Cambridge AS & A Level · Economics 9708 · Notes

Efficiency and market failure A2

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Read first: **Production possibility curves**, **Consumer and producer surplus**, **Classification of goods and services**, **Reasons for government intervention in markets**

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What you need to know

By the end of this topic you should be able to:

1. **Define productive efficiency and allocative efficiency.** Productive efficiency means making goods at the lowest possible cost per unit, wasting no resources. Allocative efficiency means using resources to make the goods and services that people value most, in the right amounts.
2. **State the conditions for each.** A firm is productively efficient at the lowest point of its average cost curve (where marginal cost equals average cost), and an economy is productively efficient on its production possibility curve. Allocative efficiency needs price to equal marginal cost, or, when there are external costs or benefits, marginal social benefit to equal marginal social cost.
3. **Explain Pareto optimality**: an allocation where nobody can be made better off without making someone else worse off. It needs both productive and allocative efficiency.
4. **Define dynamic efficiency**: efficiency improving over time, as investment, research and new technology lower costs and bring better products.
5. **Define market failure**: a free market leaving resources allocated inefficiently.
6. **Explain the reasons for market failure**: externalities, public goods, merit and demerit goods (imperfect information), market power such as monopoly, and immobile factors of production.

The details of externalities, market structures and the policies that correct market failure each have their own topic. Here you learn the efficiency ideas that they all use, and why a free market can miss them.

Understand it

Why efficiency matters

Resources are scarce, so any that are wasted are goods people could have had. Economists ask two questions about any allocation: **are goods being made as cheaply as possible?** (productive efficiency) and **are the right goods being made?** (allocative efficiency). An economy could make shoes at the lowest possible cost and still be inefficient if nobody wants that many shoes.

Productive efficiency

Productive efficiency is producing output at the **lowest possible average cost**, using the fewest resources per unit.

- **For a firm**, it is the output at the **lowest point of the average cost (AC) curve**. The marginal cost (MC) curve always cuts AC at its lowest point, so the condition is $\mathrm{MC} = \mathrm{AC}$. The firm must also be on its lowest possible AC curve: a firm with slack management, overstaffing or careless buying has costs above that curve, which is called **X-inefficiency**.
- **For an economy**, it is being **on the production possibility curve (PPC)**: you cannot make more of one good without making less of another. A point inside the PPC means some resources are unemployed or wasted.

Allocative efficiency

Allocative efficiency is when resources are allocated so that the mix of goods produced matches what consumers want most, so total satisfaction (welfare) is as large as possible.

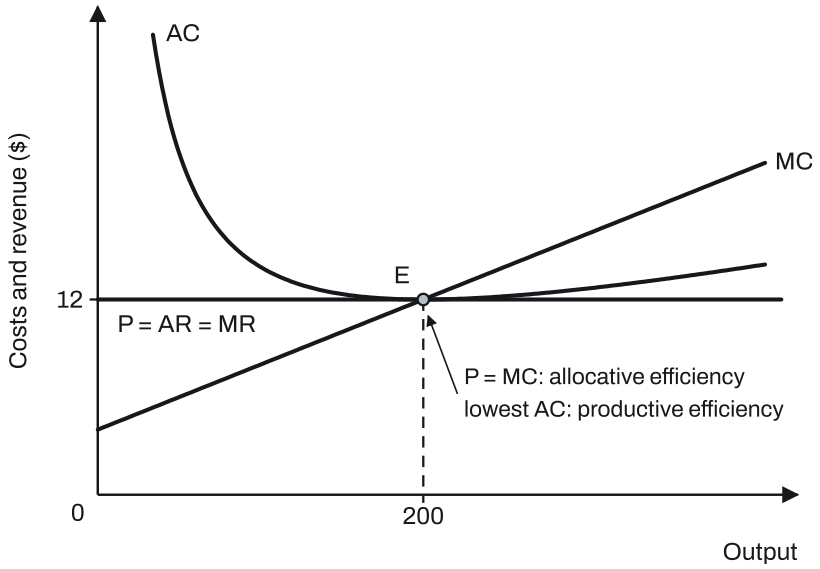
The condition is **price equals marginal cost**, $P = \mathrm{MC}$.

- **Price** measures what consumers are willing to pay for the last unit: the value they place on it.
- **Marginal cost** measures the value of the resources used to make that last unit.

If $P > \mathrm{MC}$, people value one more unit more than it costs to make: too little is being produced, and output should rise (and price fall). If $P < \mathrm{MC}$, the last unit costs more than it is worth to anyone: too much is being produced. Only at $P = \mathrm{MC}$ is no gain left from moving resources.

When production or consumption affects third parties, the price and the firm's cost leave those effects out. The condition is then $\mathrm{MSB} = \mathrm{MSC}$ (marginal social benefit equals marginal social cost). $P = \mathrm{MC}$ is the same idea when there are no externalities.

