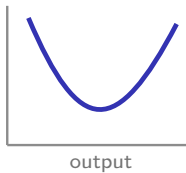


The Microeconomy

A-Level Economics ■ Topic 7

A-Level Economics



What we will cover

- 1 Utility & consumer choice
- 2 Efficiency & market failure
- 3 Costs & economies of scale
- 4 Revenue & profit
- 5 Market structures
- 6 Growth & objectives of firms



consumers maximise utility

1

Consumer choice

Calculate marginal utility from a change in total utility

Utility 效用 means satisfaction. These are illustrative utility units for one person, not measured values that can be compared across people.

One more unit at a time

Quantity: 0,1,2,3,4,5,6,7. Total utility: 0,12,22,30,36,40,40,38. Find marginal utility for the fourth, sixth and seventh units. Does diminishing marginal utility always mean total utility rises?

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Total utility 总效用 is satisfaction from the whole quantity. **Marginal utility** 边际效用 is the change from one extra unit. Use changes, not TU divided by quantity.

Positive, zero and negative marginal utility differ

With one-unit steps, $MU = \Delta TU / \Delta Q$:

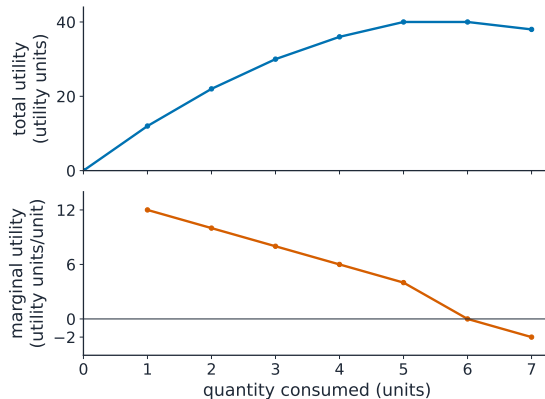
$$MU_4 = \frac{TU_4 - TU_3}{4 - 3} = \frac{36 - 30}{1} = 6 \text{ utility units/unit}$$

$$MU_6 = \frac{TU_6 - TU_5}{6 - 5} = \frac{40 - 40}{1} = 0 \text{ utility units/unit}$$

$$MU_7 = \frac{TU_7 - TU_6}{7 - 6} = \frac{38 - 40}{1} = -2 \text{ utility units/unit}$$

Diminishing marginal utility 边际效用递减 means extra satisfaction falls as quantity rises, other influences unchanged. TU rises while MU is positive, stays unchanged for a zero-MU unit and falls for a negative-MU unit.

Read total and marginal utility together



These discrete data show **total utility** 总效用 reaching 40 at 5 and 6 units, then falling. The seventh unit's marginal utility is negative; diminishing MU alone does not imply rising TU.

Find the best affordable bundle before using a shortcut

Two goods; whole units only

Income £8; A costs £2/unit and B £1/unit. At most 4A and 8B are available. A's MU for units 1–4 is 12,8,4,0. B's MU for units 1–8 is 7,6,5,4,3,2,1,0. Add each good's successive MU to get its TU. Compare all bundles that spend £8.

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A units	B units	Total spending	Combined TU
0	8	£8	28
1	6	£8	39
2	4	£8	42
3	2	£8	37
4	0	£8	24

The best listed bundle is 2A and 4B. More units of the good with the highest first-unit MU is not itself a complete budget choice.

Check feasibility as well as satisfaction

For 2A and 4B, prices are £2 and £1; income is £8. A's first two MU values are 12,8 and B's first four are 7,6,5,4. Spending must fit income; combined utility adds the two totals.

$$I = P_A Q_A + P_B Q_B$$

$$I = P_A Q_A + P_B Q_B = £2/\text{unit} \times 2 \text{ units} + £1/\text{unit} \times 4 \text{ units} = £8$$

$$TU = TU_A(Q_A) + TU_B(Q_B)$$

$$TU(2, 4) = TU_A(2) + TU_B(4) = (12 + 8) + (7 + 6 + 5 + 4) = 20 + 22 = 42 \text{ utility units}$$

The bundle is affordable and gives 42 illustrative utility units. It is best here because the other feasible bundles give less, not because the budget equation alone proves maximum satisfaction.

Check the equi-marginal rule against the chosen bundle

At 2A and 4B, the last A unit gives 8 utility and the last B unit gives 4:

$$\frac{MU_A}{P_A} = \frac{8 \text{ utility units/unit}}{£2/\text{unit}} = 4 \text{ utility units/£}$$

$$\frac{MU_B}{P_B} = \frac{4 \text{ utility units/unit}}{£1/\text{unit}} = 4 \text{ utility units/£}$$

The **equi-marginal principle** 等边际原则 compares extra utility per pound, not MU alone. For a usual interior optimum with divisible goods and a binding budget, these ratios are equal.

At a corner or with indivisible goods, exact equality need not be available. Compare feasible bundles rather than forcing the equation to hold.

A change in tastes can change the preferred bundle

Keep prices and income unchanged

Double every MU value for B, leaving A unchanged. Should the same 2A/4B bundle still be chosen? Compare the feasible bundles again.

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A units	B units	New combined TU
0	8	56
1	6	66
2	4	64
3	2	50
4	0	24

The best listed bundle becomes 1A/6B: more B and less A, with the same £8 budget. Quantity can change because tastes change; a price fall is not the only cause of buying more.

Derive demand from a price change with other influences fixed

Return to original tastes; cut A's price from £2 to £1

Income remains £8 and B's price £1. Compare the new affordable bundles using the original TU values. What happens to A's chosen quantity?

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A units	B units	TU with original tastes
0	8	28
1	7	40
2	6	47
3	5	49
4	4	46

A's chosen quantity rises 2→3 as its price falls £2→£1: two points on this person's **demand curve** 需求曲线. Exact MU/P equality is not required for this whole-unit optimum.

State the assumptions behind a utility calculation

An optimum in the table is a model result

A student says: “The table proves everyone should buy 2A and 4B.” Identify what the result assumes and why it does not establish a universal buying rule.

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The answer uses this person's stated preferences, prices, income and available quantities. The tables also assume the utilities of A and B add without interaction.

Utility numbers are illustrative, not objective readings of satisfaction. Real choices can reflect habits, incomplete information and changing preferences; people need not calculate a table explicitly.

The model gives a conditional prediction about choice. A different budget, taste or set of feasible goods can change the optimum.

Calculate what a budget line permits

Income is £24; X costs £4/unit and Y costs £1/unit. Goods are divisible. Spending cannot exceed income.

$$P_X Q_X + P_Y Q_Y \leq I; \quad \text{on the line: } P_X Q_X + P_Y Q_Y = I.$$

Find both intercepts and check bundle (3X, 12Y)

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$$Q_X^{\max} = \frac{I}{P_X} = \frac{\text{£}24}{\text{£}4/\text{unit}} = 6 \text{ units}; \quad Q_Y^{\max} = \frac{I}{P_Y} = \frac{\text{£}24}{\text{£}1/\text{unit}} = 24 \text{ units}.$$

$$E = P_X Q_X + P_Y Q_Y = \text{£}4/\text{unit} \times 3 \text{ units} + \text{£}1/\text{unit} \times 12 \text{ units} = \text{£}24.$$

The **budget line** 预算线 joins (0,24) to (6,0). Points below it are affordable; points above it are not.

Separate an income change from a price change

Start from income £24, $P_X = £4/\text{unit}$ and $P_Y = £1/\text{unit}$. Each row changes only the stated influence.

Change	X intercept	Y intercept	Shape relative to old line
Income rises to £36	9	36	Parallel outward shift
X price falls to £2/unit	12	24	Pivot about Y intercept
Y price doubles to £2/unit	6	12	Pivot about X intercept

Explain the difference before revealing the rule

Why does an income rise move both intercepts, while a change in only X's price leaves the Y intercept fixed?

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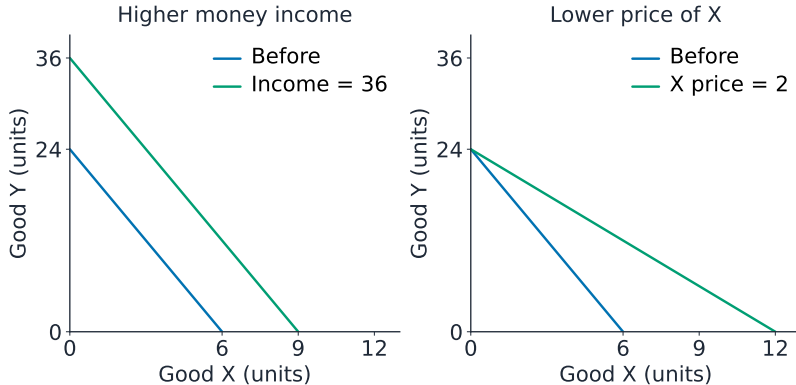
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Explain the difference before revealing the rule

Why does an income rise move both intercepts, while a change in only X's price leaves the Y intercept fixed?

Both intercepts equal income divided by the relevant price. With X horizontal, the slope is $-P_X/P_Y$; income changes do not alter that price ratio. A lower X price makes the line flatter.

Read the shift and pivot on the diagram



Income changes move both intercepts; an X-price change pivots about the Y intercept. The budget shows affordability, not choice.

Explain the curve's shape before using the map

Compare equal-satisfaction bundles in this illustrative map

$(2X, 18Y)$, $(3X, 12Y)$ and $(6X, 6Y)$ give equal satisfaction. How much Y is given up per extra X across each interval? What does the changing trade-off suggest?

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$$\frac{\text{Y given up}}{\text{extra X}} = \frac{18 - 12}{3 - 2} = 6 \text{ Y units/X unit.}$$

$$\frac{\text{Y given up}}{\text{extra X}} = \frac{12 - 6}{6 - 3} = 2 \text{ Y units/X unit.}$$

The average willingness to give up Y for another X declines as X becomes more plentiful: the curve bows towards the origin.

Downward slope assumes both goods are desirable. Curves do not cross under consistent preferences: a crossing would give contradictory satisfaction rankings. These are assumptions of the usual map, not universal preference laws.

An indifference curve ranks bundles, not spending

An **indifference curve** 无差异曲线 joins bundles giving the same satisfaction. In an illustrative smooth map, $(2X, 18Y)$, $(3X, 12Y)$ and $(6X, 6Y)$ lie on the same curve.

Same satisfaction does not mean the same cost

At prices £4/unit for X and £1/unit for Y, compare the costs of $(2, 18)$, $(3, 12)$ and $(6, 6)$ with income £24.

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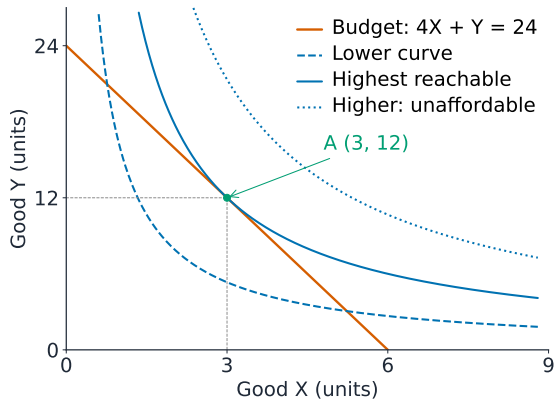
$$E = P_X Q_X + P_Y Q_Y = £4/\text{unit} \times 2 \text{ units} + £1/\text{unit} \times 18 \text{ units} = £26.$$

$$E = P_X Q_X + P_Y Q_Y = £4/\text{unit} \times 3 \text{ units} + £1/\text{unit} \times 12 \text{ units} = £24.$$

$$E = P_X Q_X + P_Y Q_Y = £4/\text{unit} \times 6 \text{ units} + £1/\text{unit} \times 6 \text{ units} = £30.$$

Only (3,12) is affordable here. Curves rank satisfaction; they do not require an objective numerical measure of utility.

Find the highest reachable curve



Consumer equilibrium 消费者均衡 is the most preferred affordable bundle: A (3,12) in this smooth illustration.

The lower curve is reachable but gives less satisfaction. The higher curve has no affordable point.

Tangency applies to this interior optimum. It is not the definition of every optimum.

A corner choice need not have tangency

A different preference pattern; unchanged prices and income

Suppose satisfaction is represented by $U = 3Q_X + Q_Y$. Each X adds 3 illustrative utility units and each Y adds 1. Income is £24, X costs £4/unit and Y costs £1/unit. Where does the consumer spend the budget?

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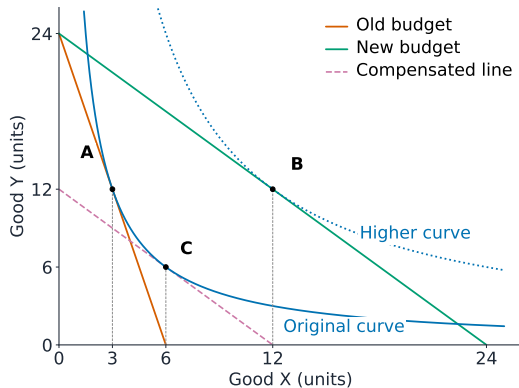
$$\frac{MU_X}{P_X} = \frac{3 \text{ utility units/unit}}{\text{£4/unit}} = 0.75 \text{ utility units/£}$$

$$\frac{MU_Y}{P_Y} = \frac{1 \text{ utility unit/unit}}{\text{£1/unit}} = 1 \text{ utility unit/£}$$

Y gives more satisfaction per pound at every bundle. The best choice is 0X and 24Y, a corner on the budget line. The straight indifference curve through it is not tangent to that line.

Highest reachable satisfaction remains the rule. Smooth convex curves, divisible goods and an interior choice are extra conditions behind the familiar tangent diagram.

Separate the two effects of a price fall



X price £4→£1/unit; income £24 and Y price £1/unit fixed. A→C: substitution; C→B: income effect.

Use the compensated line to explain the price effect

$A=(3X,12Y)$, $C=(6X,6Y)$, $B=(12X,12Y)$. The dashed line is parallel to the new budget line but touches the original indifference curve.

Read changes in X, not distances along the curve

Calculate the **substitution effect** 替代效应, **income effect** 收入效应 and total price effect on X. Is C the final choice with unchanged money income?

