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AQA A-level

Economics

Fifth Edition

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3 Price determination in a competitive market

Chapter 1 introduced you to one of the fundamental economic problems: how to allocate scarce resources between competing uses in conditions in which there are limited resources and unlimited wants. In a market economy, resource allocation is undertaken by the price mechanism operating in the system of markets that make up the economy. This is also true in the 'market sector' of a mixed economy. However, in a mixed economy there is also a 'non-market sector' in which goods and services such as roads and police are produced and delivered to final users 'outside the market'. This chapter focuses on competitive markets in which the price mechanism operates. Chapter 5 examines the less competitive markets of monopoly and imperfect competition, as well as perfectly competitive market structures. The final chapter of Part 1 of this book, Chapter 8, introduces the various market failures in which the price mechanism either does not work at all or produces resource misallocation.

LEARNING OBJECTIVES

These are to understand:

- the nature of demand and supply in a competitive market
- the difference between a movement along a demand or a supply curve and a shift of a demand or a supply curve
- the concept of elasticity and the different elasticities you need to know
- how demand and supply curves are brought together in a supply and demand diagram
- market equilibrium and disequilibrium in a supply and demand diagram
- interrelationships between markets.

3.1 The determinants of demand

Demand and markets

Before we explain what determines the level of demand, we will first examine the nature of a **market** in which the **demand** for, and the **supply** of, goods and services interact with each other.

KEY TERMS

market a voluntary meeting of buyers and sellers with exchange taking place.

demand the quantity of a good or service that consumers are willing and able to buy at given prices in a given period of time.

supply the quantity of a good or service that producers are willing and able to sell at given prices in a given period of time.

A market is a voluntary meeting of buyers and sellers in which exchange takes place. Both buyer and seller have to be willing partners to the exchange. Markets do not have to exist in a particular geographical location. Whenever a good or service is voluntarily bought and sold, a market transaction occurs. In the past, market transactions shifted away from open-air street markets to take place in shops. Shops have higher overhead costs, but they offer a permanent site of exchange and a continuing relationship between sellers and buyers. In recent years, the growth of the internet has allowed 24/7 ecommerce. As a result, many markets, especially those in commodities, raw materials and financial services, have become truly global.

SYNOPTIC LINK

This chapter mainly focuses on product markets — the markets for the goods and services which consumers buy and businesses sell. However, there are a variety of other forms of market. For example, Chapter 6 looks at the market for the factor of production known as labour, while Chapter 15 considers the market for exchanging foreign currencies.

KEY TERMS

competitive markets markets in which the large number of buyers and sellers possess good market information and can easily enter or leave the market.

ruling market price (also known as **equilibrium price**) the price at which planned demand equals planned supply.

Competitive markets occur when there are a large number of buyers and sellers all passively accepting the **ruling market price**, which is set, not by individual decisions, but by the interaction of all those taking part in the market. Highly competitive markets lack entry and exit barriers. These barriers, which exist in non-competitive markets, include the costs of setting up, the costs of acquiring information about the market and the difficulties in gaining consumer recognition when there are established brands. The absence of these barriers means that new buyers and sellers can easily enter the market without incurring costs. In the same way, buyers and sellers can leave the market if they wish to. Competitive markets also exhibit a high degree of transparency — buyers and sellers can quickly find out what everyone else in the market is doing.

The relationship between price and quantity demanded

KEY TERM

effective demand the desire for a good or service backed by an ability to pay.

Households and firms operate simultaneously in two sets of markets. The first of these contains the goods markets, in which members of households demand and buy consumer goods and services produced and supplied by firms. But for household demand in the goods market to be an **effective demand** — that is, demand backed up by an ability to pay — households must first sell their labour, or possibly the services of any capital or land they own, in the markets for factors of production. These were briefly mentioned in Chapter 1. Households' roles are therefore reversed in goods markets and factor markets. In this chapter, we ignore factor markets and focus solely on the determinants of demand for consumer goods and services.

What a demand curve shows

A demand curve, such as the one illustrated in Figure 3.1, shows the relationship between the price of a good or service and the quantity of the good or service demanded at different prices. If the price starts off high, for

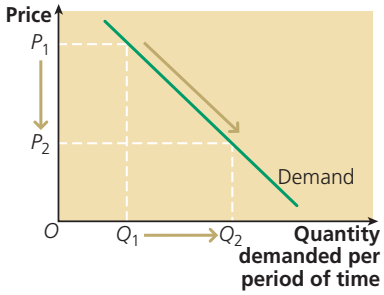


Figure 3.1 A market demand curve

example at P_1, household demand is Q_1. But if the price falls to P_2, quantity demanded increases to Q_2.

Demand for a good varies according to the time period being considered. For example, weekly demand is different from daily, monthly and annual demand. For this reason, the horizontal axis in Figure 3.1 is labelled 'Quantity demanded per period of time'. It is normal practice to use the label 'Quantity' on the horizontal axis of a demand curve diagram, as we do in the rest of this book, but this is an abbreviation. It always refers to a period of time.

TEST YOURSELF 3.1

A woman with an income of £15,000 a year dreams of owning a brand new Bugatti car priced at over £1 million. Explain why this is not an example of effective demand.

SYNOPTIC LINK

A microeconomic demand curve, such as the one illustrated in Figure 3.1, looks very similar to a macroeconomic aggregate demand curve, which is explained in Chapter 10. It is vital that you don't confuse the two. A demand curve represents an individual's demand for a single product, or the total demand for a single product, whereas an aggregate demand curve shows the planned expenditure in all markets in an economy. Likewise, don't confuse demand with consumption, which is a component of aggregate demand, also explained in Chapter 10.

Market demand and individual demand

Normally when economists refer to demand, they mean **market demand**. This is the quantity of a good or service that *all* the consumers in the market wish to, and are able to, buy at different prices. By contrast, **individual demand** is the quantity that a particular individual, such as yourself, would like to buy. The relationship between market and individual demand is simple. Market demand is just the sum of the demand of all the consumers in the market.

KEY TERMS

market demand the quantity of a good or service that all the consumers in a market are willing and able to buy at different market prices.

individual demand the quantity of a good or service that a particular consumer or individual is willing and able to buy at different market prices.

QUANTITATIVE SKILLS 3.1

Worked example: performing a percentage calculation

1 Calculate to 1 decimal place:
- **(a) 14% of £605**
- **(b) 4% of £4 million**
- **(c) 0.035% of £800**

For question (a), multiply £605 by 0.14, which gives the answer £84.70. Similarly, for question (b), multiply £4 million by 0.04, for which the answer is £160,000, and for question (c) multiply £800 by 0.00035, which gives the answer £0.28.

2 Express to 2 decimal places:
- **(a) 35 as a percentage of 450**
- **(b) 17 as a percentage of 130**
- **(c) £6 million as a percentage of £1 billion**

For question (a), divide 35 by 450 and convert into a percentage by multiplying by 100. This gives 7.777 recurring, which to 2 decimal places is 7.78%. Repeat the process for questions (b) and (c), which gives the answers 13.08% and 0.60%.

Shifts of a demand curve

Students often confuse a movement *along* a demand curve and a *shift* of a demand curve. A *movement along a demand curve* takes place only when the good's price changes. Provided the demand curve slopes downwards, a *fall* in price results in *more* of the good being demanded. This is sometimes called an extension of demand. Likewise, a contraction of demand occurs when a *rise* in price leads to *less* being demanded.

When we draw a market demand curve to show how much of the good or service households plan to demand at various possible prices, we assume that all the other variables that may also influence demand are held unchanged or constant. This is the *ceteris paribus* assumption, which means 'other things being equal'. Among the variables whose values are held constant or unchanged when we draw a demand curve are disposable income and tastes or fashion. Collectively, the variables (other than the good's own price) whose values determine planned demand are often called the **conditions of demand**. A change in a condition of demand shifts the demand curve to a new position.

KEY TERMS

condition of demand a determinant of demand, other than the good's own price, that fixes the position of the demand curve.

substitute goods alternative goods that could be used for the same purpose.

complementary goods when two goods are complements, they experience joint demand.

increase in demand a rightward shift of the demand curve.

decrease in demand a leftward shift of the demand curve.

STUDY TIP

You must understand the difference between a movement along a demand or supply curve and a shift of the curve. A movement along either curve implies a change in price alone and leads to an increase or decrease in quantity demanded or supplied. An increase or decrease in demand or supply results from a change in a factor other than price and leads to a change in the position of the curve.

The conditions of demand

The main conditions of demand are:

- the prices of **substitute goods** (or goods in competing demand) (see pages 56 and 70)
- the prices of **complementary goods** (or goods in joint demand) (see page 70)
- personal income (or, more strictly, personal disposable income, after tax and receipt of benefits)
- tastes and preferences
- population size, which influences total market size.

If any of the conditions of demand change, the position of the demand curve changes, shifting either rightwards or leftwards. Figure 3.2 illustrates a rightward shift of the demand curve, which is also called an **increase in demand**, showing that more of the good is demanded at all prices. For example, at a price of P_1, the quantity demanded increases from Q_1 to Q_2. Conversely, a leftward shift of demand (known as a **decrease in demand**) causes the quantity demanded to fall at all prices.

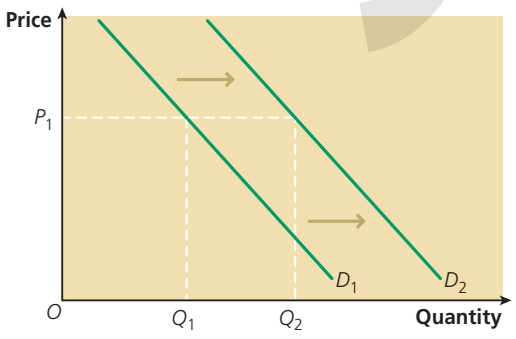


Figure 3.2 The effect of a rightward shift of demand

Events that might cause a rightward shift of a demand curve include:

- an increase in the price of a substitute good or a good in competing demand (see page 69 on the interrelationship between markets)
- a fall in the price of a complementary good or good in joint demand

- an increase in personal disposable income (but see the explanation of normal goods and inferior goods that follows)
- a successful advertising campaign making people think more favourably about the good
- an increase in population size.

TEST YOURSELF 3.2
Household income increases by 3% in a particular year. This causes demand for summer holidays to increase by 5%. Is this an example of an increase in demand or of a movement along a demand curve?

Normal goods and inferior goods

KEY TERMS
normal good a good for which demand increases as income rises and demand decreases as income falls.
inferior good a good for which demand decreases as income rises and demand increases as income falls.

When disposable income increases, demand for a good increases if the good is a **normal good**. However, some goods are examples of an **inferior good**, for which demand decreases as income increases.

