

Microeconomics is concerned with the individual parts of the economy. It is concerned with the demand and supply of *particular* goods, services and resources. It focuses in other words on individual markets.

Markets

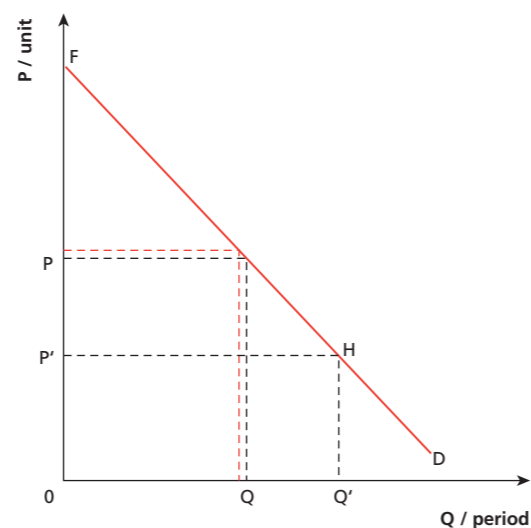
- A market can be defined as a process or an institution in which producers and consumers interact in order to sell and buy a good or a service. A **market economy** is one where market forces alone provide answers to the three fundamental questions and in which private property rights are well defined and enforced. In a pure market economy there is no government intervention beyond setting and enforcing **property rights**.
- The participants in a market economy are **consumers and producers**. The interaction of consumers and producers (firms) in markets determine the market price of each product. Changes in market conditions thus result in market price changes which set off a chain of events leading to more or less of the good being produced and thus to a change in the allocation of scarce resources. Analysis of how markets function requires examination of the behaviour of consumers and producers.

The behaviour of consumers

Demand

- The concept of demand is a way of summarizing the behaviour of buyers. Specifically, we define demand as the relationship between various possible prices of a good and the corresponding quantities that consumers are willing and able to purchase per time period, *ceteris paribus* (i.e. all other factors affecting demand remaining constant).
- This relationship is inverse (negative), meaning that if the price per unit of the product decreases consumers will be willing and able to buy more per period (*ceteris paribus*). The inverse relationship between price and quantity demanded is referred to as the **law of demand**. The law of demand asserts that if the price per unit of a good rises then quantity demanded per period of time will fall, *ceteris paribus*.
- A demand curve now shows this inverse relationship between the price per unit of a good and the quantity of the good demanded per time period. Price per unit is measured on the vertical axis; quantity demanded per time period is measured on the horizontal axis.
- For example in Fig. 2.1, if the price per unit is P then consumers will be willing and able to buy Q units per period, whereas if price decreased to P' per unit then consumers will be willing and able to buy Q' units per

Figure 2.1 The demand curve (and consumer surplus)



period, *ceteris paribus*. A demand curve can be for an individual consumer or for the whole market. The market demand curve is diagrammatically derived by the horizontal summation of the individual demand curves.

The law of demand holds because of

- The substitution effect:** if the price of good X rises, all other goods *automatically* become *relatively* cheaper; thus, people will tend to substitute other goods for X. The size of the substitution effect depends primarily on the number and closeness of available substitute goods.
- The income effect:** if the price per unit of good X rises, consumers' *real* income (the purchasing power of income) drops; thus, people will tend to buy less. The size of the income effect depends primarily on the proportion of income spent on the good.

HL

Goal of the typical consumer

It is assumed that the typical consumer tries to *maximize his or her utility*, defined as the satisfaction derived from consuming a good or a bundle of goods. She will

thus choose that bundle of goods which maximizes her satisfaction and which she can afford, given her income and the prices she faces in the market.

Consumer surplus

- Note that a demand curve can also be read 'vertically'. Unit Q in Fig. 2.1 is worth to consumers P as they would be willing to pay *at the most* P to buy it, not a cent more: if the price was even *slightly* higher (say at the level of the red dotted line) then they would not have been willing to buy *that last unit* Q. Unit Q' is worth to consumers P' as that is *the most* they would be willing to pay to acquire it.
- To consume greater and greater amounts per period, the market price must decrease as consumption of more and more units per period is worth less and less to consumers. This reflects the law of diminishing **marginal utility**, namely that the extra satisfaction derived from the consumption of greater amounts per period typically decreases.
- Given that the vertical distance reflects how much each extra unit is worth to consumers then the area (OQ'HF) in Fig. 2.1 measures how much *all* units Q' are worth to the consumer, i.e. how much she would be willing *at the most* to pay to enjoy *all* these units. If the market price is P' then she will be willing and able to consume all units up until unit Q' for which they would spend (P') times (Q') = area (OQ'HP'). Area (P'HF) is the difference between what the consumer would at the most be willing

to pay to enjoy units Q' and what she will end up paying for them in the market and is known as the **consumer surplus**.