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$$\Delta Q_X^{\text{sub}} = Q_X^C - Q_X^A = 6 - 3 = +3 \text{ units.}$$

$$\Delta Q_X^{\text{inc}} = Q_X^B - Q_X^C = 12 - 6 = +6 \text{ units.}$$

$$\Delta Q_X = \Delta Q_X^{\text{sub}} + \Delta Q_X^{\text{inc}} = 3 + 6 = +9 \text{ units.}$$

C is a comparison at reduced income, keeping satisfaction unchanged. Restoring actual income gives B. This is a **normal good** 正常品 example: both effects increase X.

Why an inferior good need not be Giffen

Separate hypothetical price-fall cases, not points on the previous map. Tastes and money income are fixed; changes in X are in units.

Case	Substitution	Income	Total
Normal good	+3	+6	+9
Inferior, not Giffen	+3	-1	+2
Giffen	+3	-5	-2

Classify by the direction and relative size of the effects

Why is case 2 an **inferior good** 低档品? What makes case 3 a **Giffen good** 吉芬品?

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Higher real income reduces X in both inferior cases. Only in the Giffen case does that fall exceed substitution towards the now cheaper X. Inferiority alone does not imply an

A shift alone does not identify its cause

Intercepts change from (6X,24Y) to (9X,36Y)

A student concludes: “Money income must have risen by 50%.” Give one explanation consistent with that claim and another that leaves money income unchanged.

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At unchanged prices £4 and £1, income £24→£36 produces the new intercepts.

Alternatively, keep income £24 and cut both prices to two-thirds of their old levels. The price ratio stays unchanged and both intercepts rise by 50%.

A parallel shift identifies a change in purchasing possibilities. Prices/income information is needed to distinguish its cause. A taste change moves the preference map, not the budget line when income and prices are unchanged.

Evaluate a price prediction using the model's conditions

Prepare an explained judgement, supported by a diagram

“A fall in price always makes a consumer buy more.” Evaluate this claim using budget lines and indifference curves.

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Prepare an explained judgement, supported by a diagram

“A fall in price always makes a consumer buy more.” Evaluate this claim using budget lines and indifference curves.

Start with labelled goods, fixed money income/other price/tastes, the budget pivot and old/new highest reachable curves. Use a parallel compensated line to distinguish substitution from income effects.

Compare normal, inferior and Giffen cases before judging the total response. For normal goods both effects increase quantity; for inferior goods the opposing effects must be compared. Do not infer the outcome from the pivot alone.

A good answer connects the diagram to a conditional judgement. The earlier Giffen example supplies a counterexample to the word “always”.

Check the assumptions before interpreting observed sales

Does lower price plus lower sales prove Giffen behaviour?

A product's price falls, its advertising campaign ends and sales fall. An analyst calls it a Giffen good. Assess the evidence using the model's conditions.

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Does lower price plus lower sales prove Giffen behaviour?

A product's price falls, its advertising campaign ends and sales fall. An analyst calls it a Giffen good. Assess the evidence using the model's conditions.

The inference is not established: the comparison does not hold tastes constant. Ending advertising could change the preference map, so the fall cannot be assigned solely to an income effect exceeding substitution.

The model assumes consistent rankings and choice of the most preferred affordable bundle. Habits, incomplete information and many alternative goods can affect its use. Indivisible goods or corners can prevent smooth tangency.

State which condition is doubtful and how it affects the prediction. Listing assumptions alone does not evaluate this observed price response.

2

Efficiency

Productive efficiency: calculate cost per unit

A plant has these illustrative monthly results at unchanged input prices and quality.

Productive efficiency 生产效率 means producing at the lowest possible average cost.

Output (units/month)	Total cost (£/month)	Average cost (£/unit)
50	450	?
100	800	?
150	1350	?

Which observed output has the lowest unit cost?

Calculate **average cost** 平均成本. Does higher output always lower it?

Work the three unit-cost calculations

$$AC = \frac{TC}{Q} = \frac{\text{£}450/\text{month}}{50 \text{ units/month}} = \text{£}9/\text{unit}.$$

$$AC = \frac{TC}{Q} = \frac{\text{£}800/\text{month}}{100 \text{ units/month}} = \text{£}8/\text{unit}.$$

$$AC = \frac{TC}{Q} = \frac{\text{£}1350/\text{month}}{150 \text{ units/month}} = \text{£}9/\text{unit}.$$

100 units has the lowest AC among the observations. The full cost curve is needed to establish the overall minimum; output alone is not evidence of efficiency.

Allocative efficiency: compare benefit with cost at the margin

In this separate illustration, there are no external costs or benefits. MB is the value of an extra unit to consumers; MC is the resource cost of that unit.

Output	MB (£/unit)	MC (£/unit)	Direction of improvement
3	9	5	?
5	7	7	?
7	5	9	?

Would a small increase or decrease raise net benefit?

Judge each row before applying the equality condition.

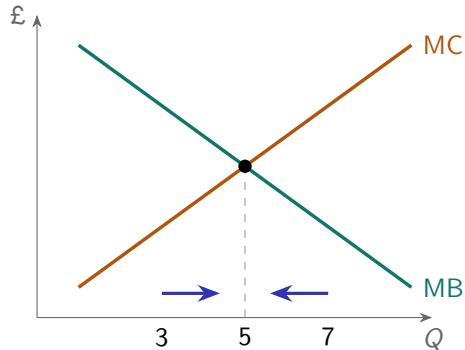
Apply the benefit–cost test before using $P=MC$

- At 3: $MB > MC$, **expand**.
- At 7: $MB < MC$, **reduce**.
- At 5: $MB = MC$, the best margin (falling MB, rising MC).

$$MSB = MSC$$

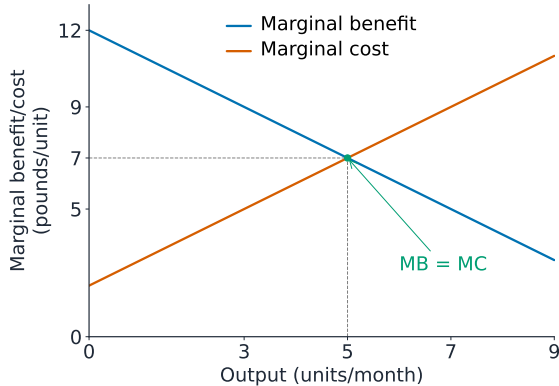
Allocative efficiency 配置效率;

$P = MC$ when price represents MB



Here private and social margins match: **Marginal social benefit** 边际社会收益 (MSB) = MB and **marginal social cost** 边际社会成本 (MSC) = MC.

Locate the allocative margin on the diagram



At output 5, $MB=MC=£7/\text{unit}$. Below 5, expansion adds net benefit; above 5, further output costs more than it benefits consumers. This model assumes no externalities.

A Pareto improvement helps someone without harming anyone

These four outcomes are the complete feasible list in a toy example. Larger scores mean a better outcome for that person; do not add the two people's scores.

Outcome	Person 1	Person 2
A	10	10
B	12	10
C	13	9
D	11	11

Find an improvement from A; then test B, C and D

Which outcomes can be improved without making either person worse off?

Use the feasible list to test Pareto optimality

Move	Person 1	Person 2	Pareto improvement?
A→B	Better	Unchanged	Yes
A→D	Better	Better	Yes
B→C	Better	Worse	No
B→D	Worse	Better	No

A can be improved. B, C and D each satisfy **Pareto optimality** 帕累托最优 within the complete list: no alternative helps someone without harming the other person.

Their different distributions show that Pareto optimality does not select a unique or necessarily fair outcome.

A productive gain may create scope for an improvement, but who gains and loses still matters.

Dynamic efficiency changes future possibilities

Same product quality, output and input prices

Successful research cuts the cost of 100 units/month from £800/month to £600/month. Calculate both unit costs and assess the improvement.

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$$AC_{\text{old}} = \frac{TC_{\text{old}}}{Q} = \frac{\text{£800/month}}{100 \text{ units/month}} = \text{£8/unit.}$$

$$AC_{\text{new}} = \frac{TC_{\text{new}}}{Q} = \frac{\text{£600/month}}{100 \text{ units/month}} = \text{£6/unit.}$$

Dynamic efficiency 动态效率: innovation improves products or methods over time. Here the same output uses fewer resources.

Lower unit cost does not prove minimum AC, allocative efficiency, lower prices or recovery of research cost. Each needs further evidence.

Competition and innovation need a mechanism, not a slogan

Assess the claim: “Only protected firms can innovate”

Firm R earns high profits but spends none on research. Firm S faces strong competition and uses retained funds plus a loan to develop a cheaper process. What can be concluded?

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Firm R earns high profits but spends none on research. Firm S faces strong competition and uses retained funds plus a loan to develop a cheaper process. What can be concluded?

R has possible research finance but no observed innovation. S faces an incentive to lower costs; competition has not prevented access to funds.

Weak expected returns or difficulty keeping an invention's gains can deter research. Market power may fund a costly project but weaken the pressure to innovate.

Judge finance, incentives and actual results. Neither competition nor market power alone establishes dynamic efficiency.

Market failure is a failed allocation, not simply an unpopular price

Two different mechanisms

A sole seller restricts output despite MB exceeding full MC. A factory ignores smoke damage to neighbours. Explain each allocation problem.

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Market failure 市场失灵 occurs when the market fails to allocate resources efficiently.

The seller leaves beneficial extra output unproduced. Market power can create this gap; a high price alone is insufficient evidence.

The factory's **externality** 外部性 creates a private/social cost gap. Ignoring damage can lead it to choose excess output.

Identify the missing cost or benefit and explain how it changes quantity. Low profit, high price or inequality alone does not prove market failure.

Why a useful public good may be underprovided

A flood-warning broadcast

Once the signal is transmitted, another person can receive it without reducing anyone else's reception. People in the area cannot be excluded from the signal for failing to pay. Why might voluntary private funding be insufficient?

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A **public good** 公共物品 is non-rival and non-excludable. Each resident can benefit while leaving others to pay, weakening the provider's ability to collect payment.

The sum of residents' benefits may justify providing the warning even when a private seller cannot recover its cost. The allocation problem is possible underprovision, not that the warning has no value.

Public ownership is not the definition. Judge the good's consumption and exclusion properties, then compare the social benefit with the resources required.

Information and mobility can weaken price signals

Explain the mechanism in each case

A buyer chooses a machine with hidden safety defects. Workers cannot fill jobs in another region immediately because of retraining and relocation barriers.

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A buyer chooses a machine with hidden safety defects. Workers cannot fill jobs in another region immediately because of retraining and relocation barriers.

Information failure 信息失灵: missing safety information can cause a choice the buyer would reject with better information.

Factor immobility 要素不流动性: higher returns do not instantly move resources to more useful activities; training and relocation barriers delay adjustment.

Allow for the real costs of information, training and moving. Show why the barrier prevents a beneficial reallocation; unemployment alone is insufficient evidence.

Check whether evidence supports each kind of efficiency

Three claims about a new factory process

The process cuts unit resource cost from £8 to £6 at unchanged quality and input prices. At the chosen output, marginal social benefit is £5/unit and marginal social cost is £7/unit. A resident loses from the associated noise. Assess productive, allocative and Pareto claims.

Check whether evidence supports each kind of efficiency

Three claims about a new factory process

The process cuts unit resource cost from £8 to £6 at unchanged quality and input prices. At the chosen output, marginal social benefit is £5/unit and marginal social cost is £7/unit. A resident loses from the associated noise. Assess productive, allocative and Pareto claims.

The innovation is evidence of a dynamic improvement and lower cost at that output. It does not establish that the firm is at its minimum possible AC.

$MSB < MSC$ at the chosen margin: reducing output would raise net social benefit. Allocative efficiency has not been achieved.

The resident's loss means this change is not a Pareto improvement as described. A rise in total benefit alone would not establish that nobody is worse off.

3

Externalities and social decisions

Separate private, external and social costs

A factory's monthly production decision

The factory uses resources costing £800/month. Its pollution causes £200/month of damage to neighbours. Identify the costs and calculate the total for society. Assume no other effects.

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Private cost 私人成本 falls on the decision-maker; **external cost** 外部成本 falls on third parties. The **social cost** 社会成本 includes both.

$$SC = PC + EC = £800/\text{month} + £200/\text{month} = £1000/\text{month}.$$

The factory's private calculation omits the neighbours' damage. A payment compensating them is not an extra resource cost to add on top of the same damage: count each effect once.

Separate private, external and social benefits

A separate training programme; all values for one year

Participants gain benefits valued at £1200/year. Other people gain £400/year from skills spreading beyond the participants. Calculate the social benefit. These are benefits, not just sales receipts.

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Private benefit 私人收益 accrues to participants; **external benefit** 外部收益 accrues to third parties. The **social benefit** 社会收益 includes both.

$$SB = PB + EB = £1200/\text{year} + £400/\text{year} = £1600/\text{year}.$$

Someone outside a transaction can gain as well as lose. A price paid or received is not automatically the full benefit or resource cost to society.

A marginal value concerns an extra unit

Two separate one-unit changes

An extra unit of production uses £7 of the firm's resources and imposes £2 of external damage. An extra unit of another service gives its user £5 of benefit and others £2. Find each social margin.

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Marginal analysis 边际分析 compares changes, not total or average values.

$$MSC = MPC + MEC = £7/\text{unit} + £2/\text{unit} = £9/\text{unit}.$$

$$MSB = MPB + MEB = £5/\text{unit} + £2/\text{unit} = £7/\text{unit}.$$

MPC and MPB are **marginal private cost** 边际私人成本 and **marginal private benefit** 边际私人收益. MEC is **marginal external cost** 边际外部成本; MEB is **marginal external benefit** 边际外部收益. MSC/MSB include the social effects.

Find the market and social quantities separately

Negative production externality; illustrative linear curves

Output Q is measured in units/month; marginal values in £/unit. $MPB = MSB = 12 - Q$, $MPC = 2 + Q$, $MSC = 4 + Q$. Find the competitive market quantity and the socially best quantity.