Efficiency in perfect competition

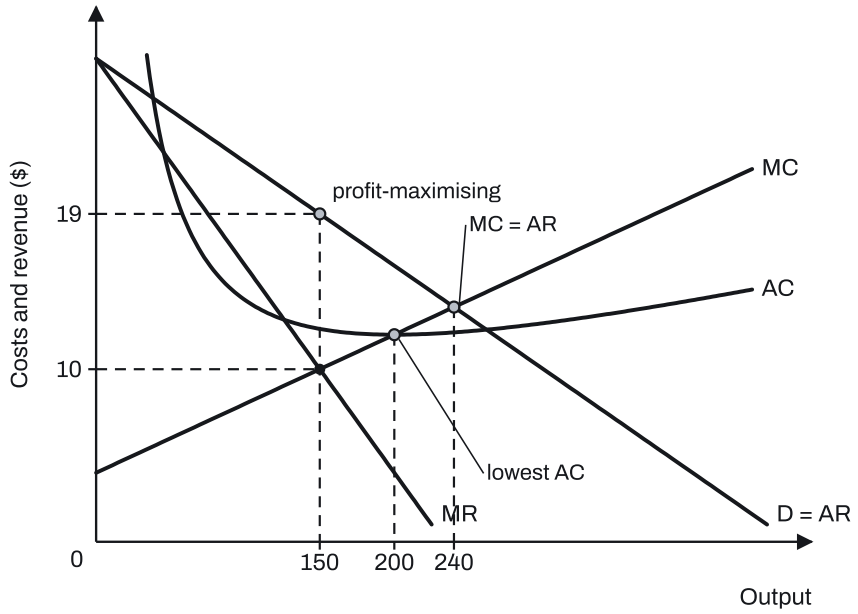


A firm in perfect competition is a price taker: it sells as much as it likes at the market price, so its demand curve is a horizontal line, $P = \mathrm{AR} = \mathrm{MR}$. In the long run, free entry and exit remove any supernormal profit, so price settles at the **lowest point of AC**. Here, with costs of $\mathrm{AC} = \frac{800}{q} + 4 + 0.02q$, that is \$12 at 200 units. At E:

- $\mathrm{MR} = \mathrm{MC}$: the firm maximises profit;
- $P = \mathrm{MC} = \$12$: **allocative efficiency**;
- AC is at its minimum: **productive efficiency**.

So long-run perfect competition is the benchmark: it reaches both. It does **not** guarantee dynamic efficiency, because firms earn only normal profit and have little to spend on research.

Inefficiency under monopoly



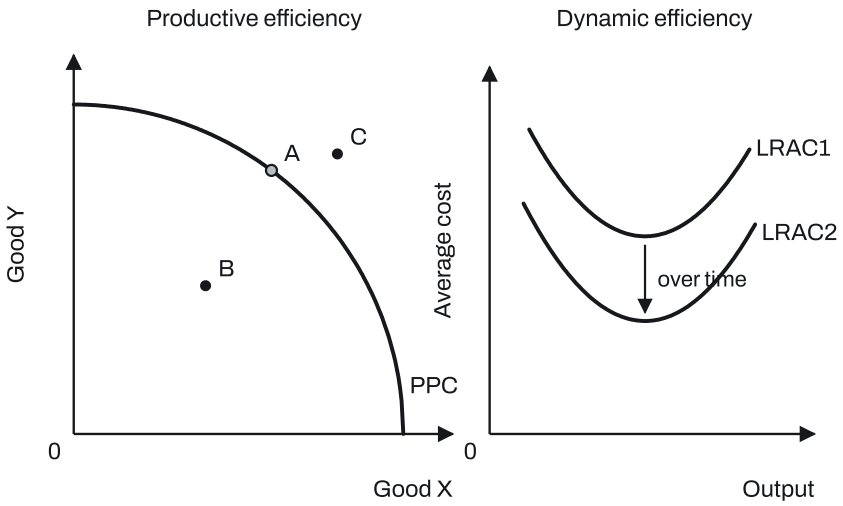
A monopoly with the same costs faces the whole market demand curve, $\mathrm{AR} = 28 - 0.06q$, so MR lies below AR. It maximises profit where $\mathrm{MR} = \mathrm{MC}$: **150 units**, sold at **$19**.

- **Allocatively inefficient.** At 150 units, consumers value the last unit at $19 but it costs only $10 to make ($P > \mathrm{MC}$). Output is restricted below the 240 units where MC cuts AR, and the price is higher.
- **Productively inefficient.** 150 units is to the left of the lowest point of AC (200 units), so average cost is not at its minimum. Without competition the monopoly may also be X-inefficient.
- **But possibly dynamically efficient.** Supernormal profit, protected by barriers to entry, can pay for research and new capital. Large scale can bring **economies of scale**, so its whole AC curve may sit below that of many small firms. A **natural monopoly** (one water network, one rail track) has costs that keep falling over the whole market, so one firm is cheaper than several.

Monopolistic competition sits between: in the long run price equals AC (normal profit) but on the falling part of AC, so firms have spare capacity (not productively efficient) and $P > \mathrm{MC}$ (not allocatively efficient).

Dynamic efficiency

Dynamic efficiency is efficiency **improving over time**: through investment, research and development (R&D), innovation and new technology, firms lower their costs and bring new or better products.



On a diagram it is a **downward shift of the whole average cost curve** (LRAC1 to LRAC2), not a movement along one curve to its lowest point; for the economy, an outward shift of the PPC. It needs money to invest, so it is helped by reinvested profit, lower taxes on retained profit, and government spending on education and research; it is held back when profits are paid out as dividends instead.

A firm that becomes dynamically efficient has **lower costs**, so its productive efficiency improves too. Its **allocative** efficiency changes only if the gap between price and marginal cost closes: a monopoly that cuts its costs but still sets $\mathrm{MR} = \mathrm{MC}$ keeps $P > \mathrm{MC}$.

Pareto optimality

An allocation is **Pareto optimal** (Pareto efficient) when **nobody can be made better off without making somebody else worse off**. A **Pareto improvement** is any change that makes at least one person better off and nobody worse off.

