

Economics essentials: core micro and macro concepts explained (Sloman companion notes)

These notes cover the core ideas of A Level 9708 and first-year university principles of economics. Each section gives the key definitions, the logic, the diagram described in words, and one applied example. Learn the boxed definitions word for word. A Quick check with full worked answers is at the end.

1. Scarcity, choice and opportunity cost

1.1 The basic economic problem

Human wants are unlimited but the resources available to satisfy them are limited. This is the basic economic problem. Because resources are scarce, every individual, firm and government must choose how to use them, and every choice means giving something up.

Scarcity: the situation in which unlimited wants exceed the limited resources available to satisfy them.

Opportunity cost: the value of the next best alternative forgone when a choice is made.

1.2 The production possibility curve (PPC)

A PPC shows the maximum combinations of two goods that an economy can produce when all its resources are fully and efficiently employed, with a given state of technology.

Diagram in words: draw good A on the vertical axis and good B on the horizontal axis. The PPC is a curve bowed outwards (concave to the origin), running from the vertical axis to the horizontal axis. A point on the curve is productively efficient. A point inside the curve shows unemployed or inefficiently used resources. A point outside the curve is currently unattainable. Moving along the curve from one point to another shows the opportunity cost: to gain more of B you must give up some A.

The curve is bowed outwards because resources are not equally suited to producing both goods. As more of good B is produced, resources that are less and less suited to B must be transferred, so the opportunity cost of each extra unit of B rises. This is called **increasing opportunity cost**. If resources were equally suited to both goods, the PPC would be a straight line with constant opportunity cost.

An **outward shift** of the whole PPC represents economic growth in productive potential, caused by more resources (for example a larger labour force) or better quality resources (education, new technology). An inward shift can follow a natural disaster or war that destroys capital.

Worked example: an economy can produce either 100 tonnes of wheat and 0 tractors, or 80 tonnes of wheat and 10 tractors. The opportunity cost of the first 10 tractors is 20 tonnes of wheat, so the opportunity cost of one tractor is $20 / 10 = 2$ tonnes of wheat.

1.3 Applied example

A government that spends more on its defence budget, with a fixed total budget, has less to spend on health and education. The opportunity cost of the extra defence spending is the hospitals and schools



that are not built. If the economy is at a point inside its PPC because of high unemployment, however, the government could increase both by putting idle resources to work, which is why the opportunity cost of spending is lower in a recession.

2. Demand, supply and price determination

2.1 Demand

Demand: the quantity of a good or service that consumers are willing and able to buy at each possible price during a given period of time.

Effective demand: a want backed by the ability to pay.

The **law of demand** states that, other things being equal (*ceteris paribus*), as price falls the quantity demanded rises. The demand curve therefore slopes downwards from left to right. Two effects explain this: the **substitution effect** (the good becomes cheaper relative to alternatives, so consumers switch towards it) and the **income effect** (a lower price raises consumers' real income, so they can afford more).

A change in the good's own price causes a **movement along** the demand curve (an extension or a contraction). A change in any other factor causes a **shift** of the whole curve. The main conditions of demand are: income, prices of substitutes, prices of complements, tastes and fashion, advertising, population and its age structure, expectations of future prices, and the availability of credit.

- **Normal good:** demand rises when income rises.
- **Inferior good:** demand falls when income rises, as consumers switch to better alternatives.
- **Substitutes:** goods in competitive demand; a rise in the price of one increases demand for the other.
- **Complements:** goods in joint demand; a rise in the price of one reduces demand for the other.

2.2 Supply

Supply: the quantity of a good or service that producers are willing and able to sell at each possible price during a given period of time.

The supply curve normally slopes upwards: a higher price makes production more profitable and allows firms to cover the rising marginal cost of extra output. A change in the good's own price causes a movement along the curve. The supply curve shifts when there is a change in costs of production (wages, raw materials, energy), technology, indirect taxes or subsidies, the number of firms, the weather (for agricultural goods), or the prices of goods in joint or competitive supply.

2.3 Equilibrium and the price mechanism

Equilibrium price: the price at which the quantity demanded equals the quantity supplied, so there is no tendency for the price to change.

Diagram in words: draw price on the vertical axis and quantity on the horizontal axis. A downward sloping D curve and an upward sloping S curve cross at the equilibrium price P_e and quantity Q_e . At a

price above P_e , quantity supplied exceeds quantity demanded: there is excess supply (a surplus), and firms cut prices until the surplus disappears. At a price below P_e , there is excess demand (a shortage), and buyers bid the price up.

The price mechanism performs three functions. Prices act as a **signal** (a rising price tells producers that consumers want more), an **incentive** (higher prices make it profitable to produce more) and a **rationing device** (when a good is scarce, the higher price limits who buys it).

When demand increases (D shifts right), the equilibrium price and quantity both rise. When supply increases (S shifts right), the price falls and quantity rises. When both shift at once, one of the two outcomes is certain and the other depends on the relative size of the shifts.

2.4 Consumer and producer surplus

Consumer surplus: the difference between the maximum price consumers are willing to pay and the price they actually pay.

Producer surplus: the difference between the price producers receive and the minimum price at which they would be willing to supply.

On the supply and demand diagram, consumer surplus is the triangle below the demand curve and above the price line, out to Q_e . Producer surplus is the triangle above the supply curve and below the price line.

2.5 Applied example

A poor cotton harvest shifts the supply of raw cotton to the left. The price of cotton rises, which raises the costs of textile firms and shifts the supply of cotton cloth to the left as well. Meanwhile demand for synthetic fibres, a substitute, increases. One shock in one market spreads to related markets through the price mechanism.

3. Elasticity

3.1 Price elasticity of demand (PED)

Price elasticity of demand: the responsiveness of the quantity demanded of a good to a change in its own price.

$PED = \text{percentage change in quantity demanded} / \text{percentage change in price}$

PED is negative for normal demand curves, but economists often quote the absolute value.

Interpretation:

Value (ignoring the sign)	Description	Effect of a price rise on total revenue
0	Perfectly inelastic	Revenue rises in proportion to price
Between 0 and 1	Inelastic	Revenue rises
1	Unitary elastic	Revenue unchanged

Greater than 1	Elastic	Revenue falls
Infinity	Perfectly elastic	Revenue falls to zero

Determinants of PED: the number and closeness of substitutes (the most important), the proportion of income spent on the good, whether the good is a necessity or a luxury, whether it is habit forming, how broadly the good is defined (food in general is inelastic, one brand of biscuit is elastic) and the time period (demand becomes more elastic over time as consumers find alternatives).

On a straight line demand curve, PED is not constant: demand is elastic at high prices and inelastic at low prices, with unitary elasticity at the midpoint.

Worked example: the price of a bus ticket rises from Rs 50 to Rs 60 and daily journeys fall from 2,000 to 1,800.