To take an example, private car transport and bus travel are not just substitutes for each other. As people's incomes rise, demand for cars generally increases, while, at the same time, demand for bus travel usually falls. If people respond in this way to changes in income then private transport is a normal good, but certain forms of public transport are inferior goods. For an individual, whether a good is normal or inferior depends on personal income, tastes and, possibly, age. For young children, junk food such as sweets is usually a normal good, but later in life, tastes change and sweets may become an inferior good.

If a good is a normal good, an increase in income shifts the good's demand curve to the right. However, if the good is inferior for most people, its demand curve shifts to the left when income increases.


Junk food may be a normal good for a child and an inferior good for an adult

EXTENSION MATERIAL

Must demand curves always slope downwards?

Demand curves don't have to slope downwards, though they usually do. However, there are circumstances in which a demand curve may be horizontal or vertical, or indeed slope upwards, showing that more is demanded as the good's price increases.

There are a number of possible explanations for upward-sloping demand curves. Some of these are as follows:

- **Speculative demand.** If the price of a good such as housing, shares or a foreign currency starts to rise, people may speculate that in the near future the price will rise even further. In this situation, demand is likely to increase. In the case of house prices, young people who wish to become first-time buyers may scramble to buy houses even when prices are rising, fearing that if they wait, they may never be able to afford to get on the 'housing ladder'.
- **Goods for which consumers use price as an indicator of quality.** Consumers may lack accurate

information about the quality of some goods they want to buy, such as second-hand cars and computers. In this situation, a potential buyer may demand more as a good's price rises, believing that a high price means high quality.

- **Veblen goods.** Some companies try to sell their goods based on the fact that they cost more than those of their competitors. Veblen goods, named after the Norwegian-American economist Thorstein Veblen, are goods of exclusive or ostentatious consumption, or 'snob' goods. They are sometimes called positional goods, though strictly speaking, a positional good is so scarce that few people can ever acquire it. Some people wish to consume Veblen goods, such as Ferrari cars, as a signal of their wealth. The 'reassuringly expensive' advertising campaign for Stella Artois beer is another good example. Until around 2007 Interbrew, the Belgian company (now part of AB InBev) that then owned the Stella brand, decided to sell its beer as a premium brand. Interbrew hoped that high prices would attract more customers. However, if you look at the prices of Stella beer today, you will find that AB InBev has now changed tack, selling its beer on a 'stack 'em high, sell 'em fast' principle, at discounted prices.

SECTION 3.1 SUMMARY

- Demand means effective demand, based on ability as well as willingness to pay.
- A market demand curve shows how much of a good all the consumers in the market intend to buy at different prices.
- For most goods, demand curves slope downwards.
- The conditions of demand fix the position of the demand curve.
- If any of the conditions of demand change, the demand curve shifts to a new position.
- Movements along a demand curve must not be confused with a shift in the position of the curve.

3.2 Price, income and cross elasticities of demand

The meaning of elasticity

KEY TERM
elasticity the proportionate responsiveness of a second variable to an initial change in the first variable.

Whenever a change in one variable (such as a good's price) causes a change to occur in a second variable (such as the quantity of the good that households are prepared to demand), an **elasticity** can be calculated. The elasticity measures the proportionate responsiveness of the second variable to the change in the first variable. For example, if a 5% increase in price were to cause households to reduce their demand by more than 5%, demand would be elastic. In this example, a change in price induces a more than proportionate response by consumers. But if the response were less than a reduction of 5%, demand would be inelastic. And if the change in price were to induce exactly the same proportionate change in demand, demand would be neither elastic nor inelastic — this is called unit elasticity of demand.

Elasticity is a useful descriptive statistic of the relationship between two variables because it is independent of the units, such as price and quantity units, in which the variables are measured.

Although, in principle, economists could calculate a great many elasticities for all the economic relationships in which they are interested, the three demand elasticities you must know are:

- price elasticity of demand
- income elasticity of demand
- cross elasticity of demand.

The following formulae are used for calculating these elasticities:

$$\text{price elasticity of demand} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

$$\text{income elasticity of demand} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}$$

$$\text{cross-elasticity of demand} = \frac{\text{percentage change in quantity of A demanded}}{\text{percentage change in price of B}}$$

STUDY TIP

Remember that elasticities are calculated by dividing the percentage change in quantity demanded (or supplied) by the percentage change in the variable that caused the change.

Price elasticity of demand

KEY TERM

price elasticity of demand measures the extent to which the demand for a good changes in response to a change in the price of that good.

Price elasticity of demand measures consumers' responsiveness to a change in a good's price. (It is sometimes called 'own price' elasticity of demand to distinguish it from cross-elasticity of demand for good A with respect to the price of B, which measures the responsiveness of demand for a particular good to a change in the price of a completely different good.)

STUDY TIP

You should apply elasticity analysis when assessing the effects of a shift of a demand or supply curve. The extent to which the good's price or equilibrium level of output changes depends on the price elasticity of the curve that has not shifted. For example, when the supply curve shifts leftwards, the price elasticity of the demand curve determines the extent to which the good's price and quantity change.

TEST YOURSELF 3.3

When the price of a small car is £15,000, there are 100,000 people in the UK who wish to buy it. When the price falls to £10,000, the number wanting to buy the car rises to 200,000. What does this information tell you about the market for small cars in the UK?

Infinite and zero price elasticity of demand

Horizontal and vertical demand curves have constant elasticities at all points on the curve. A horizontal demand curve, such as the demand curve in Figure 3.3(a), is infinitely elastic or perfectly elastic. At the other extreme,

the vertical demand curve in Figure 3.3(b) is completely inelastic or perfectly inelastic, displaying a zero price elasticity of demand at all points on the curve. When the price falls, for example from P_1 to P_2, the quantity demanded is unchanged.

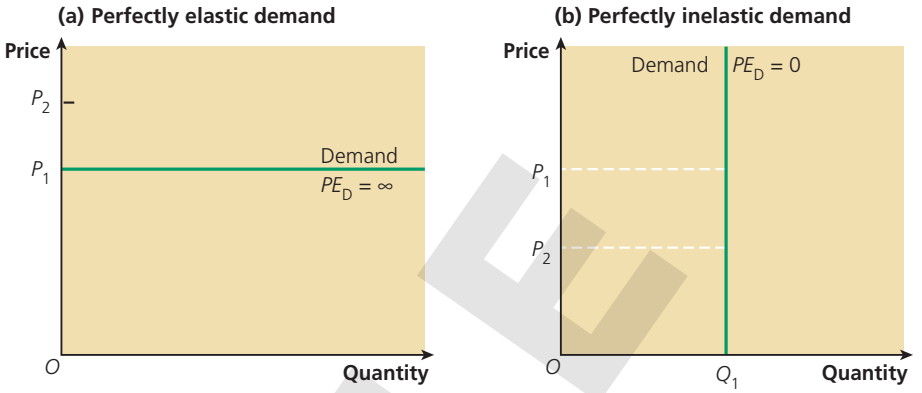


Figure 3.3 Horizontal and vertical demand curves

Figure 3.4 summarises the five demand curves you need to know.

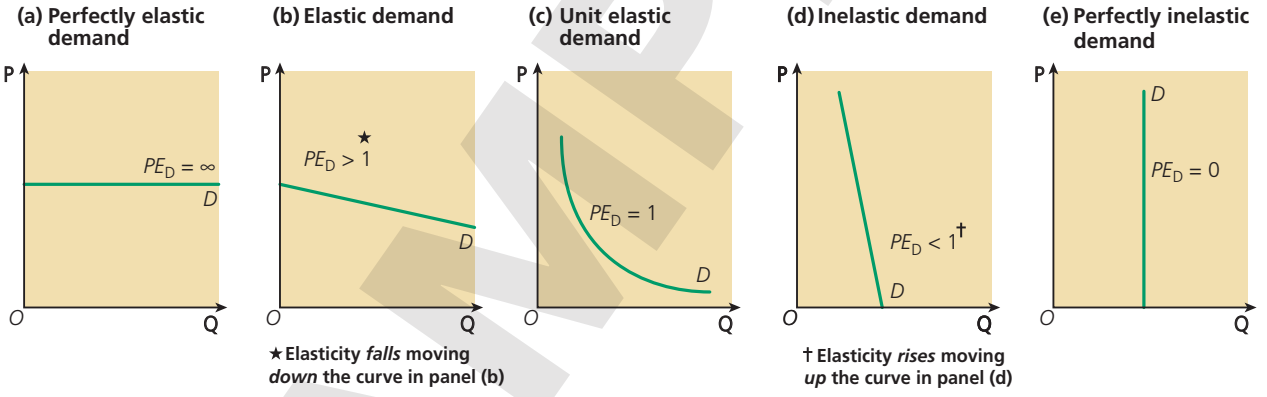


Figure 3.4 Five demand curves you need to know

Factors determining price elasticity of demand

Substitutability

Substitutability is the most important determinant of price elasticity of demand. When a substitute exists for a product, consumers respond to a price rise by switching expenditure away from the good and buying a substitute whose price has not risen. When very close substitutes are available, demand for the product is highly elastic. Conversely, demand is likely to be inelastic when no substitutes or only poor substitutes are available.

Percentage of income

The demand curves for goods or services on which households spend a large proportion of their income tend to be more elastic than those of small items that account for only a small fraction of income. This is because, for items on which only a very small fraction of income is spent, particularly for those which are rarely purchased, people hardly notice the effect of a change in price on their income. The same is not true for 'big-ticket' items such as a new car or an overseas holiday.

Necessities or luxuries

It is sometimes said that the demand for necessities is price inelastic, whereas the demand for luxuries is elastic. This statement should be treated with caution. When no obvious substitute exists, demand for a luxury good may be inelastic, while at the other extreme, demand for particular types of basic foodstuff is likely to be elastic if other staple foods are available as substitutes. It is the existence of substitutes that really determines price elasticity of demand, not the issue of whether the good is a luxury or a necessity.

The 'width' of the market definition

The wider the definition of the market under consideration, the lower the price elasticity of demand. Thus the demand for the bread produced by a particular bakery is likely to be more elastic than the demand for bread produced by all bakeries. This is because the bread baked in other bakeries provides a number of close substitutes for the bread produced in just one bakery. And if we widen the possible market still further, the elasticity of demand for bread produced by all the bakeries will be greater than that for food as a whole.

Time

The time period in question will also affect the price elasticity of demand. For many goods and services, demand is more elastic in the **long run** than in the **short run** because it takes time to respond to a price change. For example, if the price of an electric-powered car falls relative to the price of a petrol-engine car, it will take time for motorists to respond because they will be 'locked in' to their existing investment in petrol-engine cars.

