Production & Costs

AQA A-Level Economics

Productivity · Specialisation · Diminishing Returns · Cost Curves · Economies of Scale · MES

Production, Productivity & Specialisation

Definition:

Production is the process of converting inputs (land, labour, capital and enterprise) into outputs of goods and services.

Labour Productivity = Total Output ÷ Number of Workers (or hours worked)

Key concepts:

Productivity

Output per unit of input, usually per worker or per hour. Higher productivity lowers unit costs, improves competitiveness and allows higher real wages.

e.g. The UK 'productivity puzzle': output per hour grew ~2% a year before 2008, but only ~0.5% a year since — behind the USA, France and Germany.

Division of Labour

Production is split into separate tasks, each done by a specialist. Workers become more skilled, no time is lost switching tasks and capital is used efficiently.

e.g. Adam Smith's pin factory (1776): 10 specialised workers made ~48,000 pins a day. Drawbacks: boredom, low motivation and deskilling.

Money & Exchange

Specialisation requires trade — workers must swap what they produce for what they need. Money acts as a medium of exchange, avoiding the 'double coincidence of wants' of barter.

e.g. A car assembly worker produces nothing for their own use — they are paid in money, which they exchange for food, housing and other goods.

The Short Run: Diminishing Returns

Short run vs long run:

The short run is the period in which at least one factor of production (usually capital) is fixed. In the long run, all factors are variable.

The law of diminishing marginal returns:

As more units of a variable factor (labour) are added to a fixed factor (capital), the marginal product of the variable factor will eventually fall.

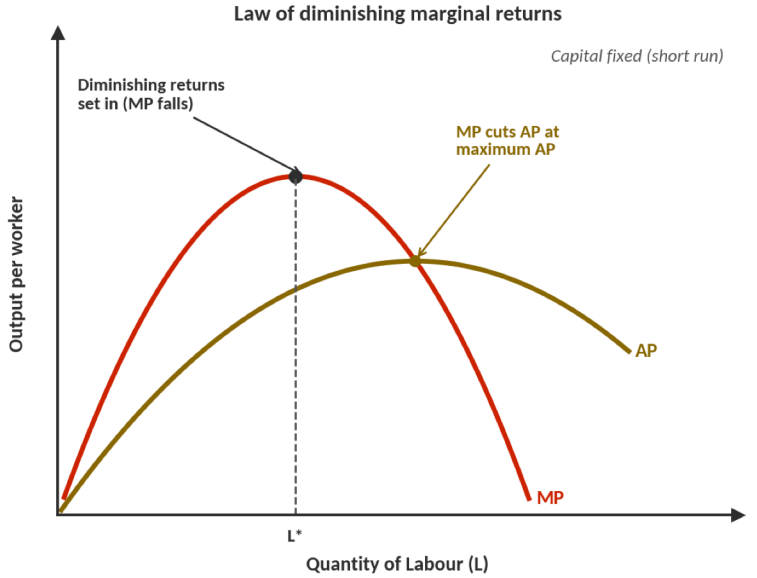
Key measures:

Total product (TP): total output. Marginal product (MP): the extra output from one more worker. Average product (AP): TP ÷ number of workers.

Why it happens:

Extra workers must share the same machines and space — each adds less than the last. MP can eventually become negative as workers get in each other's way.

Key point: diminishing returns is a short-run concept — it explains why short-run MC and AC curves are U-shaped.



Real-World Example

UK agriculture: adding fertiliser to a fixed area of land raises crop yields at first, but each extra tonne adds less — and eventually yields fall.

Short-Run Costs: Fixed vs Variable

Total Cost (TC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC). Average cost = total cost ÷ output:

Fixed Costs (TFC)

Definition: costs that do not change with output in the short run. They must be paid even if output is zero.

Examples: rent, business rates, insurance, loan interest, and salaries of permanent staff.

Average fixed cost (AFC = TFC ÷ Q) falls continuously as output rises — the fixed cost is 'spread' over more units.

In the long run, there are no fixed costs — all factors can be varied.

e.g. A cinema's rent and staff costs are the same whether it sells 10 or 300 tickets for a showing.

Variable Costs (TVC)

Definition: costs that change directly with the level of output. They are zero when output is zero.

Examples: raw materials, energy used in production, packaging, and wages of hourly or overtime workers.

Average variable cost (AVC = TVC ÷ Q) is U-shaped — it falls at first, then rises as diminishing returns set in.

Marginal cost (MC = ΔTC ÷ ΔQ) is the extra cost of producing one more unit — it only depends on variable costs.

e.g. A bakery's flour, butter and oven energy costs rise with every extra loaf produced.

Short-Run Cost Curves

Key formulas:

ATC = TC ÷ Q AVC = TVC ÷ Q AFC = TFC ÷ Q MC = ΔTC ÷ ΔQ

Why are MC and AVC U-shaped?

At first, adding workers raises MP, so the cost of each extra unit falls. Once diminishing returns set in, MP falls, so MC and then AVC rise.