Percentage change in price = $(60 \text{ minus } 50) / 50 \times 100 = +20\%$.

Percentage change in quantity = $(1,800 \text{ minus } 2,000) / 2,000 \times 100 = \text{minus } 10\%$.

PED = $\text{minus } 10 / 20 = \text{minus } 0.5$, so demand is price inelastic.

Revenue before = $50 \times 2,000 = \text{Rs } 100,000$. Revenue after = $60 \times 1,800 = \text{Rs } 108,000$. Revenue rises, as expected for inelastic demand.

3.2 Income elasticity of demand (YED)

Income elasticity of demand: the responsiveness of the quantity demanded of a good to a change in consumers' income.

$\text{YED} = \text{percentage change in quantity demanded} / \text{percentage change in income}$

A positive YED shows a normal good. A YED between 0 and 1 shows a necessity (demand rises less than proportionately); a YED greater than 1 shows a luxury (income elastic). A negative YED shows an inferior good. Firms use YED to predict how sales will change over the economic cycle.

3.3 Cross elasticity of demand (XED)

Cross elasticity of demand: the responsiveness of the quantity demanded of good A to a change in the price of good B.

$\text{XED} = \text{percentage change in quantity demanded of A} / \text{percentage change in price of B}$

Positive XED: substitutes (the larger the value, the closer the substitutes). Negative XED: complements. Zero XED: unrelated goods.

3.4 Price elasticity of supply (PES)

Price elasticity of supply: the responsiveness of the quantity supplied of a good to a change in its price.

$\text{PES} = \text{percentage change in quantity supplied} / \text{percentage change in price}$

PES is usually positive. Supply is more elastic when firms have spare capacity, when stocks can be held, when factors of production are mobile, when production is quick, and over a longer time period. Agricultural supply is inelastic in the short run because crops take a season to grow. Any straight line

supply curve drawn through the origin has a PES of exactly 1.

3.5 Incidence of an indirect tax

An indirect tax shifts the supply curve upwards (to the left) by the amount of the tax per unit. The price consumers pay rises, but usually by less than the tax. The share of the tax paid by consumers is the rise in price; the rest is paid by producers. The more inelastic the demand, the larger the share borne by consumers. This is why governments tax goods such as cigarettes and fuel: demand is inelastic, so revenue is high and quantity falls only a little.

3.6 Applied example

A mobile network considers cutting its data prices. If its customers can easily switch to rival networks, its demand is price elastic and a price cut will raise total revenue. If the whole industry cuts prices together, demand for mobile data in general is more inelastic, and industry revenue may fall. Elasticity depends on whether we are looking at one firm or the whole market.

4. Consumer theory

4.1 Utility and diminishing marginal utility

Total utility: the total satisfaction gained from consuming a given quantity of a good.

Marginal utility: the additional satisfaction gained from consuming one more unit of a good.

Law of diminishing marginal utility: as a consumer consumes more units of a good in a given period, the marginal utility from each additional unit eventually falls.

A rational consumer allocates income so that the marginal utility per rupee spent is equal across all goods. This is the **equi-marginal principle**: $MU_A / P_A = MU_B / P_B$. If the price of A falls, MU_A / P_A rises above the ratio for B, so the consumer buys more A until marginal utility falls and the ratios are equal again. This explains why the demand curve slopes downwards.

4.2 Indifference curves and the budget line

At university level, and in some A Level questions, consumer choice is shown with indifference curve analysis.

Indifference curve: a curve showing all the combinations of two goods that give a consumer the same level of satisfaction.

Budget line: a line showing all the combinations of two goods that a consumer can buy with a given income at given prices.

Diagram in words: draw good X on the horizontal axis and good Y on the vertical axis. Indifference curves are downward sloping and convex to the origin, because of a diminishing marginal rate of substitution: the more of X a consumer has, the less Y they are willing to give up for another unit of X. Higher curves represent higher satisfaction and curves never cross. The budget line is a straight line joining income / P_Y on the vertical axis to income / P_X on the horizontal axis; its slope is minus P_X / P_Y . The consumer's best affordable choice is where the budget line just touches (is tangent to) the highest possible indifference curve.

A rise in income shifts the budget line outwards parallel to itself. A fall in the price of X pivots the

budget line outwards along the X axis. The move to the new tangency can be split into a **substitution effect** (always towards the cheaper good) and an **income effect** (positive for normal goods, negative for inferior goods).

4.3 Applied example

A student spending a fixed monthly allowance on mobile data and snacks will, without thinking about it in these terms, stop buying data when an extra gigabyte gives less satisfaction per rupee than an extra snack. When the network halves the price of data bundles, the student buys more data: partly because data is now relatively cheaper (substitution effect) and partly because the allowance now stretches further (income effect).

5. Producer theory: production, costs, revenue and profit

5.1 Short run and long run

Short run: the period of time in which at least one factor of production is fixed.

Long run: the period of time in which all factors of production are variable.

The short run and long run are not fixed lengths of calendar time. A food stall might be able to change all its inputs in a few weeks; a power station may take ten years.

5.2 The law of diminishing returns

Law of diminishing returns (diminishing marginal returns): when increasing quantities of a variable factor are added to a fixed factor, the marginal product of the variable factor will eventually fall.

Marginal product is the extra output from employing one more unit of the variable factor. At first, adding workers to a fixed amount of machinery allows specialisation and marginal product rises. Eventually workers crowd each other and the machines, and each extra worker adds less output than the one before. Because each extra unit of output then needs more labour, **marginal cost rises**. Diminishing returns is a short run concept and is the reason short run cost curves are U shaped.

5.3 Short run costs

- **Fixed costs (FC):** costs that do not change with output, such as rent and insurance.
- **Variable costs (VC):** costs that change with output, such as raw materials.
- **Total cost:** $TC = FC + VC$.
- **Average fixed cost:** $AFC = FC / Q$, which falls continuously as fixed costs are spread over more output.
- **Average variable cost:** $AVC = VC / Q$.
- **Average total cost:** $ATC = TC / Q = AFC + AVC$.
- **Marginal cost:** $MC = \text{change in } TC / \text{change in } Q$, the cost of producing one more unit.

Diagram in words: with cost on the vertical axis and output on the horizontal axis, MC falls at first then rises steeply. The AVC and ATC curves are U shaped, and the MC curve cuts both of them at

their lowest points. The gap between ATC and AVC is AFC, which narrows as output rises. The rule is: if the marginal is below the average, the average falls; if the marginal is above the average, the average rises.

5.4 Long run costs and economies of scale

Economies of scale: the fall in long run average cost that occurs as a firm increases its scale of production.

Diseconomies of scale: the rise in long run average cost that occurs when a firm grows beyond a certain scale.