Tips

Demand curves can be linear or curved; they may or they may not touch the axes; just make sure that they are negatively sloped (unless you want to illustrate some special case). If you wish to illustrate the notion of the consumer surplus it is easier to have the demand curve touch the axes. Note that the above discussion refers to the demand for a product: the demand for a factor of production ('derived demand'; say, for labour services by firms) is similar but not identical. Also, be careful about the meaning of the term 'quantity demanded'. It refers to the amount that consumers are willing and able to purchase at a given price over a given time period. It does not refer to what people would simply *want* to consume. Note that 'willingness' reflects preferences whereas 'ability' reflects the income constraint people face.

Other factors affecting demand ('shift' factors)

- Changes in consumers' income**
As income rises, demand for most goods will rise and the demand curve will shift to the right. Such goods are called **normal goods**. There are exceptions to this general rule, however. As people get richer, they spend less on **inferior goods**, such as low-quality food or low-quality clothing, and switch to better-quality goods. The demand for inferior goods decreases when incomes increase and thus the demand curve for inferior goods will shift to the left. If the per capita level of income in an economy rises through time, the *pattern* of demand will change. This has important implications for production, unemployment, etc.
- Changes in the distribution of income**
If the income distribution becomes less skewed and more equal, demand for certain luxuries may drop and for certain basic goods and services may rise. Thus a policy of redistributing income through taxes and transfers may alter the patterns of demand.
- Changes in preferences (tastes)**
The more desirable people find a good, the more they will demand it. Tastes are affected by advertising, by fashion, by observing other consumers, by considerations of health, etc.
- Changes in the price of other goods**
Two cases are distinguished:
 - Case of complements:** defined as goods that are consumed together ('jointly consumed'), such as peanut butter and jelly, shoes and shoe polish, coffee and sugar, etc. When the price of a complement of good X rises, demand for X will drop (shift left; e.g. if the price of coffee rises then demand for sugar will drop).
 - Case of substitutes:** defined as goods in competitive consumption, such as coffee and tea. When the price of a substitute of good X rises, demand for X will rise (will shift right; e.g. if coffee becomes more expensive then demand for tea will increase).
- Size of the market, i.e. number of consumers**
As the size of a market (the number of consumers) increases, demand for most products will tend to rise.
- Age distribution of the population**
A change in the age distribution would affect the *pattern* of demand. The classic example refers to an ageing population (where the average age is rising) where demand for false teeth will rise and for chewing gum will drop.

Other factors affecting demand ('shift' factors) continued

- **Expectations** (of changes in market prices or in income) For example, if people think that the price of a good is going to rise in the future, they are likely to buy more of it now before prices go up, shifting its demand curve to the right.

Shifts of demand versus movements along a demand curve

This is the source of a typical mistake. A shift in the demand curve occurs when a determinant other than the price changes: we then say that a change in demand has occurred. A movement along the demand curve occurs when

there is a change in price: we then say there is a change in quantity demanded.

Tips

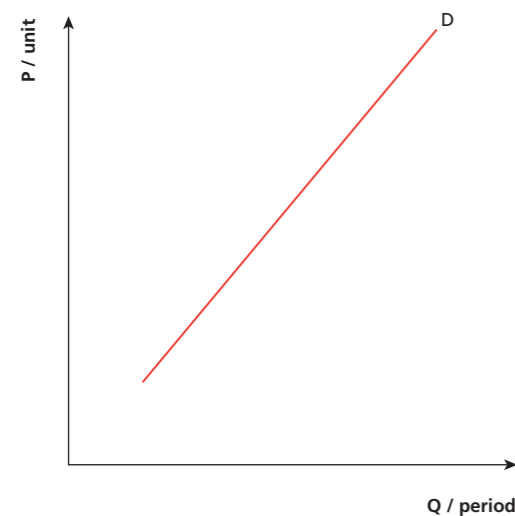
Never say that demand shifts up or down as it increases the chance of getting confused and making a mistake. Always use the expression demand shifts right (when it increases) and shifts left (when it decreases). Also note that the new demand curve does not have to be parallel to the initial one.

Exceptions to the law of demand

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- The law of demand is almost universal. It is very rare for a higher price to lead to an increase in quantity demanded per period. Giffen goods and Veblen goods are two exceptions where a rise in the price leads to more of the good being consumed per period.