Find the market and social quantities separately

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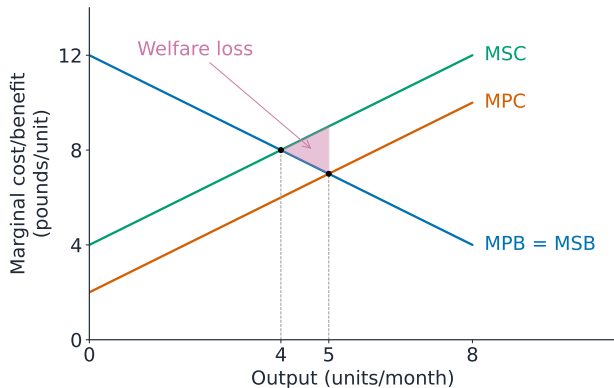
A competitive market without corrective intervention equates private benefit and cost. Society compares the social margins.

$$MPB = MPC \Rightarrow 12 - Q = 2 + Q \Rightarrow Q_m = 5 \text{ units/month.}$$

$$MSB = MSC \Rightarrow 12 - Q = 4 + Q \Rightarrow Q^* = 4 \text{ units/month.}$$

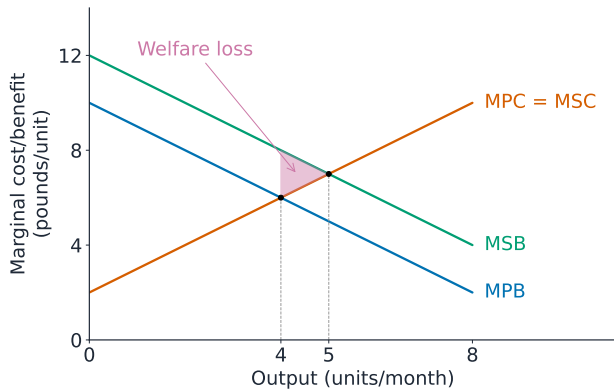
With no other distortion here, ignored damage makes market output exceed the optimum. Equality of private margins is not the social test.

Negative production externality: excess output



Factory pollution raises MSC above MPC; no consumption spillover here. $Q_m = 5 > Q^* = 4$. The shaded loss is on the excess units, where MSC exceeds MSB.

Positive consumption externality: missing output



Vaccination can protect other people: MSB exceeds MPB. With no production spillover, $Q_m = 4 < Q^* = 5$. The shaded loss is the net benefit of units not consumed.

Calculate the positive-consumption quantities

For the preceding illustration, $MPB = 10 - Q$, $MSB = 12 - Q$ and $MPC = MSC = 2 + Q$. Output uses units/month and marginal values £/unit.

Use the two equilibrium conditions

Find Q_m and Q^* . Why is the loss on missing units rather than units beyond the optimum?

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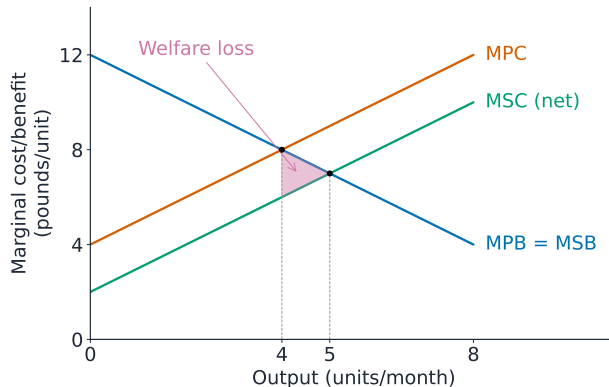
Find Q_m and Q^* . Why is the loss on missing units rather than units beyond the optimum?

$$MPB = MPC \Rightarrow 10 - Q = 2 + Q \Rightarrow Q_m = 4 \text{ units/month.}$$

$$MSB = MSC \Rightarrow 12 - Q = 2 + Q \Rightarrow Q^* = 5 \text{ units/month.}$$

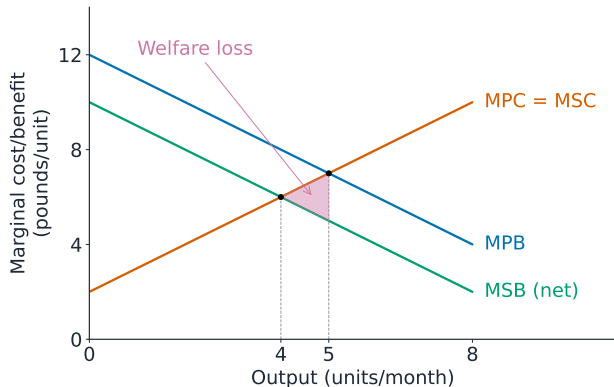
Between 4 and 5, MSB exceeds MSC. The market leaves these beneficial units unconsumed, so the lost benefit is below the optimum, not beyond it.

Positive production externality: a lower net social cost



A firm's research helps other producers. The usual diagram deducts that benefit from net MSC: $Q_m = 4 < Q^* = 5$. Count the spillover once; do not also add it to MSB.

Negative consumption externality: a lower net social benefit



Loud leisure activity harms neighbours. The usual diagram deducts that harm from net MSB. With no production spillover, $Q_m = 5 > Q^* = 4$: excess consumption causes welfare loss.

Explain the wedge before naming the quantity problem

Each row isolates one spillover, with no other distortion.

Source and sign	Standard diagram	Market outcome
Negative production	$MSC > MPC$	Too much
Positive production	Net $MSC < MPC$	Too little
Negative consumption	Net $MSB < MPB$	Too much
Positive consumption	$MSB > MPB$	Too little

Classify by the third-party effect

A factory pollutes; research helps another firm; loud music disturbs neighbours; vaccination reduces infection risks for others. Match each to the diagram, then identify the missing cost or benefit.

Explain the wedge before naming the quantity problem

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Classify by the third-party effect

A factory pollutes; research helps another firm; loud music disturbs neighbours; vaccination reduces infection risks for others. Match each to the diagram, then identify the missing cost or benefit.

Examples match the rows in order. A **negative externality** 负外部性 harms others; a **positive externality** 正外部性 benefits them.

Calculate welfare loss from the affected units

The two linear examples both differ by 1 unit/month

At market output, the social marginal gap is £2/unit. It closes linearly to zero at the optimum. Calculate the triangle area and explain what it measures.

Calculate welfare loss from the affected units

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At market output, the social marginal gap is £2/unit. It closes linearly to zero at the optimum. Calculate the triangle area and explain what it measures.

Deadweight welfare loss 无谓损失 is net social benefit lost through the wrong quantity.

$$DWL = \frac{1}{2} \times |Q_m - Q^*| \times \text{social marginal gap}.$$

$$DWL = \frac{1}{2} \times 1 \text{ unit/month} \times \text{£2/unit} = \text{£1/month}.$$

For excess output, the loss is cost exceeding benefit on extra units. For underprovision, it is benefit exceeding cost on missing units. The triangle formula applies to these straight-line gaps; loss is not the whole external cost or a transfer payment.

Choose by net social benefit, not benefit alone

Two projects are mutually exclusive. All values cover the same year; social costs include all resource costs and external damage. Social benefits include private and external benefits.

Project	SB (£/year)	SC (£/year)
A	1600	1000
B	1900	1500

Which project has the larger net gain?

Explain why choosing the highest gross benefit would give a different answer.

Compare the net gain of each project

For each project, subtract all social costs from all social benefits.

$$NSB_A = SB_A - SC_A = \text{£}1600/\text{year} - \text{£}1000/\text{year} = \text{£}600/\text{year}.$$

$$NSB_B = SB_B - SC_B = \text{£}1900/\text{year} - \text{£}1500/\text{year} = \text{£}400/\text{year}.$$

A has the higher net social benefit; B has the higher gross benefit.

Choose A on this criterion. Choosing B merely because its benefits are larger would ignore its additional costs.

A cost–benefit decision also needs a reliability check

Test the preceding project choice

A's estimated social cost rises from £1000 to £1300/year, with other estimates unchanged. Does A remain preferred? What else should be checked before treating the ranking as decisive?

A cost–benefit decision also needs a reliability check

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A's estimated social cost rises from £1000 to £1300/year, with other estimates unchanged. Does A remain preferred? What else should be checked before treating the ranking as decisive?

$$NSB_A = SB_A - SC_A = £1600/\text{year} - £1300/\text{year} = £300/\text{year}.$$

B's £400/year now exceeds A's £300/year. The ranking depends on the estimates.

Check common time periods, opportunity costs, omitted effects, double counting and who bears costs or receives benefits. A positive total gain does not show that every person gains. No discounted-value calculation is needed here.

Distinguish unequal information from changed risk incentives

Two different failures

A seller knows about a hidden defect that the buyer cannot assess. Separately, an insured operator takes less care because an insurer pays most accident costs. Explain the mechanism in each case.

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Asymmetric information 信息不对称: one party has relevant information the other lacks. The defect can distort the buyer's valuation and choice.

Moral hazard 道德风险: bearing less of an action's risk can encourage more risk-taking. The insured operator's incentive to take care weakens.

The mechanisms can coexist, but unequal information alone does not prove increased risk-taking. Harm to a third party alone does not establish moral hazard either.

Check a mixed case using all four curves

Both damage and an external benefit are present

Let $MPB = 10 - Q$, $MPC = 2 + Q$, $MSB = 14 - Q$ and $MSC = 4 + Q$. Output is in units/month and marginal values £/unit. A student predicts excess output because MSC exceeds MPC. Test that prediction.

Find the private-market intersection and the social intersection separately. Compare the quantities before deciding the direction of market failure.

A single wedge does not settle a mixed case

Under the competitive private-market conditions:

$$MPB = MPC \Rightarrow 10 - Q = 2 + Q \Rightarrow Q_m = 4 \text{ units/month.}$$

For the social optimum:

$$MSB = MSC \Rightarrow 14 - Q = 4 + Q \Rightarrow Q^* = 5 \text{ units/month.}$$

The market underprovides despite $MSC > MPC$: the external-benefit wedge is larger than the external-cost wedge here.

Use both social curves. The four single-spillover diagrams hold other distortions absent; their simple quantity rules cannot be applied blindly when several effects coexist.

4

Costs, revenue and profit

Short-run production: one oven, more workers

A bakery keeps the same oven and technology

Output is loaves per day. Labour is the number of workers employed each day; the oven is fixed. Find each worker's extra output and the average output per worker.

L	TP (loaves/day)	AP	MP
0	0	—	—
1	12	?	?
2	30	?	?
3	42	?	?
4	48	?	?
5	50	?	?
6	48	?	?

Calculate average and marginal product separately

Total product 总产量 is all output. **Average product** 平均产量 is output per unit of the variable factor; **marginal product** 边际产量 is extra output per extra unit of that factor.

$$AP_L = TP/L = 30 \text{ loaves/day} / (2 \text{ workers}) = 15 \text{ loaves/worker/day.}$$

$$MP_L = \Delta TP / \Delta L = (30 - 12) \text{ loaves/day} / (2 - 1) \text{ workers}$$

$$MP_L = \Delta TP / \Delta L = 18 \text{ loaves/worker/day.}$$

The second worker adds 18, although the average of both workers is 15. At zero workers, AP is undefined, not zero.

Diminishing marginal returns do not mean falling total output

<i>L</i>	<i>TP</i> (loaves/day)	<i>AP</i> (loaves/worker/day)	<i>MP</i> (loaves/worker/day)
1	12	12	12
2	30	15	18
3	42	14	12
4	48	12	6
5	50	10	2
6	48	8	-2

From the third worker, *MP* falls: extra workers share the same oven. *TP* still rises while *MP* is positive; it falls only when *MP* becomes negative.

MP above *AP* pulls *AP* up; *MP* below *AP* pulls *AP* down. In this discrete table *AP* peaks at two workers, without exact equality $MP=AP$.

Separate fixed cost, variable cost and total cost

A daily cost schedule; output is loaves/day

The bakery pays £60/day for its oven even at zero output. Variable costs are £0, £40, £60, £90 and £140/day at output 0, 10, 20, 30 and 40. Calculate total cost and the marginal cost of each ten-loaf increase.

Fixed cost 固定成本 does not vary with output in this short-run period. **Variable cost** 可变成本 changes with output.

$$TC = TFC + TVC, \quad MC = \Delta TC / \Delta Q = \Delta TVC / \Delta Q.$$

The fixed cost cancels from the change. A fixed cost is not necessarily a sunk cost: fixed describes output dependence; sunk describes recoverability.

Read marginal cost as an interval average

Q (loaves/day)	TFC (£/day)	TVC (£/day)	TC (£/day)	MC (£/loaf)
0	60	0	60	—
10	60	40	100	4
20	60	60	120	2
30	60	90	150	3
40	60	140	200	5

For the increase from 20 to 30 loaves/day:

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{(150 - 120)\text{£/day}}{(30 - 20)\text{ loaves/day}} = \text{£}3/\text{loaf}.$$

This is the average extra cost of that ten-loaf block, not an observation of each individual loaf's cost.

Average cost: use the same output denominator

At $Q = 20$ loaves/day, $TFC = £60/\text{day}$ and $TVC = £60/\text{day}$.

$$AFC = TFC/Q = £60/\text{day} \div 20 \text{ loaves/day} = £3/\text{loaf}.$$

$$AVC = TVC/Q = £60/\text{day} \div 20 \text{ loaves/day} = £3/\text{loaf}.$$

$$ATC = TC/Q = £120/\text{day} \div 20 \text{ loaves/day} = £6/\text{loaf}.$$

Average fixed cost 平均固定成本 plus **average variable cost** 平均可变成本 equals average total cost: $ATC = AFC + AVC$. Here AC means ATC. No average cost is defined at zero output.

A falling fixed-cost share does not guarantee falling AC

Q (loaves/day)	AFC (£/loaf)	AVC (£/loaf)	ATC (£/loaf)
10	6	4	10
20	3	3	6
30	2	3	5
40	1.5	3.5	5

AFC keeps falling because the same £60 is spread over more output. AVC can rise as extra output becomes harder to produce.

From 30 to 40, the extra block costs £5/loaf, equal to the preceding ATC, so ATC stays at £5. The lowest observed ATC is not proof of the global minimum between or beyond these observations.

Why lower marginal product can raise marginal cost

Hold the wage and other variable input requirements constant

One extra worker costs £60/day. When the worker adds 12 loaves/day, what is the additional labour cost per loaf? What if an extra worker adds only 6 loaves/day?