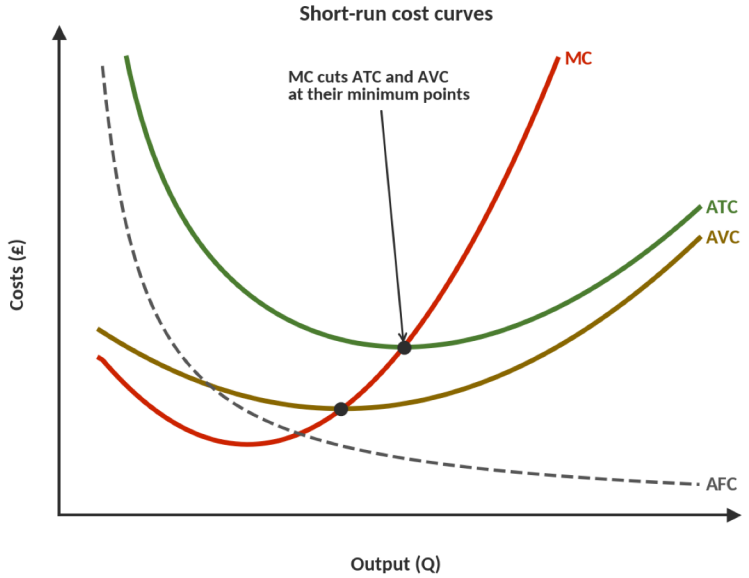
The MC–AC relationship:

If MC is below AC, AC falls. If MC is above AC, AC rises. So MC always cuts ATC and AVC at their minimum points.

The gap between ATC and AVC:

The vertical gap is AFC. It narrows as output rises because fixed costs are spread over more units.

The minimum point of ATC is the productively efficient level of output in the short run.



Real-World Example

Budget airlines: easyJet and Ryanair have high fixed costs but tiny marginal costs per passenger — filling seats with cheap fares spreads fixed costs and cuts AC.

The Long Run: Returns to Scale & the LRAC

Returns to scale:

In the long run, all factors can be increased. Returns to scale describe how output changes when all inputs rise by the same proportion.

Three types:

Increasing returns: output rises by a larger % than inputs. Constant returns: output rises by the same %. Decreasing returns: output rises by a smaller %.

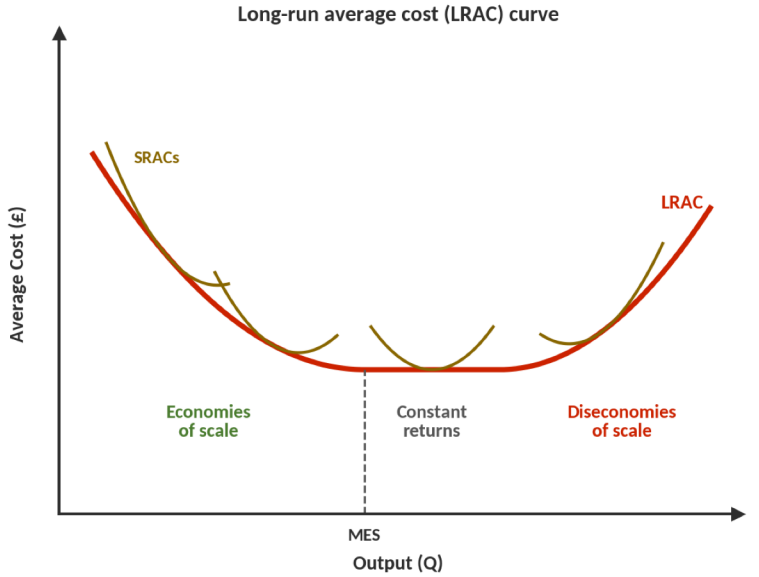
The LRAC curve:

Shows the lowest average cost of producing each output when all factors are variable. It is an 'envelope' of the short-run AC curves. It falls due to economies of scale and rises due to diseconomies of scale.

Minimum efficient scale (MES):

The lowest output at which LRAC is minimised — the point where economies of scale are exhausted.

Don't confuse returns to scale (long run, all inputs vary) with diminishing returns (short run, one input fixed).



Real-World Example

Car manufacturing: MES is very high — often estimated at 200,000+ cars a year per plant. Nissan Sunderland, the UK's largest plant, builds hundreds of thousands a year.

Internal Economies of Scale

Internal economies of scale are cost savings that arise as an individual firm grows larger — they cause LRAC to fall:

Technical Economies

Large firms can use bigger, more efficient machinery and mass production techniques.

e.g. Container ships: the largest carry 24,000+ containers at a far lower cost per box than smaller ships.

Purchasing (Bulk-Buying) Economies

Large firms buy inputs in bulk and have the bargaining power to negotiate lower prices from suppliers.

e.g. Tesco's size lets it buy far more cheaply per unit than a local independent shop.

Managerial Economies

Large firms can employ specialist managers (finance, marketing, HR), improving efficiency and decision-making.

e.g. A large firm hires a specialist tax team; a sole trader must do their own accounts.