Ama has four oranges and prefers bread; Kofi has four loaves and prefers oranges. If they swap two of each, both are happier and nobody loses: a Pareto improvement. The starting point was not Pareto optimal. Once every such gain has been taken, it is.

Pareto optimality needs:

- **productive efficiency**: the economy is on its PPC, with **no unemployed resources** (full employment), because otherwise more could be made for someone at no cost to anyone;
- **allocative efficiency**: the right mix of goods, with $P = \mathrm{MC}$ in every market;
- goods shared out so that no swap between consumers can make both better off.

Two warnings:

- **Efficiency is not equity.** An economy where one person owns almost everything can be Pareto optimal, because taking anything from them makes them worse off. Pareto optimality says nothing about whether the distribution of income is **fair**.
- There are **many** Pareto optimal points, and the theory cannot rank them.

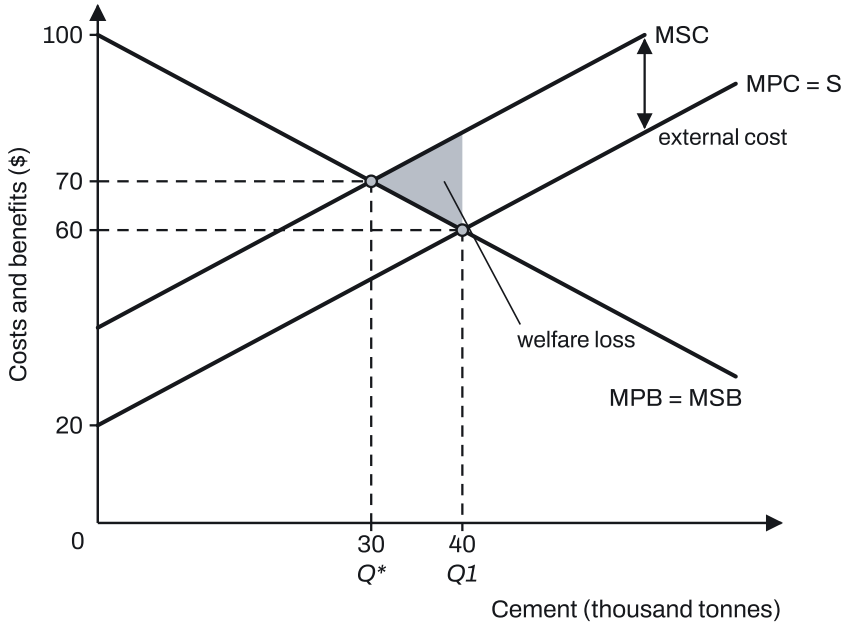
Market failure

Market failure is when the free market, left to itself, **allocates resources inefficiently**: the price mechanism does not take account of all the costs and benefits, so the market produces too much or too little of a good, or none at all, and welfare is lower than it could be. In the language above, the market misses allocative (and often productive) efficiency.

Not every problem is a market failure. A price that rises because supply has fallen (a drought, a factory fire) is the price mechanism **working**: it rations the smaller supply and signals producers to supply more. A firm making a loss is not a market failure either.

Reasons for market failure

1. Externalities. Costs or benefits that fall on third parties, outside the market. A cement works makes dust that harms people nearby, an **external cost** of $20 for every tonne. The firm counts only its private costs (MPC), so marginal social cost is $\text{MSC} = \text{MPC} + \text{external cost}$.



The market produces where private benefit equals private cost: **40 thousand tonnes at $60** ($Q_1$). The efficient output is where $\text{MSB} = \text{MSC}$: **30 thousand tonnes at $70** ($Q^*$). Between them, each extra tonne costs society more than it is worth; the **welfare loss** is the shaded triangle, $\frac{1}{2} \times 10 \times 20 = 100$, that is $100 000. So a negative externality means **over-production and under-pricing**. An external **benefit** (vaccination, education) does the reverse: MSB lies above MPB, so the market **under-produces**.

2. Public goods. Goods that are **non-excludable** (non-payers cannot be stopped from benefiting) and **non-rival** (one person's use does not reduce what is left for others), such as street lighting or flood defences. People can **free ride**, so firms cannot charge and the market provides little or none: a **missing market**.

3. Merit and demerit goods (information failure). With **imperfect information**, consumers underestimate the benefits of merit goods (health checks, education) and under-consume them, and underestimate the harm of demerit goods (tobacco) and over-consume them. Many of these goods also have externalities.

4. Market power. A monopoly or a group of colluding firms restricts output and raises price ($P > \mathrm{MC}$) and may not produce at lowest cost, as in the second diagram.

5. Factor immobility. Workers who cannot move to where jobs are (geographical immobility) or lack the skills new jobs need (occupational immobility) stay unemployed, so the economy is inside its PPC: productive inefficiency.

Inequality. A market can leave some people very poor, and governments often step in for **equity** reasons. Essay mark schemes accept this as a reason to intervene, but it is about fairness, not efficiency: in multiple choice, income inequality on its own is **not** a source of market failure.

Key facts and formulas

There is no formula list in the 9708 exam, so everything here is "Learn it".

