

Resources and scarcity

Objectives :

1. Use the production possibilities frontier to illustrate the economic problem.
2. Calculate opportunity cost.
3. Explain how specialisation and trade expand production possibilities.
4. Explain how technological change and increases in capital and human capital expand production possibilities.

Economics is the study of the use of scarce resources to satisfy unlimited human wants.

Scarcity is inevitable and is central to economic problems. What are society's resources? Why is scarcity inevitable? What are the consequences of scarcity?

Resources

A society's resources consist of natural endowments such as land, forests, and minerals; human resources, both mental and physical; and manufactured aids to production such as tools, machinery, and buildings. (Factors of production)

These factors of production are used to produce outputs:

Goods (e.g., cars, shoes)

Services (haircuts and education)

The act of making goods is called production.

The act of using them is called consumption.

Scarcity

Relative to people's desires, existing resources are inadequate; there are enough to produce only a fraction of the goods and services that are wanted.

Choice

Because resources are scarce, all societies face the problem of deciding what to produce and how much each person will consume.

A decision to have more of something requires a decision to have less of something else.

Scarcity implies that choices must be made, and making choices implies the existence of costs.

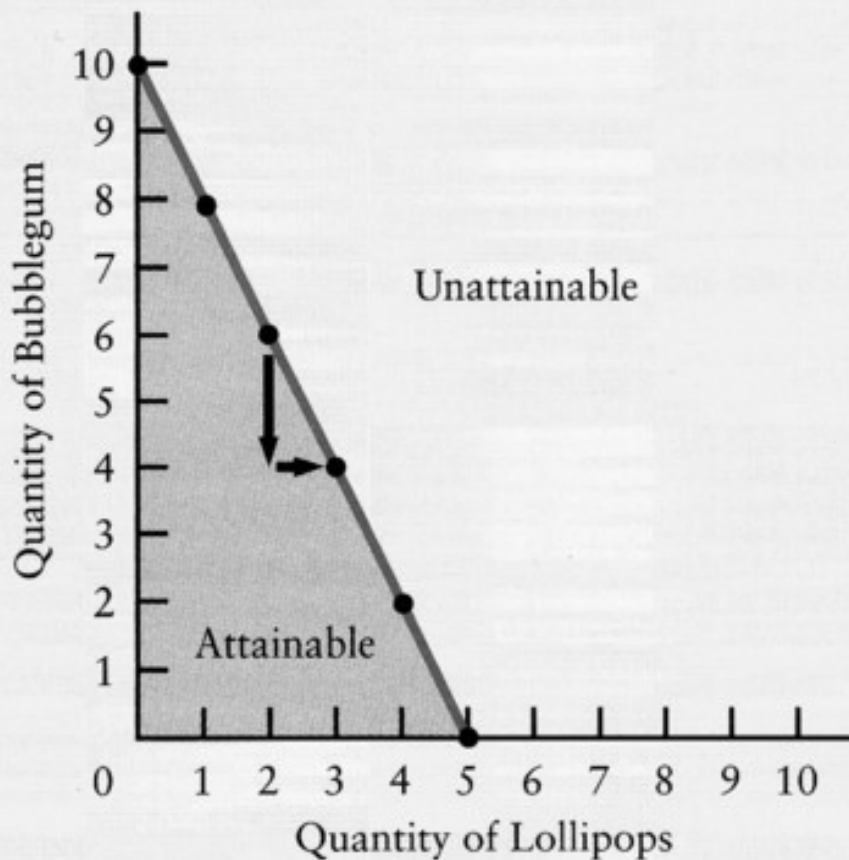
Opportunity cost

Consider the choice that must be made by your little sister who has 50 cents to spend and who is determined to spend it all on candy. For your sister there are only two kinds of candy in the world: bubblegums, which sell for 5 cents each, and lollipops, which sell for 10 cents each.

Your sister would like to buy 10 bubblegums and 10 lollipops but soon discovers that this is not possible: it is not an attainable combination, given her scarce resources.

Several combinations are attainable: 8 bubblegums and 1 lollipop, 4 b: 3 l, 2 b :4 l, some of the combinations leave money unspent, and she is not interested in them.

FIGURE 1-1 A Choice Between Bubblegums and Lollipops



A limited amount of money forces a choice among alternatives. Six combinations of bubblegums and lollipops are attainable and use all of the child's money. The negatively sloped line provides a boundary between attainable and unattainable combinations. The arrows show that the opportunity cost of 1 more lollipop is 2 bubblegums.

After careful thought, your sister has almost decided to buy 6 bubblegums and 2 lollipops, but at the last moment she decides that she simply must have 3 lollipops.

What will it cost to get this extra lollipop?