Financial Economies

Large firms are seen as lower risk, so they can borrow more cheaply and raise finance by issuing shares or bonds.

e.g. FTSE 100 firms borrow at lower interest rates than small businesses, which often rely on bank loans.

Marketing Economies

Advertising costs are spread over a larger output, so the cost per unit sold falls. Large firms can also afford national campaigns.

e.g. A £10m TV campaign costs far less per unit for Cadbury than for a small chocolatier.

Risk-Bearing Economies

Large firms can diversify into different products and markets, so a fall in demand for one product is less damaging.

e.g. Unilever sells food, cleaning and beauty products in 190 countries — spreading risk widely.

Diseconomies of Scale & External Economies

Beyond a point LRAC rises — and a firm's costs are also affected by the growth of its whole industry:

Diseconomies of Scale (Internal)

Communication problems: more layers of management slow decisions and messages get distorted.

Coordination and control: it becomes harder to monitor workers and ensure all departments work towards the same goals.

Motivation and alienation: workers in large firms may feel like 'a small cog', reducing effort and productivity.

Principal–agent problem: managers may pursue their own goals rather than the owners' (shareholders').

e.g. Large public organisations and multinationals are often criticised for slow, bureaucratic decision-making.

External Economies & Diseconomies

External economies of scale: cost savings from the growth of the whole industry in an area — they shift every firm's LRAC down.

Sources: a pool of skilled labour, specialist suppliers nearby, shared infrastructure, and local university research.

External diseconomies: costs from the industry becoming too concentrated — rising rents, congestion and labour shortages bid up wages.

These shift the LRAC curve rather than causing a movement along it.

e.g. 'Silicon Fen' in Cambridge: tech firms gain from skilled graduates and specialist investors, but face very high property costs.

Minimum Efficient Scale & Market Structure

The size of the MES relative to total market demand helps explain how many firms an industry can support:

Low MES → Many Small Firms

If costs are minimised at a low output, many small firms can compete efficiently. Markets tend to be competitive with low barriers to entry — e.g. hairdressers, cafés and plumbers.

High MES → Few Large Firms

If MES is a large share of market demand, only a few firms can reach it. Markets tend to be oligopolies — e.g. car manufacturing, aircraft production and supermarkets.

Natural Monopoly

Where economies of scale are so large that LRAC is still falling at the level of total market demand, one firm can supply the market most cheaply — e.g. water supply and rail track.

MES as a Barrier to Entry

New entrants starting small face much higher average costs than established firms operating at MES. This cost disadvantage deters entry and protects incumbent firms.

Bigger is not always better: firms growing beyond MES may face diseconomies of scale — and large firms with market power may become complacent (X-inefficiency).

★ Bonus: Technological Change & Costs

Invention vs innovation:
Invention is the creation of a new idea or product. Innovation is putting that idea into practice — turning it into a commercial product or process.

Process vs product innovation:
Process innovation changes how goods are made — it lowers costs and shifts cost curves down. Product innovation creates new or improved goods.

Effect on costs:
New technology raises productivity, shifting the SRAC and LRAC curves downward. It can also change market structure by lowering MES or creating new markets.

Evaluation:
Lower costs can mean lower prices and higher real incomes. ✗ Can cause technological unemployment. ✗ Large firms may use patents to block rivals.

Creative Destruction (Schumpeter)

New technologies and firms destroy old industries and firms. This is painful but drives long-run growth and efficiency.

Dynamic Efficiency

Investment in R&D and new technology lowers costs over time — firms need profits to fund it.

Real-World Example

Music streaming: Spotify's near-zero marginal cost per stream replaced CDs with high manufacturing and distribution costs. Virgin Megastores closed and HMV fell into administration — creative destruction in action.

Summary: Key Terms & Relationships

Key Term	Meaning
Productivity	Output per unit of input (e.g. per worker or per hour). Higher productivity lowers unit costs.
Division of labour	Splitting production into specialist tasks. Raises productivity but can cause boredom.
Short run / long run	Short run: at least one factor fixed. Long run: all factors of production variable.
Diminishing returns	Adding a variable factor to a fixed factor — MP eventually falls. Short-run concept.
Fixed / variable costs	Fixed costs don't change with output; variable costs rise with output. TC = TFC + TVC.
Marginal cost (MC)	The extra cost of producing one more unit. MC = ΔTC ÷ ΔQ.
Average total cost (ATC)	TC ÷ Q. U-shaped in the short run. MC cuts ATC at its minimum.
Returns to scale	How output changes when all inputs rise in proportion — increasing, constant or decreasing.
Economies of scale	Falling LRAC as a firm grows — technical, purchasing, managerial, financial, marketing, risk-bearing.
Diseconomies of scale	Rising LRAC as a firm grows too large — communication, coordination, motivation problems.
External economies	Cost savings from the growth of the whole industry. Shift the firm's LRAC downward.
Minimum efficient scale	The lowest output at which LRAC is minimised. Affects the number of firms in a market.
Creative destruction	New technology and firms replace old ones — Schumpeter's driver of long-run growth.