Why lower marginal product can raise marginal cost

Hold the wage and other variable input requirements constant

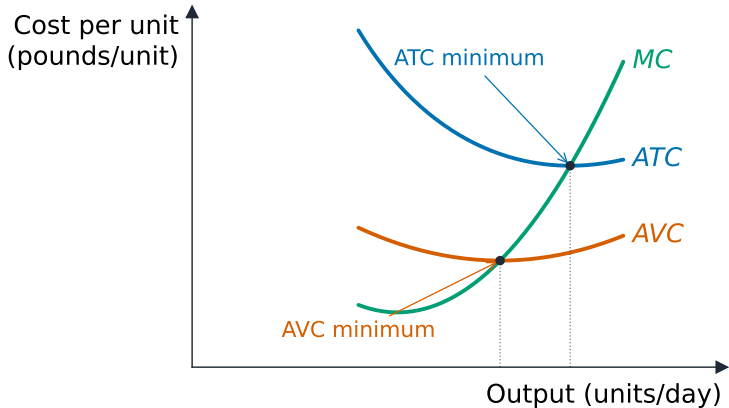
One extra worker costs £60/day. When the worker adds 12 loaves/day, what is the additional labour cost per loaf? What if an extra worker adds only 6 loaves/day?

$$MC_{\text{labour}} = w/MP_L = \text{£}60/\text{worker/day} \div 12 \text{ loaves/worker/day} = \text{£}5/\text{loaf}.$$

$$MC_{\text{labour}} = w/MP_L = \text{£}60/\text{worker/day} \div 6 \text{ loaves/worker/day} = \text{£}10/\text{loaf}.$$

With the wage unchanged, falling positive MP raises labour cost per additional loaf. This calculation concerns labour's contribution; other changing input costs must also be counted.

Short-run cost curves: consistent totals and margins



An illustrative smooth model. MC below an average pulls it down; MC above it pulls it up. MC crosses AVC and ATC at their respective minima, not at the same output. ATC minus AVC is AFC.

Recover variable cost from normal-profit information

All economic costs, including normal profit, are counted

A firm sells 10000 units/month at £10/unit. TFC is £40000/month. It makes normal profit. Find AVC. Explain why price minus AFC works in this case.

Recover variable cost from normal-profit information

All economic costs, including normal profit, are counted

A firm sells 10000 units/month at £10/unit. TFC is £40000/month. It makes normal profit. Find AVC. Explain why price minus AFC works in this case.

Normal profit means zero economic profit, so $TR = TC$.

$$TC = TR = PQ = £10/\text{unit} \times 10000 \text{ units/month} = £100000/\text{month}.$$

$$TVC = TC - TFC = £100000/\text{month} - £40000/\text{month} = £60000/\text{month}.$$

$$AVC = TVC/Q = £60000/\text{month} \div 10000 \text{ units/month} = £6/\text{unit}.$$

Here $AR = ATC$, so $AVC = AR - AFC$. With supernormal or subnormal profit, this shortcut would fail.

Returns to scale: change all inputs together

A long-run comparison at unchanged technology

100 workers and 2 machines produce 1000 units/day. With 200 workers and 4 machines, output is 2500 units/day. Classify the returns to scale. Explain why this is not a test of diminishing marginal returns.

Returns to scale 规模报酬 compare the output change when all inputs change in the same proportion. Identify the input factor and output factor separately.

Increasing, constant and decreasing returns to scale

Both inputs double in the preceding example:

$$\text{Labour factor} = L_2/L_1 = 200 \text{ workers}/100 \text{ workers} = 2.$$

$$\text{Capital factor} = K_2/K_1 = 4 \text{ machines}/2 \text{ machines} = 2.$$

$$\text{Output factor} = Q_2/Q_1 = 2500 \text{ units/day}/1000 \text{ units/day} = 2.5.$$

Increasing returns to scale 规模报酬递增: output rises more than proportionately. With doubled inputs, output 2000 would show **constant returns to scale** 规模报酬不变; output 1500 would show **decreasing returns to scale** 规模报酬递减. Those are alternative hypothetical results.

Diminishing marginal returns holds at least one input fixed. The two tests change inputs differently.

Physical returns and costs: hold input prices constant

The preceding input bundle costs £10000/day initially and £20000/day after doubling. Input prices are unchanged. Calculate unit costs.

$$AC_1 = TC_1/Q_1 = \text{£}10000/\text{day} \div 1000 \text{ units/day} = \text{£}10/\text{unit}.$$

$$AC_2 = TC_2/Q_2 = \text{£}20000/\text{day} \div 2500 \text{ units/day} = \text{£}8/\text{unit}.$$

Economies of scale 规模经济 lower LRAC as scale increases; **diseconomies of scale** 规模不经济 raise it. Here output rises faster than cost.

If input prices change, physical returns alone do not determine the cost change. Compare like products and technology as well as output.

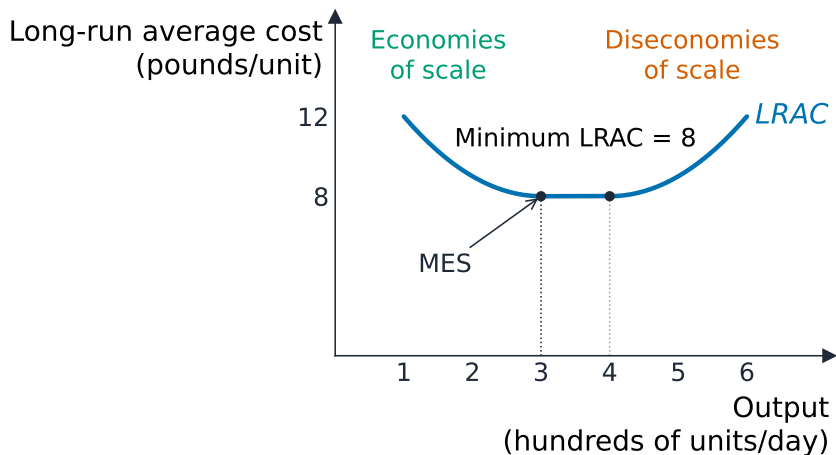
Minimum efficient scale: the first output at minimum LRAC

Illustrative lowest attainable average costs at each scale

All factors can change. Treat the listed outputs as the available choices. Find the minimum efficient scale and explain why a larger output with the same average cost is not the answer.

Output (hundreds of units/day)	LRAC (£/unit)
1	12
2	9
3	8
4	8
5	9

A flat minimum can include several efficient scales



Minimum efficient scale 最小有效规模: the first minimum LRAC. Here it is 300 units/day; 400 is equally efficient but is not MES.

Internal and external economies: whose expansion causes the gain?

Two cost reductions

A firm expands and can use a more specialised machine. Separately, a growing local industry supports a specialist repair service that reduces repair costs for local firms, including firms that have not expanded. Explain the difference.

Internal and external economies: whose expansion causes the gain?

Two cost reductions

A firm expands and can use a more specialised machine. Separately, a growing local industry supports a specialist repair service that reduces repair costs for local firms, including firms that have not expanded. Explain the difference.

Internal economies of scale 内部规模经济 arise from the firm's own expansion. Specialisation can increase output per resource and lower unit cost.

External economies of scale 外部规模经济 arise from expansion of the industry. A shared supplier or skilled labour pool can lower costs for several firms.

Name the cost mechanism. A bigger machine or a bigger industry alone is not evidence of a lower cost per unit.

Internal and external diseconomies: identify the extra cost

Two cost increases

A large firm's decisions pass through more management layers, causing delays and errors. Separately, an expanding industry bids up local rents and skilled wages. Classify each cost increase.

Internal and external diseconomies: identify the extra cost

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Internal diseconomies of scale 内部规模不经济: the firm's expansion makes coordination harder and raises its unit cost.

External diseconomies of scale 外部规模不经济: industry expansion raises local input prices, affecting other firms too.

Internal/external describes the source of the scale effect. It does not mean private/social cost, and does not classify every effect on neighbours as a scale economy.

Falling AFC and economies of scale are different explanations

Two firms each report a lower average cost

A makes more output with the same fixed oven rent. B changes every input and reorganises production in a larger plant. What evidence distinguishes spreading a fixed cost from a long-run scale economy?

Falling AFC and economies of scale are different explanations

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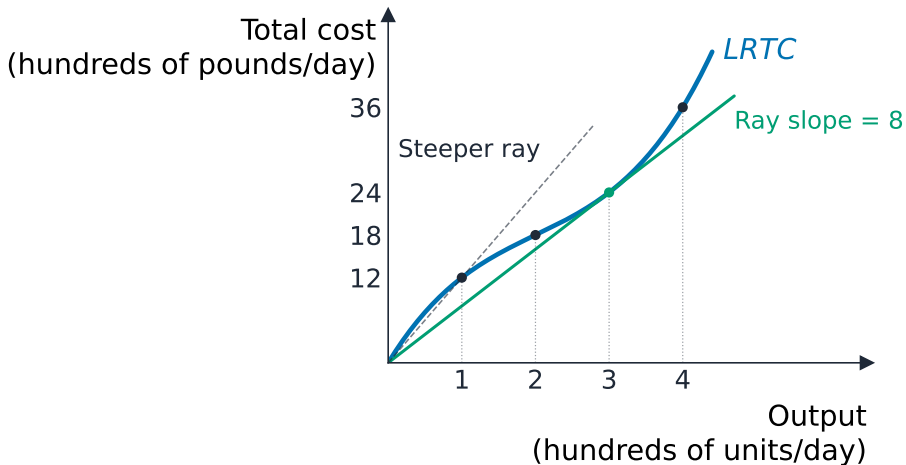
A makes more output with the same fixed oven rent. B changes every input and reorganises production in a larger plant. What evidence distinguishes spreading a fixed cost from a long-run scale economy?

A: a short-run movement spreads the same TFC over more output. AFC falls, but AVC could rise enough for ATC to rise.

B: a long-run comparison permits all inputs to change. Show that the chosen scale lowers the lowest attainable average cost.

Hold relevant input prices, product quality and technology comparable. Lower total cost alone does not establish lower cost per unit; new technology alone does not establish an effect caused by scale.

Read average cost from a total-cost diagram



$LRAC = LRTC/Q$: the slope of an origin ray. The shallowest ray gives minimum LRAC, at 300 units/day here. The local slope measures MC.

Total, average and marginal revenue

A single price applies to every unit sold

A firm sells 10 units/day at £50/unit. To sell 11 units/day it must charge £48/unit on every unit. Find both total revenues, the new average revenue and the extra revenue per extra unit.

Total revenue 总收益: $TR = PQ$.

Average revenue 平均收益: $AR = TR/Q$. With a single price, AR equals that price.

Marginal revenue 边际收益: $MR = \Delta TR / \Delta Q$. It is a change in revenue, not the new price.

A price cut on existing units reduces marginal revenue

$$TR_{10} = P_{10}Q_{10} = \text{£}50/\text{unit} \times 10 \text{ units/day} = \text{£}500/\text{day}.$$

$$TR_{11} = P_{11}Q_{11} = \text{£}48/\text{unit} \times 11 \text{ units/day} = \text{£}528/\text{day}.$$

$$AR_{11} = TR_{11}/Q_{11} = \text{£}528/\text{day} \div 11 \text{ units/day} = \text{£}48/\text{unit}.$$

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{(528 - 500)\text{£/day}}{(11 - 10) \text{ units/day}} = \text{£}28/\text{unit}.$$

The extra unit brings £48, but the price cut loses £2 on each of the previous ten units. Net revenue rises by only £28/day.

Contrast a price taker with a downward-sloping demand curve

Use the same extra unit, with a different price condition

A price taker can sell 10 or 11 units/day at an unchanged £50/unit. Calculate MR and compare it with the preceding price-cut case.

Contrast a price taker with a downward-sloping demand curve

Use the same extra unit, with a different price condition

A price taker can sell 10 or 11 units/day at an unchanged £50/unit. Calculate MR and compare it with the preceding price-cut case.

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{(550 - 500)\text{£/day}}{(11 - 10) \text{ units/day}} = \text{£}50/\text{unit}.$$

An unchanged price on all units gives $MR = AR = P$. With a downward-sloping demand curve and one price for all units, a price cut generally makes MR lower than AR.

Do not assume MR equals price for every firm, or apply a single-price formula to discriminatory sales without checking how revenue is earned.

Normal profit can coexist with positive accounting profit

Include the owner's next best use of resources

Annual revenue is £24000 and explicit costs are £18000. The owner's time and funds have an opportunity cost of £6000/year. Classify the economic profit.

Normal profit can coexist with positive accounting profit

Include the owner's next best use of resources

Annual revenue is £24000 and explicit costs are £18000. The owner's time and funds have an opportunity cost of £6000/year. Classify the economic profit.

$$TC = \text{explicit costs} + \text{opportunity costs} = \text{£}18000/\text{year} + \text{£}6000/\text{year} = \text{£}24000/\text{year}.$$

$$\pi = TR - TC = \text{£}24000/\text{year} - \text{£}24000/\text{year} = 0.$$

Economic profit 经济利润 is zero, so the firm makes **normal profit** 正常利润: the required return is covered within economic cost. Accounting profit is £6000/year because it omits the implicit opportunity cost here.

Calculate supernormal and subnormal profit

100 units/month; economic AC is £9/unit

Find profit when AR is £12, £9 or £8/unit. Keep the output and cost assumption fixed across these three alternatives.

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$$\pi = (AR - AC)Q = (£12/\text{unit} - £9/\text{unit})100 \text{ units/month} = £300/\text{month}.$$

$$\pi = (AR - AC)Q = (£9/\text{unit} - £9/\text{unit})100 \text{ units/month} = 0.$$

$$\pi = (AR - AC)Q = (£8/\text{unit} - £9/\text{unit})100 \text{ units/month} = -£100/\text{month}.$$

Supernormal profit 超常利润 is above normal; **subnormal profit** 次正常利润 is below normal. A negative economic profit does not by itself show that immediate closure is best.

Find the best output by comparing total profit

Only these daily outputs are feasible

Calculate $\pi = TR - TC$ for each row. Can the profit-maximising output be identified from TR alone?

Q (units/day)	TR (£/day)	TC (£/day)	Profit (£/day)
0	0	4	?
1	10	8	?
2	18	13	?
3	24	19	?
4	28	26	?