Formula	Status
Allocative efficiency (no externalities): $P = \mathrm{MC}$, the value of the last unit to consumers equals the cost of making it	Learn it
Allocative efficiency with externalities: $\mathrm{MSB} = \mathrm{MSC}$	Learn it
Productive efficiency for a firm: output at the lowest point of AC, where $\mathrm{MC} = \mathrm{AC}$	Learn it
Productive efficiency for an economy: production on the production possibility curve	Learn it
Marginal social cost: $\mathrm{MSC} = \mathrm{MPC} + \text{marginal external cost}$	Learn it
Marginal social benefit: $\mathrm{MSB} = \mathrm{MPB} + \text{marginal external benefit}$	Learn it
Welfare loss of an externality $= \frac{1}{2} \times (\text{market output} - \text{efficient output}) \times (\text{gap between MSC and MSB at the market output})$	Learn it
Profit maximisation: $\mathrm{MR} = \mathrm{MC}$ (perfect competition long run: $P = \mathrm{MR} = \mathrm{MC} = \text{minimum AC}$)	Learn it

Rules to learn:

- $P > \mathrm{MC}$: too little produced, so output should rise and price fall. $P < \mathrm{MC}$: too much produced.
- Pareto optimal: nobody can gain without someone losing. Pareto improvement: someone gains, nobody loses. Pareto optimality needs productive and allocative efficiency, and says nothing about fairness.
- Dynamic efficiency: a downward shift of the AC curve over time (or an outward shift of the PPC).

How to do it

We tagged 66 questions for this topic (2021–2025): 37 Paper 3 multiple choice and 29 Paper 4 data response and essay questions. For the essays we count only the parts about efficiency and market failure; four questions have parts of two types, so the counts add up to 70.

Question type	Questions
Recognise Pareto optimality and Pareto improvements (mostly multiple choice)	12
Identify which type of efficiency a change produces (multiple choice)	10
Evaluate whether free markets or governments achieve efficiency (20- or 25-mark essay)	9
Compare the efficiency of market structures (essay, or an 8-mark part)	8
Define and explain productive, allocative and dynamic efficiency (multiple choice, or a 4- to 12-mark part)	7
Explain why a source causes market failure (multiple choice, or a 12-mark part)	6
State the allocative efficiency condition and what moves a market towards it (multiple choice)	6
Use an MSC and MSB diagram to show allocative inefficiency (10-mark part or essay)	6
Find the efficient point on a cost and revenue diagram or a PPC (multiple choice)	4
Judge from a data extract whether there is market failure or more efficiency (4- or 5-mark part)	2

1. Recognise Pareto optimality and Pareto improvements (12 questions)

Eleven multiple choice (**9708/34/O/N/25 Q6**, **9708/31/O/N/25 Q5**, **9708/33/O/N/23 Q10**, **9708/33/M/J/23 Q2**, **9708/33/O/N/22 Q1**, **9708/31/O/N/22 Q1**, **9708/33/M/J/22 Q1**, **9708/32/F/M/22 Q1**, **9708/31/O/N/21 Q1** and repeats) and one 13-mark essay part (**9708/43/O/N/22 Q2** (b)).

1. **Find the option with the definition**: no one can be made better off without making someone else worse off.
2. **What you can deduce from it**: resources are **allocated efficiently**. Reject "income is fairly or equally distributed", "people are rational", "there are no externalities" and "firms maximise profit".
3. **What it needs**: productive **and** allocative efficiency. Evidence that an economy is there: **full employment** (it is on its PPC). Evidence against: unemployment, waste, unexploited gains from trade.
4. **Actions that move towards it**: anything that creates a gain without a loss, such as **training** unemployed or low-skilled workers so the same resources produce more.

Variations:

- **A table of allocations**: a Pareto improvement is a row where at least one person has **more** and **nobody has less**.
- **Essay part (13 marks)**: whether Pareto optimality needs productive and allocative efficiency and whether it makes society more equitable. Define Pareto optimality, link it to both efficiencies with a PPC and $P = \mathrm{MC}$, then separate efficiency from **equity**: a Pareto optimal allocation can be very unequal, and a fairer one may need someone to lose. The 2022 report said the top level needed this distinction.

2. Identify which type of efficiency a change produces (10 questions)

All multiple choice (**9708/32/F/M/25 Q7**, **9708/33/O/N/23 Q5**, **9708/31/O/N/23 Q8**, **9708/33/M/J/23 Q4**, **9708/32/F/M/23 Q4**, **9708/32/M/J/22 Q3**, **9708/33/M/J/21 Q2**, **9708/32/F/M/21 Q1** and repeats).

1. **A downward shift of the AC (or LRAC) curve over time**: dynamic efficiency. A **move along** the curve to its lowest point is productive efficiency.
2. **What causes it**: reinvested profit, R&D, new capital, lower taxes on retained profit, enterprise education. **What reduces it**: higher dividends paid out of profit.
3. **Tables of "improves / unchanged"**: lower costs improve dynamic and productive efficiency; allocative efficiency improves only if P moves towards MC. A profit-maximising monopoly that invests its profit in better capital still sets $\mathrm{MR} = \mathrm{MC}$, so allocative efficiency is unchanged.
4. **Several diagrams at once**: a better production technique lowers ATC, shifts the market supply curve right and shifts the PPC out along that good's axis.

3. Evaluate whether free markets or governments achieve efficiency (9 questions)

Essays: 20 marks from 2023 (**9708/44/M/J/25 Q2**, **9708/41/O/N/25 Q2**, **9708/42/M/J/24 Q2**, **9708/41/O/N/23 Q2**) and 25 marks or a 13-mark (b) part in 2021–2022 (**9708/42/O/N/22 Q2**, **9708/42/O/N/21 Q2**, **9708/43/M/J/21 Q2**, **9708/42/M/J/21 Q2** and a repeat). Topics: can efficiency be reached without government, is market failure the cause of climate change, should health care be private, can market failure always be overcome, do externalities explain all market failure.