In other circumstances, the response might be greater in the short run than in the long run. A sudden rise in the price of petrol might cause motorists to economise in its use for a few weeks before getting used to the price and drifting back to their old motoring habits.

KEY TERMS

short run the time period in which at least one factor of production is fixed and cannot be varied.

long run the time period in which no factors of production are fixed and all the factors of production can be varied.

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.1

Elasticity and tobacco taxation

Various studies have calculated the price elasticity of demand for cigarettes of different groups in society, such as the young and the old, and men and women.

A World Bank review concluded that price rises of about 10% would on average reduce tobacco consumption by about 4% in richer countries. Smokers in poorer nations tend to be more sensitive to price changes.

Reviewing 86 studies, Gallet and List found a mean price elasticity of –0.48, meaning that, on average, a 10% increase in price will be followed by a decrease in consumption of 4.8%. They also found greater responsiveness among younger people, with an average price elasticity of –1.43 for teenagers, –0.76 for young adults and –0.32 for adults. They found an average price sensitivity of –0.50 for men and –0.34 for women. Studies have also tended to show greater price sensitivity among low-income groups.

Follow-up questions

1. What is the formula which is used for calculating price elasticity of demand?
2. Name the other two types of elasticity of demand besides price elasticity of demand.
3. Suggest two reasons why adult smokers may be less responsive to a rise in the price of cigarettes than teenage smokers.
4. Most of the elasticity statistics quoted above lie between zero and –1. Discuss the significance of this for governments.

QUANTITATIVE SKILLS 3.2

Worked example: performing an elasticity calculation

People's average incomes fall from £1,000 a week to £600 a week. As a result, demand for potatoes increases from 1 million tonnes to 1.2 million tonnes a week. Calculate the income elasticity of demand for potatoes.

The formula for calculating income elasticity of demand is:

$$\text{income elasticity of demand} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}$$

The percentage change in quantity demanded is +20%. The percentage change in income is –40%. Placing these figures into the formula:

$$\text{income elasticity of demand} = \frac{+20\%}{-40\%} = -0.5$$

The minus sign indicates that the good is an inferior good. The number 0.5 indicates that demand is inelastic.

Price elasticity of demand, total consumer expenditure and firms' total revenue

As an alternative to using the formula to calculate price elasticity of demand between two points on a demand curve, a simple rule can be used to determine the general nature of the elasticity between the two points:

- If total consumer expenditure increases in response to a price fall, demand is elastic.
- If total consumer expenditure decreases in response to a price fall, demand is inelastic.
- If total consumer expenditure remains constant in response to a price fall, demand is neither elastic nor inelastic, i.e. elasticity = unity (or since the demand curve slopes downwards, the elasticity is minus unity or –1).

Consider, for example, Figure 3.5, which shows an elastic demand curve D. At price P_1, total consumer expenditure is shown by the rectangle bounded by P_1, a, Q_1 and O. When the price falls to P_2, the consumer expenditure rectangle changes to the area bounded by P_2, b, Q_2 and O. Clearly, the second of these rectangles is larger than the first rectangle, so total consumer expenditure increases, following a fall in price, when the demand curve is elastic.

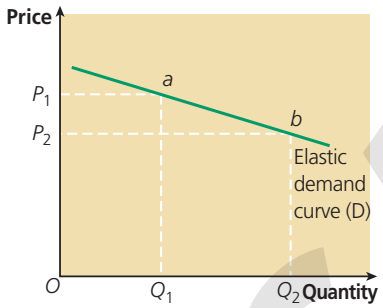


Figure 3.5 The effect of a price fall on total consumer expenditure when demand is elastic

STUDY TIP

Total consumer expenditure is exactly the same as firms' total sales revenue, so if we prefer, we can state the rule in terms of revenue rather than consumer expenditure.

EXTENSION MATERIAL

The slope of a demand curve and its elasticity

Although economists typically illustrate price elastic demand with a shallow-sloping demand curve and price inelastic demand with a steep one, it is interesting to note that the elasticity of demand varies along the length of a demand curve. Take a careful look at the two demand curves in Figure 3.6. In Figure 3.6(a), a straight line (or linear) demand curve has been drawn. Obviously, a straight line has a constant slope. But although the slope is the same at all points on the curve, the elasticity is not.

Moving along a linear downward-sloping demand curve, the price elasticity of demand falls from point to point along the curve. Demand is elastic (or greater than unity) at all points along the top half of the curve. Elasticity equals unity exactly half way along the curve, falling below unity and towards zero along the bottom half of the curve.

If elasticity falls from point to point moving down a linear demand curve, it follows that a non-linear curve (i.e. a curved line) is needed to show the same elasticity at all points on the curve. Figure 3.6(b) shows a demand curve with a constant elasticity of 1 at all points on the curve: that is, elasticity equals unity at all points on the curve. Mathematicians call this a rectangular hyperbola. Whenever the price falls, the proportionate change in quantity demanded exactly equals the proportionate change in price. In this case, consumer expenditure remains unchanged following a rise or fall in price.

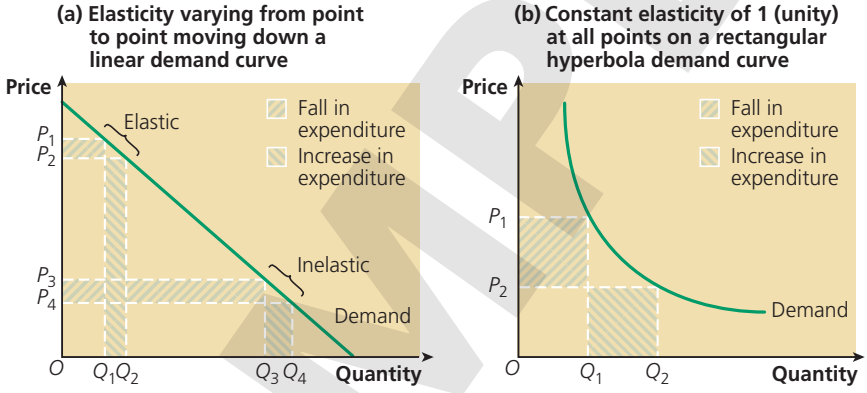


Figure 3.6 Price elasticity of demand and the slope of the demand curve

TEST YOURSELF 3.4
Draw a diagram to illustrate what happens to total consumer expenditure in the event of a price fall when the demand curve is inelastic.

Income elasticity of demand

KEY TERM
income elasticity of demand measures the extent to which the demand for a good changes in response to a change in income; it is calculated by dividing the percentage change in quantity demanded by the percentage change in income.

The nature of **income elasticity of demand** — which measures how demand responds to a change in income — depends on whether the good is a normal good or an inferior good.

When disposable income increases, a demand curve shifts rightwards, but only if the good is a normal good, for which demand increases as income increases. However, some goods are inferior goods, for which demand decreases as income increases, and an increase in income shifts the demand curve leftwards.

Income elasticity of demand is *always* negative for an inferior good and positive for a normal good. This is because the quantity demanded of an inferior good falls as income rises, whereas the quantity demanded of a normal good rises with income.

Normal goods can be further divided into superior goods or luxuries, for which the income elasticity of demand is greater than +1, and necessities, with an income elasticity lying between zero and +1. Although the quantity demanded of a normal good always rises with income, it rises by a greater percentage for a superior good (such as a luxury car). Conversely, demand for a basic good or necessity such as shoe polish rises by a smaller percentage than income.

TEST YOURSELF 3.5
The UK's income elasticity for overseas holidays is +1.6. What does this tell you about UK demand for overseas holidays?

The size and sign (positive or negative) of income elasticity of demand affect how a good's demand curve shifts following a change in income.

Cross elasticity of demand

KEY TERM
cross elasticity of demand measures the extent to which the demand for a good changes in response to a change in the price of another good; it is calculated by dividing the percentage change in quantity demanded by the percentage change in the price of another good.

Cross elasticity of demand (or cross-price elasticity of demand) measures how the demand for one good responds to changes in the price of another good. The cross elasticity of demand between two goods or services indicates the nature of the demand relationship between the goods. There are three possibilities:

- complementary goods (or joint demand)
- substitutes (or competing demand)
- an absence of any discernible demand relationship.

Cars and petrol or diesel fuel, for example, are complementary goods: they are in joint demand. A significant increase in fuel prices, such as the 30.7% increase in petrol prices in the year to March 2022, will have some effect on the demand for cars, though the effect may not be great. By contrast, private car travel and bus travel are substitute goods. A significant increase in the cost of running a car will cause some motorists to switch to public transport — provided its price does not rise by a similar amount as well.

As with the case of income elasticity of demand, the size and sign (positive or negative) of cross elasticity of demand affect how a good's demand curve shifts following, in this case, a change in the price of another good. For example, a cross elasticity of demand of +0.3 for bus travel with respect to the price of running a car indicates that a 10% increase in the cost of private motoring would cause the demand for bus travel to increase by just 3%. For most demand relationships between two goods, cross elasticities of demand are inelastic rather than elastic, both when the goods are in joint demand and when they are substitutes.

Complementary goods, or goods which are demanded together, such as bicycles and bike lamps, have negative cross elasticities of demand. A rise in the price of one good leads to a fall in demand for the other good. Suppose, for example, that the cross elasticity of demand for bike lamps with respect to the price of new bicycles is –0.5: this tells us that a 10% increase in the price of a new bicycle leads to a 5% fall in the demand for bike lamps.

By contrast, the cross elasticity of demand between two goods which are substitutes for each other is positive. A rise in the price of one good causes demand to switch to the substitute good whose price has not risen. Demand for the substitute good increases. For example, a new bicycle and a new motor scooter are substitutes for each other. If the cross elasticity of demand for a new

TEST YOURSELF 3.6
The price of a gaming console for a particular games provider rises by 30%. In subsequent years, the demand for games cartridges for this system falls by 10%. What does this tell you about the cross elasticity of demand between the two products?

bicycle with respect to the price of a motor scooter is +0.4, this tells us that a 10% increase in the price of a new motor scooter will lead to a 4% increase in the demand for new bicycles as consumers switch between the two types of private transport.

If we select two goods at random — for example, pencils and suitcases — the cross elasticity of demand between the two goods will be zero. When there is no discernible demand relationship between two goods, a rise in the price of one good will have no measurable effect upon the demand for the other. The cross elasticity of demand is zero, unless, of course, both items make up an important part of household expenditure.

STUDY TIP
Elasticity basically means responsiveness. Demand elasticities measure how consumers respond to a change in a good's price, income, or the price of another good. You should learn the formulae for each type of elasticity — for example, income elasticity of demand — and avoid making three basic mistakes when using them. The mistakes are:

- missing out the word 'percentage' (or the % sign) from the formula
- writing the formula 'upside down'
- confusing the different elasticities.

