticity of demand

1. **The number of close substitutes** – the more close substitutes there are in the market, the more elastic is demand because consumers find it easy to switch.

2. **The cost of switching between products** – there may be significant **costs** involved in switching. In this case, demand tends to be relatively inelastic. For example, mobile phone service providers may insist on a12 month contract.

3. **The degree of necessity or whether the good is a luxury** – necessities tend to have an inelastic demand whereas luxuries tend to have a more elastic demand.

4. **The proportion of a consumer's income allocated to spending on the good** – products that take up a high % of income will tend to have a more elastic demand

5. **The time period allowed following a price change** – demand tends to be more price elastic, the longer that consumers have to respond to a price change. They may search for cheaper substitutes and switch their spending.

6. **Whether the good is subject to habitual consumption** – consumers become less sensitive to the price of the good of they buy something out of habit (it has become the default choice).

7. **Peak and off-peak demand** - demand tends to be price inelastic at peak times and more elastic at off-peak times – this is particularly the case for transport services.

8. **The breadth of definition of a good or service** – if a good is broadly defined, i.e. the demand for petrol or meat, demand is often inelastic. But specific brands of petrol or beef are likely to be more elastic following a price change.

Demand curves with different price elasticity of demand
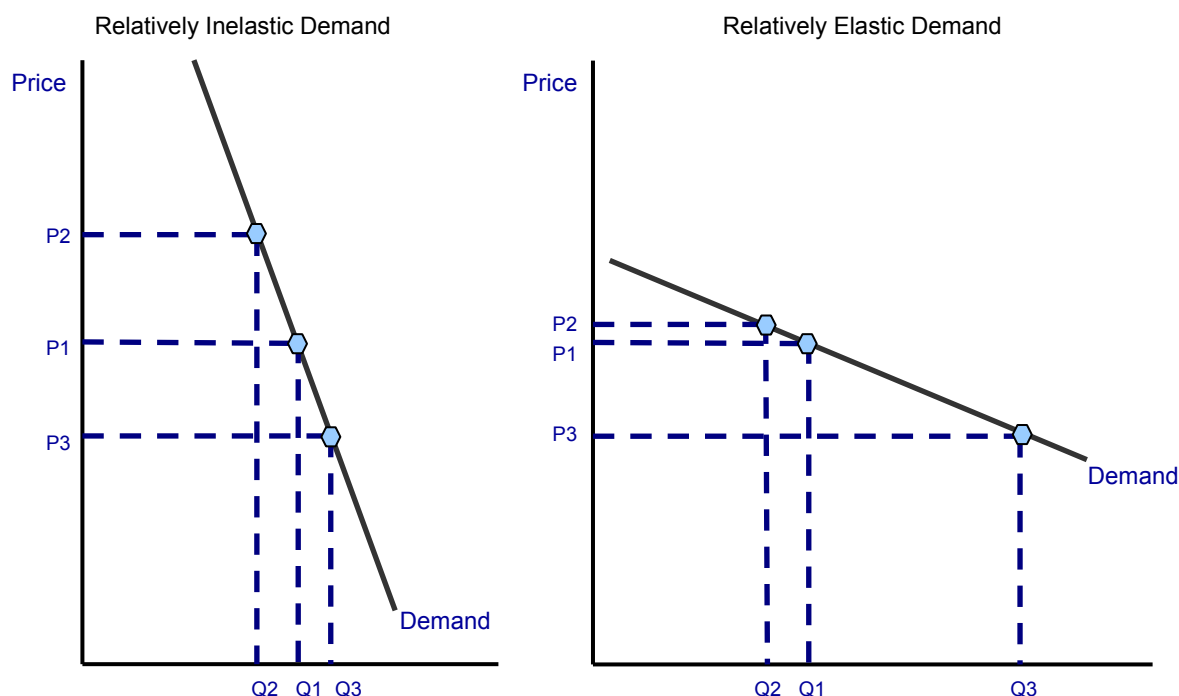
Elasticity of demand and total revenue for a producer

The relationship between elasticity of demand and a firm's total revenue is an important one.