Internal economies of scale arise from the growth of the firm itself:

- **Technical:** larger, more efficient machines; the law of increased dimensions (a tanker twice as big costs less than twice as much to build and run).
- **Purchasing (bulk buying):** discounts on large orders of inputs.
- **Managerial:** large firms can employ specialist managers.
- **Financial:** large firms borrow more cheaply because lenders see them as less risky.
- **Marketing:** advertising costs are spread over more units.
- **Risk bearing:** large firms can diversify products and markets.

External economies of scale arise from the growth of the whole industry, often in one area: a pool of skilled labour, specialist suppliers and shared infrastructure. The concentration of sports goods makers in Sialkot is an example. Diseconomies of scale come mainly from management problems: poor communication, slow decision making, weak coordination and low worker motivation in very large organisations.

Diagram in words: the long run average cost (LRAC) curve is an envelope of many short run ATC curves. It falls while there are economies of scale, may be flat over a range of output (constant returns to scale), and rises when diseconomies set in. The output at which LRAC first reaches its minimum is the **minimum efficient scale**.

5.5 Revenue and profit

- **Total revenue:** $TR = P \times Q$.
- **Average revenue:** $AR = TR / Q = P$, so the AR curve is the firm's demand curve.
- **Marginal revenue:** $MR = \text{change in } TR / \text{change in } Q$.

Profit maximisation rule: a firm maximises profit where marginal cost equals marginal revenue ($MC = MR$), with MC rising through MR.

Normal profit: the minimum profit needed to keep a firm in its present industry in the long run; it is included in costs.

Supernormal (abnormal) profit: profit above normal profit, where AR is greater than ATC.

The logic: if MR is greater than MC, producing one more unit adds more to revenue than to cost, so profit rises; if MC is greater than MR, the last unit reduced profit. Profit is highest where they are equal.

In the short run a firm continues to produce, even at a loss, as long as price covers average variable

cost, because it must pay its fixed costs anyway. If price falls below AVC, the firm should shut down at once. In the long run the firm must cover all its costs (price at least equal to ATC) or leave the industry.

5.6 Applied example

A bakery producing 1,000 loaves a day has fixed costs of Rs 20,000 and variable costs of Rs 60 per loaf. $ATC = (20,000 + 60,000) / 1,000 = \text{Rs } 80$. If it doubles output to 2,000 loaves with the same oven, $ATC = (20,000 + 120,000) / 2,000 = \text{Rs } 70$, because the fixed cost is spread more thinly. If it builds a second, larger bakery with bulk flour contracts, it may lower long run average cost further through economies of scale.

6. Market structures

6.1 The spectrum of competition

Markets are classified by the number of firms, the type of product, the ease of entry and exit, and the information available. From most to least competitive: perfect competition, monopolistic competition, oligopoly, monopoly.

Barriers to entry: factors that make it difficult or impossible for new firms to enter a market, such as economies of scale, high start-up (sunk) costs, legal barriers like patents and licences, control of raw materials, brand loyalty and deliberate strategies by existing firms.

6.2 Perfect competition

Assumptions: very many buyers and sellers, identical (homogeneous) products, perfect information, freedom of entry and exit, and firms are price takers. Each firm faces a perfectly elastic (horizontal) demand curve at the market price, so $P = AR = MR$.

Diagram in words: draw two diagrams side by side. On the left, the industry supply and demand curves set the market price. On the right, the firm's horizontal $AR = MR$ line at that price meets its U shaped MC curve; profit is maximised where $MC = MR$. If the price is above ATC at that output, the firm earns supernormal profit, shown as a rectangle between price and ATC. This attracts new firms, industry supply shifts right, the price falls, and in the long run each firm earns only normal profit, where price equals the minimum of ATC.

In long run equilibrium, $P = MC$ (allocative efficiency) and $P = \text{minimum ATC}$ (productive efficiency). Perfect competition is a benchmark rather than a common real market; some agricultural and currency markets come close.

6.3 Monopoly

Pure monopoly: a market with a single seller of a product with no close substitutes, protected by high barriers to entry.

In practice, competition authorities may investigate a firm with a large market share (for example, in the UK, a share of 25% or more is often used as a working guide) even if it is not the only seller. The monopolist faces the downward sloping market demand curve. MR lies below AR because to sell one more unit it must lower the price on all units; for a straight line demand curve the MR curve is twice as steep as AR.

Diagram in words: draw downward sloping AR and a steeper MR, with U shaped MC and ATC.

Output is where $MC = MR$. Price is read up from that output to the AR curve. Because barriers stop entry, the supernormal profit rectangle (between price and ATC) can persist in the long run. Price is above MC, so the monopolist is allocatively inefficient; output is lower and price higher than under perfect competition, causing a deadweight welfare loss.

Possible benefits of monopoly: economies of scale may give lower costs than many small firms (a **natural monopoly** such as water pipes or electricity grids, where one firm can supply the whole market at lower average cost than two), and supernormal profit can fund research and development (dynamic efficiency).

6.4 Monopolistic competition

Many firms sell differentiated products (restaurants, hairdressers, clothing shops) with low barriers to entry. Each firm has a downward sloping but fairly elastic demand curve. In the short run a firm can earn supernormal profit; new firms then enter and take customers, shifting each firm's AR curve left until it just touches the ATC curve. In long run equilibrium $AR = ATC$ (normal profit), but at an output below the minimum of ATC, so there is excess capacity and productive inefficiency. Consumers gain variety in return.

6.5 Oligopoly

Oligopoly: a market dominated by a few large firms which are interdependent, so each firm must take account of the likely reactions of its rivals when making decisions.

Oligopolists may **compete** (price wars, but more often non-price competition through advertising, branding, quality and loyalty schemes) or **collude** (agree on prices or output). Formal collusion is a **cartel**; it is illegal in most countries. Tacit collusion includes **price leadership**, where firms follow the price set by a dominant firm.

The **kinked demand curve** model explains price rigidity: if a firm raises its price, rivals do not follow, so demand above the current price is elastic; if it cuts its price, rivals follow, so demand below the current price is inelastic. The MR curve has a vertical gap at the kink, so MC can rise or fall within the gap without changing the profit maximising price.

Game theory analyses interdependent decisions. In the classic two-firm pricing game, each firm does better individually by cutting price whatever the other does (a dominant strategy), so both end up cutting and both earn less than if they had both kept prices high. This is the **prisoners' dilemma**, and it explains why cartels tend to break down.

6.6 Applied example

Mobile telecoms in many countries is an oligopoly: a handful of networks, high sunk costs for spectrum licences and towers, and heavy branding. Prices for similar bundles tend to be close, and firms compete through bonus data offers and advertising rather than open price wars. Regulators watch for collusion and may cap the prices charged for connecting calls between networks.