SECTION 3.2 SUMMARY

- Elasticity means responsiveness.
- There are three important demand elasticities: price, income and cross elasticity of demand.
- The slope of a demand curve is not the same as price elasticity of demand.
- It is important to understand the determinants of all the elasticities you need to know.
- It is important to learn all the elasticity formulas, and not confuse them.
- You should be able to interpret elasticity statistics.

3.3 The supply of goods and services

Market supply

KEY TERM
market supply the quantity of a good or service that all the firms in a market plan to sell at given prices in a given period of time.

Normally when economists refer to supply, they mean market supply. **Market supply** is the quantity of a good or service that all the firms or producers in the market plan to sell at different prices. By contrast, supply by a single firm is the quantity that a particular firm within the market would like to sell. As with demand, the relationship between the two is simple. Market supply is just the sum of the supply of all the firms or producers in the market at different market prices.

Figure 3.7 shows a market supply curve which indicates that as a good's price rises, more is supplied. If the price starts off low, for example at P_1, firms are willing to supply Q_1. But if the price rises to P_2, planned supply increases to Q_2.

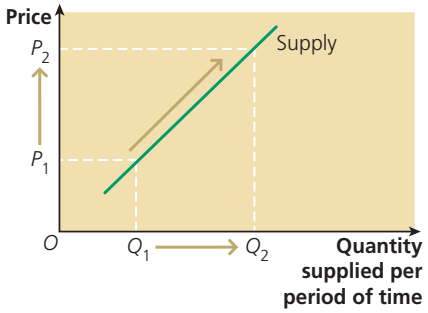


Figure 3.7 A market supply curve

The main reason for upward-sloping supply curves stems from the profit-maximising objective which economists assume firms have. If we assume that a firm always aims to make the biggest possible profit, it follows that a firm will only want to supply more of a good if it is profitable to do so.

For a firm, **profit** is the difference between the **total revenue** the firm receives when selling the goods or services it produces and the costs of producing the goods. Assuming firms do not change their size or scale, the cost of producing extra units of a good generally increases as firms produce more of the good. As a result, it is unprofitable to produce and sell extra units of a good unless the price rises to compensate for the extra cost of production. Rising prices will also encourage new firms to enter the market. The result is the upward-sloping market supply curve we have illustrated.

As with demand, the supply of a good varies according to the time period being considered. Hence the words 'Quantity supplied per period of time' on the horizontal axis in Figure 3.7. In later diagrams, this is shortened to 'Quantity'. But again, as with demand, remember that this is an abbreviation.

KEY TERMS

profit the difference between total sales revenue and total costs of production.

total revenue all the money received by a firm from selling its total output.

TEST YOURSELF 3.7

A farmer sells 100 sheep at a price of £20 per sheep. What is the farmer's total revenue and why is this not the same as the farmer's profit?

SYNOPTIC LINK

Microeconomic supply curves look very similar to aggregate supply curves, which are explained in Chapter 10. Don't confuse the two. Microeconomic supply curves show the willingness of individual firms or the total number of firms in one market to supply a single product, whereas aggregate supply curves show the total planned output of all firms in an economy taken together.

Shifts of a supply curve

Earlier in the chapter, we saw that a market demand curve shows how much all the consumers in the market plan to buy at different prices of the good, assuming all the other factors that influence demand remain constant. These 'other factors' were called the conditions of demand and we explained how, if any of them change, the demand curve shifts to a new position.

In exactly the same way, a market supply curve shows the quantities of the good that all the firms in the market plan to supply at different possible prices, assuming the **conditions of supply** remain unchanged. Again, if the *ceteris paribus* assumption no longer holds, one or more of the conditions of supply change and the supply curve shifts to a new position.

KEY TERM

condition of supply a determinant of supply, other than the good's own price, that fixes the position of the supply curve.

The conditions of supply

The main conditions of supply are:

- costs of production, including
  - wage costs
  - raw material costs

KEY TERMS

increase in supply a rightward shift of the supply curve.

decrease in supply a leftward shift of the supply curve.

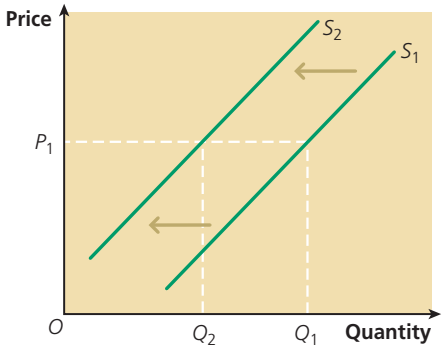


Figure 3.8 A leftward shift of the supply curve

- energy costs
- costs of borrowing
- technical progress
- taxes imposed on firms, such as VAT, excise duties and the business rate
- subsidies granted by the government to firms.

As we have noted, if any of the conditions of supply change, the supply curve shifts to a new position. As with demand, a rightward shift of supply is known as an **increase in supply**, whereas a leftward shift is known as a **decrease in supply**. An increase in wage costs, which for many firms are the most important cost of production, shifts the supply curve leftwards (or upwards). Firms reduce the quantity of the good they are prepared to supply because production costs have risen. For example, when the price is P_1 in Figure 3.8, a leftward shift of supply from S_1 to S_2 causes the quantity firms are prepared to supply to fall from Q_1 to Q_2. An expenditure tax such as VAT imposed by the government on firms would have a similar effect to an increase in costs of production.

Supply curves tend to shift rightwards when technical progress occurs, reducing production costs, or when firms enter the market. A subsidy given to firms by the government, being similar to a reduction in costs of production, would also shift the supply curve to the right.

TEST YOURSELF 3.8

Having set the price of bread at £3 a loaf, bread shops bake 10 million loaves, which they then try to sell. However, 8 million of these loaves remain unsold. What is likely to happen next in the bread market?

EXTENSION MATERIAL

Expenditure taxes and subsidies

A supply curve shifts leftwards (or upwards) when the government imposes an expenditure tax such as customs and excise duties or VAT on firms. From a firm's point of view, the tax is similar to a rise in production costs. Firms try to pass the tax on to consumers by increasing the price of the good. For this reason, expenditure taxes provide examples of indirect taxes. The higher price charged means consumers indirectly pay the tax, even though the firms and not the consumers pay the tax to the government.

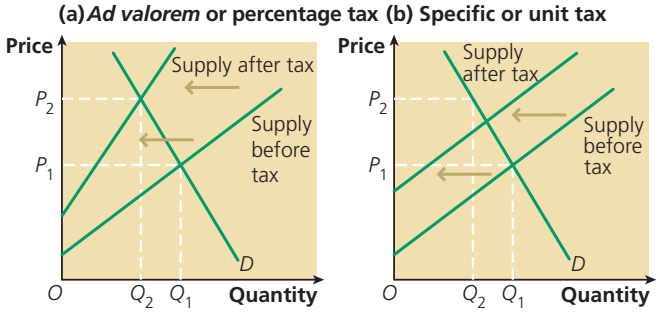


Figure 3.9 An expenditure tax shifting a supply curve

How the supply curve shifts depends on whether the tax that firms are forced to pay is an *ad valorem* tax or a specific tax. In the case of an *ad valorem* tax such as VAT, which is levied at the same percentage rate (e.g. 20%) on the price, the new supply curve is steeper than the old supply curve. This is shown in Figure 3.9(a). If a good is priced at £1, 20% of the price without the tax is 20p. However, if the price of a good is £2, the government collects 40p of tax revenue for each unit of the good sold.

But in the case of a specific tax or unit tax, such as the excise duty levied on tobacco, the tax levied does not depend on the good's price. Because of this, the new and old supply curves are parallel to each other, separated, as Figure 3.9(b) illustrates, by the size of the tax levied on each unit of the good. When an indirect tax is imposed on a good, the supply curve shifts vertically upwards by the amount of the tax.

A subsidy given by the government to producers has the opposite effect to an expenditure tax; it shifts the supply curve to the right. In the case of

a specific subsidy, which is illustrated in Figure 3.10, the sum of money paid to firms for each unit of the good produced is the same whatever the price of the good and hence the vertical distance between the two supply curves equals the subsidy per unit. By contrast, the size of the subsidy would vary if the subsidy were dependent on the price of the good.

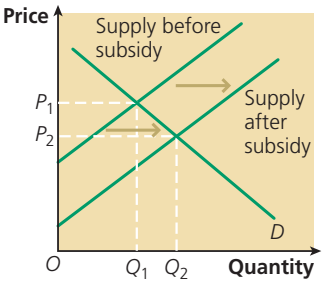


Figure 3.10 A specific or unit subsidy shifting a supply curve

TEST YOURSELF 3.9

Suppose the government subsidises private education by giving parents £5,000 a year if their child attends a private school. Would this shift the demand curve for, or the supply curve of, private education? Justify your answer.

SECTION 3.3 SUMMARY

- A market supply curve shows how much of a good all the firms in the market intend to supply at different prices.
- Supply curves usually slope upwards because higher prices lead to higher profits, encouraging existing firms to produce more and attracting new firms into the market.
- The conditions of supply fix the position of the supply curve.
- If any of the conditions of supply change, the supply curve shifts to a new position.
- Movements along a supply curve must not be confused with a shift in the position of the curve.

3.4 Price elasticity of supply

KEY TERM
price elasticity of supply measures the extent to which the supply of a good changes in response to a change in the price of that good.

In contrast to demand elasticities explained earlier in the chapter, there is only one supply elasticity you need to know. This is **price elasticity of supply**, which measures how the supply of a good responds to an initial change in a good's price.

The formula for price elasticity of supply is:

$$\text{price elasticity of supply} = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}}$$

Just as with demand curves, you must not confuse the *slope* of a supply curve with its *elasticity*. Upward-sloping *straight-line* (linear) supply curves display the following price elasticities:

- If the supply curve intersects the price axis, the curve is elastic at all points, though elasticity falls towards unity as you move from point to point up the curve.
- If the supply curve intersects the quantity axis, the curve is inelastic at all points, though elasticity rises towards unity as you move from point to point up the curve.
- If the supply curve passes through the origin, elasticity equals unity (+1) at all points on the curve.