Relatively Inelastic Demand

Relatively Elastic Demand
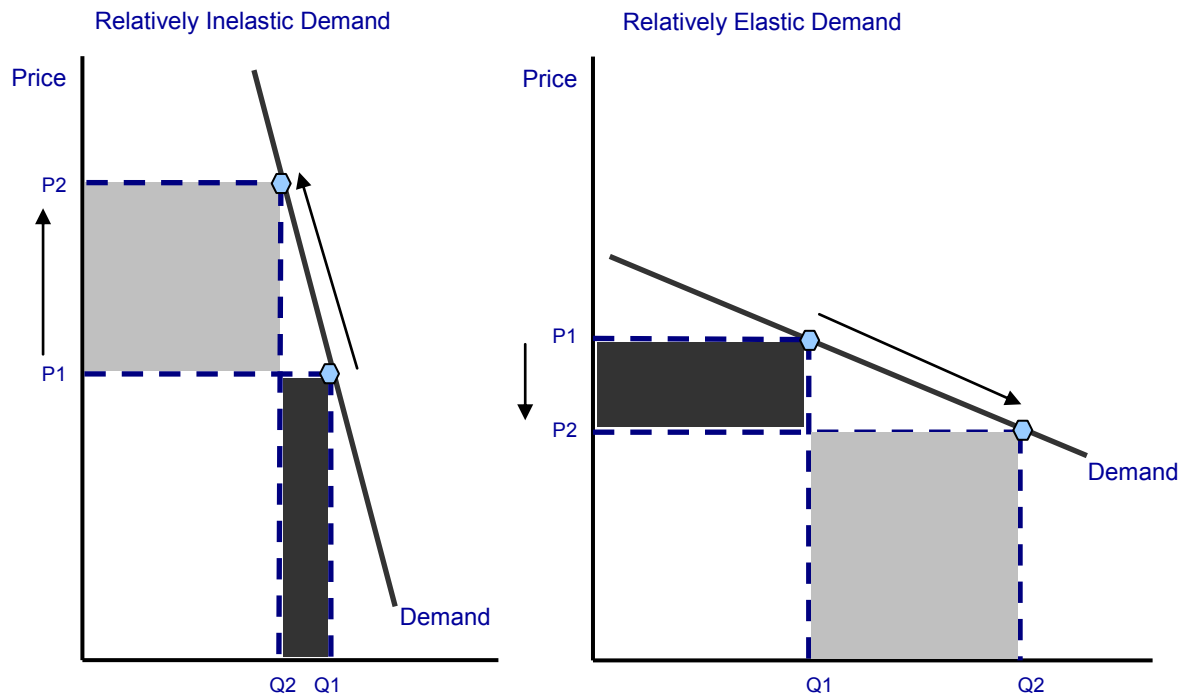
- When demand is inelastic – a rise in price leads to a rise in total revenue – for example a 20% rise in price might cause demand to contract by only 5% (Ped = -0.25)

- When demand is elastic – a fall in price leads to a rise in total revenue - for example a 10% fall in price might cause demand to expand by only 25% (Ped = +2.5)

The table below gives an example of the relationships between prices; quantity demanded and total revenue. As price falls, the total revenue initially increases, in our example the maximum revenue occurs at a price of £12 per unit when 520 units are sold giving total revenue of £6240.

| Price	Quantity	Total Revenue	Marginal Revenue
£ per unit	Units	£s	£s
20	200	4000	
18	280	5040	13
16	360	5760	9
14	440	6160	5
12	520	6240	1
10	600	6000	-3
8	680	5440	-7
6	760	4560	-11

- Consider the elasticity of demand of a price change from £20 per unit to £18 per unit. The % change in demand is 40% following a 10% change in price – giving an elasticity of demand of -4 (i.e. highly elastic).
- In this situation when demand is price elastic, a fall in price leads to higher total consumer spending / producer revenue
- Consider a price change further down the estimated demand curve – from £10 per unit to £8 per unit. The % change in demand = 13.3% following a 20% fall in price – giving a co-efficient of elasticity of – 0.665 (i.e. inelastic). A fall in price when demand is price inelastic leads to a reduction in total revenue.