Figure 2.2 Positively sloped demand curves: Giffen and Veblen goods



Giffen goods

Giffen goods have the following *three* characteristics:

- they are very strongly inferior goods;
- they are consumed by the very poor;
- expenditure on these goods must represent a very significant proportion of total consumer expenditures.

- Being very strongly inferior goods, the income effect runs in the opposite direction of the substitution effect and dominates it, leading to the perverse result described. All Giffen goods are inferior goods but not all inferior goods are Giffen goods.
- Giffen goods were first mentioned in 1895 by Alfred Marshall in his *Principles*. The original example was bread, which in Sir Robert Giffen's time (19th century) was consumed by the very poor in London. The typical textbook example has since been potatoes, consumed by very poor Irish farmers during the 1845 famine. Both examples have been refuted by analysis of historical data. Recent research using detailed panel data has shown that in China, where 30% of the population still survives on less than a dollar a day per person, noodles in the north and rice in the south exhibit such Giffen behaviour.

Veblen goods

- Veblen goods are the other exception to the law of demand. These are goods viewed as status symbols. They are valued because their high price is beyond the reach of other individuals.
- Beluga caviar and Franck Muller watches selling for \$750,000 may be good examples. Increasing the price for these goods may not decrease quantity demanded. Veblen goods should obviously not be confused with inferior goods.

Tip

Remember that inferior goods (unless they are also Giffen goods) have typical, negatively sloped, demand curves.

Exceptions to the law of demand continued

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The role of expectations

A further exception to the law of demand is the case when the quantity demanded of a product rises as the price rises, because of **expectations** that the price will rise even

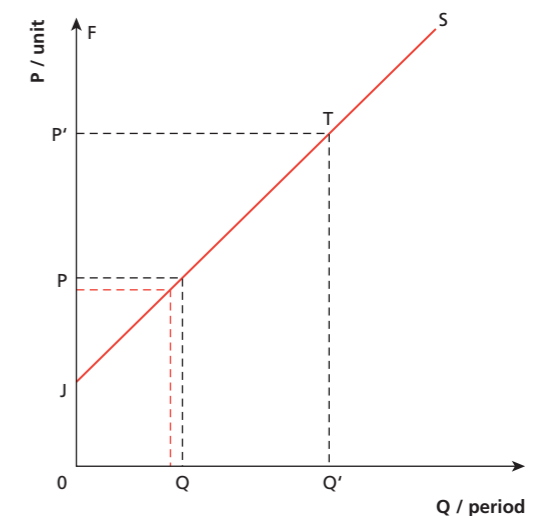
more in the future. This is known as the 'bandwagon' effect, with buyers 'jumping on the bandwagon'. Not all economists agree about this. It is perhaps preferable to treat expectations of a future price increase as a shift factor of a typical downward sloping demand curve (see page 10).

The behaviour of producers

Supply

- Supply is a way to analytically summarize the behaviour and the goals of firms.
- It is defined as the relationship between various possible prices and the corresponding quantities that firms are willing to offer per time period, *ceteris paribus*.
- The supply curve is a graph showing the relationship between the price per unit of a good and the quantity that a firm (or firms) is willing to offer per period of time.
- Typically, supply is upward sloping, meaning that if the price per unit of a product increases then a firm will be willing to offer a greater quantity per period of time, *ceteris paribus*.
- In Fig. 2.3, if the price is P then producers will be willing to offer Q units per period, whereas if the price increased to P' then producers will be willing to offer Q' units per period.
- The question is why? A simplistic answer is that at higher prices, a firm's profit margin is greater, thus it will be willing to offer more of the good per period. Also, since it becomes more and more difficult for a firm to produce more per period *using existing capacity*, it will be willing to do so only if price per unit rises.

Figure 2.3 The supply curve (and producer surplus)



Producer surplus

- Note that the supply curve in Fig. 2.3 can also be read 'vertically': a firm would be willing to offer unit Q only if the price in the market is *at least* P . P is *the minimum price the firm would be willing to accept*.
- Even if the price was *slightly* lower (at the red dotted line level) the firm would not be willing to offer unit Q . Why? Because it would not cover the extra cost of producing that unit. The vertical distance thus reflects how much *each extra* unit costs the firm to produce.
- Thus area $(OQ'TJ)$ measures how much *all units* Q' cost the firm to produce. It represents the minimum amount it requires in order to offer all these Q' units. If the market price is P' per unit then the firm will be willing to offer all units up until unit Q' for which they would earn (P') times $(Q') = \text{area } (OQ'TP')$.
- Area (JTP') represents the difference between what the firm earns when producing and selling Q' units and the minimum amount of money it requires to be willing to offer these units. This is the 'producer surplus'.