Answer plan (20 marks: Table A 14 for knowledge and analysis, Table B 6 for evaluation)

1. **Define** productive efficiency (minimum AC), allocative efficiency ($P = \mathrm{MC}, \mathrm{MSB} = \mathrm{MSC}$) and market failure.
2. **The case for markets (AO2)**: a labelled diagram of perfect competition in the long run reaching both efficiencies; price signals guide resources to what people want; competition cuts costs.
3. **Why markets fail (AO2)**: two or three sources, each as a chain, for example negative externality → firm ignores external cost → MSC above MPC → market output above Q^* → welfare loss, with the MSC diagram. Others: public goods (free riders, missing market), merit goods (information failure), monopoly ($P > \mathrm{MC}$), factor immobility. Use a diagram: **in 2025, an answer with no diagram was capped at Level 2 (8 marks) for knowledge and analysis.**
4. **What government can do (AO2)**: name and apply one or two policies, such as indirect taxes, subsidies, regulation, direct provision, pollution permits, property rights, information and "nudges". (The policies themselves are a separate topic.)
5. **Evaluation (AO3)**: the size of a failure is hard to **measure** (how big is the external cost?); subsidies and direct provision have an **opportunity cost**; **government failure** (wrong tax rate, bureaucracy, political pressure, regulators captured by the industry); **time lags**; some failures are small and markets self-correct; perfect competition is a theoretical model.
6. **Judgement**: answer the question's exact words ("only", "always", "without government"). For example: markets can reach efficiency for ordinary private goods in competitive industries, but not where there are externalities, public goods or market power; there government can improve the outcome, but only if the gain is bigger than the cost of the policy and the risk of government failure.

For 25-mark questions (2021–2022), the same plan was marked in four levels (Level 4: 18–25); a 13-mark (b) part needed a developed comparison and a conclusion for Level 4 (9–13).

4. Compare the efficiency of market structures (8 questions)

Essays (**9708/43/M/J/24 Q2**, **9708/43/O/N/23 Q3**, **9708/42/O/N/23 Q3**, **9708/41/O/N/21 Q2**, **9708/42/F/M/21 Q3** (b), **9708/42/F/M/22 Q2** (a) and a repeat) and an 8-mark data-response part (**9708/44/O/N/25 Q1** (c)).

Answer plan (20-mark essay)

1. **Define** productive, allocative and dynamic efficiency.
2. **Perfect competition** with a long-run diagram: $P = \mathrm{MC}$ and minimum AC, so both efficiencies.
3. **Monopoly** (or monopolistic competition) with its diagram: $\mathrm{MR} = \mathrm{MC}$ gives $P > \mathrm{MC}$ and output below minimum AC; higher price, lower output.
4. **Evaluation**: monopoly may be **dynamically efficient** (supernormal profit funds R&D), gain **economies of scale** (lower AC than many small firms, possibly lower prices), or be a **natural monopoly**; but profit may go to dividends, and X-inefficiency is likely without competition. Perfect competition is unrealistic and its firms cannot afford much R&D. Monopolistic competition spends on non-price competition (advertising), which raises costs.
5. **Judgement** on "always", "ideal" or "most efficient": static efficiency favours competition; dynamic efficiency may favour large firms; it depends on the industry (economies of scale, how fast technology changes) and on regulation.

8-mark "consider whether monopoly always acts against consumers": mark schemes give up to 4 for each side (one mark for the point, one for its explanation), 7 for the argument, and 1 for a conclusion. Against consumers: loss of productive, allocative or dynamic efficiency, each explained (or a diagram showing them). For consumers: economies of scale, R&D, natural monopoly, each explained. Then one sentence of judgement. Worked example 4 below has these points in full.

The March 2022 report said many candidates confused dynamic efficiency with the other two and wrongly concluded that perfect competition is best at it.

5. Define and explain productive, allocative and dynamic efficiency (7 questions)

Multiple choice (**9708/32/O/N/21 Q1**, **9708/33/O/N/25 Q1**) and written parts (**9708/44/O/N/25 Q1** (a), 4 marks; **9708/43/M/J/21 Q1** (c) and a repeat, 5 marks; **9708/42/M/J/21 Q2** (a), 12 marks; **9708/42/F/M/21 Q1** (a)).

- **Multiple choice**: productive efficiency is "the output cannot be made at a lower unit cost" (not "profit cannot be raised", not "cannot produce outside the PPC"). An economy wants efficiency so that **resources are not wasted** (not to make incomes equal).
- **4-mark part, two definitions**: two marks each, a meaning and a condition. Allocative: making what consumers want most (1), $P = \mathrm{MC}$ (1). Productive: lowest use of resources per unit (1), minimum AC, or being on the PPC (1).
- **5-mark part comparing an extract's idea with economists' definitions**: an article that measures "efficiency" as output per unit of input (a number of patients treated per dollar) is close to productive efficiency, but says nothing about whether the output is what people value most (allocative). Make that contrast.

- **12-mark part**: all three types, each defined, with a diagram (AC curve, P = MC, LRAC shifting down) and a comment on how they can conflict.

