

Cambridge IGCSE · Economics 0455 · Notes

Production possibility curve (PPC) diagrams

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Read first: [The nature of the economic problem](#), [Opportunity cost](#)

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What you need to know

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

1. **Define a production possibility curve (PPC)**, draw one, and read what a PPC diagram shows.
2. **Explain what it means for an economy to produce at a point under (inside), on or beyond (outside) its PPC**, and why the position matters.
3. **Show a movement along a PPC** and use it to show **opportunity cost**.
4. **Show a shift of the whole PPC**, explain what causes it to shift outwards or inwards, and what the shift means for the economy's growth.

The whole topic is the same for every candidate (0455 has no Core/Extended split). It builds on scarcity and opportunity cost from the two earlier topics.

Understand it

What a PPC is

A country has a fixed amount of land, labour, capital and enterprise at any moment, and a given level of technology. A **production possibility curve** shows **the maximum combinations of two products (or two groups of products) that an economy can make when it uses all its resources fully and efficiently**. It shows the economy's **productive capacity** at a point in time, not what people want to buy and not prices.

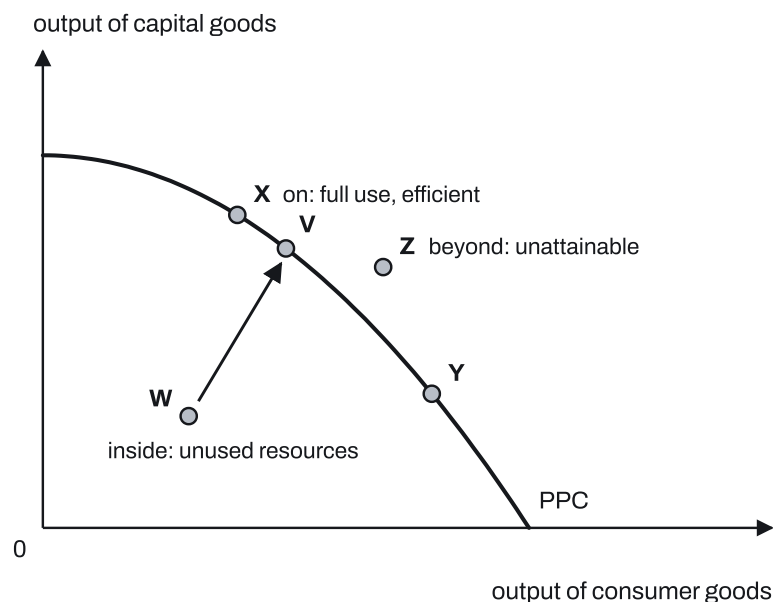
The axes each measure the **output** of one product. Economists often use **capital goods** (machines, factories, roads: things used to make other things) and **consumer goods** (things households use up, such as food and phones), but any two named products will do, such as food and machines. The axes are never price and quantity: that is a demand and supply diagram.

Here is an example economy. Each row is a combination it can just manage when every resource is in use:

Consumer goods (units)	Capital goods (units)	Capital goods given up for the extra 20 consumer goods
0	100	—
20	96	4
40	84	12
60	64	20
80	36	28
100	0	36

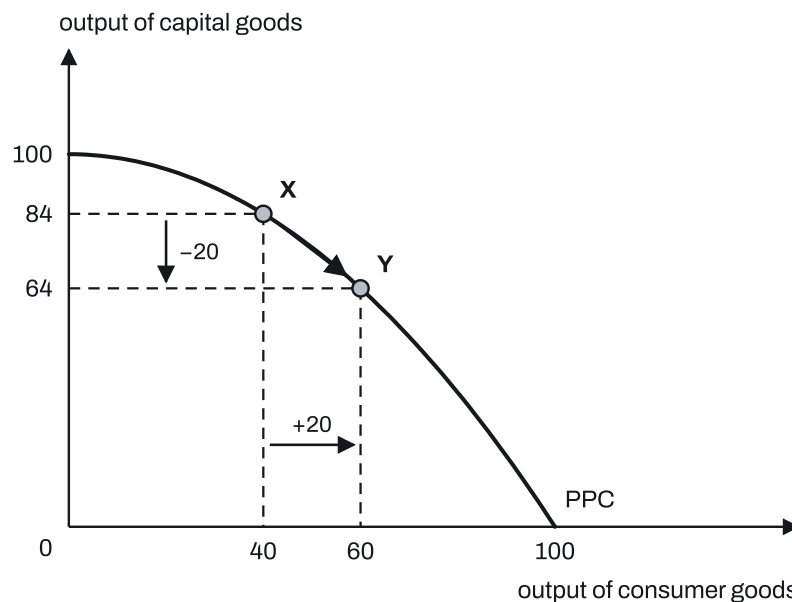
Plotting the rows and joining them gives the PPC.