7. Market failure and government intervention

7.1 Efficiency and market failure

Allocative efficiency: the situation where resources are allocated so that the goods and services produced are those that consumers value most; it occurs where price equals marginal cost ($P = MC$), or where marginal social benefit equals marginal social cost.

Productive efficiency: producing at the lowest possible average cost.

Market failure: a situation in which the free market fails to allocate resources efficiently.

The main sources of market failure are externalities, public goods, merit and demerit goods, information failure, market power and factor immobility. Inequality of income is often treated alongside them as an equity issue.

7.2 Externalities

Externality: a cost or benefit arising from production or consumption that affects a third party not involved in the transaction and is not reflected in the market price.

Social cost = private cost + external cost.

Social benefit = private benefit + external benefit.

Negative production externality diagram in words: draw marginal private benefit (MPB, equal to demand) sloping down, marginal private cost (MPC, equal to supply) sloping up, and marginal social cost (MSC) above MPC, the vertical gap being the marginal external cost. The free market produces where $MPB = MPC$, but the socially optimal output is lower, where $MSC = MSB$. The market overproduces; the triangle between MSC and MSB from the optimal output to the market output is the **deadweight welfare loss**.

Positive consumption externality: MSB lies above MPB (for example, vaccination protects others as well as the person vaccinated). The market underproduces compared with the optimum where $MSB = MSC$.

7.3 Public goods

Public good: a good that is non-excludable and non-rival in consumption.

Non-excludable: once provided, it is impossible or too costly to prevent people who have not paid from benefiting.

Non-rival: one person's consumption does not reduce the amount available to others.

Because of non-excludability, people can benefit without paying: the **free rider problem**. Private firms cannot charge, so the market provides none or too little, a case of complete market failure (a missing market). Examples are national defence, street lighting and flood defences. Governments provide them financed by taxation. Goods that are only partly non-rival or non-excludable, such as a road that becomes congested, are **quasi-public goods**.

7.4 Merit and demerit goods and information failure

Merit good: a good that is underconsumed in a free market because consumers underestimate its private benefits, and which often also gives positive externalities, such as education and health care.

Demerit good: a good that is overconsumed in a free market because consumers underestimate its harm to themselves, and which often also gives negative externalities, such as tobacco.

Merit and demerit goods are linked to **information failure**: consumers lack full information or do not act on it. **Asymmetric information** is when one side of a transaction knows more than the other, as in the market for second-hand cars (sellers know the quality, buyers do not), which can drive good quality products out of a market.

7.5 Methods of government intervention

Policy	How it works	Main problems
Indirect tax	Raises MPC towards MSC, reducing output of goods with external costs; ideally the tax equals the marginal external cost (a Pigouvian tax)	Hard to value the externality; regressive; may encourage smuggling
Subsidy	Lowers costs and raises output of merit goods or goods with external benefits	Opportunity cost of government spending; firms may become inefficient
Maximum price	A legal ceiling set below equilibrium to make a necessity affordable	Excess demand, queues, black markets
Minimum price	A legal floor set above equilibrium, for example to raise farm incomes or cut alcohol consumption	Excess supply; surpluses must be bought and stored
Regulation	Laws that ban or limit activities, such as emissions limits or a smoking ban	Monitoring and enforcement costs
Tradable pollution permits	A cap on total pollution; firms that cut emissions cheaply sell spare permits	Setting the right cap; initial allocation

Government failure: a situation in which government intervention leads to a less efficient allocation of resources than would have occurred without it.

7.6 Applied example

Smog from crop burning and vehicle emissions imposes health costs on people who neither farm nor drive. These are negative externalities, so too much burning and driving takes place. Policies used or discussed include bans on crop residue burning, subsidies for machines that remove stubble, emissions standards for vehicles and fuel quality rules. Each must be enforced to work, and a badly enforced ban is an example of potential government failure.

8. Labour markets

8.1 The demand for labour

Derived demand: labour is demanded not for its own sake but for the output it produces.

Marginal revenue product of labour (MRP): the additional revenue a firm earns from employing one more worker. $MRP = \text{marginal physical product} \times \text{marginal revenue}$.

A profit maximising firm employs workers up to the point where the wage equals MRP. Because of diminishing returns, MRP falls as more workers are employed, so the MRP curve is the firm's demand

curve for labour and it slopes downwards. Demand for labour increases if productivity rises (better training or capital) or if the price of the product rises. The elasticity of demand for labour is greater when labour is a large share of total costs, when capital can easily replace labour, and when demand for the product is elastic.

8.2 The supply of labour

The supply of labour to an occupation rises with the wage and also depends on non-wage factors: working conditions, job security, training and promotion prospects, status, and the qualifications needed.

8.3 Wage determination and differentials

In a competitive labour market, the wage is set where the demand for and supply of labour are equal. Wage differentials arise because occupations differ in the productivity and skill of workers, in the scarcity of those skills, in the non-wage attractions of the job, and because of trade unions, discrimination and government regulation. A surgeon earns more than a cleaner because the supply of people able and willing to be surgeons is small relative to demand, and their MRP is high.

8.4 Trade unions, minimum wages and monopsony

A **trade union** bargains collectively for higher wages and better conditions. In a competitive market, a wage set above equilibrium raises pay for those employed but reduces the number of jobs. A **national minimum wage** set above the equilibrium has the same predicted effect in a competitive market.

Monopsony: a market with a single buyer, for example a single large employer of labour in a town.

A monopsony employer faces an upward sloping supply of labour, and to hire one more worker it must raise the wage for all its workers, so the marginal cost of labour lies above the supply curve. It employs where MRP equals the marginal cost of labour, then pays the lower wage read from the supply curve. Employment and wages are both below competitive levels. In this case a union or a minimum wage set between the monopsony wage and the competitive wage can raise both wages and employment.

8.5 Applied example

When large garment exporters cluster in one district, workers may have few alternative employers, giving the factories some monopsony power. A rise in the legal minimum wage then need not cost jobs if it moves pay closer to the competitive level, but if it is set well above workers' MRP, factories may automate or relocate. The outcome depends on where the minimum is set relative to productivity.

9. National income and aggregate demand and supply

9.1 Measuring national income

Gross domestic product (GDP): the total value of goods and services produced within a country in a given period, usually a year.

Gross national income (GNI): GDP plus net primary income from abroad (income earned by residents abroad minus income earned by foreigners in the country).

GDP can be measured three ways which, in principle, give the same answer: the **output** method (sum of value added by each industry, avoiding double counting of intermediate goods), the **income** method (sum of wages, rent, interest and profit, excluding transfer payments such as pensions) and the **expenditure** method ($C + I + G + (X \text{ minus } M)$). In practice a statistical discrepancy appears because of errors and the informal economy.

