## AS Markets & Market Systems

Price Elasticity of Demand

*In this chapter we look at the idea of elasticity of demand, in other words, how sensitive is the demand for a product to a change in the product's own price. You will find that elasticity of demand is perhaps one of the most important concepts to understand in your AS economics course*

**Defining elasticity of demand**

**Ped** measures the **responsiveness of demand** for a product 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 nearly always move in opposite directions, economists usually do not bother to put in the minus sign. We are concerned with the **co-efficient** of elasticity of demand.

**Understanding values for price elasticity of demand**

- **If Ped = 0** then demand is said to be **perfectly inelastic**. This means that demand does not change at all when the price changes – the demand curve will be vertical
- **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**. Producers know that the change in demand will be proportionately smaller than the percentage change in price
- **If Ped = 1** (i.e. the percentage change in demand is exactly the same as the percentage change in price), then demand is said to **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.
- **If Ped > 1**, then demand responds more than proportionately to a change in price i.e. **demand is elastic**. For example a 20% 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 –1.5

**What Determines Price Elasticity of Demand?**

**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



- **The number of close substitutes for a good / uniqueness of the product** – the more close substitutes in the market, the more elastic is the demand for a product because consumers can more easily switch their demand if the price of one product changes **relative** to others in the market. The huge range of package holiday tours and destinations make this a highly competitive market in terms of pricing – many holiday makers are price sensitive
- **The cost of switching between different products** – there may be significant **transactions costs** involved in switching between different goods and services. In this case, demand tends

to be relatively inelastic. For example, mobile phone service providers may include penalty clauses in contracts or insist on 12-month contracts being taken out

- **The degree of necessity or whether the good is a luxury** – goods and services deemed by consumers to be necessities tend to have an inelastic demand whereas luxuries will tend to have a more elastic demand because consumers can make do without luxuries when their budgets are stretched. I.e. in an economic recession we can cut back on discretionary items of spending
- **The % of a consumer's income allocated to spending on the good** – goods and services that take up a high proportion of a household's income will tend to have a more elastic demand than products where large price changes makes little or no difference to someone's ability to purchase the product.
- **The time period allowed following a price change** – demand tends to be more price elastic, the longer that we allow consumers to respond to a price change by varying their purchasing decisions. In the short run, the demand may be inelastic, because it takes time for consumers both to notice and then to respond to price fluctuations
- **Whether the good is subject to habitual consumption** – when this occurs, the consumer becomes much less sensitive to the price of the good in question. Examples such as cigarettes and alcohol and other drugs come into this category
- **Peak and off-peak demand** - demand tends to be price inelastic at peak times – a feature that suppliers can take advantage of when setting higher prices. Demand is more elastic at off-peak times, leading to lower prices for consumers. Consider for example the charges made by car rental firms during the course of a week, or the cheaper deals available at hotels at weekends and away from the high-season. Train fares are also higher on Fridays (a peak day for travelling between cities) and also at peak times during the day
- **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 fairly inelastic. But specific brands of petrol or beef are likely to be more elastic following a price change

**Wi-fi prices and price elasticity of demand**

From airports to hotels to conference centres. From inter-city rail services to sports stadiums and libraries, more and more people are demanding wireless internet connections for personal and business use. But demand is being constrained by the limited availability of services and, in places, high user charges. However the price of connecting to the internet through wi-fi services is set to fall as competition in the sector heats up. Nearly 90 per cent of laptops now come with wi-fi connections as standard and many public areas are being equipped with hotspots, but users often complain about the high price of accessing the internet. At present airports and hotels can charge high prices because in many cases a wi-fi service provider has exclusivity on the area. However the supply of wi-fi services is more competitive on the high street and prices are falling rapidly as restaurants and coffee shops are using low-priced wi-fi access as a means of attracting customers. The more wi-fi providers there are in the market-place, the higher is the price elasticity of demand for wi-fi connections.

Wireless usage is growing across the UK with sales of 3G cards growing by 475%; these are mostly through business channels. In the consumer market, sales of Wi-Fi routers for the home have grown by 77% many broadband providers are now providing free wireless routers with each new broadband subscription.