Points inside, on and beyond the curve



- **Inside the curve (W).** The economy could make more of both products, but it isn't. Some resources are **unemployed or underused** (workers without jobs, factories standing idle, as in a recession), or they are used inefficiently. Output is **lower than it could be**, so resources are wasted. Moving from W (30 consumer goods, 30 capital goods) to V on the curve (50 consumer goods, 75 capital goods) gives 20 more consumer goods **and** 45 more capital goods, with no opportunity cost, because the extra output comes from resources that were doing nothing.
- **On the curve (X, Y).** Every resource is **fully employed** and used efficiently: output is at its **maximum**. The only way to make more of one product is to make less of the other.
- **Beyond the curve (Z).** The economy **cannot reach** this combination with its current resources and technology. At 70 consumer goods it can make at most 51 capital goods, not 70. Z becomes possible only if the PPC shifts outwards. (A country can **consume** beyond its PPC by importing, but it cannot **produce** there.)

Movement along the curve and opportunity cost



A move **along** the PPC happens when resources are **reallocated** from one product to the other, for example when a government encourages more factories to make consumer goods. Since all resources are already in use, more of one product means less of the other. Going from X to Y, the economy gains 20 consumer goods and gives up $84 - 64 = 20$ capital goods: that is the **opportunity cost** of the extra consumer goods.

To find the opportunity cost of a move along a PPC:

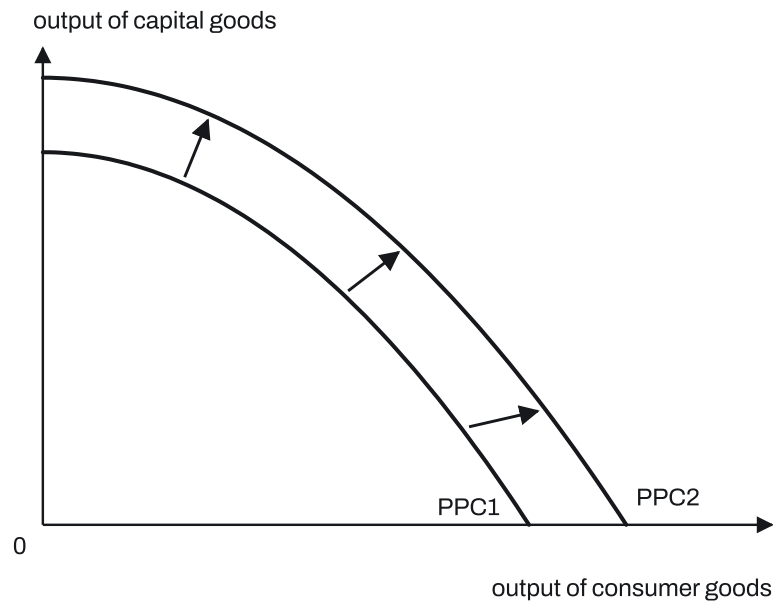
- the **gain** is read on the axis of the product that increases;
- the **opportunity cost** is read on the **other** axis: how much of the other product falls.

Why the curve bows outwards. Resources are not equally good at making everything. The first consumer goods use the resources best suited to them (and least useful for capital goods), so they cost little. As more consumer goods are made, resources that are really better at making machines have to be moved, so each extra batch costs more. In the table, each extra 20 consumer goods costs 4, then 12, 20, 28 and 36 capital goods: the **opportunity cost rises**. Per consumer good that is $4 \div 20 = 0.2$ capital goods at first, and $36 \div 20 = 1.8$ at the end. So the opportunity cost of one more unit of a good is **greatest where the curve is steepest**, near that good's own axis. If resources were equally good at both products, the opportunity cost would stay the same and the PPC would be a **straight line** (a person's hours split between work and leisure is an example).

Capital goods now or consumer goods now? A country that puts more resources into consumer goods today enjoys higher living standards now, but gives up capital goods, so it builds fewer machines and factories and its future growth is slower. A country that makes more capital goods now gives up consumer goods today, but its PPC will shift further outwards later. The point on the curve with the **most capital goods** leads to the **biggest outward shift** in future, and so the most consumer goods in future.