Nominal GDP is measured at current prices. **Real GDP** removes the effect of inflation by measuring at constant prices. Real GDP per head divides by the population. **Net** measures subtract depreciation (capital consumption).

Worked example: nominal GDP rises from \$400 bn to \$440 bn while the price index rises from 100 to 105.

Real GDP in the second year at base year prices = $440 \times 100 / 105 = \$419$ bn (to 3 significant figures).

Real growth = $(419 \text{ minus } 400) / 400 \times 100 = \text{about } 4.8\%$, much less than the 10% nominal rise.

GDP per head is an imperfect measure of living standards. It ignores the informal economy, unpaid work, leisure, the distribution of income, pollution and the depletion of natural resources, and it needs adjusting for differences in price levels between countries (purchasing power parity). Broader measures such as the Human Development Index combine income with life expectancy and education.

9.2 The circular flow of income

In a simple economy, households supply factor services to firms and receive incomes, and spend those incomes on firms' output. Money flows round in a circle. Some income leaks out as **withdrawals** (savings S , taxation T and imports M) and money is added as **injections** (investment I , government spending G and exports X). National income is in equilibrium when planned withdrawals equal planned injections: $S + T + M = I + G + X$. If injections exceed withdrawals, income rises; if withdrawals exceed injections, income falls.

9.3 Aggregate demand

Aggregate demand (AD): the total planned spending on a country's goods and services at each possible price level in a given period. $AD = C + I + G + (X \text{ minus } M)$.

- **Consumption (C):** depends mainly on disposable income, and also on interest rates, wealth, confidence and the availability of credit. The **marginal propensity to consume (MPC)** is the fraction of an extra unit of income spent on consumption.
- **Investment (I):** spending on capital goods. It depends on interest rates, business confidence (expected future profits), technology, and changes in demand. The **accelerator** principle says investment depends on the rate of change of output, which makes investment very volatile.
- **Government spending (G):** set by government policy.
- **Net exports (X minus M):** depend on the exchange rate, incomes abroad and at home, and relative inflation rates.

The AD curve slopes downwards against the price level because a higher price level reduces real wealth (wealth effect), makes exports less competitive (international trade effect) and pushes up interest rates (interest rate effect). A change in any component other than through the price level shifts

the AD curve.

9.4 The multiplier

Multiplier: the number of times by which a change in an injection changes national income.

$k = 1 / (1 \text{ minus MPC}) = 1 / \text{MPW}$, where MPW is the marginal propensity to withdraw (MPS + MPT + MPM).

An injection becomes income for someone, who spends part of it, which becomes income for someone else, and so on. Each round is smaller because part is withdrawn. The total rise in income is a multiple of the original injection.

Worked example: in an open economy with government, the marginal propensity to save is 0.1, the marginal tax rate is 0.2 and the marginal propensity to import is 0.2.

$\text{MPW} = 0.1 + 0.2 + 0.2 = 0.5$, so $k = 1 / 0.5 = 2$.

An increase in government spending of \$5 bn raises national income by $2 \times 5 = \$10$ bn, assuming spare capacity.

9.5 Aggregate supply

Aggregate supply (AS): the total output that firms in an economy are willing and able to produce at each possible price level in a given period.

Short run aggregate supply (SRAS) slopes upwards because, with some input prices such as money wages fixed in the short run, a higher price level raises profitability. SRAS shifts with changes in costs: wages, raw material and energy prices, indirect taxes and the exchange rate (through import prices).

Long run aggregate supply (LRAS) shows the productive potential of the economy. Two views are taught:

- **Classical (free market) view:** LRAS is vertical at the full employment level of output. In the long run, wages and prices are flexible, so output is determined by the quantity and quality of resources, not by the price level. Increasing AD only raises prices in the long run.
- **Keynesian view:** the AS curve is horizontal at low output (much spare capacity, so more AD raises output without raising prices), then curves upwards as bottlenecks appear, and becomes vertical at full capacity.

LRAS shifts right when the quantity or quality of factors increases: investment in capital, education and training, technology, more labour through migration or higher participation, and supply-side reforms. This matches an outward shift of the PPC.

9.6 Macroeconomic equilibrium

Diagram in words: draw the price level on the vertical axis and real national output on the horizontal axis. The downward sloping AD curve crosses SRAS at the equilibrium price level and output. In the classical version a vertical LRAS shows full employment output Y_f . If AD shifts right while the economy is below Y_f , output rises with some rise in the price level. If AD shifts right when the economy is at full capacity, the main effect is on prices.

The gap between actual output and potential output is the **output gap**. A negative output gap (actual

below potential) means spare capacity and unemployment; a positive output gap means the economy is overheating, with inflationary pressure.

9.7 Applied example

A sharp rise in world oil prices raises firms' costs in an oil-importing country. SRAS shifts left: the price level rises and real output falls at the same time. This combination, cost-push inflation with falling output, is called **stagflation**, and it is hard to fix with demand management alone because boosting AD would raise prices further.

10. Money and interest rates

10.1 Money and its functions

Money: anything that is generally acceptable as a means of payment for goods and services and in settlement of debts.

Money has four functions: a **medium of exchange** (removing the need for a double coincidence of wants under barter), a **unit of account** (a common measure of value), a **store of value** (wealth can be held over time) and a **standard of deferred payment** (debts can be settled in the future). Good money is acceptable, durable, portable, divisible, uniform and limited in supply.

10.2 The money supply and credit creation

The money supply includes notes and coins and, much more importantly, bank deposits. Narrow money covers cash and liquid deposits; broad money adds less liquid deposits. Most money in a modern economy is created by commercial banks when they lend.

When a bank makes a loan, it credits the borrower's account, creating a new deposit. Banks keep only a fraction of deposits as liquid reserves. In the simple textbook model, the **credit multiplier** = $1 / \text{reserve ratio}$.

Worked example: a bank receives a new cash deposit of Rs 1,000 and keeps a reserve ratio of 10%. It can lend Rs 900, which is spent and redeposited, allowing Rs 810 more lending, and so on.

Credit multiplier = $1 / 0.10 = 10$.

Maximum total deposits = $10 \times 1,000 = \text{Rs } 10,000$.

In practice, lending is limited by demand for loans, banks' assessment of risk, capital requirements and central bank regulation, so the multiplier is not fixed.

10.3 The demand for money and interest rates

Keynes's theory of liquidity preference identifies three motives for holding money: the **transactions motive** (for everyday spending, rising with income), the **precautionary motive** (for unexpected needs) and the **speculative motive** (holding money instead of bonds when interest rates are expected to rise and bond prices to fall). The opportunity cost of holding money is the interest forgone, so the demand for money curve slopes downwards against the interest rate.