Marginal profit explains the output comparison

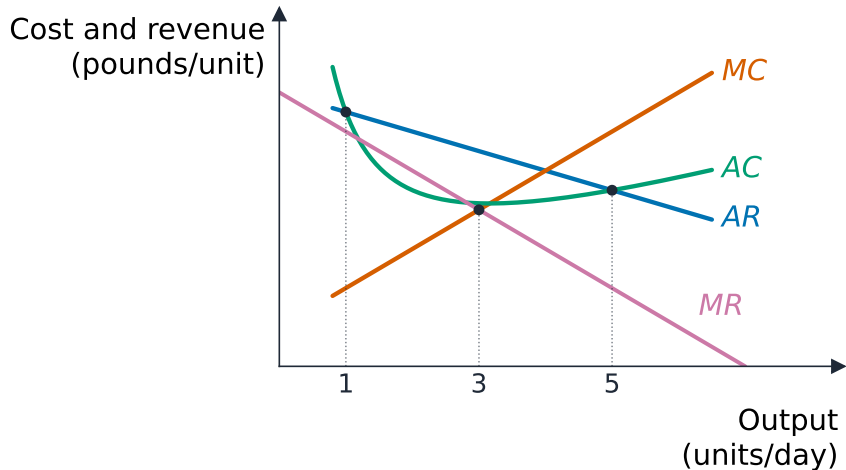
Q (units/day)	Profit (£/day)	MR (£/unit)	MC (£/unit)
0	-4	-	-
1	2	10	4
2	5	8	5
3	5	6	6
4	2	4	7

For the move from 2 to 3 units/day:

$$\Delta\pi = \Delta TR - \Delta TC = (24 - 18)\text{£/day} - (19 - 13)\text{£/day} = 0.$$

Both 2 and 3 maximise profit at £5/day. The fourth unit raises TR but lowers profit because its MC exceeds MR. Discrete choices can tie; equality is not a universal instruction to pick one unique quantity.

Normal-profit output differs from profit-maximising output



Which outputs give $AR=AC$? Which gives $MR=MC$? Explain why these conditions answer different questions.

Use $MR=MC$ with the conditions for a maximum

In the preceding illustrative smooth model, $MR = 14 - 2Q$ and $MC = 2 + 2Q$, in £/unit. Q is the numeric output in units/day.

$$MR = MC \Rightarrow 14 - 2Q = 2 + 2Q \Rightarrow Q_{\pi} = 3 \text{ units/day.}$$

Below 3, MR exceeds MC ; above 3, MC exceeds MR . Profit first rises and then falls. The marked $AR=AC$ outputs, 1 and 5, give normal profit instead.

For a smooth interior maximum, marginal profit must change from positive to negative. With several intersections, compare total profit; also check feasible boundaries and stopping production. Equality alone is insufficient.

A short-run loss does not always justify stopping production

Only 0 or 100 units/month are feasible this month

At 100 units, AVC is £4/unit and ATC is £6/unit. The £200/month fixed cost is unavoidable; variable costs can be avoided by stopping. Compare the two choices at prices of £5 and £3/unit.

For each price, compare revenue minus all economic costs with the loss if production stops. Keep long-run exit separate: costs currently unavoidable may be avoidable later.

Compare the loss with unavoidable fixed cost

At £5/unit, producing covers all variable cost and contributes to fixed cost:

$$\pi = (P - ATC)Q = (£5/\text{unit} - £6/\text{unit})100 \text{ units/month} = -£100/\text{month}.$$

At £3/unit:

$$\pi = (P - ATC)Q = (£3/\text{unit} - £6/\text{unit})100 \text{ units/month} = -£300/\text{month}.$$

Stopping gives $\pi = -TFC = -£200/\text{month}$. Produce at the first price; stop at the second under the stated choices and cost assumptions.

At a price equal to AVC, producing and stopping would give the same loss here. Long-run exit requires a new comparison of avoidable costs, opportunities and expected returns.

5

Market structures

Identify structure from evidence, not profit alone

Three illustrative markets

A: many small farms sell the same grade of wheat; each accepts the market price. B: many cafes sell different menus and service, with easy entry. C: three airlines watch each other's fares and face costly entry.

Name the closest model for each. Does a reported loss prove that a firm is not a monopoly?

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Three illustrative markets

A: many small farms sell the same grade of wheat; each accepts the market price. B: many cafes sell different menus and service, with easy entry. C: three airlines watch each other's fares and face costly entry.

Name the closest model for each. Does a reported loss prove that a firm is not a monopoly?

Use the number and size of sellers, product differences and barriers. Profit is an outcome that also depends on demand and cost.

Market structures describe conditions, not guaranteed profits

	structure	key feature
A	perfect competition 完全竞争	many sellers, identical product: price takers
B	monopolistic competition 垄断竞争	product differentiation 产品差异化: some price-setting power
C	oligopoly 寡头垄断	a few firms: interdependence ; a cartel 卡特尔 is possible, not necessary
–	monopoly 垄断	one seller in the relevant market; Barriers to entry 进入壁垒 can protect profit

Weak demand or high costs can still cause a loss, and even one seller may face a credible entry threat. Define the product and geographical market first.

A competitive firm takes price; the market determines it

One small farm, unchanged market price

The market price is £10 per unit. The farm can sell 4 or 5 units per day without changing that price. Find TR, AR and MR for the extra unit. Would the whole market's demand curve be horizontal too?

A competitive firm takes price; the market determines it

One small farm, unchanged market price

The market price is £10 per unit. The farm can sell 4 or 5 units per day without changing that price. Find TR, AR and MR for the extra unit. Would the whole market's demand curve be horizontal too?

Distinguish one firm's sales from total market sales. Market demand and supply determine the price this firm accepts.

Horizontal firm demand gives price equal to AR and MR

$$TR_4 = PQ = £10/\text{unit} \times 4 \text{ units/day} = £40/\text{day}$$

$$TR_5 = PQ = £10/\text{unit} \times 5 \text{ units/day} = £50/\text{day}$$

$$AR_5 = TR/Q = £50/\text{day} \div 5 \text{ units/day} = £10/\text{unit}$$

$$MR = \Delta TR / \Delta Q = (£50 - £40) / 1 \text{ unit} = £10/\text{unit}$$

For the price-taking firm, $P = AR = MR$. Its extra sale does not lower the price on earlier units. Market demand usually slopes down; it is not this horizontal firm-level curve.

Short-run profit can be positive, zero or negative

Compare producing with stopping

At the best positive output of 4 units/day, TC is £40/day and TVC is £24/day. At prices £12, £10 and £8 per unit, find economic profit. Assume these cost/output data apply separately in each case. Fixed cost is unavoidable today.

Short-run profit can be positive, zero or negative

Compare producing with stopping

At the best positive output of 4 units/day, TC is £40/day and TVC is £24/day. At prices £12, £10 and £8 per unit, find economic profit. Assume these cost/output data apply separately in each case. Fixed cost is unavoidable today.

Also compare the £8 case with stopping. This exercise supplies the best positive output; it does not claim that the same output is optimal after every price change.

A loss need not make stopping the better choice

P (£/unit)	TR (£/day)	TC (£/day)	π (£/day)
12	48	40	8
10	40	40	0
8	32	40	-8

For each row, $TR = PQ$ and $\pi = TR - TC$. Zero economic profit includes the owner's normal return.

$$TFC = TC - TVC = £40/\text{day} - £24/\text{day} = £16/\text{day}$$

$$AVC = TVC/Q = £24/\text{day} \div 4 \text{ units/day} = £6/\text{unit}$$

At £8, production covers variable cost and £8/day of fixed cost. Loss £8/day is better than the stopping loss £16/day. Price-taking alone does not guarantee normal profit today.

Explain the movement to long-run normal profit

An unchanged competitive industry

Existing firms earn economic profit. Entry is free, buyers know prices and new firms can access the same technology and inputs. What happens to market supply, price and each firm's profit? Reverse the reasoning for losses.

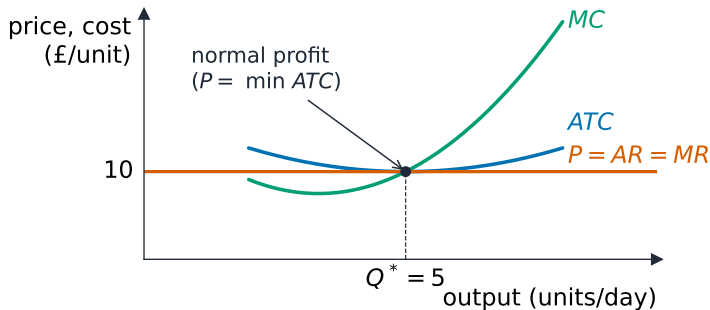
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Entry shifts market supply right and tends to reduce price. Exit after losses shifts supply left and tends to raise price. Each remaining firm responds to the new market price.

Read the competitive long-run equilibrium



long-run PC: $P = AR = MR = \min ATC$ · normal profit

Normal profit ($P = ATC$) alone does not prove social efficiency.

Normal profit and efficiency need separate explanations

Here $Q = 5$ units/day and $P = ATC = £10/\text{unit}$, so

$$\pi = (P - ATC)Q = (£10 - £10)/\text{unit} \times 5 \text{ units/day} = £0/\text{day}.$$

Production at minimum ATC is productively efficient in this cost model. $P = MC$ is allocatively efficient only if price represents marginal benefit and private and social margins coincide.

Free entry/exit and the model's information and cost assumptions support the long-run result. External costs, poor information or changing conditions can break the welfare inference.

Neither a zero-profit observation alone nor a single cost minimum proves innovation over time. Compare finance, incentives and actual investment when judging dynamic efficiency.

Derive supply by comparing feasible profits

Whole units per day, fixed cost £6/day

Only outputs 0–4 are feasible. TVC is 0,2,6,12,20 pounds/day. At prices £1,£3,£5 and £7 per unit, choose output to maximise profit, including stopping. Use $\pi = PQ - (TFC + TVC)$.

Derive supply by comparing feasible profits

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Only outputs 0–4 are feasible. TVC is 0,2,6,12,20 pounds/day. At prices £1,£3,£5 and £7 per unit, choose output to maximise profit, including stopping. Use $\pi = PQ - (TFC + TVC)$.

Successive units cost £2,£4,£6 and £8. Compare the price received for each extra unit with its extra cost, then check stopping and the full profit totals.

Supply follows marginal cost only on the relevant range

P (£/unit)	Best Q	TR	TC	π
1	0	0	6	-6
3	1	3	8	-5
5	2	10	12	-2
7	3	21	18	3

Q is units/day; money totals are £/day. At £3, the second unit costs £4 but earns £3; at £7, the fourth costs £8 but earns £7. Stopping loses £6/day.

For a smooth conventional cost curve, the competitive firm's short-run supply is the rising MC branch above minimum AVC. Below that threshold it supplies zero; at the threshold it is indifferent between stopping and the best positive output.

Add firms' quantities at each price to obtain industry supply. A monopoly has no such price-only supply rule: its chosen output depends on its demand and marginal revenue too.

Choose output before reading a monopoly's price

Illustrative daily model, no external effects

Demand is $P = AR = 18 - Q$; $MR = 18 - 2Q$. Total cost is $TC = 20 + 2Q + Q^2$, so $MC = 2 + 2Q$. Quantity is units/day, prices and marginal costs are £/unit, and total costs are £/day. Find the best output, its selling price and economic profit.

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Demand is $P = AR = 18 - Q$; $MR = 18 - 2Q$. Total cost is $TC = 20 + 2Q + Q^2$, so $MC = 2 + 2Q$. Quantity is units/day, prices and marginal costs are £/unit, and total costs are £/day. Find the best output, its selling price and economic profit.

Find the output using the marginal comparison. Then read price from AR, not MR. Check total profit and stopping.

MR gives the output; AR gives the price

For a smooth interior maximum with these curves,

$$MR = MC$$

$$18 - 2Q = 2 + 2Q \Rightarrow Q = 4 \text{ units/day}$$

$$P = 18 - Q = 18 - 4 = \text{£}14/\text{unit}$$

$$TR = PQ = \text{£}14/\text{unit} \times 4 \text{ units/day} = \text{£}56/\text{day}$$

$$TC = 20 + 2Q + Q^2 = 20 + 2(4) + 4^2 = \text{£}44/\text{day}$$

$$\pi = TR - TC = \text{£}56/\text{day} - \text{£}44/\text{day} = \text{£}12/\text{day}$$

Here $MR - MC = 16 - 4Q$ changes from positive to negative at 4. Stopping loses the unavoidable fixed cost £20/day; production is better. The marginal equality alone is not a complete check in every model.

Profit is price minus average cost, multiplied by output

Read three heights at the chosen output

At 4 units/day, AR is £14/unit, MR and MC are £10/unit, and ATC is £11/unit. Which height is the selling price? Which gap gives profit per unit? Which area gives total economic profit?

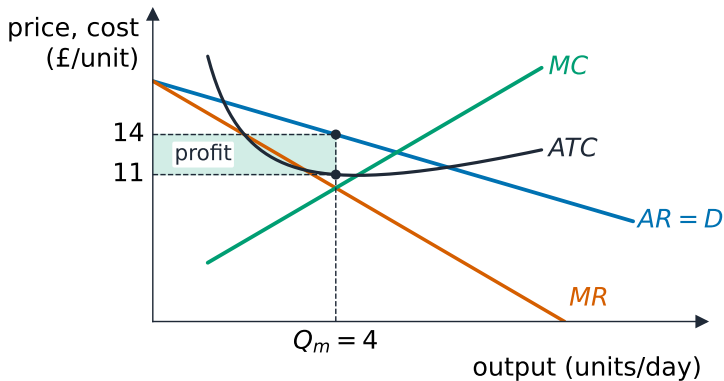
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Price is AR, not MR. The profit gap is AR minus ATC, not AR minus MC.

Read a consistent monopoly diagram



Profit is $(P - ATC)Q$, not $(P - MC)Q$. Price is read from AR.

The same monopoly can make profit, normal profit or a loss

Keep demand and variable cost unchanged, but compare three alternative fixed costs. Each case still has $Q = 4$ and $P = £14/\text{unit}$.

Fixed cost (£/day)	TR (£/day)	TC (£/day)	π (£/day)
20	56	44	12
32	56	56	0
40	56	64	-8

Variable cost is £24/day in every case. Extra unavoidable fixed cost changes ATC and profit, but not MC here. In the loss case, producing loses £8/day rather than the £40/day lost by stopping.

Barriers may protect a profit from entry. They cannot guarantee profit when demand is weak or costs are high.

Compare profit maximisation with the social margin

Same demand and marginal cost as before

At the monopoly output $Q = 4$, buyers' marginal benefit is £14/unit and marginal cost is £10/unit. With no external effects or information problems, does the next small increase in output create a net social gain? Find the output where the two social margins are equal.