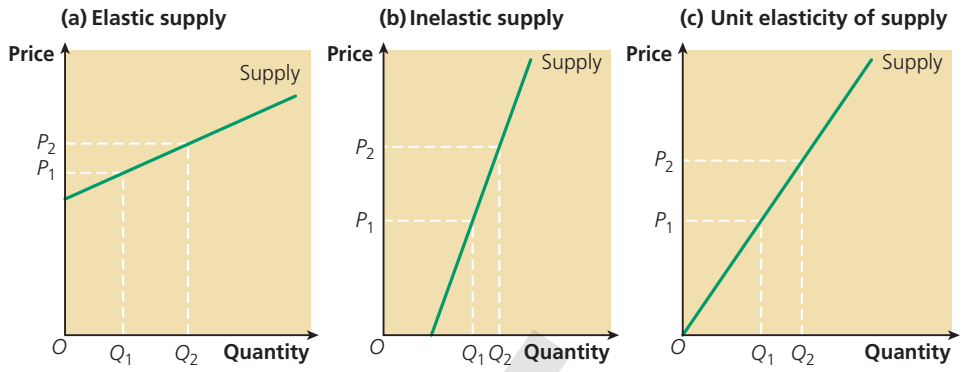


Figure 3.11 Price elasticity of supply and linear supply curves

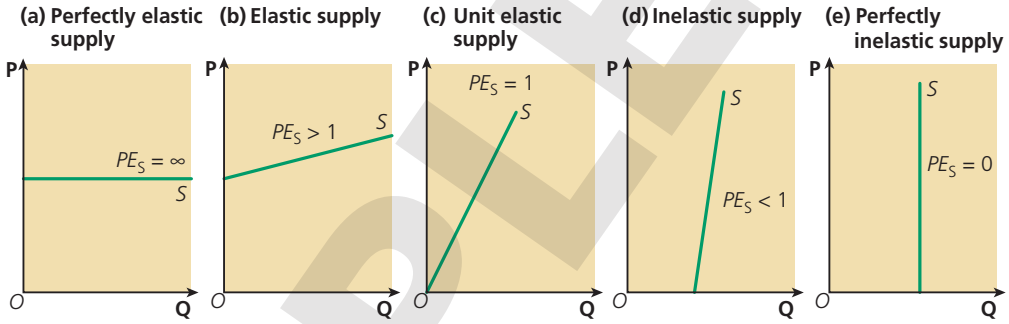


Figure 3.12 The five linear supply curves you should know

TEST YOURSELF 3.10

If the price of a good with a price elasticity of supply of 2.5 increases by 10%, the quantity supplied will:

A fall by 25%

B rise by 25%

C fall by 40%

D rise by 0.4%

Explain your answer.

STUDY TIP

You should understand why price elasticity of supply is usually positive and why price elasticity of demand is usually negative. This is because we assume that a standard demand curve slopes downwards left to right, showing that as the price of a product falls, the quantity demanded increases. Conversely, a standard supply curve slopes upwards left to right, showing that an increase in the price of a product usually leads to an increase in the quantity supplied.

The factors determining price elasticity of supply

The length of the production period

If firms can convert raw materials into finished goods very quickly (e.g. in just a few hours or days), supply will tend be more elastic than when several months are involved in production, as with many agricultural goods.

The supply of most agricultural goods is price inelastic

The availability of spare capacity

When a firm possesses spare capacity, and if labour and raw materials are readily available, production can generally be increased quickly in the short run.

The ease of accumulating stocks

When stocks of unsold finished goods are stored at low cost, firms can respond quickly to a sudden increase in demand. Alternatively, firms can respond to a price fall by diverting current production away from sales and into stock

accumulation. The ease with which stocks of raw materials or components can be bought from outside suppliers and then stored has a similar effect.

The ease of switching between alternative methods of production

When firms can quickly alter the way they produce goods — for example, by switching between the use of capital and labour — supply tends to be more elastic than when there is little or no choice. In a similar way, if firms produce a range of products and can switch raw materials, labour or machines from one type of production to another, the supply of any one product tends to be elastic.

The number of firms in the market and the ease of entering the market

Generally, the more firms there are in the market, and the greater the ease with which a firm can enter or leave, the greater the elasticity of supply.

Time

We have already noted that demand is more elastic in the long run than in the short run because it takes time to respond to a price change. The same is true for supply. Figure 3.13 shows three supply curves of increasing elasticity, S_1, S_2 and S_3, which illustrate respectively market period supply, short-run supply and long-run supply.

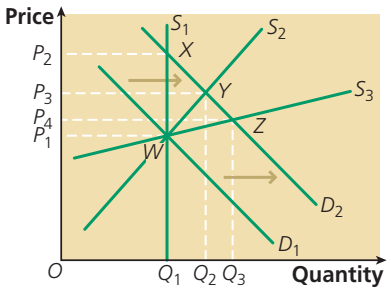


Figure 3.13 The effect of the time period upon price elasticity of supply

- **Market period supply.** The market period supply curve S_1 is shown by a vertical line. S_1 depicts the situation facing firms following a sudden and unexpected rightward shift of demand from D_1 to D_2. When surprised by a sudden increase in demand, firms cannot immediately increase output. In the market period, supply is completely inelastic, and the price rises from P_1 to P_2 to eliminate the excess demand brought about by the rightward shift of the demand curve.
- **Short-run supply.** The higher price means that higher profits can be made, creating the incentive for firms to increase output. In the short run, firms increase output by hiring more variable factors of production, such as labour. The short-run increase in output is shown by the movement up the short-run supply curve, S_2. The short-run supply curve is more elastic than the market period supply curve, S_1. In the short run, supply increases to Q_2, and the price falls from P_2 to P_3.
- **Long-run supply.** If firms believe the increase in demand will be long-lasting, and not just a temporary phenomenon, they may increase the scale of production by employing more capital and other factors of production that are fixed in the short run, but variable in the long run. When this happens, firms move along the long-run supply curve S_3. Output rises to Q_3 and the price falls once again, in this case to P_4.

STUDY TIP

You should understand why, for most goods, both the demand curve and the supply curve are more price elastic in the long run than in the short run.

In a competitive industry with low or non-existent barriers to entry, elasticity of supply is greater in the long run than in the short run, because in the long run firms can enter or leave the market. Short-run supply is less elastic because supply is restricted to the firms already in the industry.

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.2

Housing market elasticities in the UK

UK households have an income elasticity of demand for housing that exceeds +1. However, demand for housing is price inelastic. These demand elasticities, combined with a low price elasticity of supply for housing, push the UK's housing market towards long-term rising prices.

To prevent rapid price rises, new housing would need to have a price elasticity of supply of +10 for supply to equal demand in the long term. But if the price elasticity of supply for new housing remains low, as Table 3.1 shows, house prices will never be stable in the UK when the demand for housing is increasing. Prices are also likely to be unstable when both demand and supply are highly price inelastic.

Table 3.1 Price elasticity of supply in the housing market for different countries

Country	Price elasticity of supply
Canada	+1.2
UK	+0.4
USA	+2.0
France	+0.3
Ireland	+0.6

Follow-up questions

1 State the formula used for measuring price elasticity of supply.
2 Distinguish between the slope and the elasticity of a supply curve.
3 Suggest why the price elasticity of supply of new houses is lower in the UK than in the USA.
4 'To prevent rapid price rises, new housing would need to have a price elasticity of supply of +10 for supply to equal demand in the long term.' Explain this statement.

EXTENSION MATERIAL

A closer look at perfectly elastic demand and supply

Figure 3.14 shows a perfectly elastic demand curve and a perfectly elastic supply curve. (These can also be labelled infinitely elastic demand and infinitely elastic supply.) Although the two parts of Figure 3.14 appear to be identical (apart from the labels), this is misleading. The apparent similarity disguises a significant difference between perfectly elastic demand and perfectly elastic supply. In Figure 3.14(a), demand is infinitely elastic at all prices on or *below* the demand curve, though if the price rises *above* the demand curve (e.g. from P_1 to P_2), the amount demanded immediately falls to zero. This is because perfect substitutes are available when demand is perfectly price elastic. Customers cease to buy the good as soon as the price rises *above* the demand curve, switching spending to the perfect substitutes whose prices have not changed.

By contrast, in Figure 3.14(b), supply is infinitely elastic at all prices on or *above* the supply curve, though if the price falls *below* the supply curve (e.g. from P_1 to P_2), the amount supplied immediately drops to zero. P_1 is the minimum price acceptable to firms. If they are paid this price (or any higher price), firms stay in the market. The incentive to stay in the market disappears at any lower price and firms leave the market, unable to make sufficient profit.

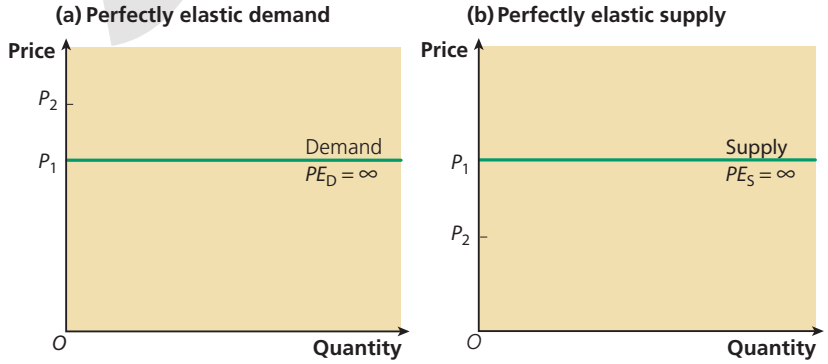


Figure 3.14 Perfectly price elastic demand and supply curves

TEST YOURSELF 3.11
Draw a diagram which shows a demand curve shifting rightwards along a supply curve with a zero price elasticity of supply. Explain what happens to the equilibrium price and quantity. Suggest a real-world market which the diagram illustrates.

SECTION 3.4 SUMMARY
- There is only one supply elasticity you need to know: price elasticity of supply.
- The slope of a supply curve is not the same as price elasticity of supply.
- It is important to understand the determinants of price elasticity of supply.
- You should be able to interpret price elasticity of supply statistics.

3.5 The determination of equilibrium market prices

The interaction of demand and supply

We now bring together the market demand and market supply curves explained earlier in the chapter to see how the equilibrium price is achieved in a competitive market within the economy. The market we will look at is the tomato market. Its essential features are shown in Figure 3.15.

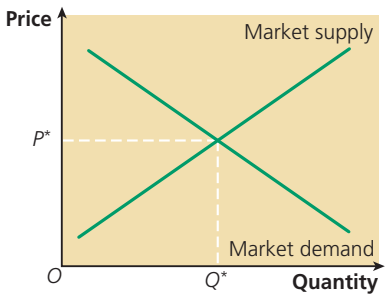


Figure 3.15 Market equilibrium in the tomato market

The market demand curve in Figure 3.15 shows how many tomatoes all the consumers in the market plan to purchase at different prices in a particular period of time. The market supply curve shows how many tomatoes all the farmers and firms in the market wish to supply at different prices in the same time period. The equilibrium market price, P^* in Figure 3.15, is located where the market demand curve for tomatoes intersects or cuts through the market supply curve of tomatoes. We will now look at the concept of **equilibrium** (and its opposite, **disequilibrium**) in greater depth.