6. Explain why a source causes market failure (6 questions)

Multiple choice (**9708/32/F/M/25 Q2**, **9708/33/M/J/22 Q13**, **9708/33/O/N/21 Q2** and a repeat) and a 12-mark part (**9708/43/M/J/22 Q2** (a) and a repeat).

- **"Which is an example of market failure?"**: **under-provision of a socially desirable good**. Not: a firm selling below cost, a surplus from a guaranteed minimum price (that is government intervention), or poorer people being unable to afford an expensive good.
- **"Which is not a source?"**: **income inequality**. Read "not" carefully: the 2022 report said many candidates picked non-excludability, which **is** a source.
- **Public goods**: the reason is that **non-excludability leads to free riding**, so no firm can charge. Rivalry is the opposite of a public good.
- **12-mark part on public goods**: define non-rival and non-excludable with examples, explain free riding and the missing market, then link to **allocative inefficiency**: the good is worth more to society than it costs, yet is not produced. The 2022 report said few answers made that link; it is what lifts the answer.

7. State the allocative efficiency condition and what moves a market towards it (6 questions)

All multiple choice (**9708/32/M/J/25 Q2**, **9708/33/O/N/24 Q3**, **9708/32/F/M/23 Q10**, **9708/32/M/J/22 Q2**, **9708/32/O/N/25 Q8**, **9708/32/O/N/22 Q1**).

1. The condition in words: **the cost of producing the last unit equals the value consumers place on it**. In symbols: MC equals **price, that is average revenue**.
2. It is reached when a **perfectly competitive market is in equilibrium**, not when everyone who needs a product gets it, not at lowest cost (that is productive), and not where a monopolist earns normal profit.
3. **MC below price** means output should **increase** and price **decrease**.
4. Moves towards it: **entry of new firms**, more competition, a **subsidy** for an under-provided good. Moves away: collusion, mergers, higher concentration, supernormal profit, monopsony.

8. Use an MSC and MSB diagram to show allocative inefficiency (6 questions)

A 10-mark data-response part (**9708/42/M/J/25 Q1** (d)) and essays (**9708/41/O/N/24 Q2**, **9708/42/M/J/22 Q4** (a), **9708/42/F/M/22 Q2** (b), **9708/43/M/J/23 Q2** and a repeat): coal-fired power, climate change, city car congestion, subsidies for private schools.

1. **Define** private cost, external cost, social cost ($\text{MSC} = \text{MPC} + \text{external cost}$) and allocative efficiency ($\text{MSB} = \text{MSC}$).
2. **Name the external cost or benefit** in the question's context and who bears it, using any figures in the extract.
3. **Draw** the diagram: axes (costs and benefits, quantity), MPC, MSC above it for an external cost (or MSB above MPB for an external benefit), MPB = MSB, the market output Q_1 and the efficient output Q^*, and the **welfare-loss triangle**.

4. **Explain**: the market ignores the external cost, so $Q_1 > Q^*$, over-production and under-pricing, a welfare loss.
5. **Conclude** in the question's words: allocative efficiency is not reached at Q_1; the efficient output is Q^*.

In essays, then evaluate a policy (type 3, step 5). The 2023 report said answers without a relevant diagram could not reach Level 3, and that the link from a merit good to positive externalities to allocative efficiency was often missing.

9. Find the efficient point on a cost and revenue diagram or a PPC (4 questions)

All multiple choice (**9708/32/F/M/22 Q3**, **9708/32/M/J/21 Q1**, **9708/33/M/J/22 Q2** and a repeat).

- **Monopoly or monopolistic competition diagram**: allocative efficiency is where **MC cuts AR** (demand), not where MC cuts MR (profit maximisation) and not where MC cuts AC (productive efficiency).
- **PPC**: every point **on** the curve is productively efficient; a point inside is not. Being on the curve does **not** prove allocative or Pareto efficiency, because you don't know whether that mix is what people want.

10. Judge from a data extract whether there is market failure or more efficiency (2 questions)

9708/42/F/M/24 Q1 (a), 5 marks, (b), 4 marks; **9708/42/F/M/21 Q1** (b).

1. **Identify** what the extract says caused the change (a fall in supply, a breakdown, a rule).
2. **Define** market failure: the price mechanism fails to take account of all costs and benefits, giving allocative inefficiency.
3. **Test the evidence**: a price rise caused by a supply shortage is the market **working**, not failing, unless the extract shows external costs, missing goods or abuse of market power. Say whether the evidence supports market failure; either answer can score if it is justified.
4. **For "competition or efficiency"**: find the evidence for each (cheaper supply for rivals means more competition; lower profits may cut investment, so less dynamic efficiency), then conclude.

Worked examples

Example 1

The table shows a firm's average revenue, marginal cost and average cost at five levels of output.

Output	Price (AR), $	Marginal cost, $	Average cost, $
100	45	15	30.00
200	40	25	25.00
300	35	35	26.67
400	30	45	30.00
500	25	55	34.00

At which outputs is the firm productively efficient and allocatively efficient?

	Productively efficient	Allocatively efficient
A	200	300
B	300	200
C	200	200
D	100	500

[1]

Productive efficiency is the lowest average cost: \$25 at 200 units, which is also where $\mathrm{MC} = \mathrm{AC}$. Allocative efficiency is where price equals marginal cost: \$35 at 300 units. C takes the point where MC meets AC for both; D picks the lowest MC and the lowest price; B swaps them. The answer is **A** (1).