Other factors affecting supply ('shift' factors)

- Changes in input prices**
 If, for example, wages or raw material prices decrease then a firm at each price will be willing to offer more per period as production is now less costly. The supply curve will shift to the right.
- Changes in technology**
 Improvements in technology lower the costs of production since they permit less to be spent on inputs. Supply will thus increase and shift to the right.
- Change in productivity**
 Productivity of a factor is defined as output per unit of input. If, for example, labour becomes more experienced, better trained or healthier then labour productivity will increase, meaning that output per worker will be greater. It follows that supply will increase and shift to the right.
- Changes in government policy**
 Government subsidies (per unit of output payments to firms) will lower production costs, while imposing indirect taxes will increase production costs. The supply decision is thus in both cases affected.
- Size of the market**
 The market supply will be affected if the number of firms in the market changes. As, for example, more firms are lured into a market the market supply will tend to rise.
- Expectations**
 The expectation that a price will be higher in the future may cause supply of the product to decrease now.
- Other factors**
 Weather conditions for obvious reasons affect the supply of farm products; a terrorist act or a war may affect the supply of oil, etc.

Tips

Supply curves may be straight lines or curves; they may or may not start from the vertical (or horizontal) axis. Just make sure they are (in the general case) upward sloping. To illustrate the producer surplus it is easier to have your supply curve start from the vertical axis. The supply of a factor of production (say of labour services by 'workers') is similar but not identical to the supply of a good. Also an increase or a decrease in supply should always be referred to as a shift to the right or to the left, respectively. Using 'up' or 'down' may lead to confusion as, for example, a shift down on the diagram reflects an increase in supply. It is a shift to the right.

Equilibrium

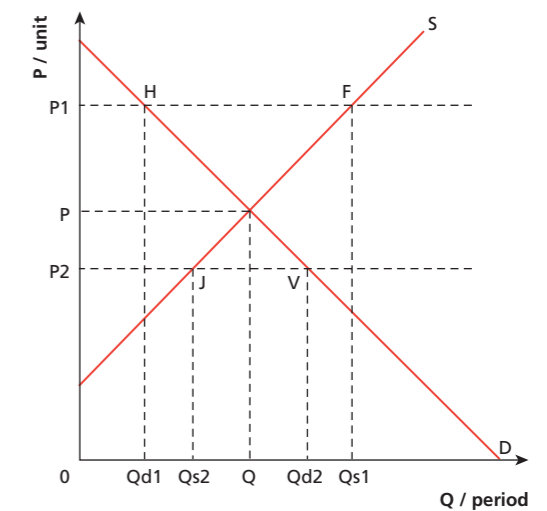
Price and output determination in a competitive market

- The price at which a good will be sold in a competitive market will be determined by the interaction between consumers and producers, in other words by the interaction of demand and supply.
- If at some price excess supply exists (if quantity supplied per period exceeds quantity demanded) then the price will tend to drop.
- If at some price excess demand exists (if quantity demanded per period exceeds quantity supplied) then the price will tend to rise.
- It follows that there will be no tendency for the price to change if there is neither excess supply nor excess demand in the market. This requires that quantity demanded per period at that price is equal to quantity supplied. This price is the **equilibrium price** (or **market clearing price**) and the corresponding quantity is the **equilibrium quantity**.

Price and output determination in a competitive market continued

- Referring to Fig. 2.4, could P_1 be the 'equilibrium' price? At P_1 consumers are willing to buy Q_{d1} units per period while firms are willing to offer Q_{s1} units per period. Quantity supplied *per period* is greater than quantity demanded. There is excess supply (a surplus) equal to $Q_{s1} - Q_{d1} = HF$ units per period which will create pressure for the price to fall. Since the excess supply creates a tendency for the market price to fall it follows that P_1 is not an 'equilibrium' price.
- Could P_2 be the 'equilibrium' price? At P_2 consumers are willing to buy Q_{d2} units per period while firms are willing to offer Q_{s2} units per period. Quantity demanded *per period* is greater than quantity supplied. There is excess demand (a shortage) equal to $Q_{d2} - Q_{s2} = JV$ units per period which will create pressure for the price to rise. Since the excess demand creates a tendency for the market price to rise (to change) it follows that P_2 is not an 'equilibrium' price.
- Quantity demanded per period is equal to quantity supplied only at price P . At P there is no excess demand or excess supply so the market 'clears'. Price P is thus the equilibrium price.