Diagram in words: draw the interest rate on the vertical axis and the quantity of money on the

horizontal axis. The money supply is a vertical line if the central bank fixes it. The downward sloping liquidity preference curve crosses it at the equilibrium interest rate. An increase in the money supply shifts the vertical line right and lowers the interest rate.

There is an inverse relationship between bond prices and interest rates: a bond that pays a fixed sum each year is worth less when new bonds offer a higher rate.

10.4 The quantity theory of money

Fisher equation of exchange: $MV = PT$ (often written $MV = PY$), where M is the money supply, V the velocity of circulation, P the price level and T the number of transactions (or Y real output).

The equation is an identity. Monetarists add two assumptions: V is stable and T (or Y) is fixed in the long run at full employment. Then any rise in M leads to a proportional rise in P . Keynesians argue that V can change and that output can rise when there is spare capacity, so the link from money to prices is weaker.

10.5 Applied example

When a central bank raises its policy rate, banks raise the rates they charge on loans and pay on deposits. Borrowing to buy cars or houses becomes more expensive and saving becomes more rewarding, so consumption falls. Firms postpone investment. If the higher rate attracts foreign savings, the currency appreciates, making exports dearer. All of these reduce AD and reduce inflationary pressure, but usually with a lag of many months.

11. Inflation and unemployment

11.1 Inflation and its measurement

Inflation: a sustained increase in the general price level over time.

Deflation: a sustained fall in the general price level.

Disinflation: a fall in the rate of inflation, with prices still rising.

Inflation is measured with a **consumer price index** (CPI). Statisticians survey household spending to choose a representative basket of goods and services, give each item a weight according to its share of spending, record prices regularly and calculate a weighted average relative to a base year (index = 100).

Worked example (weighted price index): a basket has food (weight 50) with a price index of 110, transport (weight 30) with 120, and housing (weight 20) with 105.

Weighted index = $(50 \times 110 + 30 \times 120 + 20 \times 105) / 100 = (5,500 + 3,600 + 2,100) / 100 = 112$.

Prices have risen by 12% since the base year.

11.2 Causes of inflation

- **Demand-pull inflation:** AD grows faster than the economy's ability to supply, so AD shifts right along a steepening AS curve. Causes include rapid growth in consumer credit, government spending or exports.

- **Cost-push inflation:** rising costs of production shift SRAS left: higher wages not matched by productivity, higher import prices (often after a currency depreciation), rising energy prices, and higher indirect taxes.
- **Monetary causes:** monetarists argue that inflation results from the money supply growing faster than real output.
- **Expectations:** if workers and firms expect inflation, they build it into wage claims and prices, creating a wage-price spiral.

11.3 Consequences of inflation

Costs of inflation: it reduces the real value of savings and of fixed incomes; it redistributes from lenders to borrowers when unexpected; it makes exports less competitive if higher than abroad; it creates uncertainty that discourages investment; firms face **menu costs** (changing price lists) and households face **shoe leather costs** (time spent managing money to avoid losses). Very high inflation (hyperinflation) destroys confidence in money altogether.

11.4 Unemployment

Unemployment: the situation where people of working age who are willing and able to work, and are actively seeking work, cannot find a job.

Unemployment rate = $\text{number unemployed} / \text{labour force} \times 100$

The labour force is the employed plus the unemployed. Unemployment is measured by a claimant count (people receiving unemployment benefit) or by a labour force survey using the International Labour Organization definition; the survey is used for international comparisons.

Type	Cause	Example of a remedy
Frictional	People between jobs while searching	Better job information, job centres and online matching
Structural	Long term decline of an industry; mismatch of skills or location	Retraining, regional policy, help with moving
Cyclical (demand-deficient)	Fall in AD in a recession	Expansionary fiscal or monetary policy
Seasonal	Work that depends on the time of year	Diversification of the local economy
Technological	Machines replace workers	Training in new skills
Real wage (classical)	Wages held above the market clearing level	Labour market flexibility

Costs of unemployment include lost output (the economy is inside its PPC), lower tax revenue and higher benefit spending, loss of skills, poverty, and social problems such as poor health and crime. Some economies also have large **underemployment** and **disguised unemployment**, where people work fewer hours than they want or in jobs where their marginal product is close to zero.

11.5 The Phillips curve

The original Phillips curve, based on UK data, showed an inverse relationship between unemployment and the rate of wage inflation. It suggested governments could trade lower unemployment for higher

inflation.

Diagram in words: with inflation on the vertical axis and unemployment on the horizontal axis, the short run Phillips curve slopes downwards and is convex to the origin. The expectations-augmented version adds a **vertical long run Phillips curve** at the **natural rate of unemployment**. If the government tries to push unemployment below the natural rate, it succeeds only temporarily; once workers expect the higher inflation, the short run curve shifts upwards and unemployment returns to the natural rate with higher inflation. The policy lesson is that, in the long run, the natural rate can be lowered only by supply-side policies.

11.6 Applied example

After a large depreciation of a currency, the prices of imported fuel, machinery and food rise quickly. This is cost-push inflation. If workers then demand higher wages to protect their real incomes, and firms pass the costs on, a wage-price spiral can follow. A central bank may raise interest rates to stop expectations of inflation becoming entrenched, even though this slows growth and may raise cyclical unemployment for a time.

12. Fiscal, monetary and supply-side policy

12.1 Fiscal policy

Fiscal policy: the use of government spending and taxation to influence aggregate demand and the economy.

Budget deficit: government spending greater than tax revenue in a year.

National debt: the total accumulated amount the government owes.

Expansionary fiscal policy (higher G or lower taxes) shifts AD right, raising output and employment when there is spare capacity, with the effect magnified by the multiplier. **Contractionary** fiscal policy does the opposite and is used to reduce inflation or a budget deficit.

Taxes can be **direct** (on income and wealth, such as income tax and corporation tax) or **indirect** (on spending, such as sales tax or VAT and excise duties). A tax is **progressive** if the proportion of income paid rises as income rises, **proportional** if it stays the same, and **regressive** if it falls.

Automatic stabilisers are tax and spending items that change with the economic cycle without any decision: in a recession tax revenue falls and benefit spending rises, cushioning the fall in AD.

Discretionary fiscal policy is a deliberate change in tax rates or spending.

Limitations of fiscal policy: time lags (recognising the problem, deciding, implementing, and waiting for the effect), the risk of **crowding out** (government borrowing pushes up interest rates and reduces private investment), the size of the national debt, political pressure, and uncertainty about the size of the multiplier.

12.2 Monetary policy

Monetary policy: the use of interest rates, the money supply and the exchange rate by the central bank to influence aggregate demand, usually to meet an inflation target.

The main instrument is the policy interest rate. The transmission mechanism: a rise in the policy rate

raises market interest rates, reduces borrowing for consumption and investment, encourages saving, lowers asset prices (and so wealth), and may cause the currency to appreciate; AD falls and inflationary pressure eases.