KEY TERMS
equilibrium a state of rest or balance between opposing forces.
disequilibrium a situation in which opposing forces are out of balance.

Market equilibrium and disequilibrium

The concepts of equilibrium and disequilibrium are important in economic theory and analysis. You should think of equilibrium as a *state of rest* or a *state of balance between opposing forces* and of disequilibrium as a situation of the opposing forces being out of balance. In a market, the opposing forces are supply and demand. **Market equilibrium** in Figure 3.15 occurs where the demand curve and the supply curve cross each other. At price P^*, households *plan* to demand exactly the same quantity of tomatoes that firms *plan* to supply. P^* is therefore the equilibrium price, with Q^* being the equilibrium quantity.

In summary, **market disequilibrium** occurs when:

- planned demand < planned supply, in which case the price falls, or when
- planned demand > planned supply, in which case the price rises.

Market equilibrium occurs when:

- planned demand = planned supply, in which case the price does not change.

KEY TERMS
market equilibrium a market is in equilibrium when planned demand equals planned supply, where the demand curve crosses the supply curve.
market disequilibrium exists at any price other than the equilibrium price, when either planned demand < planned supply or planned demand > planned supply.

SYNOPTIC LINK

Refer back to the mention of 'ruling market price' on page 46. This tends to be the price at market equilibrium.

STUDY TIP

It is important to understand the concepts of equilibrium and disequilibrium in economics. These concepts help to explain why markets move from one state of rest to another. You will come across many other examples besides market equilibrium and disequilibrium. In your later studies, look out for profit-maximising equilibrium, equilibrium wage rate, equilibrium national income (or macroeconomic equilibrium) and balance of payments equilibrium.

TEST YOURSELF 3.12

What is meant by the equilibrium price of a good?

How excess demand and excess supply lead to changes in price

It is impossible at most prices for both households and firms simultaneously to fulfil their market plans. In Figure 3.16, P_1 is a disequilibrium price for tomatoes because the tomato growers and sellers cannot fulfil their plans at this price. When price is P_1 in Figure 3.16, firms would like to supply Q_2, but households are only willing to purchase Q_1.

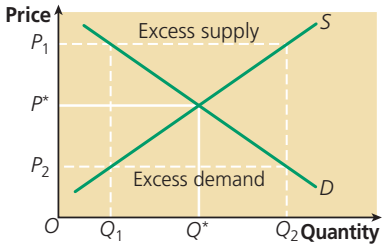


Figure 3.16 Disequilibrium and equilibrium in the tomato market

KEY TERMS

excess supply when firms wish to sell more than consumers wish to buy, with the price above the equilibrium price.

excess demand when consumers wish to buy more than firms wish to sell, with the price below the equilibrium price.

To explain this further, it is useful to divide the market into two 'sides' — the short side and the long side. When the price is P_1, households, or the people wishing to buy tomatoes, are on the short side of the market, while tomato producers are on the long side. The economic agents on the short side can always fulfil their market plans, but those on the long side cannot. Thus, when the price is P_1, households can purchase exactly the quantity of tomatoes they wish to, namely Q_1. Farmers and other tomato producers, however, are in a different situation. They would like to sell Q_2, but can only sell Q_1, as long as the price remains at P_1. The difference between Q_2 and Q_1 is **excess supply** or unsold stock.

The market is also in disequilibrium at price P_2 because households are unable to buy as much as they wish to at this price. Households would like to buy Q_2 tomatoes, but they cannot because at this price tomato producers are only willing to supply Q_1. The situation is now reversed compared to P_1. Tomato buyers are on the long side of the market and farmers and tomato sellers are on the short side. In this case, the difference between Q_2 and Q_1 is **excess demand** or unfulfilled demand. Households end up buying Q_1 tomatoes because this is the maximum quantity that tomato producers are prepared to sell at this price.

How a shift of supply disturbs market equilibrium

Once supply equals demand in a market — for example, at point X in Figure 3.17 — the market remains in equilibrium until an external event hits the market and causes either the market supply curve or the market demand curve to shift to a new position.

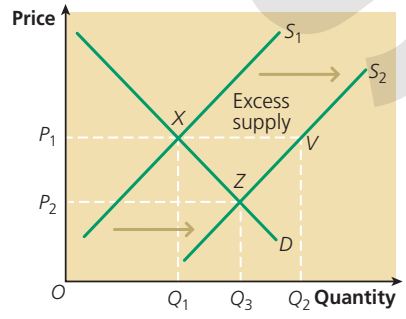


Figure 3.17 The effect of a rightward shift of the market supply curve of tomatoes

Figure 3.17 illustrates what happens in the tomato market when an event such as a bumper harvest causes the supply curve of tomatoes to shift rightwards, from S_1 to S_2. Before the shift of the supply curve,

P_1 was the equilibrium price of tomatoes. However, once the supply curve shifts, P_1 becomes a disequilibrium price. Too many tomatoes are offered for sale at this price, which means there is excess supply in the market. The excess supply is shown by $Q_2 - Q_1$, or the distance between X and V.

To get rid of this unsold stock, tomato producers reduce the price they are prepared to accept. The market price falls from P_1 to P_2, which eliminates the excess supply. In the new equilibrium, planned supply once again equals planned demand, but at the lower equilibrium price of P_2.

TEST YOURSELF 3.13
The equilibrium price for centre court tickets at an international tennis final is £5,000. The official ticket provider sells these tickets for £100. What do you think happens in the second-hand market for tickets to watch the tennis match?

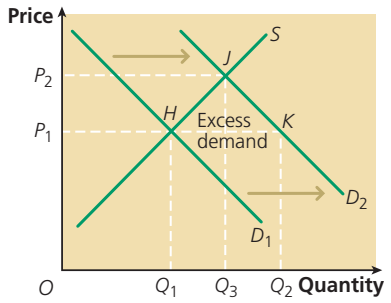


Figure 3.18 The effect of a rightward shift of the market demand curve for tomatoes

STUDY TIP
Make sure you can distinguish between a shift of a supply or demand curve, and the adjustment to a new equilibrium along the curve that does not shift.

How a shift of demand disturbs market equilibrium

Figure 3.18 shows what happens in the market for tomatoes following an increase in consumers' incomes. Tomatoes are usually considered a normal good: that is, a good for which demand increases as income increases. Before the increase in consumers' incomes, the equilibrium price of tomatoes was P_1, determined at the intersection of curves D_1 and S. At this price, planned demand equals planned supply. However, increased incomes shift the market demand curve rightwards from D_1 to D_2. Immediately, disequilibrium replaces equilibrium in the market. The rightward shift of demand creates excess demand in the market, as long as the price remains at P_1. Excess demand is shown by $Q_2 - Q_1$, or the distance between H and K.

The market adjustment mechanism now swings into action to get rid of the excess demand. The price increases to P_2 to eliminate the excess demand, and the quantity of tomatoes bought and sold rises to Q_3. In response to the increase in demand from H to K, there is a movement along the supply curve between H and J (an extension of supply) to establish the new equilibrium.

TEST YOURSELF 3.14
There are 30 million customers and 1 million firms producing the good in a particular market in the UK. Explain why you would classify this market as being competitive or uncompetitive.

SYNOPTIC LINK
See Figure 3.8 on page 59, which shows a leftward shift of a supply curve. This could be caused by the imposition of a specific tax or by a cut in a subsidy previously given to firms.

EXTENSION MATERIAL

How the effect of an expenditure tax depends on elasticity of demand

Figure 3.8, earlier in the chapter, can be used to show what can happen when an expenditure tax is imposed on a particular good. The tax shifts the good's supply curve to the left. From the point of view of the firms that produce and sell the good, the tax has the same effect as a rise in costs of production, such as a rise in wage costs. As is the case with cost increases, by raising the price of the good to cover the tax, firms try to increase the price charged to customers by the full amount of the tax. However, their ability to do this depends on price elasticity of demand for the good or service in question.

Figure 3.19 shows that when demand is relatively elastic, consumer resistance means that some, but not all, of a tax (in this case, a specific tax) is passed on to consumers as a price rise. The tax per unit (labelled T in Figure 3.19) is measured by the vertical distance between S_1 (the supply curve before the tax was imposed) and S_2 (the supply curve after the tax was imposed). Immediately after the imposition of the tax, firms may try to raise the price to $P_1 + T$, passing all the tax on to consumers. However, there is excess supply at this price. To get rid of the excess supply, the price falls to P_2. In the new equilibrium, part, but not all, of the tax has been passed onto consumers as a price rise.

The part of the tax passed on to consumers is called the *shifted incidence* of the tax. The rest of the tax (the *unshifted incidence*) is borne by firms or producers. In Figure 3.19, the total tax revenue paid by firms to the government is shown by the rectangle bounded by heavy black lines. The part of the tax rectangle above what was previously the equilibrium price (P_1), shows the shifted incidence of the tax. The part of the tax rectangle below P_1 shows the unshifted incidence.

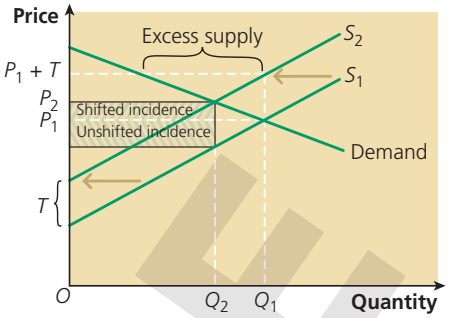


Figure 3.19 Shifting the incidence of a tax when demand is price elastic

You should now draw diagrams similar to Figure 3.19, but with perfectly elastic, relatively inelastic and completely inelastic demand curves. The diagrams will show that firms' ability to pass the incidence of a tax on to consumers as a price rise is greatest when demand is completely inelastic, and non-existent when demand is perfectly elastic.

Students often confuse the effect of an increase in an indirect tax imposed on firms with the effect of a direct tax such as income tax imposed on individuals. Whereas a tax imposed on firms shifts the *supply curve* of a good, income tax shifts the *demand curve* for a good by reducing consumers' incomes. An increase in income tax shifts the demand curve for normal goods leftwards, but if the good is an inferior good, the demand curve shifts rightwards.

Finally, note that subsidies granted to firms have the opposite effect to taxes imposed on them. Subsidies granted to firms shift the supply curve rightwards, showing that firms are prepared to supply more of the good at all prices.

TEST YOURSELF 3.15

Distinguish between an expenditure tax and an income tax. Illustrate on a supply and demand graph the possible effect of an increase in both the percentage rate at which VAT is levied on the good and the rate at which income tax is levied, assuming the good is an inferior good.

STUDY TIP

Many students never really get to grips with microeconomic analysis because they fail to understand the difference between market *plans* and market *action*. Your market plans are what you wish to do when you go shopping. Your market action is what you *end up doing*, i.e. the goods you actually purchase.