Shifts of the whole curve

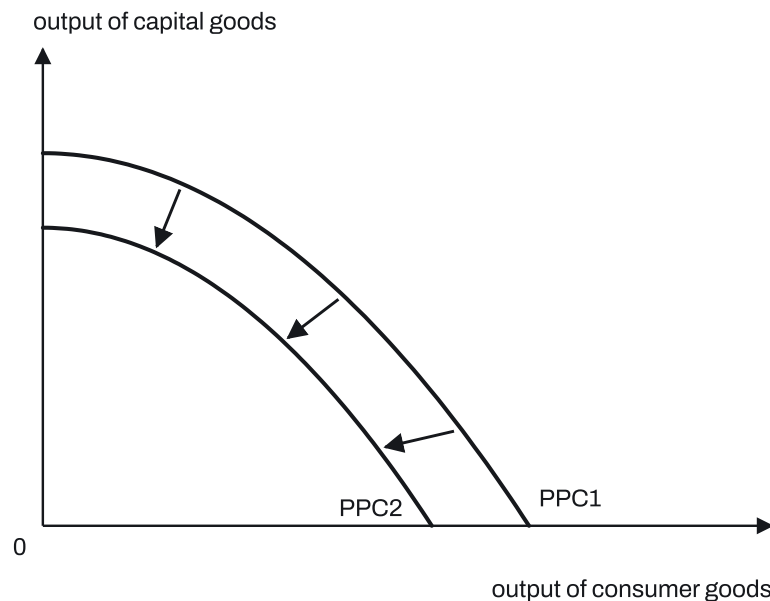
The PPC shifts when the **quantity or quality of the factors of production** changes, or technology changes. This changes the productive capacity: the maximum the economy can make.



An outward shift (to the right) means the economy can now produce more of both products: its productive capacity has grown. This is **economic growth** in the sense of greater potential output. Causes:

- **more resources:** investment in capital goods (more machines and factories), immigration or a larger labour force (for example a higher retirement age), discovery of new natural resources such as oil or gas, land reclamation;
- **better resources:** education and training (more skilled, more productive workers), better healthcare (healthier workers, fewer days lost), research and development, new technology.

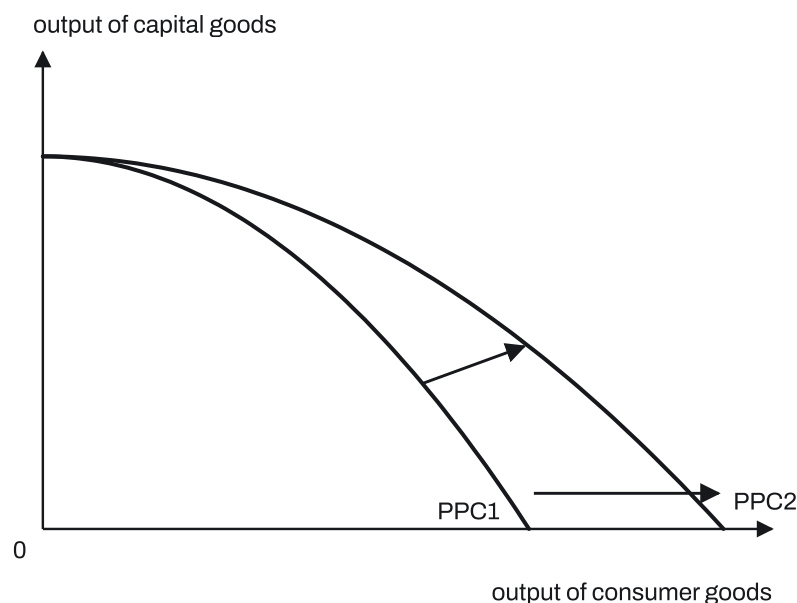
The consequences: more goods and services can be made, so living standards can rise, and scarcity is eased. After the shift in the diagram, point Z (70, 70) lies inside PPC2 (at 70 consumer goods PPC2 allows about 79.2 capital goods), so it has become attainable.



An inward shift (to the left) means productive capacity has fallen: the economy can make less of both products. Causes:

- **fewer resources:** natural disasters, storms or wars that destroy factories, roads, bridges and farmland; emigration of workers or entrepreneurs; a shrinking or ageing labour force; using up non-renewable resources such as oil; climate change flooding land;
- **worse resources:** less education or training (fewer students at university), poorer health, land losing its quality, old technology not being replaced.