Example 2

Explain the difference between productive efficiency and dynamic efficiency. **[4]**

Productive efficiency means producing a given output at the lowest possible average cost, so that no resources are wasted (1). For a firm this is the output at the lowest point of its average cost curve, where marginal cost equals average cost (1). Dynamic efficiency means efficiency improving over time, as firms invest in research, new technology and new methods (1), so that the whole average cost curve shifts downwards, or new and better products appear (1). The first is about using today's technology as well as possible at one moment; the second is about improving the technology over time.

Example 3

Extract: Farms in a river valley use large amounts of chemical fertiliser to raise crop yields. Rain washes some of it into the river, where it kills fish and raises the cost of cleaning drinking water for towns downstream. The farms pay nothing towards these costs.

With the help of a diagram, consider whether the market for crops grown in the valley leads to market failure. **[8]**

Model answer (marked like a data-response "consider" part: up to 4 marks for one side, up to 3 for the other, 1 for the conclusion):

Yes, the market fails (max 4). Market failure is when the free market allocates resources inefficiently because the price mechanism leaves out some costs or benefits; here the fish deaths and water-cleaning costs fall on third parties, so they are an external cost of production (1). The marginal social cost of crops is therefore the marginal private cost plus this external cost, so MSC lies above MPC (1).

Diagram to draw: the fourth diagram in this note, with crop output on the horizontal axis: MPB = MSB, MPC, MSC above MPC, the market output Q_1 where MPB = MPC, the efficient output Q^* where MSB = MSC, and the welfare-loss triangle between them (correct axes, curves and labels (1)).

The farms produce where their private benefit equals their private cost, at Q_1, which is more than the allocatively efficient Q^*: too many crops are grown with too much fertiliser and the price is too low, so society loses the welfare-loss triangle (1).

No, or not by much (max 3). Crops also bring external benefits that the farms are not paid for, such as a secure local food supply and jobs in the valley (1). These put MSB above MPB, which pushes the efficient output back up towards Q_1 and partly offsets the external cost (1). And the extract gives no figures: the damage may be small, or already limited by rules on fertiliser use, in which case Q_1 is close to Q^* and any failure is minor (1).

Conclusion. The extract shows a real external cost that the farms ignore, so the market probably over-produces and some market failure exists; but whether it is significant depends on how large that cost is compared with the external benefits of farming, which would need to be measured before the government acts (1).

(8 marks.)

Example 4

A government is considering whether to break up the country's only airline, a privately owned monopoly, into four competing airlines. With the help of diagrams, evaluate whether this would make the airline industry more efficient. **[20]**

Model answer (outline of each paragraph):

1. **Definitions.** Productive efficiency: output at the lowest average cost (minimum AC). Allocative efficiency: $P = \text{MC}$, the value of the last seat to passengers equals its cost. Dynamic efficiency: costs falling and services improving over time through investment and innovation. *(AO1: accurate definitions.)*
2. **The monopoly now.** The airline maximises profit where $\text{MR} = \text{MC}$. With the second diagram: output is below the level where MC cuts AR, so $P > \text{MC}$ and too few seats are sold at too high a fare (allocative inefficiency); output is below the lowest point of AC (productive inefficiency); with no rivals, costs may also be higher than they need be (X-inefficiency). *(AO2: developed analysis with a labelled diagram.)*
3. **What break-up could do.** Four airlines compete on fares, so each faces more elastic demand; price is pushed towards marginal cost and output rises, closer to allocative efficiency. Competition forces each airline to cut waste, so costs fall towards the lowest possible AC. In the limit, with free entry, the industry moves towards the perfectly competitive outcome in the first diagram, $P = \text{MC} = \text{minimum AC}$. *(AO2: analysis of the gain: with paragraphs 1–2, Table A Level 3.)*
4. **Against: economies of scale.** An airline has large fixed costs (aircraft, maintenance bases, booking systems). Four smaller airlines may each have higher average costs than one large one, so the industry could become **less** productively efficient, and fares might not fall at all. If the market is a natural monopoly, one firm is the cheapest way to supply it. *(AO3: developed evaluative point.)*
5. **Against: dynamic efficiency.** The monopoly's supernormal profit can pay for new, fuel-efficient aircraft and better routes. Four airlines earning near-normal profit may invest less, so costs fall more slowly over time. But a protected monopoly may simply pay its profit out as dividends; rivalry can push firms to innovate to win passengers. *(AO3: weighs both sides of dynamic efficiency.)*
6. **What it depends on.** The size of economies of scale compared with the size of the market; whether new airlines can enter (slots at airports); whether the four would collude, which would bring back $P > \text{MC}$; and the cost of the break-up itself. *(AO3: identifies what the outcome depends on.)*

7. **Conclusion.** Breaking up the monopoly is likely to improve **allocative** efficiency, because competition pushes fares towards marginal cost and more passengers fly. Its effect on **productive** and **dynamic** efficiency is uncertain and could be negative if economies of scale are large. So it makes the industry more efficient only if the market is big enough for four airlines to operate near the lowest point of their cost curves; if not, regulating the monopoly's fares could be the better option. *(Justified conclusion answering "whether", Table B Level 2.)*

(Table A Level 3: 14; Table B Level 2: 6; **20/20**.)