QUANTITATIVE SKILLS 3.3

Worked example: calculating the equilibrium price of a good

Table 3.2 shows the demand and supply schedules for chocolate bars.

Table 3.2 Demand and supply schedules for chocolate bars

Price per bar (£)	Quantity of bars demanded per week	Quantity of bars supplied per week
0.75	180	240
0.70	200	200
0.65	220	160
0.60	240	120

As a result of a fall in the price of cocoa beans, the supply of chocolate bars rises by 60 bars at all prices. What is the new equilibrium price of chocolate bars?

According to the table, the initial equilibrium price of chocolate bars is 70p, at which demand and supply are equal at 200 chocolate bars. If 60 more chocolate bars are supplied at each price, following the fall in the cost of manufacturing the bars, 300 bars are supplied at a price of 75p, 260 bars at a price of 70p, and 220 bars at a price of 65p. This is the new equilibrium price because at this price, demand equals supply at 220 bars. The supply curve has shifted upwards by 60 at each price.

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.3

Auctions

In theory, an auction provides a quick and efficient method of establishing equilibrium in a market. Auctions have been brought into many people's everyday lives through sites such as eBay. But they also have a long history spanning many different domains. For example, the US government uses auctions to sell Treasury bills and timber and oil leases, 'auction houses' Christie's and Sotheby's use them to sell art, and Morrell & Co. and the Chicago Wine Company use them to sell wine.

Each bidder has an intrinsic value for the item being auctioned — the bidder is willing to purchase the item for a price up to this value, but not for any higher price.

Three types of auction at which a single item is sold are:

- **Ascending-bid auctions**, also called English auctions. The seller gradually raises the price, bidders drop out until only one bidder remains, and that bidder wins the object at this final price.
- **Descending-bid auctions**, also called Dutch auctions. The seller gradually lowers the price from a high initial value until the first moment when a bidder accepts and pays the current price. These auctions are called Dutch auctions because flowers have long been sold in the Netherlands using this procedure.
- **First-price sealed-bid auctions.** In this kind of auction, bidders submit simultaneous 'sealed bids' to the seller. The terminology comes from the original format for such auctions, in which bids were written down and provided in sealed envelopes to the seller, who would open them all together. The highest bidder wins the object and pays the value of their bid.

Follow-up questions

1 What is meant by 'equilibrium in a market'?
2 What type of auction are eBay auctions?
3 Research another example of a descending-bid auction.
4 In the UK, second-hand or used cars are sometimes sold at auction. Describe another way in which second-hand cars are sold.

SECTION 3.5 SUMMARY

- Market equilibrium occurs at the price at which the demand curve crosses the supply curve: that is, where demand equals supply.
- Disequilibrium occurs when there is either excess demand or excess supply in the market.
- In a competitive market, changes in the market price eliminate excess demand or excess supply; this is how the price mechanism helps to allocate scare resources.

3.6 The interrelationship between markets

So far in this chapter we have looked at how the price mechanism operates in a competitive market. We have seen how shifts of either the demand or supply curve for the good disturb market equilibrium and trigger an adjustment process to establish a new equilibrium.

Shifts of curves are often caused by events taking place in other markets in the economy. On the supply side, they can be caused by a change of price of a good in joint supply (see below). On the demand side, shifts can be caused by a change in price of a good in complementary demand (joint demand) or a substitute good, both of which we have already mentioned. They can also be caused by a change in the price of a good in composite demand or derived demand, as will be explained below.

Joint supply, joint demand, competitive demand, composite demand and derived demand

Joint supply

KEY TERM
joint supply when one good is produced, another good is also produced from the same raw materials, perhaps as a by-product.

Joint supply occurs when production of one good leads to the supply of a by-product. Suppose, for example, that the demand for beef increases, possibly because of rising incomes in economically developing countries. In these countries, meat is a relatively expensive luxury which people tend to buy more of if their incomes rise. The slaughter of more cows to meet this demand leads to production of more cow hides, which increases the supply of leather.

The interrelationship between the beef and leather markets is shown in Figure 3.20. Note that the price of beef *rises* following the rightward shift of the *demand* curve for beef, but the price of leather *falls* following the rightward shift of the *supply* curve of leather. A rise in the price of the first good leads to a shift of the supply curve of the other good in joint supply. In this example, beef is the main product and leather is the by-product, though the relationship could be reversed.

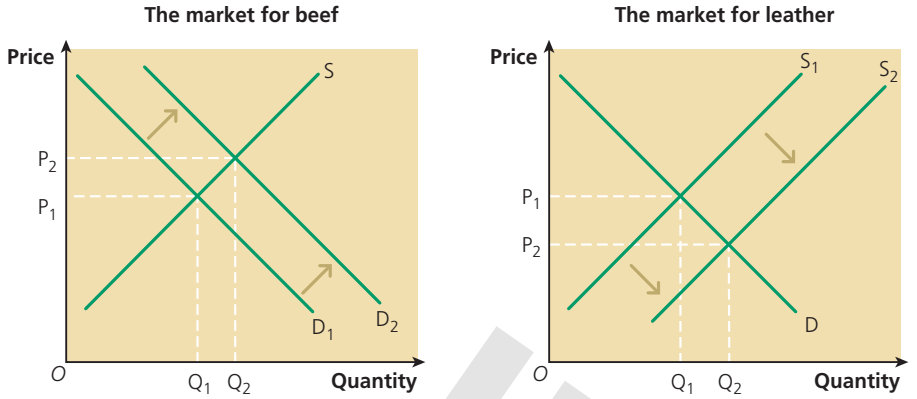


Figure 3.20 The interrelationship between two goods in joint supply

STUDY TIP

Make sure you don't confuse joint supply with *competing* supply, which is related to the concept of composite demand. The relationship between food and biofuel, shown in the Application of Economics in the Real World 3.4 which follows shortly, provides a topical example. Increased demand for biofuels such as ethanol has diverted crop growing away from food supply to the supply of fuel for motor vehicles. Because farmers producing crops such as wheat, maize and sugar can earn a higher price by selling their produce to energy companies, the supply curve of crops for food is shifting leftwards. We will leave it to you to draw appropriate diagrams to illustrate competing supply.

KEY TERMS

competitive demand when a good is viewed by consumers as an alternative for another good, i.e. the two goods are substitutes.

composite demand demand for a good which has more than one use, which means that an increase in demand for one use of the good reduces the supply of the good for an alternative use. It is related to the concept of competing supply.

derived demand demand for a good or factor of production, wanted not for its own sake, but as a consequence of the demand for something else.

TEST YOURSELF 3.16

With the help of two examples, distinguish between joint demand and composite demand.

Joint demand and competitive demand

As noted earlier, an increase in the price of a good in joint demand (or a complementary good) has the opposite effect to an increase in the price of a substitute good (or a good in **competitive demand**). For example, Sony games consoles and Sony games are in joint demand, but Sony and Xbox consoles are in competing demand, so they are substitute goods. Following a significant rise in the price of Sony consoles, demand for them falls, which in turn reduces the demand for Sony games. The demand curve for Sony games shifts leftwards. But the demand curve for Xbox consoles shifts rightwards, assuming that consumers consider an Xbox console to be a good substitute for a Sony console.

Composite demand

Students often confuse competitive demand, which occurs in the case of substitutes, with *composite demand* and *derived demand*. **Composite demand** is demand for a good which has more than one use. An increase in demand for one use of the good reduces the supply of the good for an alternative use: for example, if more wheat is used for biofuel, less is available for food, unless wheat growing increases.

Derived demand

By contrast, **derived demand** for a good occurs when a good is necessary for the production of other goods. The demand for capital goods such as machinery and raw materials is derived from the demand for consumer goods or finished goods. If the demand for cars falls, so does the demand for engines and gear boxes.

STUDY TIP

When you are studying interrelated markets, it is often useful to make use of the concept of cross elasticity of demand. This means you can comment on the extent to which two products are substitutes for, or complements to, each other.

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.4

Composite demand and competing supply: biofuels and food

In recent years, high food prices have led experts to warn of the danger of a global food crisis. Many factors have contributed to the price rises, but the growth in production of biofuels has been one of the most important. Much of US maize production goes into biofuels. In 2022, 8.4% of motor fuels refined in the UK were biofuels, often made from wheat and maize, which are staple foods in the developing world.

Increased demand for biofuels inevitably drives food prices higher, though second- and third-generation biofuels are sourced in other ways: for example, from wood cellulose. Biofuel use is set to grow, and it is still the case that less food is grown as biofuel production increases.

Source: ONS

Follow-up questions

1 How are composite demand and competing supply related?
2 Explain how diverting crop production to meet the demand for biofuel is affecting world poverty.
3 Explain two causes, other than increased biofuel production, of recent changes in food prices.
4 In your view, are biofuels a source of clean energy or a source of dirty energy?

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.5

Digital downloads and streaming replace CDs and DVDs

In 2000, when the first MP3 players were hitting the market, no one anticipated that sales of music downloads would overtake CD and DVD sales. Even when the iTunes store opened in 2003, Apple was only vying for a small market share.

Worldwide music streaming revenues are estimated to have risen, while sales of physical formats have dropped, yet within the physical format, sales of traditional vinyl records are staging a recovery.

What have we given up by adopting music streaming technology? Booklets, posters and CDs we can hold in our hands. What are we gaining? Instant satisfaction, convenience and mobile purchasing power.

As sales have moved online, many physical shops have closed. Now it seems that CDs could be phased out. How will our ways of consuming music evolve as time goes on?

Follow-up questions

1 Over the last 50 years, demand for recorded music switched first from vinyl records to CDs and then to downloading files and on to streamed music. However, vinyl sales are now growing again. Explain two reasons for these changes in demand.
2 How would you describe the demand relationship between CDs and music streaming?
3 Why have many music shops closed in recent years?
4 How have online firms such as Spotify, Google and Amazon affected UK retail markets in recent years?

EXTENSION MATERIAL

Why prices are often unstable in agricultural markets

In recent history, agricultural markets for foodstuffs and primary products such as rubber have experienced two closely related problems:

- Until recently, there was a long-run trend for agricultural prices to fall relative to those of manufactured goods.
- Prices have fluctuated considerably from year to year.

Agricultural markets are prone to disequilibrium and random shifts of the supply curve from year to year, caused by climatic factors, natural disasters and other world events, such as the Russian invasion of Ukraine in 2022. Climatic factors include long- and short-term changes in weather which can have significant impacts upon supply. These factors can all lead to unacceptable fluctuations in agricultural prices which, as Chapter 8 explains, may require government intervention to stabilise the price.