Compare profit maximisation with the social margin

Same demand and marginal cost as before

At the monopoly output $Q = 4$, buyers' marginal benefit is £14/unit and marginal cost is £10/unit. With no external effects or information problems, does the next small increase in output create a net social gain? Find the output where the two social margins are equal.

Compare AR with MC for this welfare question, not MR with MC. Profit maximisation and allocative efficiency use different margins.

A welfare comparison needs its assumptions

With $MSB = AR = 18 - Q$ and $MSC = MC = 2 + 2Q$,

$$MSB = MSC$$

$$18 - Q = 2 + 2Q \Rightarrow Q^* = 16/3 \text{ units/day}$$

$$P^* = 18 - Q^* = 18 - 16/3 = \text{£}38/3 \text{ per unit}$$

The illustrative social output is about 5.33 units/day, above the monopoly's 4; its marginal-cost price is about £12.67/unit.

This comparison holds demand and costs fixed and excludes other distortions. A real intervention must also consider cost recovery, information, incentives and implementation. Monopoly status alone does not establish the size of a welfare loss or prove poor innovation.

Normal profit can coexist with spare capacity

A differentiated-product firm after entry

Use the previous demand $AR = 18 - Q$, $MR = 18 - 2Q$ and $MC = 2 + 2Q$, but $TC = 32 + 2Q + Q^2$. At $Q = 4$ units/day, find price, ATC and profit. Does zero profit prove production at minimum ATC?

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Use the previous demand $AR = 18 - Q$, $MR = 18 - 2Q$ and $MC = 2 + 2Q$, but $TC = 32 + 2Q + Q^2$. At $Q = 4$ units/day, find price, ATC and profit. Does zero profit prove production at minimum ATC?

In monopolistic competition, entry of close substitutes reduces each incumbent's demand. Its own demand remains downward sloping; it does not become a price taker.

Entry removes profit without making firm demand horizontal

Here $MR = MC$ at $Q = 4$ units/day and $P = £14/\text{unit}$.

$$TC = 32 + 2Q + Q^2 = 32 + 2(4) + 4^2 = £56/\text{day}$$

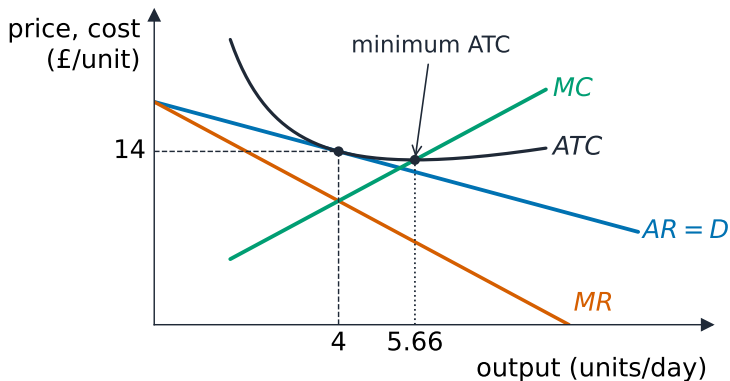
$$ATC = TC/Q = £56/\text{day} \div 4 \text{ units/day} = £14/\text{unit}$$

$$\pi = (P - ATC)Q = (£14 - £14)/\text{unit} \times 4 \text{ units/day} = £0/\text{day}$$

But $ATC = 32/Q + 2 + Q$ reaches its minimum at about 5.66 units/day, not 4. This is excess capacity in the model. Also $P = 14 > MC = 10$: normal profit does not establish allocative efficiency.

This illustrates the standard free-entry long-run model. Product variety can benefit buyers; evaluate that benefit as well as the cost/output comparison.

Read zero profit and the cost minimum separately



At 4, $P = ATC$ gives normal profit. Minimum ATC occurs at a larger output.

Test whether one network can serve the market more cheaply

Illustrative network, same service quality

Market demand is 100 units/month. Each separate network costs £120/month to maintain plus £2/unit supplied. Compare one network supplying all 100 with two networks supplying 50 each. Assume duplicating the networks is necessary if there are two suppliers.

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A **natural monopoly** 自然垄断 arises when one firm can serve the relevant market at lower total cost than several firms. Having only one seller is not enough evidence by itself.

Natural monopoly concerns costs over the relevant demand range

$$TC_{\text{one}} = 120 + 2Q = 120 + 2(100) = \text{£}320/\text{month}$$

$$TC_{\text{two}} = 2[120 + 2(50)] = \text{£}440/\text{month}$$

$$AC_{\text{one}} = TC_{\text{one}}/Q = \text{£}320/\text{month} \div 100 \text{ units/month} = \text{£}3.20/\text{unit}$$

$$AC_{\text{two}} = TC_{\text{two}}/Q = \text{£}440/\text{month} \div 100 \text{ units/month} = \text{£}4.40/\text{unit}$$

Duplicating the fixed network adds £120/month here. LRAC falls over the relevant range. This cost case does not justify any price the monopolist chooses, or prove efficient management.

Regulation must consider service, costs, investment and demand. A growing market or new technology may change the cost advantage.

Separate a high cost from evidence of avoidable inefficiency

Compare like with like

A network supplies 100 identical service units/month. Its actual cost is £440/month; a feasible best-practice method costs £320/month at the same input prices, quality and reliability. Calculate the avoidable cost gap and its value per unit. Would a more expensive remote location prove the same problem?

Separate a high cost from evidence of avoidable inefficiency

Compare like with like

A network supplies 100 identical service units/month. Its actual cost is £440/month; a feasible best-practice method costs £320/month at the same input prices, quality and reliability. Calculate the avoidable cost gap and its value per unit. Would a more expensive remote location prove the same problem?

X-inefficiency × 低效率 is avoidable cost above the feasible best-practice cost for the same output. Weak competitive pressure can permit it, but firm size alone does not prove it.

A cost comparison needs controlled conditions

$$\text{Avoidable cost} = TC_{\text{actual}} - TC_{\text{best}} = \text{£}440/\text{month} - \text{£}320/\text{month} = \text{£}120/\text{month}$$

$$\text{Gap per unit} = \text{Avoidable cost}/Q$$

$$\text{Gap per unit} = \text{£}120/\text{month} \div 100 \text{ units/month} = \text{£}1.20/\text{unit}$$

Poor supervision, waste or weak cost control could explain such a verified gap. Extra quality, higher input prices or difficult geography may instead explain higher costs without X-inefficiency.

Producing away from minimum ATC concerns the scale of output on a cost curve. X-inefficiency concerns avoidable cost above a feasible curve at the given output. Do not treat these as the same test.

Calculate concentration using the largest firms together

Annual sales in one defined market

Firms A–F sell £60m, £50m, £40m, £20m, £16m and £14m. Calculate the four-firm **concentration ratio** 集中度. A and B then merge; total market sales stay unchanged. Re-rank the firms and calculate the new ratio.

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The ratio is the combined share of the largest specified number of firms. Use the same market, year and sales measure in numerator and denominator.

Re-rank the firms after a merger

$$CR_4 = \frac{\text{sales of largest four}}{\text{total market sales}} \times 100$$

$$CR_4 = \frac{(60 + 50 + 40 + 20) \text{ £m/year}}{200 \text{ £m/year}} \times 100 = 85\%$$

$$CR_{4,\text{after}} = \frac{(110 + 40 + 20 + 16) \text{ £m/year}}{200 \text{ £m/year}} \times 100 = 93\%$$

All sales figures are £million/year. The merged firm sells £110m/year; the new fourth-largest sells £16m/year. Do not count A and B separately after merging.

The ratio rises by 8 percentage points. 85% was a combined share, not each firm's share. High concentration suggests dominance by a few firms, but does not by itself prove collusion, high prices or barriers to potential entry.

Identify the obstacle to entry or exit

Four barriers, four mechanisms

A licence limits suppliers. A rival cannot obtain a suitable harbour site. An incumbent has a large low-cost network. Buyers strongly prefer an established brand. Explain how each could make entry harder.

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Legal restriction; physical scarcity; a cost disadvantage for small entrants; and a market disadvantage from buyer loyalty. Categories can overlap: explain the mechanism rather than guessing a label alone.

Contestability depends on credible potential entry

A **contestable market** 可竞争市场 faces effective pressure from potential entrants. The ideal model has free entry/exit, access to comparable technology and costs, and no unrecoverable entry costs.

Even a few sellers may keep prices close to cost if an entrant can quickly win sales and leave without a large loss. Existing seller count and entry conditions answer different questions.

Test the threat

A newcomer can rent identical equipment and return it freely. Alternatively, it must build a specialist plant that has no resale value. Which case makes quick entry and exit more credible, and why?

Calculate the unrecoverable part of an entry investment

Leaving does not recover every payment

An entrant pays £20,000 for equipment and £5,000 for launch advertising. On exit it can sell the equipment for £18,000; the advertising cannot be recovered. Find the sunk cost. Is every fixed cost necessarily sunk?

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A **sunk cost** 沉没成本 cannot be recovered once incurred. Fixed describes how cost responds to output over a period; sunk describes recoverability.

Unrecoverable costs weaken the threat of quick entry

Sunk cost = initial outlay – recoverable value

$$\text{Sunk cost} = (£20,000 + £5,000) - £18,000 = £7,000.$$

An entrant must expect to recover this £7,000 through future returns. A temporarily attractive price may be insufficient, especially if incumbents can react quickly.

Equipment that can be resold is not wholly sunk. Once a cost is already sunk, it should not by itself justify continued production; compare future avoidable costs and returns. Exit penalties or other future obligations are separate costs that may affect the decision.

Read both firms' profits in a payoff matrix

Two firms choose simultaneously, once

Each chooses a high or low price. Each cell gives (A's profit, B's profit), in £/week. There is no binding agreement. Which choice is better for A for each possible choice by B? Then reverse roles.

	B: high	B: low
A: high	(700,700)	(200,900)
A: low	(900,200)	(400,400)

A **payoff matrix** 收益矩阵 records outcomes for each combination of choices. Choose one rival action at a time; do not compare only the joint totals.

Find each firm's response to each rival action

	B high	B low
A high	A 700 B 700	A 200 B 900
A low	A 900 B 200	A 400 B 400

£/week

- B high: A prefers **low** ($900 > 700$). B low: A still prefers **low** ($400 > 200$).
- Symmetric, so B also picks low: **low/low**, £400 each. Neither gains by changing alone.
- High/high gives £700 each, but each is tempted to cut.

A **Prisoner's Dilemma** 囚徒困境: individually preferred responses produce an outcome worse for both than mutual cooperation.

Explain why coordination may fail or persist

$$\text{Joint profit}_{HH} = \text{£}700/\text{week} + \text{£}700/\text{week} = \text{£}1,400/\text{week}$$

$$\text{Joint profit}_{LL} = \text{£}400/\text{week} + \text{£}400/\text{week} = \text{£}800/\text{week}$$

The higher joint total does not remove the incentive to undercut. A cartel must address incentives, monitoring and responses to cheating; entry and different costs can weaken coordination.

Repeated interaction and credible future responses may change behaviour. The one-shot table does not prove that every oligopoly must collude or always start a price war. Check the actual payoffs and assumptions.

More sales or revenue need not mean more profit

Illustrative monthly forecasts, unit variable cost £6

Initially price is £10/unit, sales are 100 units/month and fixed cost is £200/month. A cut to £9/unit is forecast to sell 115 units/month. Alternatively, keep price £10 and spend £60/month extra on service/advertising, with forecast sales of 120 units/month. Compare revenue and profit in all three cases.

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Price competition 价格竞争 changes price to attract buyers. **Non-price competition** 非价格竞争 changes service, quality, branding or promotion. Both have costs and uncertain rival/customer responses.

Compare the cost as well as the demand response

Use $TR = PQ$, $TC = TFC + vQ$ and $\pi = TR - TC$, where $v = £6/\text{unit}$.

Case	Q	TR	TC	π
Initial	100	1000	800	200
Price cut	115	1035	890	145
Extra service/ad	120	1200	980	220

Q is units/month; totals are £/month. The price cut raises revenue by £35/month but lowers profit by £55/month. The other forecast adds £20/month profit after its £60/month extra fixed spending.

These are forecasts, not guaranteed gains. If rivals match the offer or extra sales disappoint, recalculate. A lower price can benefit buyers even when it reduces the firm's profit.

6

Firms

Different prices need an explanation

Four pricing rules for comparison

A seller charges each unit at the buyer's maximum willingness to pay. Another offers a lower unit price for a larger quantity. A cinema checks student IDs for a cheaper ticket. A shop charges more to deliver to a distant address because delivery costs more. Which rules use price discrimination? What evidence would you need for the quantity discount?

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Four pricing rules for comparison

A seller charges each unit at the buyer's maximum willingness to pay. Another offers a lower unit price for a larger quantity. A cinema checks student IDs for a cheaper ticket. A shop charges more to deliver to a distant address because delivery costs more. Which rules use price discrimination? What evidence would you need for the quantity discount?

Price discrimination 价格歧视 means different prices for the same product where the difference is not explained by different supply costs.

Individual values, quantity menus and identifiable groups

degree	how price is set	what it needs
First-degree price discrimination 一级价格歧视	each unit at that buyer's maximum willingness to pay	detailed information
Second-degree price discrimination 二级价格歧视	unit price varies with quantity or a menu; buyers choose	not a discount explained entirely by lower costs
Third-degree price discrimination 三级价格歧视	identifiable groups pay different prices (students, adults)	group separation must work

A distant delivery charge may just reflect higher cost. A fare rising near departure sorts buyers by willingness to pay, but timing alone does not establish its precise degree.

Compare uniform and individual-unit prices

An illustrative buyer and constant marginal cost

One buyer's maximum prices for successive units are £12, £9 and £6. Later units have no value. Supply costs £4/unit, with no fixed or administration cost. The buyer purchases when value equals price. Compare uniform prices £12, £9 and £6, then pricing the three units at £12, £9 and £6 respectively. Find quantity, revenue, cost and profit.

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Compare total profit across the feasible quantities. Do not confuse different unit values with three different customers in this example.