Figure 2.4 The determination of equilibrium price in a competitive market



Tip

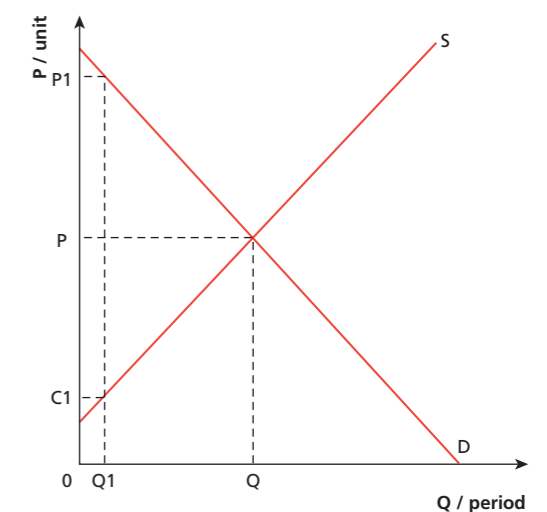
A shortage (or a surplus) is *not* an area but the horizontal distance between the quantity demanded and the quantity supplied at some price.

The question of resource allocation

The allocation of scarce resources in a market economy

- A problem any society faces is how much to produce of each good, and thus how many resources should be allocated in the production of each. To illustrate the problem, think of a society endowed with two resources, labour and land, wishing to produce two goods, say apples and oranges. The problem it faces is how many apples to produce and how many oranges and, consequently, how much land and how much labour to allocate in the production of apples and how much to oranges. Since resources are scarce, producing more apples implies that fewer oranges can be produced.
- Figure 2.5 incorporates all the necessary information to determine the answer. The demand curve drawn reflects how much each extra unit of apples is valued by consumers and more generally by society. The supply curve reflects how much each extra unit of apples costs to produce (as it shows the minimum price required for the unit to be offered). In this simple setup it should be clear that producing an extra unit of apples requires more resources allocated in apple production, so the cost of each extra unit of apples produced are the oranges that need to be sacrificed.

Figure 2.5 The allocation of scarce resources (a)



The allocation of scarce resources in a market economy continued

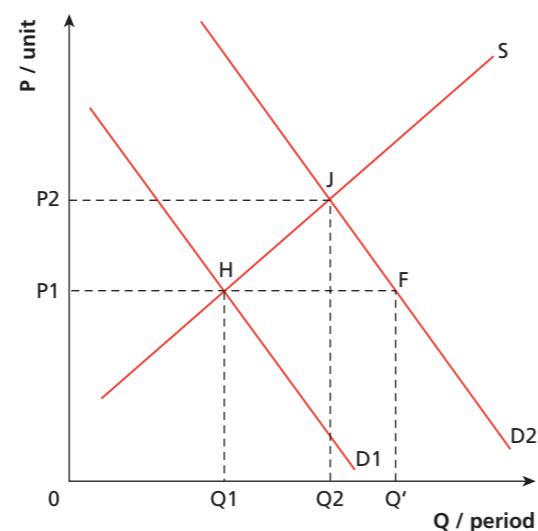
- Should unit Q1 be produced from society's point of view? The answer will be yes, if it is valued more than what it costs to produce it. The demand curve for apples informs us that unit Q1 is valued by society at P1 dollars (or yuan), as that is how much consumers would *at the most* be willing to pay.
- The supply curve for apples informs us that it costs C1 dollars (or yuan) to produce unit Q1 as that is the *minimum suppliers would be willing to accept to offer that unit*. Since unit Q1 is valued more than what it costs, the answer is that it should be produced.
- Thus, more units of apples (in general, more of any good 'x') should be produced as long as the valuation of the extra unit (what people would be at the most willing to pay) exceeds the extra cost of producing it.
- It follows that the very last unit of apples society would want to be produced is that unit which is valued as much

- as it costs to produce it. In Fig. 2.5 this would be unit Q. Stopping short of that unit (producing a tiny bit less than unit Q) would beg the question why not produce a 'tiny bit' more.
- The startling result of *competitive* markets is that even though each consumer and each producer is looking after his own self-interest (consumers aiming at maximizing utility and producers aiming at maximizing profit) the market outcome is precisely the best possible from society's point of view; this idea was first expressed by the famous economist Adam Smith. In a competitive market, price will indeed gravitate to P dollars (or yuan) per unit and output will be exactly Q units per period, so all units worth more than what they cost to produce are indeed produced.