Limitations: time lags of a year or more, weak effect in a deep recession when confidence is low (lower rates may not persuade firms to invest), one rate for the whole economy, and conflict with other objectives such as growth and the exchange rate.

12.3 Supply-side policy

Supply-side policy: policy that aims to increase the productive capacity of the economy, shifting LRAS to the right.

Market-based supply-side policies include cutting income and corporation taxes to raise incentives, reducing trade union power, privatisation, deregulation and reducing benefits to strengthen the incentive to work. **Interventionist** supply-side policies include government spending on education, training, infrastructure and research, and subsidies for investment. Supply-side policies can lower inflation and unemployment at the same time and improve international competitiveness, but they take a long time to work and some may increase inequality.

12.4 Applied example

A government facing high inflation and a large budget deficit might combine contractionary fiscal policy (cutting subsidies and raising tax collection) with tight monetary policy (a higher policy rate). Both reduce AD, so inflation should fall, but growth slows and unemployment may rise in the short run. To avoid permanently lower growth, the government could protect spending on education and infrastructure, which are supply-side measures.

13. International trade and exchange rates

13.1 Absolute and comparative advantage

Absolute advantage: a country has an absolute advantage in producing a good if it can produce more of it than another country with the same resources.

Comparative advantage: a country has a comparative advantage in producing a good if it can produce it at a lower opportunity cost than another country.

The theory of comparative advantage states that if countries specialise in the goods in which they have a comparative advantage and trade, total world output rises and both countries can gain, even if one country has an absolute advantage in both goods. Gains depend on the terms of trade (the rate at which exports exchange for imports) lying between the two countries' opportunity cost ratios.

Worked example: with the same resources, Country A can make 20 units of cloth or 10 units of rice; Country B can make 12 units of cloth or 12 units of rice.

Opportunity cost of 1 rice: in A = $20 / 10 = 2$ cloth; in B = $12 / 12 = 1$ cloth. B has the comparative advantage in rice.

Opportunity cost of 1 cloth: in A = $10 / 20 = 0.5$ rice; in B = $12 / 12 = 1$ rice. A has the comparative advantage in cloth.

A should specialise in cloth and B in rice. Any terms of trade between 1 and 2 cloth per unit of rice benefit both.

13.2 Protectionism

Methods of protection: **tariffs** (taxes on imports), **quotas** (limits on the quantity of imports), **subsidies** to domestic producers, embargoes (complete bans), exchange controls, and administrative barriers such as complex standards.

Tariff diagram in words: draw domestic demand and supply with a horizontal world supply line at the world price, below the domestic equilibrium. Under free trade the country consumes where demand meets the world price, produces where domestic supply meets it, and imports the difference. A tariff raises the world price line by the amount of the tariff. Consumption falls, domestic production rises, imports fall, and the government gains revenue equal to the tariff times the new imports. Consumer surplus falls by more than the gain in producer surplus plus tariff revenue: the two triangles left over are deadweight losses (one from inefficient domestic production, one from lost consumption).

Arguments for protection include protecting **infant industries** until they achieve economies of scale, protecting strategic industries, preventing dumping (selling below cost), protecting jobs in the short run, and correcting a balance of payments deficit. Arguments against include higher prices and less choice for consumers, inefficiency in protected industries, retaliation by other countries, and a loss of the gains from comparative advantage.

13.3 The balance of payments

Balance of payments: a record of all the financial transactions between the residents of one country and the rest of the world over a given period.

- **Current account:** trade in goods, trade in services, primary income (wages, interest, profits and dividends from abroad), and secondary income (current transfers such as workers' remittances and foreign aid).
- **Capital account:** capital transfers and the purchase and sale of non-produced, non-financial assets; usually small.
- **Financial account:** flows of direct investment, portfolio investment, other investment such as loans, and changes in reserve assets.

Overall the accounts must balance, with a net errors and omissions item covering measurement errors. A current account deficit must be matched by a net inflow on the financial and capital accounts. A current account deficit is a concern if it is large and persistent, financed by short term borrowing, or caused by poor competitiveness rather than by importing capital goods that will raise future productivity.

Policies to correct a current account deficit are **expenditure-reducing** (contractionary fiscal and monetary policy that lowers income and so imports) and **expenditure-switching** (depreciation or protection that switches spending from imports to domestic goods), plus supply-side policies to improve competitiveness in the long run.

13.4 Exchange rates

Exchange rate: the price of one currency expressed in terms of another currency.

Floating exchange rate: an exchange rate determined by the demand for and supply of the currency on the foreign exchange market, without government intervention.

Fixed exchange rate: an exchange rate held at a set value against another currency by the central bank.

In a floating system, demand for a currency comes from foreigners buying the country's exports, foreigners investing in the country, and speculators expecting the currency to rise. Supply of the currency comes from residents buying imports and investing abroad. The equilibrium exchange rate is where demand equals supply.

Diagram in words: draw the price of the currency (for example dollars per rupee) on the vertical axis and the quantity of rupees on the horizontal axis. A downward sloping demand curve and upward sloping supply curve cross at the equilibrium rate. A rise in demand for the country's exports shifts demand right and the currency **appreciates**. A rise in demand for imports shifts supply right and the currency **depreciates**. Under a fixed system the corresponding terms are revaluation and devaluation, and the central bank uses its foreign exchange reserves or interest rates to hold the rate. A **managed float** lets the market set the rate while the central bank intervenes to smooth sharp movements.

Factors that affect exchange rates: relative interest rates (higher rates attract financial inflows), relative inflation rates, the current account position, investor confidence, speculation, and central bank intervention.

Marshall-Lerner condition: a depreciation of the currency will improve the current account balance only if the sum of the price elasticities of demand for exports and imports is greater than one.

The **J-curve effect** describes what often happens after a depreciation. In the short run demand for exports and imports is inelastic because contracts are fixed and buyers take time to switch, so the current account first worsens (imports cost more in domestic currency while volumes barely change). Over time demand becomes more elastic, volumes adjust, and the current account improves. Plotting the balance against time gives a shape like the letter J.

13.5 Applied example

Workers' remittances are recorded as secondary income in the current account and are a large source of foreign currency for countries such as Pakistan, the Philippines and Bangladesh. A rise in remittances increases demand for the domestic currency, which tends to make it appreciate, and helps finance the trade deficit in goods. If remittances fall, the currency comes under pressure to depreciate, which raises the price of imported fuel and can feed into inflation.