CHANGE IN THE MARKET	WHAT HAPPENS TO TOTAL REVENUE?
Ped is inelastic and a firm raises its price.	Total revenue increases
Ped is elastic and a firm lowers its price.	Total revenue increases
Ped is elastic and a firm raises price.	Total revenue decreases
Ped is -1.5 and the firm raises price by 4%	Total revenue decreases
Ped is -0.4 and the firm raises price by 30%	Total revenue increases
Ped is -0.2 and the firm lowers price by 20%	Total revenue decreases
Ped is -4.0 and the firm lowers price by 15%	Total revenue increases

Elasticity of demand and indirect taxation

Many products are subject to indirect taxes. Good examples include the excise **duty on cigarettes** (cigarette taxes in the UK are among the highest in Europe) alcohol and fuels. Here we consider the effects of indirect taxes on a producers costs and the importance of price elasticity of demand in determining the effects of a tax on market price and quantity.
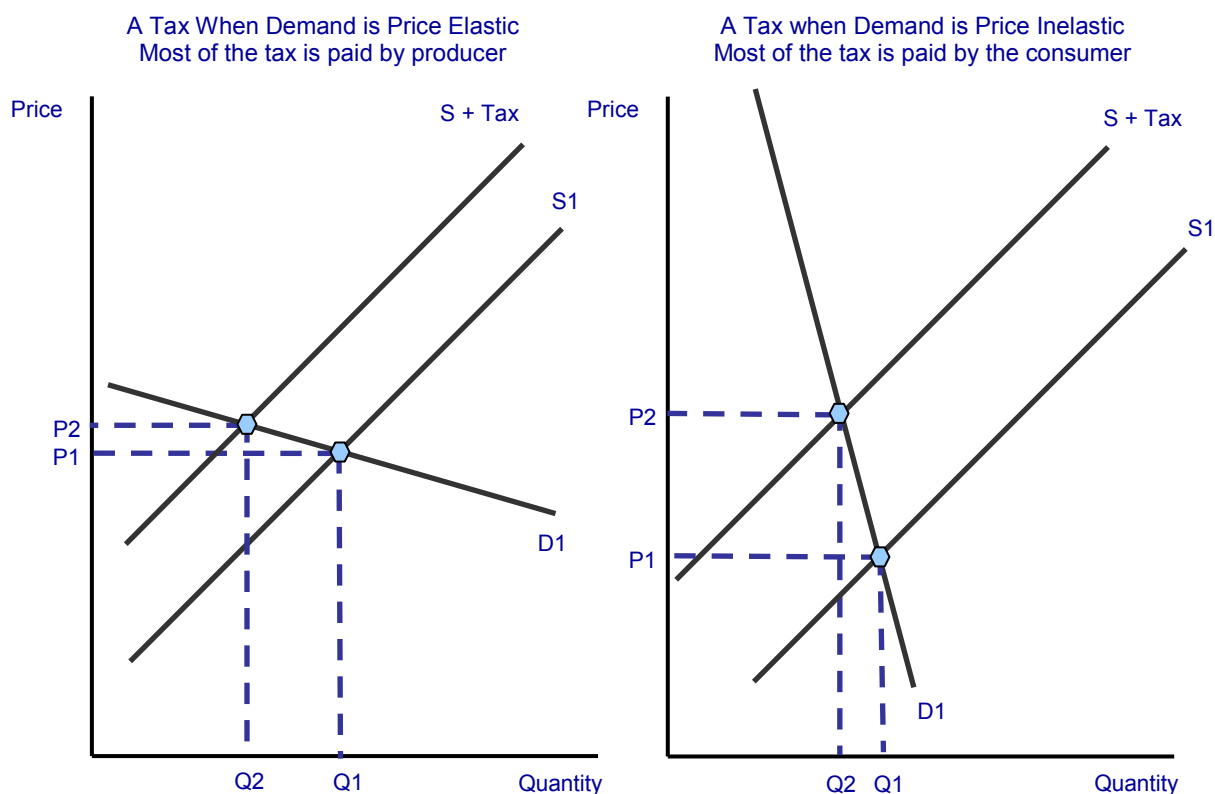
A tax increases the costs of a business causing an inward shift in supply. The vertical distance between the pre-tax and the post-tax supply curve shows the tax per unit. With an indirect tax, the

supplier may be able to pass on some or all of this tax to the consumer by raising price. This is known as **shifting the burden of the tax** and this depends on the elasticity of demand and supply.