The power of relative price changes

- Assume now that preferences in this society change and that, for example, more apples are in demand. Why and how will more apples be produced and thus additional scarce resources attracted and employed in apple production? What mechanisms will come into play to guarantee that these changed preferences of society will be satisfied?
- Focusing on Fig. 2.6, let the price of apples initially be P1 per unit and the output of the apple industry Q1 units per period. A greater demand for apples can be shown as a shift of the demand for apples to the right to D2. Of course, no one in the market sees the shift but now there will be excess demand for apples equal to HF units per period. As a result P1 is no longer an equilibrium price. There is pressure for the price to rise.
- The rise in the price of apples is visible and it initiates changes in the behaviour of both firms and consumers. Changing relative prices thus have 'signalling power'. Some consumers will drop out of the market or will cut down on their purchases. On the other side, higher prices mean increased profits for existing firms and an opportunity for other firms to enter the market and partake in these profits. As a result quantity supplied per period rises but it should be realized that for this to happen more resources will have to shift into apple production.

Figure 2.6 The allocation of scarce resources (b)



- The price mechanism thus leads to a change in resource allocation as rising relative prices and profits provide the signal and the incentive for firms to produce more. Eventually, the extension of supply (from H to J) and the contraction of demand (from F to J) will stop when the new equilibrium price P2 per unit is reached and industry output is higher at Q2 units per period.

Elasticity

In general, **elasticity** is defined as the *responsiveness* of some economic variable, when another economic variable changes.

Price elasticity of demand

Definition: The responsiveness of quantity demanded to a change in price.

Symbol: PED

Measure: The percentage change in quantity demanded divided by the percentage change in price:

$$PED = \frac{\% \Delta Q_d}{\% \Delta P}. \text{ Thus } PED = \frac{(\Delta Q/Q)}{(\Delta P/P)} = (\Delta Q/\Delta P) * (P/Q)$$

- PED is thus the **ratio of the changes** of two variables (price and quantity demanded) that move in opposite directions: if the price of the good goes up, then the quantity demanded goes down and vice versa, implying that if the denominator has a plus sign (the price increased) then the numerator will have a negative sign (the quantity demanded will have decreased).
- As a result PED is always a *negative* number. Note that often the minus sign is ignored. *But* in any calculation questions *never forget to use the minus sign* even if it is not provided.

Ranges of price elasticity of demand

- Demand is **elastic** (for small changes around the initial price) if the percentage change in quantity demanded is larger than the percentage change in price ($PED > 1$). Alternatively we can say that if a change in price leads to a *proportionately* greater change in quantity demanded then demand for the product is price elastic.
- Demand is **inelastic** (for small changes around the initial price) if the percentage change in quantity demanded is smaller than the percentage change in price ($0 < PED < 1$). Alternatively we can say that if a change in price leads to a *proportionately* smaller change in quantity demanded then demand for the product is price inelastic.
- Demand is **unit elastic** if the percentage change in quantity demanded is equal to the percentage change in price ($PED = 1$).
- Demand is **perfectly elastic** if a small change in price leads to an infinitely large change in quantity demanded ($PED \rightarrow \infty$). This means that if, for example, the price of a product rises *even slightly*, nothing will be bought by consumers. A demand curve of infinite price elasticity is a line parallel to the quantity axis.
- Demand is **perfectly inelastic** if a small change in price leads to no change in the quantity demanded ($PED = 0$). Price changes have no effect on the amount purchased per period. A demand curve of zero price elasticity is a line parallel to the price axis.

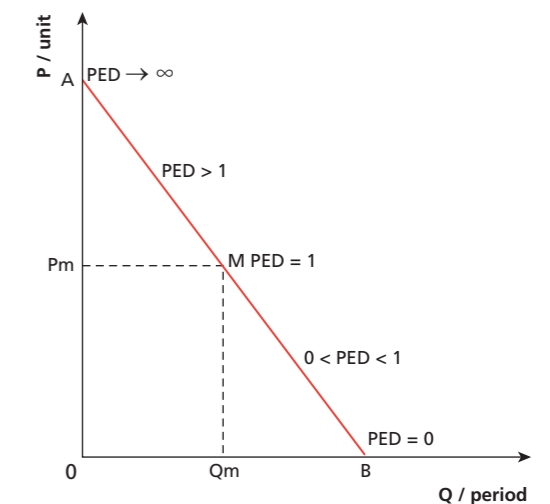
Note that the minus sign is ignored.