The consequences: less can be produced, products become **more scarce** (especially if the population is still growing), and living standards tend to fall.



A shift along one axis. If a change affects only one industry, only that end of the curve moves. Better technology or training in the consumer goods industries moves the curve out along the consumer goods axis, while the capital goods end stays where it was. The same idea works for two named goods: training onion farmers and using more technology on onion farms pushes out only the onion end.

What does **not** shift the PPC

- **A fall in unemployment, using idle resources, or recovery from a recession:** the economy moves from a point inside the curve **towards** it, not beyond it. The curve itself does not move.
- **A recession or rising unemployment:** the point moves **inside** the curve. (But if factories actually **close down and are lost**, or workers leave the country, capacity itself falls.)
- **Price changes and changes in what consumers want to buy:** these may move the economy **along** the curve, but they do not change what it can make.

Key facts and formulas

This topic has no formula list in the exam. "Learn it" means you must remember it.

Fact	Status
PPC: the maximum combinations of two products an economy can make with all its resources fully and efficiently used	Learn it
Axes: the output of two named products (e.g. capital goods and consumer goods), never price and quantity	Learn it
Inside: unemployed or underused resources, output below the maximum; on: full employment of resources, maximum output, efficient; beyond: unattainable now	Learn it
Movement along the PPC = reallocating resources; it shows opportunity cost	Learn it
Opportunity cost of a move = the fall on the other axis	Learn it
Bowed-out curve: rising opportunity cost; straight line: constant opportunity cost	Learn it
Outward shift: more or better resources or technology, higher productive capacity (economic growth)	Learn it
Inward shift: fewer or worse resources, lower productive capacity	Learn it
Using unemployed resources moves a point towards the curve; it does not shift the curve	Learn it

How to do it

In the questions we have tagged for this topic (42 questions, 2021–2025), we counted only the parts about PPCs: one part in each question, so 42 parts. 30 are Paper 1 multiple choice and 12 are Paper 2 written parts.

Question type	Questions
Multiple choice: what shifts the PPC	11
Multiple choice: movement along the PPC and opportunity cost	8
Multiple choice: points inside, on or beyond the PPC	8
Analyse or draw a PPC shift diagram (4–6 marks)	6
Multiple choice: opportunity cost calculation	3
Explain two causes of a PPC shift (4 marks)	2
Explain points inside, on or outside the PPC (4 marks)	2
Analyse opportunity cost using a PPC (6 marks)	1
Discuss whether the PPC will shift (6 marks)	1

1. Multiple choice: what shifts the PPC (11 questions)

- 1. Decide whether the diagram (or question) shows a shift or a movement.** A new curve means a shift; a new point on the same curve means a movement; a point moving from inside to the curve means idle resources being used.
- 2. For a shift, ask: has the quantity or quality of resources, or technology, changed?** Outward: more investment, better education, more productive workers, new technology, new resources. Inward: destroyed factories, lost non-renewable resources, lower productivity, emigration, old technology not replaced.
- 3. Cross out** options about unemployment falling, recovery from recession, prices, or changing consumer tastes: none of those move the curve.

Variations you will meet:

- **From a point on one curve to a point beyond it** (for example K on PPC1 to L on PPC2): the answer is more investment or more productive workers, never "using unemployed resources" (that only reaches the first curve). Unemployed workers finding jobs moves a point **towards** the curve; employed workers becoming more productive shifts the curve.
- **A true/false table of causes:** better education and higher investment shift the curve outwards; lower unemployment does not.
- **Only one end moves:** pick a change in the industry on that axis only (training and technology on onion farms moves only the onion end).
- **Scarcity:** products become more scarce when the PPC shifts inwards (left) while the population grows.

- **Which point gives the biggest future shift, or the most consumer goods in future?** The point with the **most capital goods** now (on the curve, at the capital goods axis if it is an option).
- **A movement from a point on an outer curve to a point on an inner curve:** a fall in productivity or lost resources.

2. Multiple choice: movement along the PPC and opportunity cost (8 questions)

1. **A movement between two points on the same curve means resources have been reallocated** from one product to the other.
2. **It shows the opportunity cost of producing more of the product that increases**, measured in the other product. It is not a social cost, and total output does not rise.
3. **Read the direction:** towards more consumer goods raises living standards now; towards more capital goods means more investment and faster growth later but fewer consumer goods now.