Quick check

1. Define opportunity cost and use a production possibility curve, described in words, to explain why the opportunity cost of producing more of one good usually increases. [5]
2. The price of a product falls from \$8 to \$6 and the quantity demanded rises from 300 to 360 units per week. (a) Calculate the price elasticity of demand. (b) State whether demand is elastic or inelastic and calculate the change in total revenue. [5]

3. Consumers' incomes rise by 5% and the quantity demanded of a good falls by 2%. Calculate the income elasticity of demand and state what type of good it is. [3]
4. Explain the difference between diminishing returns and diseconomies of scale. [4]
5. Explain why a firm in perfect competition earns only normal profit in the long run. [6]
6. Explain, with reference to a diagram described in words, why a free market overproduces a good whose production creates a negative externality, and evaluate the use of an indirect tax to correct it. [10]
7. In an economy the marginal propensity to save is 0.15, the marginal rate of tax is 0.25 and the marginal propensity to import is 0.1. Investment rises by \$12 bn. Calculate the multiplier and the final change in national income. [3]
8. Distinguish between demand-pull and cost-push inflation, and explain why cost-push inflation makes policy choices difficult. [6]
9. Explain how an increase in the central bank's policy interest rate is expected to reduce inflation. [6]
10. With the same resources, Country X can make 30 phones or 15 bicycles and Country Y can make 10 phones or 10 bicycles. Determine which country has the comparative advantage in each good. [4]
11. Explain why a depreciation of a country's currency may make its current account worse before it makes it better. [5]

1. Opportunity cost is the value of the next best alternative forgone when a choice is made. On a PPC with good A on the vertical axis and good B on the horizontal axis, the curve is bowed outwards. Moving down the curve, each extra unit of B requires giving up a larger amount of A. This is because resources are not equally suited to both goods: the first resources moved into B are the ones best suited to it, but as production of B increases, resources that are less and less productive in B (and more productive in A) must be moved, so more A is sacrificed for each extra unit of B.

2. (a) Percentage change in price = $(6 \text{ minus } 8) / 8 \times 100 = \text{minus } 25\%$. Percentage change in quantity = $(360 \text{ minus } 300) / 300 \times 100 = +20\%$. PED = $20 / \text{minus } 25 = \text{minus } 0.8$. (b) The absolute value 0.8 is less than 1, so demand is price inelastic. Revenue before = $8 \times 300 = \$2,400$. Revenue after = $6 \times 360 = \$2,160$. Total revenue falls by \$240, as expected when price falls and demand is inelastic.

3. YED = $\text{minus } 2 / 5 = \text{minus } 0.4$. The value is negative, so the good is an inferior good: demand falls as income rises.

4. Diminishing returns is a short run concept: when more units of a variable factor are added to a fixed factor, the marginal product of the variable factor eventually falls, so marginal and average costs rise. Diseconomies of scale is a long run concept: all factors are variable, and long run average cost rises because the firm has grown too large, mainly through management, communication and motivation problems. The first is caused by a fixed factor, the second by the scale of the whole organisation.

5. In the short run, if the market price is above a firm's average total cost at the output where $MC = MR$, the firm earns supernormal profit. Because there is perfect information and there are no barriers to entry, new firms are attracted into the industry. Industry supply shifts to the right, and

the market price falls. The horizontal $AR = MR$ line facing each firm moves down. Entry continues until the price has fallen to the minimum point of ATC , where $AR = ATC$ and only normal profit is made. If firms made losses, some would leave and the price would rise back to this point. So in long run equilibrium each firm earns normal profit, with $P = MC = \text{minimum } ATC$.

6. Diagram: price and costs on the vertical axis, quantity on the horizontal. MPB (demand) slopes down, MPC (supply) slopes up and MSC lies above MPC , the gap being the marginal external cost. The market produces where $MPB = MPC$, because producers ignore costs they impose on third parties. The social optimum is where $MSB = MSC$, at a lower output. Between the two outputs, the cost to society of each unit (MSC) is greater than its benefit (MSB), so there is overproduction and a deadweight welfare loss shown by the triangle between MSC and MSB over that range. An indirect tax equal to the marginal external cost shifts MPC up to MSC , so the market now produces at the optimum and the polluter pays (the externality is internalised). It also raises revenue that could fund clean-up. Evaluation: the external cost is very hard to measure in money terms, so the tax may be set too high or too low; if demand is price inelastic, output falls only a little and the tax mainly raises prices; the tax may be regressive, hitting poorer consumers hardest; firms may relocate or evade the tax; and regulation or tradable permits may achieve a more certain cut in pollution. A tax is most suitable when the external cost per unit is fairly stable and measurable.

7. $MPW = 0.15 + 0.25 + 0.1 = 0.5$. Multiplier = $1 / 0.5 = 2$. Change in national income = $2 \times 12 = \$24 \text{ bn}$.

8. Demand-pull inflation occurs when aggregate demand grows faster than the economy's productive capacity: AD shifts right and, as the economy nears full capacity, the price level rises. Cost-push inflation occurs when costs of production rise, for example wages, imported raw materials or energy: $SRAS$ shifts left, raising the price level. Cost-push inflation is difficult because it is accompanied by falling output and rising unemployment (stagflation). If the government reduces AD to cut inflation, output and employment fall even further; if it raises AD to protect jobs, inflation rises further. Demand management cannot solve both problems at once.

9. A higher policy rate leads banks to raise their lending and deposit rates. Borrowing becomes more expensive, so households borrow and spend less on credit-financed goods such as cars and houses, and those with variable rate loans have less disposable income. Saving becomes more attractive, reducing consumption. Firms face higher costs of borrowing, so fewer investment projects are profitable and investment falls. Higher rates reduce asset prices, lowering wealth and spending. Higher rates may attract foreign funds, causing the currency to appreciate, which makes exports dearer and imports cheaper, reducing net exports and import prices. Lower C , I and $(X \text{ minus } M)$ reduce AD , easing demand-pull pressure, and cheaper imports reduce cost pressure. The effect works with a time lag, often a year or more.

10. Opportunity cost of 1 phone: in $X = 15 / 30 = 0.5$ bicycle; in $Y = 10 / 10 = 1$ bicycle. X has the lower opportunity cost, so X has the comparative advantage in phones. Opportunity cost of 1 bicycle: in $X = 30 / 15 = 2$ phones; in $Y = 10 / 10 = 1$ phone. Y has the comparative advantage in bicycles, even though X has an absolute advantage in both goods.

11. After a depreciation, each unit of imports costs more in domestic currency and each unit of exports earns less foreign currency. In the short run, demand for imports and exports is price inelastic because contracts are already agreed, consumers take time to find alternatives and firms take time to expand export capacity. Volumes therefore change very little while the price effect

dominates, and the current account worsens. Over time demand becomes more elastic: foreign buyers switch to the cheaper exports and domestic buyers switch away from dearer imports. If the Marshall-Lerner condition is met (sum of the price elasticities of demand for exports and imports greater than one), the current account then improves. Plotting the balance against time gives a J shape.