The long-run downward trend can be explained by shifts of the demand and supply curves for agricultural products over extended periods of time. This is shown in Figure 3.21, where the equilibrium price for an agricultural product in an early historical period is P_1. Over time, both the demand and supply curves have shifted rightwards. The shift in the demand curve was caused, for example, by rising incomes and population growth, while improved methods of farming increased supply. But for many farm products this shift of supply has greatly exceeded the shift of demand, resulting in a fall to the lower equilibrium price P_2.

Since the global recession ended in 2009, we might be seeing the beginning of a long-run trend for food price rises. Can you think of reasons why this might be happening?

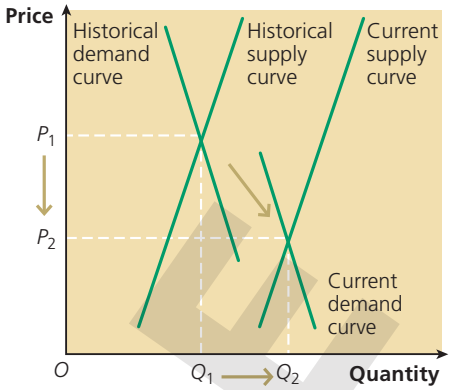


Figure 3.21 The long-run fall in the prices of agricultural products

Figure 3.22 provides an explanation of fluctuating farm prices. In the diagram, price volatility is caused by random shifts of the short-run supply curve in response to fluctuations in the harvest. The diagram shows two short-run supply curves: a 'good harvest' supply curve, S_1, and a 'bad harvest' supply curve, S_2. Weather conditions and other factors outside farmers' control shift the position of the supply curve from year to year between the limits set by S_1 and S_2. As a result, market prices fluctuate from year to year within the range of P_1 to P_2.

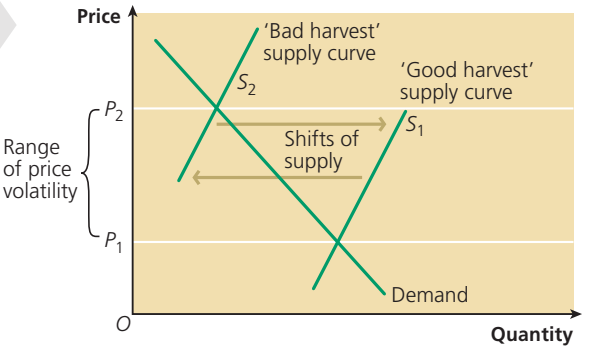


Figure 3.22 Fluctuating agricultural prices caused by shifts of supply

STUDY TIP

Make sure you understand the different ways in which governments can intervene in agricultural and commodity markets to try to stabilise prices.

QUANTITATIVE SKILLS 3.4

Worked example: calculating the income elasticity of demand for a good

Table 3.3 shows a price index for food covering the years 2018–22.

Table 3.3 Food price index, 2018–22

Year	Price index
2018	90
2019	100
2020	105
2021	120
2022	110

Which one of the following can be deduced from the data?

A Compared with 2021 the price of food was 10% cheaper in 2022.
B Farmers' revenue from the sale of food rose by 10% in 2019.
C The average price of food increased between 2018 and 2021.
D The price of food rose throughout the period from 2018 to 2022.

This question is testing your understanding of how index numbers are used in economics. Possible answers A, B and D are wrong, leaving C as the correct answer. A is wrong because food was 8.3% cheaper in 2022 not 10% cheaper. To calculate this, you take the change of index points of 10 between the two years as a ratio of 120 and turn this into a percentage. B is wrong because the index numbers do not allow you to calculate farmers' revenue. C is correct because the price index for food increased in every year between 2018 and 2021. D is wrong because the index did not increase between 2021 and 2022.

APPLICATION OF ECONOMICS IN THE REAL WORLD 3.6

Markets for new and second-hand cars

The number of new cars registered in 2021 in the UK rose by 1.0% compared with a year earlier, although sales were still 28.7% below 2019 levels. A car is a consumer durable good, delivering a constant stream of consumer services throughout its life. Provided it is properly looked after and escapes a serious crash, a new car typically lasts about 15 years. However, unlike a house, which is the ultimate consumer durable good (often with a much longer life than a person living in it), almost all new cars lose value or depreciate as soon as they have been driven off the showroom forecourt. This means that the prices of most cars fall throughout their lives.

In a recession or economic downturn, new-car owners may hang on to their cars for longer before they sell them — which decreases the supply of second-hand cars — and/or the demand for second-hand cars may fall because people cannot afford them. There are all sorts of possibilities.

Since 2017, the demand for new cars has been depressed for a number of reasons. First, there was bad publicity about 'dirty diesels'. Second, a new tougher emissions standard was introduced, which meant that owners of heavily-polluting cars pay more tax on their vehicles and on diesel fuel. Third, there was a lack of investment in the infrastructure needed for electrically powered vehicles. Fourth, consumer confidence fell following the Brexit referendum vote in 2016. Lastly, the Covid pandemic which was first detected in the UK in early 2020 further damaged consumer and business confidence as well as increasing the number of people working from home. The pandemic also affected global supply chains, driving up prices of car components.

Follow-up questions

1 What is a consumer durable good? Give another example besides a car.
2 Research what has happened to the prices of new cars in the UK between 2018 and the time you are reading this case study.
3 What is meant by depreciation and why do most cars depreciate?
4 How does the market for second-hand cars illustrate the problem of market misinformation?

QUANTITATIVE SKILLS 3.5

Worked example: calculating means and medians and constructing a line graph

Table 3.4 shows the sales of new vehicles in Great Britain between 2001 and 2021.

Table 3.4 New vehicle sales in Great Britain, 2001-21

Year	Sales (million)	Year	Sales (million)	Year	Sales (million)
2001	3.1	2010	2.4	2019	2.3
2002	3.2	2011	2.4	2020	1.6
2003	3.2	2012	2.5	2021	1.7
2004	3.2	2013	2.7		
2005	3.0	2014	3.0		
2006	2.9	2015	3.2		
2007	3.0	2016	3.3		
2008	2.7	2017	3.1		
2009	2.4	2018	2.4		

Source: Department of Transport

(a) Calculate the mean value to 2 decimal places, and the median values, of new vehicle sales in Great Britain between 2001 and 2021.

Mean values are calculated by adding up all the values in a data series and then dividing the total by the number of values in the series. The total of all the values is 57.3, which divided by 21 is 2.73 to 2 decimal places.

By contrast, the median value separates the higher half of the data series from the lower half. The data arranged from highest values to lowest values is 3.3; 3.2; 3.2; 3.2; 3.2; 3.1; 3.1; 3.0; 3.0; 3.0; 2.9; 2.7; 2.7; 2.5; 2.4; 2.4; 2.4; 2.4; 2.3; 1.7; 1.6. The highest values extend from 3.3 to 3.0 and the lowest values from 2.7 to 1.6. The median value is 2.9.

(b) Draw a continuous line graph from the data shown in the table.

The answer is shown in Figure 3.23.

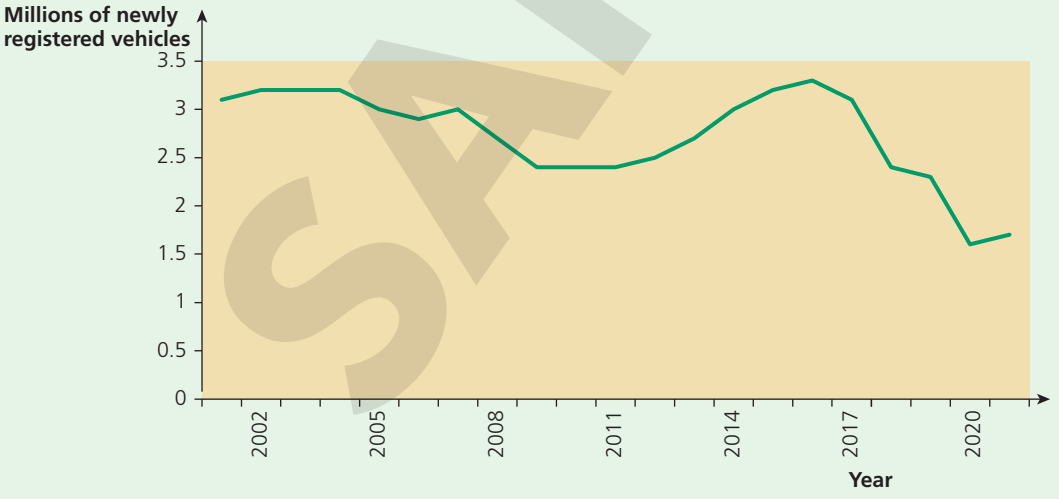


Figure 3.23 New vehicle sales in Great Britain, 2001-21

SECTION 3.6 SUMMARY

- You should practise applying market theory to different real-world markets.
- Make sure you understand the difference between joint demand and joint supply.
- Composite demand and derived demand are also relevant to the interrelationships between markets.
- It is important to understand the relationships between agricultural markets.
- Cross elasticity of demand is often an appropriate analytical tool when studying interrelated markets.

Questions

1 Evaluate the view that a fall in a good's price will inevitably lead to more demand for the good.

2 With an example of each, explain the difference between a normal good and an inferior good.

3 Explain how price elasticity of demand affects both total consumer spending and the total revenue received by firms when a good's price changes.

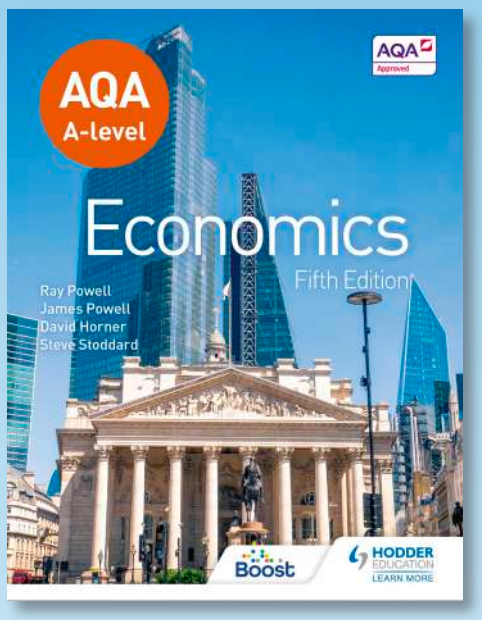
4 List and explain three factors which would cause a demand curve to shift to the left.

5 The cross elasticity of demand for good A with respect to the price of good B is +0. 8. Interpret this statistic.

6 List and explain three reasons why a supply curve may shift rightwards or downwards.

7 Explain how a low price elasticity of supply of new housing has affected UK house prices in recent decades.

8 With the help of an appropriate diagram, explain the effect on a good's price of a government subsidy granted to producers of the good.



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