Variations you will meet:

- **Which movement shows a policy?** More manufactured goods instead of agricultural goods means a move along the curve towards the manufactured goods axis.
- **Where is the opportunity cost of one more unit of good X greatest?** Where the curve is steepest for X: near the X axis, where lots of Y is given up for each extra X.
- **Which diagram shows opportunity cost?** The one with a move **along** a single curve, not a shift and not a move from inside to the curve.
- **Hours for work and leisure** on a straight-line PPC: more work hours means a movement along the line towards the work axis.

3. Multiple choice: points inside, on or beyond the PPC (8 questions)

1. **On:** maximum output with current resources and technology; all resources fully used; efficient.
2. **Inside:** unemployed or underused resources, for example in a recession or after a pandemic; output below what is possible.
3. **Beyond:** cannot be reached now.

Variations you will meet:

- **Which combinations can the economy produce now?** Every point **on or inside** the curve, and none beyond it.
- **From inside to the curve:** output of **both** goods can rise, using existing resources.
- **What is the PPC for?** It shows the productive capacity of the economy at a point in time; it does not measure supply or answer "what to produce" on its own.
- **After a recession closes factories or a disaster damages infrastructure:** the economy's production point ends up **inside** its original curve (fewer goods of both kinds). Check whether the question wants a new point inside the old curve or on a new, inner curve.

4. Analyse or draw a PPC shift diagram (4–6 marks) (6 questions)

These ask you to show an event (technological progress, better-quality resources, investment in education and health, a storm, climate change, a smaller labour force) on a PPC. Up to 4 marks go to the diagram and up to 2 to the written analysis. "Draw" questions give marks for the diagram only.

1. **Axes:** label both with two outputs (1). "A" and "B" alone lose the mark; "good X" and "good Y" are accepted; naming real products, such as "capital goods" and "consumer goods", is safest. Price and quantity are wrong.
2. **The original curve**, sloping down and touching **both** axes (1). Label it PPC1.
3. **The new curve**, also touching **both** axes: further out for an increase, further in for a decrease (1). Label it PPC2.
4. **Show the shift** with arrows from PPC1 to PPC2 (1).
5. **Analysis (2):** say how the event changes the **quantity or quality of the factors of production** (1), so the economy's **productive capacity / maximum output** rises or falls (1). For example: a storm destroys factories, roads and farmland (1), so the maximum output the economy can produce falls (1).

Use diagram 3 above for an outward shift and diagram 4 for an inward shift.

5. Multiple choice: opportunity cost calculation (3 questions)

1. **Find the starting and finishing combinations** from the table or the axes.
2. **The opportunity cost is the fall in the other product.**

Variations you will meet:

- **A table:** moving from 50 units of goods and 0 services to 40 units of goods and 10 services costs $50 - 40 = 10$ units of goods (not services, and not zero).
- **Hours on a straight-line PPC:** a person with 10 free hours a day who increases study from 2 to 7 hours gives up $7 - 2 = 5$ hours of sport.
- **Line segments on an axis:** name the segment on the axis of the product that **falls** (for example the fall in consumer goods when capital goods rise from OG to OH).

6. Explain two causes of a PPC shift (4 marks) (2 questions)

Point-marked: for each cause, 1 mark for identifying it and 1 for explaining it. Plan: **cause** → **how it changes the quantity or quality of resources**.

For an outward shift (any two):

- more investment (1): more resources go into capital goods, so there are more machines and factories (1);
- immigration (1): the labour force gets bigger (1);
- land reclamation (1): more land is available, for example for crops (1);
- education and training (1): workers become more skilled and productive (1);

- research and development or new technology (1): capital becomes more productive (1);
- discovery of new resources such as oil (1): extra output can be produced (1).

For an inward shift, use a smaller labour force (fewer workers, so fewer resources), fewer students at university (lower-quality labour), destroyed factories or infrastructure, lost land or resources used up. Take them from the source when there is one. A diagram earns nothing in these parts.

7. Explain points inside, on or outside the PPC (4 marks) (2 questions)

About 2 marks per point: say what the position means (1) and what that means for output (1).