Price elasticity of demand varies along a typical demand curve

Note that even along a linear, negatively sloped, demand curve PED continuously varies, taking on all values from infinity to zero.

- Referring to Fig. 2.7, at the midpoint M of the demand curve AB that corresponds to price Pm (located at the midpoint of segment OA), $PED = 1$.
- Within line segment AM corresponding to prices higher than Pm within the segment APm, demand is price elastic ($PED > 1$).
- Within line segment MB corresponding to prices lower than Pm within the segment PmB, demand is price inelastic ($0 < PED < 1$).
- Lastly, at point A price elasticity of demand tends to infinity while at point B price elasticity of demand is zero.

Figure 2.7 PED along a negatively sloped linear demand curve



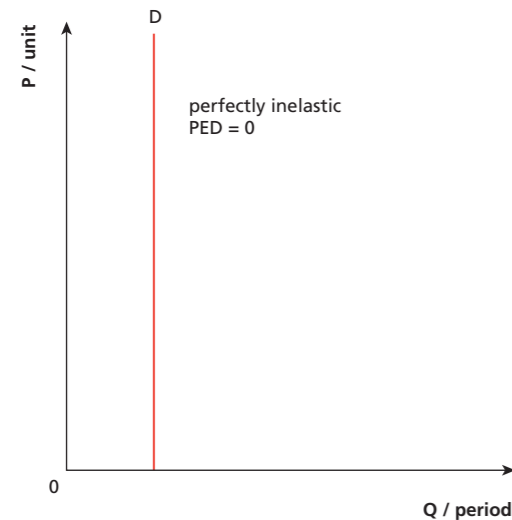
Tips

A common mistake is to consider the price elasticity of demand for a linear demand curve that is at a 45 degree angle to both axes as constant and equal to 1. This is not the case. Price elasticity for such a demand curve *also* varies from infinity to zero. The slope of such a curve is 1 but slope is *not* elasticity. Strictly speaking it is incorrect to characterize any linear demand as price elastic if it is flat, and as price inelastic if it is steep. But, since for two intersecting linear demand curves, the flatter one is indeed more price elastic, then, *for small price changes around the intersection price*, it is accepted to claim that a flatter demand curve is relatively price elastic whereas a relatively steep one is relatively price inelastic.

Demand curves with constant PED

- The case of a perfectly inelastic demand curve: $PED = 0$
The demand curve (Fig. 2.8) is thus vertical at some quantity. Any change in price will lead to no change in quantity demanded.

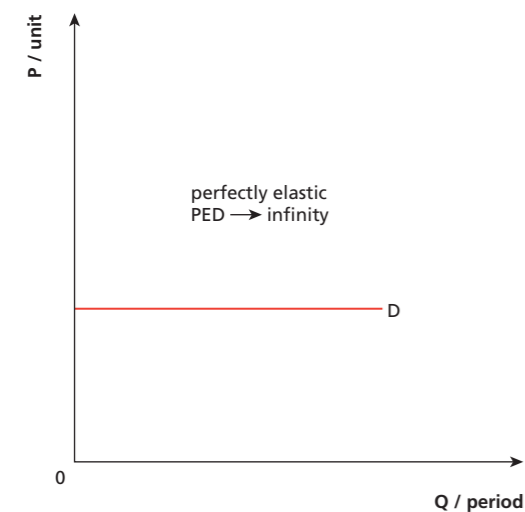
Figure 2.8 Perfectly price-inelastic demand curve



Often used to describe the case of highly addictive goods such as drugs or to describe the individual demand for pharmaceutical products for which no substitutes exist.

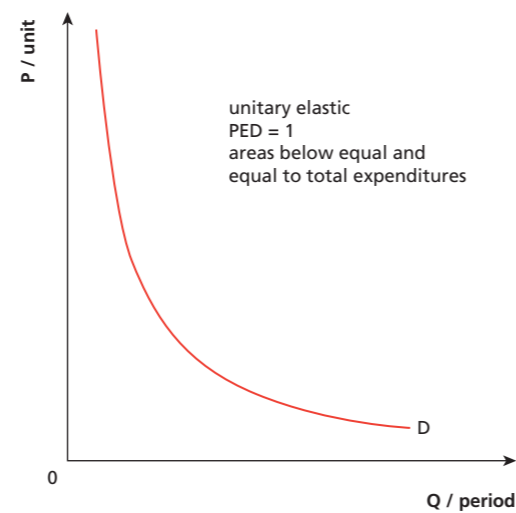
- The case of a perfectly elastic demand curve: $PED \rightarrow \infty$
The demand curve (Fig. 2.9) is horizontal at some price. It is used to describe the demand that a perfectly competitive firm faces. Such a firm is so 'tiny' in size compared to the market that it can sell any amount at the going market price. It is as if it is facing a perfectly elastic demand at the market price.