Consider the two charts above. In the left hand diagram, the demand curve is drawn as price elastic. The producer must absorb the majority of the tax itself (i.e. accept a lower profit margin on each unit sold). When demand is elastic, the effect of a tax is still to raise the price – but we see a bigger fall in equilibrium quantity. Output has fallen from Q to Q1 due to a contraction in demand. In the right hand diagram, demand is drawn as price inelastic (i.e. Ped <1 over most of the range of this demand curve) and therefore the producer is able to pass on most of the tax to the consumer through a higher price without losing too much in the way of sales. The price rises from P1 to P2 – but a large rise in price leads only to a small contraction in demand from Q1 to Q2.
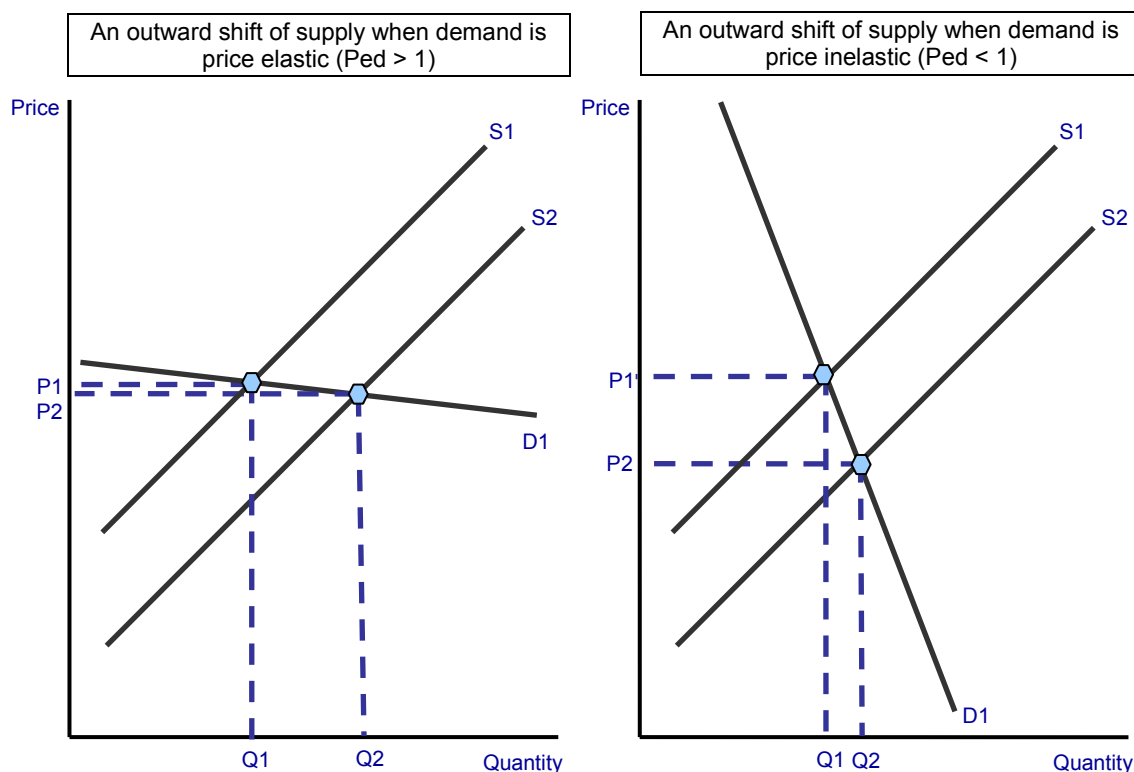
The usefulness of price elasticity for producers

Firms can use PED estimates to predict:

- The effect of a change in price on the total revenue & expenditure on a product.

- The likely **price volatility** in a market following changes in supply – this is important for commodity producers who may suffer big price movements.

- The effect of a **change in an indirect tax** on price and quantity demanded and also whether the business is able to pass on some or all of the tax onto the consumer.

- Information on the PED can be used by a business as part of a policy of **price discrimination**. This is where a monopoly supplier decides to charge different prices for the same product to different segments of the market e.g. peak and off peak rail travel or prices charged by many of our domestic and international airlines.

Price elasticity of demand and changing market prices

The price elasticity of demand will influence the effects of shifts in supply on price and quantity in a market. This is illustrated in the next two diagrams.

An outward shift of supply when demand is price elastic (Ped > 1)

An outward shift of supply when demand is price inelastic (Ped < 1)

- In the left hand diagram below we have drawn a highly elastic demand curve. We see an outward shift of supply – which leads to a large rise in equilibrium price and quantity and only a relatively small change in the market price.

- In the right hand diagram, a similar increase in supply is drawn together with an inelastic demand curve. Here the effect is more on the price. There is a sharp fall in the price and only a relatively small expansion in the equilibrium quantity.