- **Inside:** resources are unemployed or used inefficiently (1), so output is lower than the economy could produce (1).
- **On:** all resources are fully employed and used efficiently (1), so output is at its maximum and more of one good means less of the other (1).
- **Outside:** cannot be reached with current resources and technology (1); it needs more or better resources, which would shift the PPC out (1).

Answer about the two points the question names (inside **and outside**, or inside **and on**). A diagram is not needed.

8. Analyse opportunity cost using a PPC (6 marks) (1 question)

Diagram plus analysis, like type 4, but with **one** curve and a **movement along** it.

1. Draw one PPC with capital goods and consumer goods on the axes, touching both axes.
2. Mark two points on it, X and Y, with Y having more consumer goods, and an arrow from X to Y.
3. Show with dashed lines to the axes the gain in consumer goods and the fall in capital goods.
4. Analyse: the economy is using all its resources (on the curve), so to make more consumer goods resources must move from capital goods (1); the capital goods given up are the opportunity cost, the next best alternative forgone (1); with fewer capital goods, future productive capacity grows more slowly (1).

9. Discuss whether the PPC will shift (6 marks) (1 question)

Section A Discuss: up to 4 marks for reasons why it might and up to 4 for reasons why it might not, from the source. Each point earns credit once.

1. **Why it might shift right:** find anything that adds resources or improves them: lower interest rates encouraging investment (1), so more capital goods (1); a higher retirement age or more workers (1), so a larger labour force (1); capital-intensive production raising productivity (1).
2. **Why it might not (or might shift left):** anything that removes or worsens resources: entrepreneurs emigrating (1), so less enterprise (1); farmland losing quality (1); an ageing workforce (1).
3. **Judgement:** say which is stronger, and what it depends on (how big each change is, and how long it lasts).

Talk about **productive capacity**, not about this year's output or prices: bad weather cutting one year's grape harvest does not shift the PPC.

Worked examples

Example 1

The table shows the maximum combinations of food and machines a country can produce.

Food (units)	Machines (units)
0	60
10	56
20	46
30	30
40	0

The country is producing 20 units of food and 46 machines. It decides to produce 30 units of food and stays on its production possibility curve. What is the opportunity cost of this decision?

- **A** 10 units of food
- **B** 16 machines
- **C** 30 machines
- **D** 46 machines

[1]

The gain is 10 units of food. The opportunity cost is the fall on the other axis: $46 - 30 = 16$ machines. The answer is **B**. (1)

A is the gain, not the cost, and is in the wrong product. C is the number of machines still made, and D is the number made before.

Example 2

Explain the difference between a production point inside a PPC and a production point on a PPC. [4]

A point inside the PPC means that some of the economy's resources are unemployed or not used efficiently (1). As a result, output is lower than the economy could produce, so it could make more of both products without giving anything up (1). A point on the PPC means that all resources are fully employed and used efficiently (1). Output is at its maximum, so making more of one product has an opportunity cost: less of the other (1).

Example 3

Analyse, using a production possibility curve (PPC) diagram, the effect of an increase in investment on an economy. [6]

Diagram: capital goods on the vertical axis and consumer goods on the horizontal axis (1); PPC1 sloping down and touching both axes (1); PPC2 further out, also touching both axes (1); arrows from PPC1 to PPC2 (1). (Diagram 3 above.)

Investment means more capital goods, such as machines and factories, so the quantity (and often the quality) of the economy's capital increases (1). This raises the economy's productive capacity: it can now produce more of both capital goods and consumer goods, so the PPC shifts outwards, which is economic growth (1).

Example 4

Read the source. *Country R has recently discovered a large gas field. Its central bank has cut interest rates. However, its population is ageing, and many young graduates leave to work abroad.*

Discuss whether or not Country R's production possibility curve (PPC) is likely to shift to the right. [6]

Why it might. The discovery of a gas field adds to the country's natural resources (1), so it can produce more output than before (1). Lower interest rates make borrowing cheaper, which encourages firms to invest in capital goods (1), increasing the quantity of capital and the productive capacity of the economy (1). (4 marks: the maximum for one side.)

Why it might not. An ageing population means more workers retiring (1), so the labour force shrinks and there are fewer resources to produce with (1). Young graduates emigrating means the country loses its most skilled workers (1), lowering the quality of its labour force and its productivity (1). (4 marks on this side too: the 6-mark total is reached.)

Judgement. The PPC is likely to shift right if the extra gas and investment add more to productive capacity than the country loses through retirement and emigration. That depends on how large the gas field is and whether the government can keep graduates, for example with higher-paid jobs in the new industry.