Figure 2.9 Perfectly price-elastic demand curve



- The case of a unitary elastic demand curve: $PED = 1$
The demand curve (Fig. 2.10) in this case is asymptotic to both axes, i.e. it never touches either. The demand curve is a rectangular hyperbola.

Figure 2.10 Unitary elastic demand curve



All areas below the curve represent firm revenues and are equal in size. In other words in a unitary elastic demand curve a change in price does not change total firm revenues.

Relationship between PED and total revenues

- What will happen to firms' revenues (and hence to consumer expenditures) if there is a change in price? The answer depends on the price elasticity of demand. Total revenues (TR) which a firm collects are the product of the price per unit and the quantity sold ($TR = PQ$). It is not the same as profits which are the difference between the total revenues collected and the total costs incurred.

Three cases can be distinguished:

- Case 1: Price changes when $PED > 1$ (demand is price elastic)**
A change in price leads to a change in the *opposite* direction in quantity demanded. When demand is price elastic, quantity demanded changes *proportionately* more than price. Thus the change in quantity has a bigger effect on revenues than does the change in price. Thus, if demand is elastic, total expenditure changes in the same direction as quantity demanded. If P rises then Q falls proportionately more. Thus TR will *fall*. But if P falls, then Q rises proportionately more and thus TR will *rise*.
- Case 2: Price changes when $0 < PED < 1$ (demand is price inelastic)**
In this case, price rises *proportionately* more than quantity. Thus, the change in price has a bigger effect on total revenue than does the change in quantity. Total revenues change in the same direction as price. If P rises then Q falls proportionately less, thus TR *rises*. But if P falls, Q rises proportionately less, thus TR *falls*.
- Case 3: Price changes when $PED = 1$ (demand is unitary elastic)**
In this case, price and quantity change in exactly the same proportion. The demand curve is a 'rectangular hyperbola'. A change in price will have no effect on total revenues. On a graph of *total revenues* against Q , the function will be a straight line parallel to the horizontal axis.

Demand curves with constant PED continued

PED and the shape of the TR curve

It follows from the above that there is a close relationship between price elasticity of demand and the shape of the total revenues curve a firm faces.

Focusing on Fig. 2.11a which illustrates the typical, linear, negatively sloped demand curve:

- At zero quantity (at the origin) total revenues are zero and at zero price (point H) total revenues are also zero.
- As price decreases (think of 'walking down' the price axis) from point F to P_m , quantity demanded increases from 0 to Q_m . Since demand for that price range is price elastic the resulting increase in quantity demanded is proportionately greater so total revenues rise.
- Now, skip to the midpoint price P_m . If price continues to decrease past P_m all the way down to zero, quantity demanded increases from Q_m to H. Since demand is now price inelastic, the resulting increase in quantity demanded is proportionately smaller, so total revenues decrease.
- Since we established that revenues rise all the way to the midpoint Q_m and then, right after Q_m , they decrease, it necessarily follows that at Q_m they are at a maximum. Thus, right below the midpoint of the linear demand curve where PED is equal to 1, total revenues are maximized.

- (HL only) Define marginal revenue as the extra revenue from selling one more unit of output. MR is thus the change in TR because of a change in Q so it is the slope of the TR curve. At Q_m where TR is maximum it follows that MR is zero. If demand is a negatively sloped line then MR has double the slope. In Fig. 2.11a it will thus go through output Q_m .

Focusing on Fig. 2.11b which illustrates a unitary elastic demand curve:

- The percentage increase in quantity demanded is equal to the percentage decrease in price. As a result total revenues remain unchanged (constant). In the bottom diagram TR is thus drawn as a straight line parallel to the quantity axis illustrating that total revenues do not change as output varies.

Focusing on Fig. 2.11c which illustrates the case of a perfectly elastic demand curve:

- Here the firm is so tiny that it can sell all it wants at the price P' , say, for example, £3.00 per unit. It follows that the total revenue curve is a rising straight line starting from the origin as the revenues from one unit sold will be £3.00, the revenues from two units sold will be £6.00, the revenues from three units sold will be £9.00 etc.

Figure 2.11 Price elasticity of demand and the shape of the total revenues curve