Note: WiFi stands for Wireless Fidelity
*Source: The Cloud and GFK UK Technology Barometer, 2006*

**Demand curves with different price elasticity of demand**

Elasticity of demand measures the responsiveness of demand to changes in price
Where the % change in demand is greater than % change in price – demand is elastic
Where the % change in demand is less than % change in price – demand is inelastic
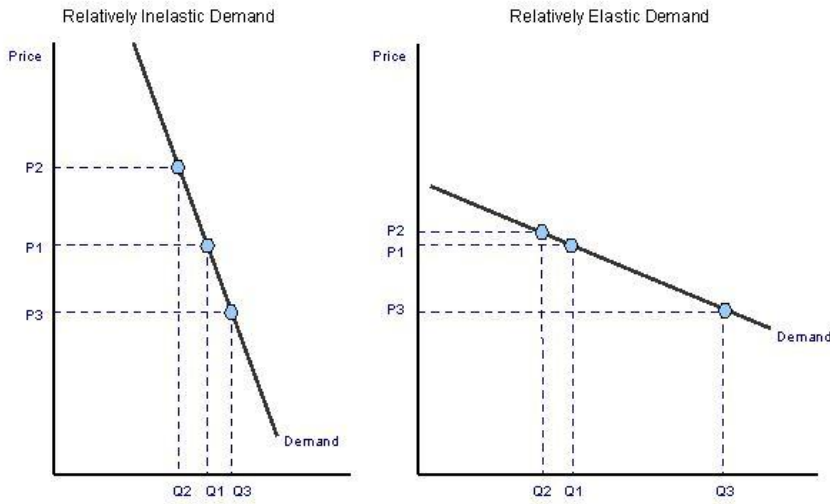


**Elasticity of demand and total revenue for a producer**

The relationship between price elasticity of demand and a firm's total revenue is a very important one. The diagrams below show demand curves with different price elasticity and the effect of a change in the market price.
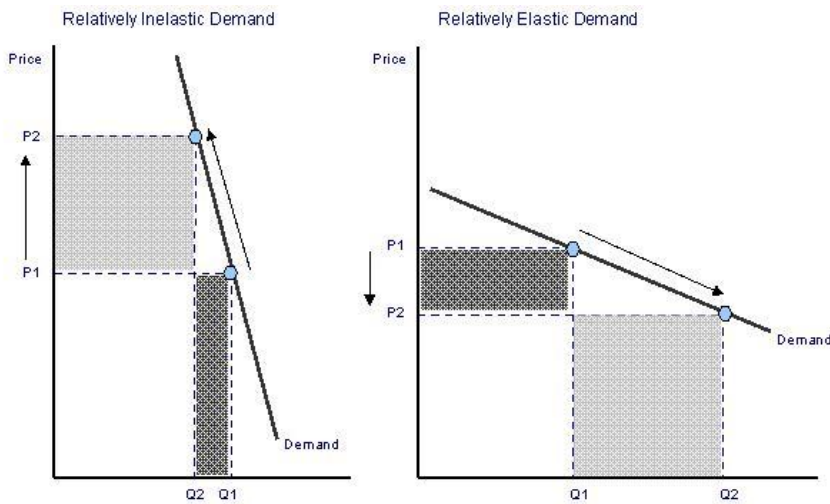


When demand is inelastic – a rise in price leads to a rise in total revenue – for example a 20% rise in price might cause demand to contract by only 5% (Ped = -0.25)
When demand is elastic – a fall in price leads to a rise in total revenue - for example a 10% fall in price might cause demand to expand by only 25% (Ped = +2.5)

The table below gives a simple example of the relationships between market prices; quantity demanded and total revenue for a supplier. 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 | |

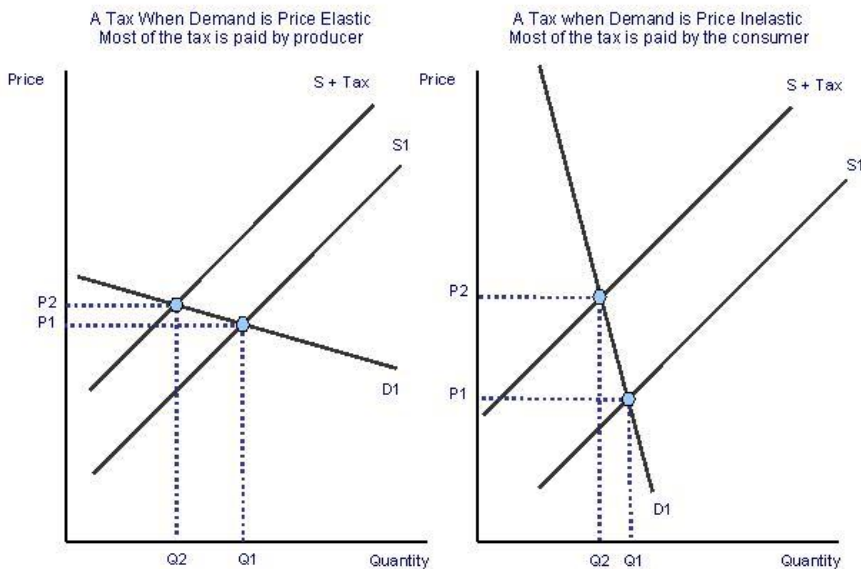| | | | |
|---|---|---|---|
| 18 | 280 | 5040 | 13 |
| 16 | 360 | 5760 | 9 |
| 14 | 440 | 6160 | 5 |
| 12 | 520 | 6240 | 1 |
| 10 | 600 | 6000 | -3 |
| 8 | 680 | 5440 | -7 |
| 6 | 760 | 4560 | -11 |