Common mistakes

- **Drawing a demand and supply diagram, or labelling the axes price and quantity.** A PPC's axes are the outputs of two named products. Examiners see this confusion in most years.
- **Labelling the axes just "A" and "B".** That loses the axis mark. "Good X" and "good Y" are accepted, but naming real products (capital goods and consumer goods, or two named goods) is safest.
- **Curves that stop short of the axes.** Both the old and the new curve must touch **both** axes, or the curve marks are lost.
- **Not showing the shift.** Draw arrows from PPC1 to PPC2 and label both curves.
- **Describing the diagram instead of analysing it.** "The curve shifts from PPC1 to PPC2" earns little. Say **why**: the event changes the quantity or quality of resources, so productive capacity changes.

- **Saying that using unemployed resources shifts the PPC.** It moves a point from inside the curve towards it. Examiners also see answers claiming that a point outside the curve can be reached by producing more with existing resources: it cannot.
- **Saying a point inside means a shortage of natural resources.** It means resources the economy **has** are not being used.
- **Stopping at "inefficient".** For a point inside, go on to say that output is lower than it could be; for a point on, that output is at its maximum. That development is the second mark.
- **Confusing capacity with this year's output.** A bad harvest or a fall in spending changes what is produced, not what could be produced.
- **Reading opportunity cost on the wrong axis.** It is the fall in the **other** product.

How to get the marks

- **Command words.** *Define*: the exact meaning (maximum combinations of two products with all resources fully used). *Explain*: identify, then link with "so" or "because". *Analyse*: develop the chain in detail, and draw the diagram if the question says "using a PPC diagram". *Discuss*: both sides, then a judgement. *Draw*: the diagram alone earns the marks.
- **"Using a PPC diagram" (4–6 marks):** four quick diagram marks (labelled axes, first curve, new curve, arrows) plus two for the analysis (the effect on resources, then on productive capacity). Don't spend long on words; don't skip them either.
- **Explain two causes (4):** two causes, each identified (1) and explained (1). Keep to two clearly separated points; take them from the source if it gives them.
- **Section A Discuss (6):** up to 4 marks a side, so two developed points each side reach the maximum. A point only counts once, but a new reason on the other side is rewarded.
- **Use the stimulus:** source material usually hides the causes (a storm, a shrinking labour force, new investment). Quote them.
- **A definition of a PPC is words:** a diagram on its own does not define it.
- **Multiple choice:** decide first whether the question is about a shift, a movement along, or a point inside, then check which way the move goes.

Quick check

1. Which change would shift a country's production possibility curve outwards?
 - **A** a fall in unemployment
 - **B** a rise in the price of consumer goods
 - **C** the discovery of new oil reserves
 - **D** a move of resources from consumer goods to capital goods
2. Use the table in "Understand it". The economy is on its PPC producing 60 consumer goods and 64 capital goods, and moves to 80 consumer goods. What is the opportunity cost, in total and per extra consumer good?

3. *Country Q was hit by a hurricane that flattened factories and ports, and many of its doctors and engineers have since moved abroad.* Explain two effects of these events on Country Q's PPC. [4]
4. An economy is producing at a point inside its PPC. Its government creates jobs for unemployed workers. Does the PPC shift? Explain.

Answers

1. **C.** New oil adds to the country's natural resources, so capacity rises. A moves a point towards the curve, B changes no resources, and D is a movement along the curve (though it may shift the curve out **later**). (1)
2. Capital goods fall from 64 to 36, so the opportunity cost is $64 - 36 = 28$ capital goods, or $28 \div 20 = 1.4$ capital goods for each extra consumer good.
3. The hurricane destroyed factories and ports (1), reducing the quantity of capital, so the PPC shifts inwards (1). Skilled doctors and engineers leaving (1) reduces the quantity and quality of labour, lowering productive capacity further (1).
4. No. The workers were already part of the economy's resources, so its productive capacity has not changed. Using them moves the production point from inside the curve towards the curve, raising output of both goods.

Past questions to try

- [0455/21/O/N/24 Q1](#): part (f), a PPC diagram for technological progress.
- [0455/21/M/J/23 Q5](#): part (b), a point inside and a point on the PPC.
- [0455/11/O/N/21 Q2](#): the opportunity cost from a straight-line PPC.
- [0455/12/O/N/22 Q3](#): which combinations can be produced now.