First-degree pricing changes both surplus and quantity

Uniform price	Q	TR	TC	Profit
£12/unit	1	£12	£4	£8
£9/unit	2	£18	£8	£10
£6/unit	3	£18	£12	£6

These thresholds give the best uniform price for each possible quantity. The best uniform outcome is two units at £9, with £10 profit; no sale gives zero.

$$TR_{\text{individual}} = \sum P_i = £12 + £9 + £6 = £27$$

$$TC_{\text{individual}} = MC \times Q = (£4/\text{unit})(3 \text{ units}) = £12$$

$$\pi_{\text{individual}} = TR - TC = £27 - £12 = £15.$$

The seller captures the first unit's £3 consumer surplus and serves the third unit too. This result depends on the stated information and purchase assumptions.

A quantity menu lets the buyer choose

Keep the same values and costs

Charge £9 for the first unit, £9 for the second and £5 for the third. Total bills are £9, £18 and £23. Total willingness to pay is £12, £21 and £27. Which quantity does the buyer prefer? Find profit and compare it with the best uniform-price profit.

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Compare total willingness to pay minus the whole bill for each quantity. This is a quantity menu; the seller does not assign a price from the buyer's identity.

An extra unit can attract the buyer without taking all surplus

Q	Total value (£)	Bill (£)	Buyer net benefit (£)
1	12	9	3
2	21	18	3
3	27	23	4

The buyer strictly prefers three units. Supply cost is £4/unit throughout:

$$\pi = TR - TC = £23 - (£4/\text{unit})(3 \text{ units}) = £11.$$

Profit is £1 above the best uniform outcome. Extra administration cost above £1 removes that gain. A buyer with different values may choose another quantity; the menu does not force everyone to buy three.

Group prices require separate decisions

A different market: at most one visit per customer

In A, two customers will pay up to £12 and £10. In B, two will pay up to £7 and £5. Cost is £4/visit; no fixed or administration cost. Buyers purchase at equality. Group membership is verified and tickets are non-transferable. Find the best single price, then the best price for each group. Compare profit.

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Try willingness-to-pay thresholds: £12, £10, £7 and £5. Then optimise each group's profit separately under the constant marginal cost assumption.

Separate prices can serve a buyer excluded by one price

One price £12/£10/£7/£5 gives respectively 1/2/3/4 visits and profit £8/£12/£9/£4. Best uniform price: £10, two visits, profit £12.

A: £10 for two visits earns £12 profit, versus £8 at £12 for one. B: £7 for one earns £3, versus £2 at £5 for two.

$$TR = P_A Q_A + P_B Q_B$$

$$TR = (£10/\text{visit})(2 \text{ visits}) + (£7/\text{visit})(1 \text{ visit}) = £27$$

$$TC = MC(Q_A + Q_B) = (£4/\text{visit})(3 \text{ visits}) = £12$$

$$\pi = TR - TC = £27 - £12 = £15.$$

One additional B customer is served. Profit rises £3 before administration costs. Other demand or cost conditions can give different output and buyer effects.

Resale can undermine group separation

A student discount that adults can bypass

A venue charges students £5 and adults £9 for the same visit. Anyone can buy a transferable student ticket online without an ID check. Explain why this weakens the policy. Would an ID check automatically make it profitable?

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Adults can use the cheap route; resale lets others bypass the higher price. ID checks and non-transferable tickets may help, but verification costs and enforcement matter.

Effective pricing needs power, information and separation

power	some price-setting power – a full single-seller monopoly is not needed
information	enough to set useful prices or options for each group
separation	cheap resale or switching must not defeat the policy; third-degree pricing needs identifiable segments with different demand responses

With a common marginal cost, the **less elastic** group bears the **higher mark-up**.
Not necessary: every group's demand being inelastic, or price leadership.

Age or income alone does not prove an elasticity, and bad forecasts can lose buyers. Weigh the gain against **verification, administration and enforcement** costs.

Profit, access, efficiency and distribution are separate outcomes

profit	may rise – but information, resale and administration costs can remove the gain
access	some customers pay more; others gain access at a lower price
efficiency	total output can rise, fall or stay the same: the effect is conditional
distribution	efficient output does not prove fair distribution

Perfect first-degree benchmark

The third unit adds **£6 benefit** against **£4 cost**: serving it adds **£2 total surplus**. Consumer surplus becomes **zero** under the purchase-at-equality assumption.

Greater profit *might* finance investment or keep a service operating – neither follows automatically. Compare each outcome with a **feasible alternative**.

Separate how a firm grows from what it sells

Two illustrative expansion plans

A bakery opens a second shop using its own staff and investment. A car maker builds its own food business, without buying another firm. Which uses internal growth? Which also changes the firm's product range into another industry?

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Ask two questions: is another existing business being acquired, and is the firm entering a different product or market? These are different classifications.

Diversification does not always require buying another firm

internal growth 内部增长 also called **organic growth** 有机增长: expansion through the firm's **own** investment – capacity, staff, branches or product lines. Both examples use it.

diversification 多元化经营 expanding into a **different product or market** – internally (the car maker's food business) or by acquiring another business.

External growth 外部增长 combining existing businesses through a **merger** 合并 or **takeover** 收购; a takeover **transfers control**, it is not opening another branch.

A rise in sales is an **outcome** of growth, not the whole definition.

Classify the direction from the buyer's position

Four purchases by a car maker

The car maker buys: A another car maker; B a tyre supplier; C a car dealership; D a food company. Classify each integration. Explain why B and C have different directions even though both are vertical.

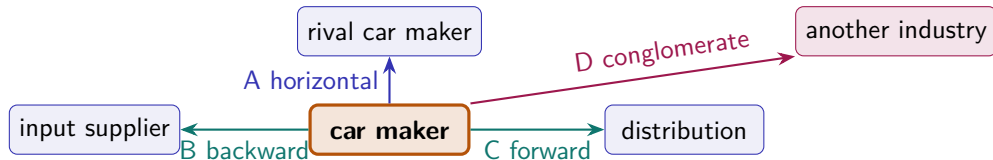
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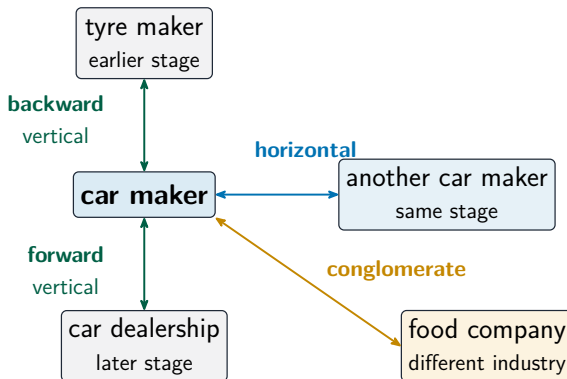
Draw the production chain first. Inputs are earlier stages; distribution to buyers is later. Identify the acquiring firm before naming a direction.

Same stage, earlier stage, later stage or another industry



- A: **horizontal integration** 横向一体化: a firm at the same stage of the same industry.
- B, C: **vertical integration** 纵向一体化, different stages of one chain: **backward vertical integration** 后向纵向一体化 towards inputs, **forward vertical integration** 前向纵向一体化 towards final buyers. Reversing who buys whom reverses the direction.
- D: **conglomerate integration** 混合一体化: external diversification; spreading risk is a possible aim, not a guaranteed result.

Follow the production chain from the car maker



Backward moves towards inputs; forward moves towards buyers. Arrows show joining choices.

Check a merger's savings against its transition costs

Illustrative monthly cost forecast

Two firms together sell 200 units/month at £6/unit. Their combined cost is £1,000/month. A merger is forecast to reduce recurring cost to £800/month at unchanged output, but adds a £300 transition bill in its first month. Find average cost and profit before, in the first month, and in a later normal month.

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Use the same output, quality and period for each comparison. A forecast operating saving is not a complete investment appraisal.

A recurring saving need not appear in the first month

Use $AC = TC/Q$, $TR = PQ$ and $\pi = TR - TC$. Revenue is £1,200/month in every case here.

Case	TC (£/month)	AC (£/unit)	Profit (£/month)
Before	1000	5.00	200
First month	1100	5.50	100
Later month	800	4.00	400

The first-month cost includes the £300 transition bill. Later savings require the forecast to hold; coordination problems or lost customers may change it.

Acquisition price, financing and opportunity costs also matter. Even genuine cost savings need not lower selling prices if the merged firm has more market power. Compare effects on buyers, workers, suppliers and owners.

Explain why a small firm survives or chooses not to grow

Different firms, different constraints

A specialist repairer has few local customers and serves them personally. An online craft seller reaches buyers nationwide but wants to keep control. A supplier makes small batches to the designs of large manufacturers. Give a reason each can remain small and a condition that could make expansion attractive.

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Distinguish limited demand, owner preference, production costs and a specialised role. Small size does not by itself prove failure.

A small market and a small firm are different claims

the repairer	limited local demand, few scale economies in personal service – yet a new location or a franchise model could still permit growth
the craft seller	reaches a large area but may choose control over expansion
the supplier	survives by meeting specialised orders reliably – a niche 利基市场: a narrow customer need or market segment

- distinctive products, flexibility and service **help** – they do not **guarantee** survival; easy entry still attracts rivals
- **finance**, management capacity and the likely cost path constrain expansion
- exit penalties may make leaving costly, but past **sunk** spending alone is no reason to continue an avoidable loss

Compare the conditions for an effective cartel

Two illustrative industries

A has three similar-cost firms, stable demand, observable sales and difficult entry. B has twenty firms with different costs, volatile orders, hard-to-observe sales and easy entry. Which is more favourable to maintaining a supply agreement? Explain at least two mechanisms and one reason it could still break down.

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Revisit the payoff matrix: a high joint profit does not remove each member's incentive to undercut or sell above its agreed quantity.

Cartel conditions affect incentives, monitoring and entry

	A: cartel more stable	B: cartel less stable
members	few: easy to coordinate	many, with different costs
monitoring	stable demand: odd sales stand out	volatile demand hides cheating
entry	barriers keep outsiders out	entrants expand supply outside it

An effective restriction raises price and member profits but cuts output and buyer choice: output below the social optimum can create [welfare loss](#).

High concentration alone does not prove a stable cartel. Cheating, entry or changes in costs/demand can undo it; profit is not guaranteed.

Identify whose objective a manager is following

Owner profit and manager preference

Project A gives £10,000/month profit before bonuses and an easier schedule. B gives £12,000/month before bonuses but needs more supervision. The manager's fixed salary is the same. Which does a profit-seeking owner prefer? How would a bonus of 10% of profit change the manager's financial incentive? Does it guarantee the same choice?

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A **principal-agent problem** 委托代理问题 arises when the decision-maker's incentives differ from those of the person represented, especially when actions are hard to observe.

An incentive can reduce conflict without eliminating it

The owner prefers B in this comparison. A 10% bonus gives

$$\text{Bonus}_A = 0.10 \times \text{profit}_A = 0.10 \times \text{£}10,000/\text{month} = \text{£}1,000/\text{month}$$

$$\text{Bonus}_B = 0.10 \times \text{profit}_B = 0.10 \times \text{£}12,000/\text{month} = \text{£}1,200/\text{month}$$

B pays the manager £200/month more. An easier schedule may still be worth more than this to the manager, so the bonus does not guarantee alignment.

Divorce of ownership from control 所有权与控制权分离 can create this conflict.

Monitoring, profit-related pay and longer-term share incentives may help, but can cost money or encourage short-term targets and risky choices. Check the chosen performance measure.

Profit, revenue and quantity sold

One firm, three measures

Reuse $P = 18 - Q$ and $TC = 20 + 2Q + Q^2$. Q is in units/day; money totals are £/day. Economic cost includes normal profit. For this task only whole outputs 0–10 are feasible. At $Q=4$, $TR=56$ and $TC=44$. At $Q=9$, $TR=81$ and $TC=119$. Which output earns more revenue? Which earns more profit?

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Use $TR = PQ$ and $\pi = TR - TC$. An objective says what is being maximised; a constraint limits the allowed choices.

More revenue can coincide with less profit

$$\pi_4 = TR_4 - TC_4 = \text{£}56/\text{day} - \text{£}44/\text{day} = \text{£}12/\text{day}$$

$$\pi_9 = TR_9 - TC_9 = \text{£}81/\text{day} - \text{£}119/\text{day} = -\text{£}38/\text{day}$$

$$\Delta TR = TR_9 - TR_4 = \text{£}81/\text{day} - \text{£}56/\text{day} = \text{£}25/\text{day}$$

$$\Delta TC = TC_9 - TC_4 = \text{£}119/\text{day} - \text{£}44/\text{day} = \text{£}75/\text{day}$$

The extra cost exceeds extra revenue by £50/day. The move raises revenue but lowers profit.

That comparison alone does not yet prove which output is best across all feasible choices.

A price cut changes revenue on earlier units too

A uniform-price seller moves from $Q=4$ at £14/unit to $Q=9$ at £9/unit. The five additional units bring in £45/day, but the original four each sell for £5 less.

$$\Delta TR = P_9(Q_9 - Q_4) + Q_4(P_9 - P_4)$$

$$\Delta TR = (£9/\text{unit})(5 \text{ units/day}) + (4 \text{ units/day})(-£5/\text{unit})$$

$$\Delta TR = £45/\text{day} - £20/\text{day} = £25/\text{day}.$$

On a smooth diagram, the signed area under MR between the outputs gives this revenue change. The rectangle $P \times Q$ gives total revenue at one output; it is not profit.

Three objectives applied to the same feasible choices

Q (units/day)	TR (£/day)	TC (£/day)	Profit (£/day)
0	0	20	-20
1	17	23	-6
2	32	28	4
3	45	35	10
4	56	44	12
5	65	55	10
6	72	68	4
7	77	83	-6
8	80	100	-20
9	81	119	-38
10	80	140	-60

Choose the output for each objective: profit, revenue, sales with profit ≥ 0 .

The constraint changes which output is allowed

objective	Q	why
Profit maximisation 利润最大化	4	£12/day, the highest profit in the table (beats the £20/day loss at $Q=0$)
Revenue maximisation 收益最大化	9	TR is £81/day, although economic profit is negative
Sales maximisation 销售最大化	6	the most sold with at least normal profit; $Q=7$ violates the constraint

Normal profit is already in economic cost: non-negative economic profit means $TR \geq TC$, not that revenue is zero.