Common mistakes

- **Mixing up the efficiencies.** Productive efficiency is lowest AC; allocative is $P = \mathrm{MC}$; dynamic is a downward shift of AC over time. The March 2022 report saw many answers confuse dynamic efficiency with the other two and then conclude that perfect competition is the most dynamically efficient.
- **Writing MR = MC for allocative efficiency.** $\mathrm{MR} = \mathrm{MC}$ is profit maximisation. Allocative efficiency is where MC meets **price** (AR).
- **Discussing market failure without saying "allocative inefficiency".** The 2021 and 2022 reports said answers lost marks because they described externalities or public goods but never linked them to an inefficient allocation of resources.
- **Equating efficiency with fairness.** The November 2022 report said only the better candidates kept Pareto optimality (efficiency) apart from equity; the distinction was needed for the top level.
- **Reading a Pareto table wrongly.** In June 2023, 42% chose a row with a bigger total where one consumer had fewer goods. Someone losing anything rules it out.
- **Missing "not" in the stem.** In June 2022, many chose a genuine source of market failure when the question asked which was not one.
- **Inaccurate cost diagrams.** The June 2023 report noted that many monopoly diagrams did not have MC cutting AC at its lowest point. Draw MC through the bottom of the U.
- **Leaving out the diagram, or drawing one that the text never uses.** Mark schemes from 2023 cap answers with no diagram at Level 2 when a diagram is asked for. Label Q_1, Q^* and the welfare loss, and refer to them.
- **No evaluation, or a one-sided answer.** The June 2024 report said many answers to the perfect competition essay had good analysis but little evaluation. Every essay needs developed points on both sides and a conclusion that answers the question's words.

How to get the marks

- **Multiple choice**: write the three conditions in the margin (lowest AC; $P = \mathrm{MC}$; AC shifts down over time) and test each option against them. For Pareto tables, compare every person's row with the start.
- **Definitions** that earn AO1 marks: productive efficiency (lowest average cost, on the PPC), allocative efficiency ($P = \mathrm{MC}$, what consumers want most), dynamic efficiency (over time, investment and innovation), Pareto optimality (no one better off without someone worse off), market failure (free market misallocates resources).
- **"Explain"** (4 marks): two points, each with a development, such as a meaning and its condition.

- **"Consider" or "Discuss"** (8 to 10 marks in data response): points on both sides, each explained, using the extract; then a conclusion. Mark schemes usually cap each side (for example 4 marks each) and keep one mark for the conclusion, so a one-sided answer cannot reach full marks.
- **"With the help of a diagram"**: the diagram carries marks (axes and labels, correct curves, the welfare loss or the efficient output marked). Draw it large and refer to it in the text.
- **20-mark essays** ("Evaluate", "Assess", "Consider whether"): Table A (14) rewards accurate definitions and developed chains of analysis with explained diagrams; Table B (6) rewards **developed** evaluative comments and a **justified conclusion that answers the question's exact words** ("always", "only", "ideal"). A conclusion that just repeats the analysis stays in Level 1 of Table B.
- **Apply to the context**: health care, coal, airlines, education. Generic answers about "a good" score less well than ones that name the external cost, the firm or the market in the question.

Quick check

1. Thirty units of a good are shared between four people as 9, 7, 8 and 6. Which new allocation is a Pareto improvement? **A** 10, 7, 8, 6 **B** 12, 7, 5, 6 **C** 8, 8, 8, 8 **D** 9, 7, 8, 5
2. A bus company uses part of its profit to install software that plans routes so each bus uses less fuel, lowering its average cost at every level of output. Its fares do not change. Which type of efficiency has improved, and which has not necessarily improved?
3. A firm sells its product at $30. The marginal cost of its last unit is $22, and its average cost is $21, although its lowest possible average cost is $18. Is the firm allocatively efficient? Is it productively efficient? What change in output would move it towards allocative efficiency?
4. Explain two reasons, other than externalities, why a free market may fail to allocate resources efficiently. **[4]**
5. An economy is Pareto optimal. Explain why its distribution of income might still be thought unfair. **[3]**

Answers

1. **A**. Person 1 gains and nobody loses. B has the same total but person 3 loses; C has a bigger total (32) but person 1 loses; D makes person 4 worse off. (1)
2. **Dynamic efficiency** has improved: its average cost curve has shifted down through new technology, so its **productive** efficiency is better too. **Allocative** efficiency has not necessarily improved: fares are unchanged, so if they were above marginal cost before, the gap is now even wider.
3. Not allocatively efficient: price ($30) is above marginal cost ($22), so consumers value the last unit at $8 more than it costs to make. Not productively efficient: its average cost ($21) is above the lowest possible ($18). It should **increase** output (and price would fall) until price equals marginal cost.
4. Public goods are non-excludable, so people can benefit without paying and free ride (1); no firm can charge, so the market provides none even though society values the good, a missing market (1). Monopoly power lets a firm restrict output to where MR = MC (1); price is then above marginal cost, so less is produced than consumers want and resources are misallocated (1). (Also accept merit and demerit goods through imperfect information, or factor immobility leaving resources unemployed.)
5. Pareto optimality means nobody can be made better off without someone being made worse off (1). It is about efficiency, so it can hold whatever the distribution: if one group owns most of the resources, taking any from them makes them worse off, so the unequal allocation is still Pareto optimal (1). Whether a distribution is fair is a value judgement about equity, which the Pareto test does not make (1).

Past questions to try

- **9708/33/M/J/23 Q2**: spotting a Pareto improvement in a table of allocations.
- **9708/32/F/M/25 Q7**: which efficiencies change when a monopoly reinvests its profit.
- **9708/32/F/M/22 Q3**: finding the allocatively efficient point on a monopoly diagram.
- **9708/43/M/J/24 Q2**: why long-run perfect competition is efficient, and what stops efficiency.