Consider the price 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 taxation imposed by the government. 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 When Demand is Price Elastic
Most of the tax is paid by producer

Price

S + Tax

S1

P2
P1

D1

Q2    Q1    Quantity

A Tax when Demand is Price Inelastic
Most of the tax is paid by the consumer

Price

S + Tax

S1

P2

P1

D1

Q2  Q1    Quantity

A tax increases the costs of a business causing an inward shift in the supply curve. 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 onto the consumer through a higher price. This is known as **shifting the burden of the tax** and the ability of businesses to do this depends on the price 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 price elasticity of demand (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 unexpected changes in supply – this is important for commodity producers who may suffer big price movements from time to time.
The effect of a **change in a government 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 price elasticity of demand can be used by a business as part of a policy of **price discrimination** (also known as yield management). 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 yield management by many of our domestic and international airlines.

**Habitual spending on cigarettes remains high but sales are falling**

Sales of cigarettes are falling by the impact of higher taxes mean that smokers must spend more to finance their habits according to new research from the market analyst Mintel. Total sales of individual sticks for the UK in 2006 are forecast to be 68 billion, eleven billion lower than in 2001. Over a quarter of cigarettes are brought into the UK either duty free or through the black market. Total consumer spending on duty-paid cigarettes is likely to exceed £13 billion, 13% higher than in 2001. In the past, increases in the real value of duty (taxation) on cigarettes **has had had little effect on demand** from smokers because demand has been inelastic. But there are signs that a tipping point may have been reached. Sales of nicotine replacement therapies such as patches, lozenges and gums have boomed by nearly 50% over the past five years to around £97 million. But for every £1 spent on nicotine replacement, over £130 is spent on cigarette sticks.

Nearly half of smokers tried to kick the habit last year. According to the Mintel research, smokers under the age of 34 are the most likely to stop smoking, with people aged 65 and over the least likely

to try quitting. A ban on smoking in public places comes into force in England, Northern Ireland and Wales in the spring of 2007, the same ban became law in Scotland in March 2006.

*Sources: Adapted from Mintel Research, the Guardian and the Press Association*

## Average price of cigarettes (20 king size filter)
Price per packet in pence, source: ONS
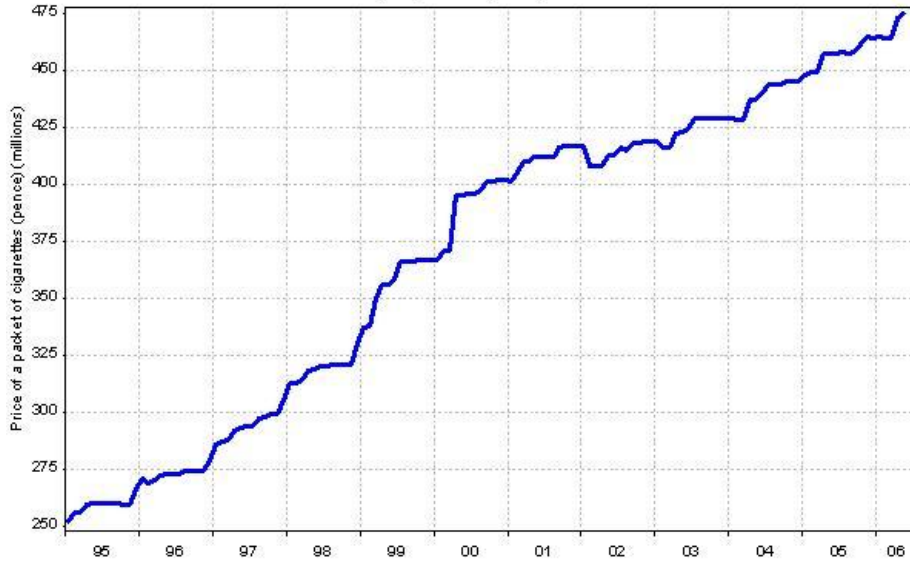


Source: Reuters EcoWin

*Author: Geoff Riley, Eton College, September 2006*