Marginal conditions need the objective and a maximum

For divisible output in this illustrative model:

$$MR = MC \Rightarrow 18 - 2Q = 2 + 2Q \Rightarrow Q_{\pi} = 4$$

$$MR = 0 \Rightarrow 18 - 2Q = 0 \Rightarrow Q_R = 9$$

At $Q=4$, MR exceeds MC just below and falls below it just above: profit changes from rising to falling. At $Q=9$, MR changes from positive to negative: revenue reaches its maximum.

An intersection alone is insufficient. Compare boundaries, stopping and other intersections. With a positive fixed market price, a price taker's revenue rises up to its output limit; it has no interior $MR=0$ point.

Constrained sales and integer outputs

The continuous upper zero-profit boundary satisfies

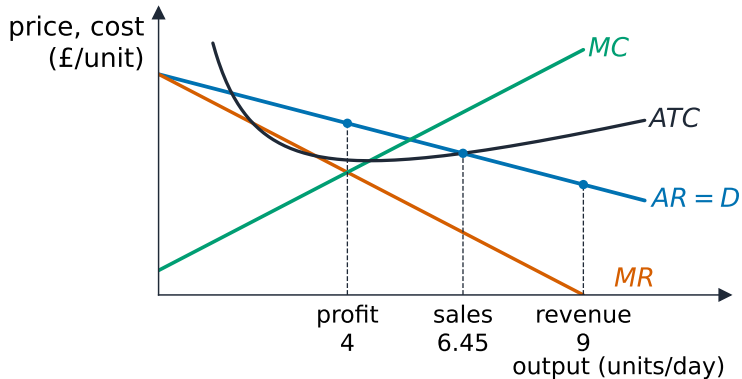
$$\pi = TR - TC = 16Q - 2Q^2 - 20 = 0$$

$$Q_s = 4 + \sqrt{6} \approx 6.45 \text{ units/day.}$$

This is the largest output with AR at least ATC in this model. The lower boundary is $4 - \sqrt{6} \approx 1.55$; crossing AR=ATC does not by itself select the sales maximum.

If only whole units are possible, choose $Q=6$. Rounding up to 7 violates the profit constraint. Read the price from AR after choosing Q ; the firm's price is not its MR or MC.

Different objectives on the same curves



Profit $Q=4$; constrained sales $Q \approx 6.45$; revenue $Q=9$ with $AR < ATC$.

A satisfactory profit target leaves several choices

A stated target and a secondary preference

In the integer table, a manager must earn at least £10/day. Once that target is met, the manager prefers the greatest quantity sold. Identify all acceptable outputs, then choose one. Does it maximise profit?

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Profit **satisficing** 满意化 accepts a satisfactory profit target instead of the highest possible profit. The target and any secondary aim must be stated.

Meeting a target differs from maximising profit

Target: profit at least £10/day

- $Q = 3, 4$ and 5 all **meet the threshold**.
- The manager picks $Q = 5$, the largest acceptable quantity: profit **£10/day**.
- Profit-maximising would pick $Q = 4$: **£12/day**.

- a preference for fewer working hours could select a **different** acceptable choice
- satisficing does not promise that every stakeholder is happy
- owner preferences, managerial incentives and the time period can change the objective: a **revenue-linked bonus** can raise revenue while reducing profit

Use evidence about **targets and constraints** rather than assuming an objective from firm size.

Survival requires bills to be paid on time

Profit is not the same as available cash

A firm reports £200 profit this month, but some customers have not paid. It has £1,200 available and £1,500 of bills due now. Calculate the immediate cash gap. Does positive profit guarantee survival? Would an economic loss by itself prove it must close today?

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Cash gap = bills due – cash available = £1,500 – £1,200 = £300. The firm needs finance, receipts or an agreed delay; these are not guaranteed.

A survival policy needs a feasible route forward

Survival preserve cash, reduce investment or accept a **temporary economic loss** to keep operating when demand or finance is weak.

Compare

- future **receipts**
- **avoidable** costs
- cash needs and access to **finance**

Traps

- positive reported profit $\neq$ cash available when needed
- a temporary loss need not mean **immediate closure**: stopping can leave unavoidable costs
- indefinite avoidable losses are not a viable policy

State the **time period** and the evidence that demand, costs or finance can improve.

Entry deterrence and removing an existing rival

Two separate illustrative cases

A: an established firm's AC is £4/unit; a potential entrant expects AC £7/unit. The established firm charges £6 to discourage entry. B: a firm charges £3 with AC £4 while an existing rival has AC £5, aiming to remove the rival and raise prices later. Distinguish the strategies. Which case requires the established firm to accept a loss at these outputs?

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Identify whether the target is a potential entrant or an existing rival. A low price alone does not prove the purpose.

A low price need not be below the established firm's cost

A – limit pricing

Limit pricing 限制性定价 deters **potential** entry.

$P = £6$ is **£2/unit above** the established AC of £4, but **£1 below** the entrant's expected AC.

Entry may still occur if costs fall, a niche is available or prices are expected to rise.

B – predatory pricing

Predatory pricing 掠夺性定价 aims to remove an **existing** rival, accepting short-run losses to recoup them later.

P is **£1 below its own AC** and £2 below the rival's AC at the relevant outputs.

Finance, rival endurance and re-entry decide success. Promotions, lower costs or weak demand also produce low prices: **price alone proves neither purpose nor success.**

Following a price change and evidence of leadership

A common price is not a complete explanation

A large supplier announces £5/unit. Several rivals follow the next day. Give an explanation based on leadership and an alternative explanation involving costs. What evidence would distinguish them?

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Price leadership 价格领导 occurs when one firm sets or announces a price change and others follow. The leader may be dominant or regarded as a useful guide; a formal agreement is not required.

Leadership describes a pattern, not proof of collusion

Rivals follow the first supplier's price rise – collusion?

Following the first supplier is **consistent with leadership**. But a shared input-cost rise could lead firms **independently** to similar prices. Check **timing**, each firm's **costs** and evidence of **communication** before claiming collusion.

price leadership

says **who others follow**

limit pricing

says the firm seeks to **deter entry**

They describe different features and can occur together; neither guarantees the greatest profit. Price leadership is not a necessary condition for price discrimination.

One demand line has different elasticities

For illustrative $Q = 18 - P$, the gradient is -1 . Point **price elasticity of demand** 需求价格弹性 uses $PED = (\Delta Q / \Delta P)(P/Q)$.

P (£/unit)	Q (units/day)	PED	TR (£/day)
14	4	3.5	56
9	9	1	81
6	12	0.5	72

The same slope does not mean the same percentage responsiveness. Predict the revenue effect of a small price cut at $P=14$ and $P=6$, then verify finite cuts to £13 and £5 using $TR = PQ$.

A price cut can raise or lower revenue

$$TR_{14} = P_{14}Q_{14} = (£14/\text{unit})(4 \text{ units/day}) = £56/\text{day}$$

$$TR_{13} = P_{13}Q_{13} = (£13/\text{unit})(5 \text{ units/day}) = £65/\text{day}$$

$$TR_6 = P_6Q_6 = (£6/\text{unit})(12 \text{ units/day}) = £72/\text{day}$$

$$TR_5 = P_5Q_5 = (£5/\text{unit})(13 \text{ units/day}) = £65/\text{day}$$

The elastic-region cut raises revenue; the inelastic-region cut lowers it. The line's midpoint $P=9, Q=9$ gives maximum $TR=£81/\text{day}$.

Unit point elasticity does not keep revenue unchanged over every finite move away from that point. A whole unit-elastic segment is different. Costs are still needed to judge profit.

Rival reactions change the demand response

An illustrative current price and two responses

At £10/unit a firm sells 10 units/day. Rivals ignore its rise to £11, and it sells 8. Rivals match its cut to £9, and it sells 10.5. Calculate all three revenues. Explain why both price changes can reduce revenue.

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A **kinked demand curve** 拐折需求曲线 assumes rivals ignore a rise but match a cut. Demand is relatively elastic above the existing price and relatively inelastic below it.

Matching a cut limits the extra quantity gained

$$TR_{10} = P_{10}Q_{10} = (£10/\text{unit})(10 \text{ units/day}) = £100/\text{day}$$

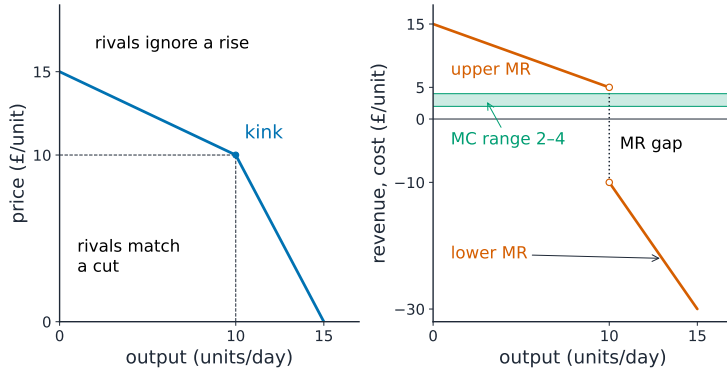
$$TR_{11} = P_{11}Q_{11} = (£11/\text{unit})(8 \text{ units/day}) = £88/\text{day}$$

$$TR_9 = P_9Q_9 = (£9/\text{unit})(10.5 \text{ units/day}) = £94.50/\text{day}$$

When rivals ignore the rise, buyers can switch to cheaper rivals. When rivals match the cut, quantity rises too little to offset the lower price.

These are assumed reactions, not a rule for all oligopolies. A demand shift or a different rival response changes the prediction.

Kinked demand and a gap in marginal revenue



Rivals ignore rises and match cuts; marginal cost is constant.

At $Q=10$, MC from £2 to £4/unit stays within the £5 to -£10/unit MR gap.

Stable price can accompany falling profit

The model uses $P = 15 - 0.5Q$ up to $Q=10$, then $P = 30 - 2Q$. Upper MR reaches £5/unit; lower MR starts at -£10/unit. MC of £2 or £4/unit lies in this gap, so best $Q=10$ and $P=£10$ /unit remain unchanged.

With fixed cost £10/day and constant MC:

$$TR = PQ = (£10/\text{unit})(10 \text{ units/day}) = £100/\text{day}$$

$$TC_2 = F + MC_2Q = £10/\text{day} + (£2/\text{unit})(10 \text{ units/day}) = £30/\text{day}$$

$$\pi_2 = TR - TC_2 = £100/\text{day} - £30/\text{day} = £70/\text{day}$$

$$TC_4 = F + MC_4Q = £10/\text{day} + (£4/\text{unit})(10 \text{ units/day}) = £50/\text{day}$$

$$\pi_4 = TR - TC_4 = £100/\text{day} - £50/\text{day} = £50/\text{day}$$

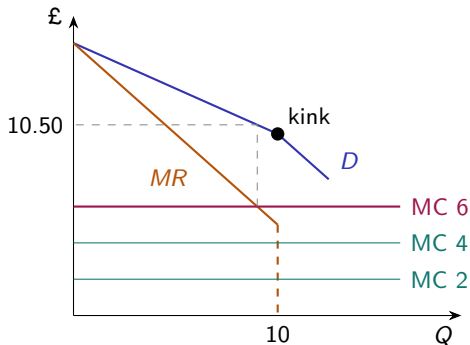
The price-rigidity result does not mean profit is unchanged.

The cost range and initial price limit the explanation

- Inside the **MR gap**: cutting Q loses more revenue than cost saved; raising Q adds more cost than revenue $\Rightarrow Q = 10$ for MC of £2 or £4/unit.
- At MC = £6/unit, **above the gap**, use the upper $MR = MC$:

$$15 - Q = 6 \Rightarrow Q = 9$$

$$P = 15 - 0.5Q = 15 - 0.5(9) = \text{£}10.50$$



The kink explains why an existing price **persists** over a range of costs, not how the initial price was chosen. Rival reactions, demand or costs can change; stable prices alone do not establish collusion.

Exam decisions and their conditions

- Identify the objective and constraint. Compute TR, TC and profit separately; higher sales or revenue does not guarantee higher profit.
- Use $MR=MC$ as a conditional marginal test. Check feasible alternatives, boundaries and stopping; read price from AR at the chosen Q.
- Compare market structures using entry/exit, product differences, information and price-setting power as well as firm numbers.
- Normal profit covers economic cost. On a smooth U-shaped cost diagram, MC crosses AC at its interior minimum; not every cost technology has this shape.

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Recap

One extra unit changes the average

A cost comparison, with units

Ten units cost £500 in total; eleven cost £540. Find AC at ten units, the marginal cost of the eleventh and AC at eleven. Does the evidence prove that eleven units is the output with minimum AC?

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Use $AC = TC/Q$ and $MC = \Delta TC / \Delta Q$. Compare the extra unit's cost with the old average before judging the direction of change.

A lower average is not proof of the lowest average

$$AC_{10} = TC_{10}/Q_{10} = £500/(10 \text{ units}) = £50/\text{unit}$$

$$MC_{11} = \frac{TC_{11} - TC_{10}}{11 - 10} = \frac{£540 - £500}{1 \text{ unit}} = £40/\text{unit}$$

$$AC_{11} = TC_{11}/Q_{11} = £540/(11 \text{ units}) \approx £49.09/\text{unit}$$

MC is below the old AC, so adding this unit lowers the average. These two observations do not establish the overall minimum; later units could lower it further.

On the standard smooth U-shaped curve, MC crosses from below to above AC at its interior minimum. Discrete or non-U-shaped costs need their actual data.

Check the evidence behind each conclusion

- 1 A firm has $AR=ATC$. A student says its revenue is zero. Is that correct?
- 2 A firm has $MR=MC$ at a plotted point. Does this alone prove the largest possible profit?
- 3 A car maker buys a tyre supplier. The tyre supplier instead buys the car maker. Is the direction the same?
- 4 A seller charges $P=MC$, but production creates unpriced smoke damage. Does $P=MC$ prove allocative efficiency?

Give a reason or missing condition for each answer before revealing the next slide.

Check yourself

1. $AR=ATC$ means zero economic profit at positive output, not zero revenue. Normal profit is included in economic cost.
2. Check the change in marginal profit, other intersections and feasible boundaries, including stopping. A discrete comparison may have no exact $MR=MC$ point.
3. Car maker buying tyre supplier is backward vertical integration. Tyre supplier buying car maker is forward. Identify the buyer's initial stage.
4. Unpriced smoke damage makes MSC exceed private MC. Even if P represents MSB, $P=$ private MC need not equal MSC. Allocative efficiency compares the social margins.