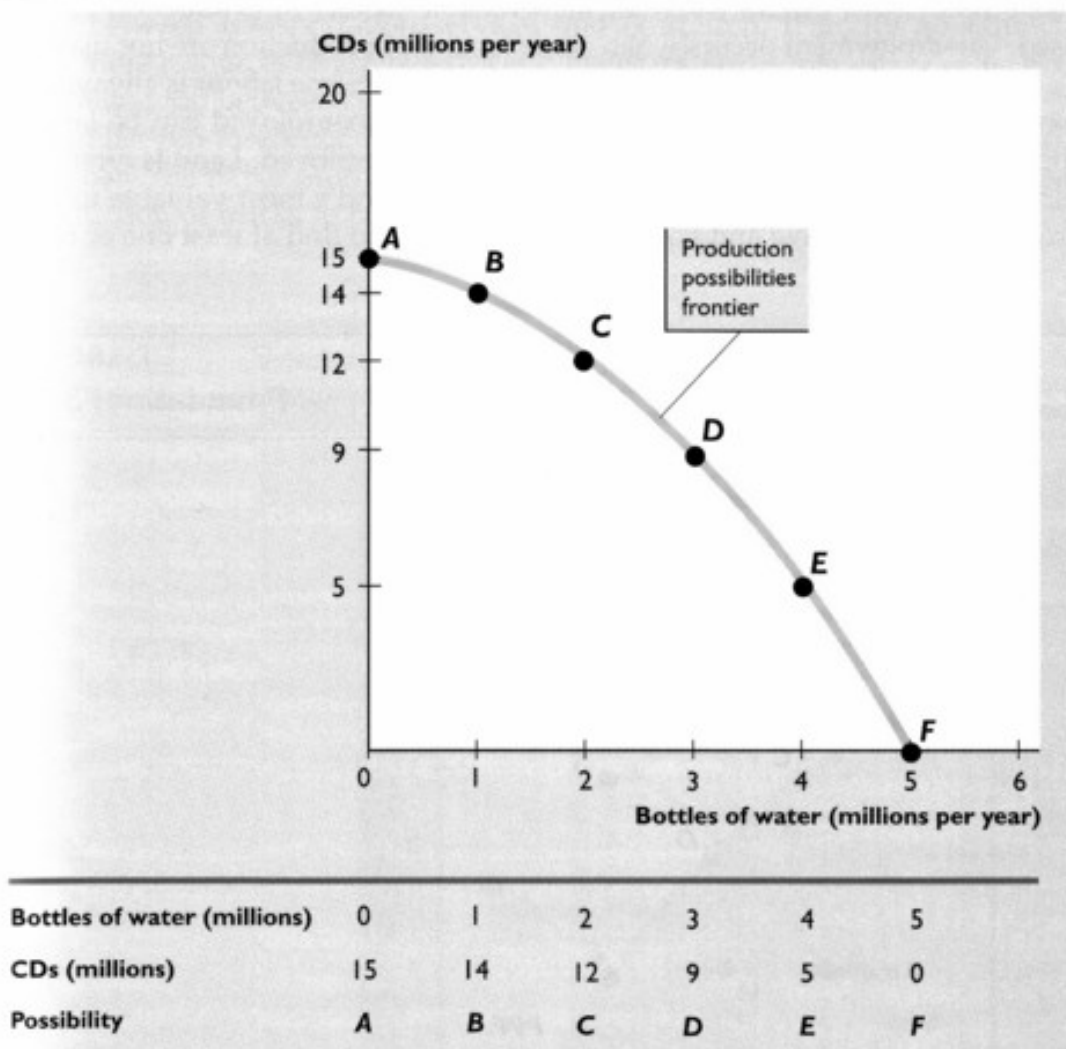
2 bubblegums (the opportunity cost)

←
This **central idea** in economics is in fact the benefit given up to get something else. (different combinations of quantities)

Production possibilities.

The production possibilities frontier is the boundary between the combination of goods and services that can be produced and the combinations that cannot be produced with a fixed quantity of available factors of production.

The Production Possibilities Frontier

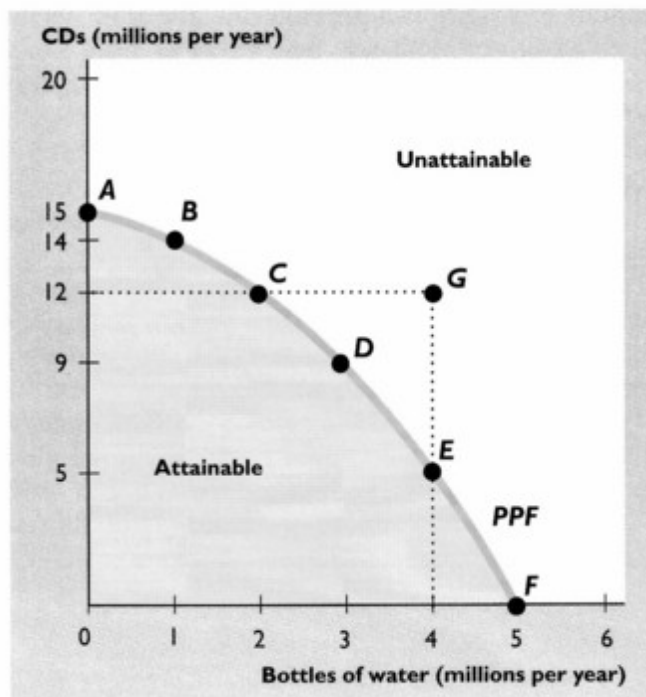


The PPF is a valuable tool for illustrating the effects of scarcity and its consequences. It puts three features of production possibilities in sharp focus. They are the distinctions between:

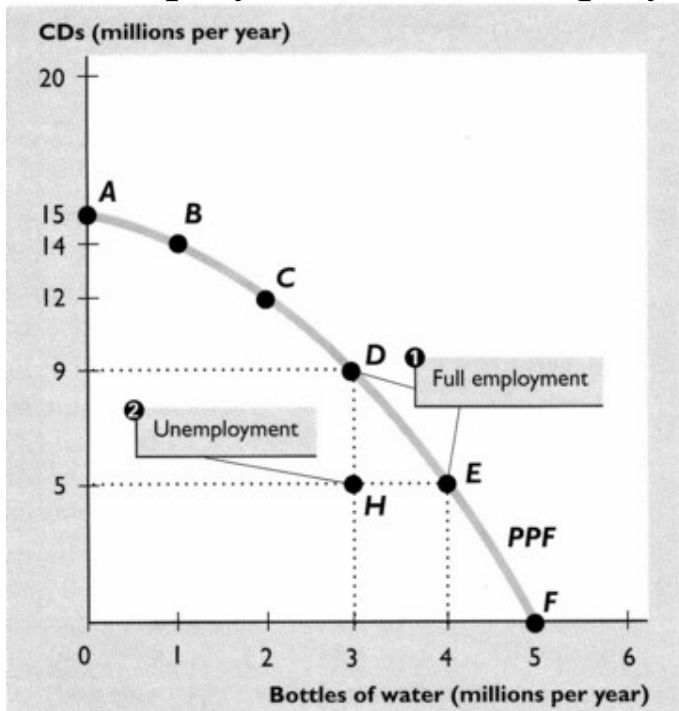
- Attainable and unattainable combinations
- Full employment and unemployment
- Tradeoffs and free lunches.

Attainable and Unattainable Combinations

The production possibilities frontier, PPF, separates attainable combinations from unattainable ones. We can produce at any point inside the PPF (the orange area) or on the frontier. Points outside the production possibilities frontier such as point G are unattainable.



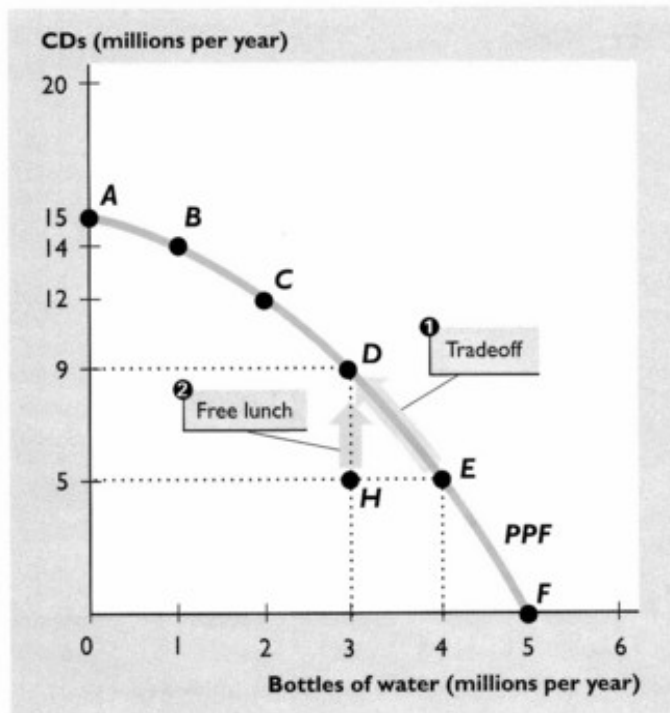
Full employment and unemployment



- ① When resources are fully employed, production occurs at points on the PPF such as D and E.
- ② When resources are unemployed, production occurs at a point inside the frontier such as point H.

Tradeoffs and Free Lunches

- 1 When resources are fully employed, we face a tradeoff. If we are producing 5 million CDs a year at point E, to produce 9 million CDs at point D, we must trade some bottled water for CDs and move along the PPF.
- 2 When resources are unemployed, there is a free lunch. If we are producing 5 million CDs a year at point H, to produce 9 million CDs at point D, we move to the PPF and get a free lunch.



Practice Problem

TABLE I

Hours	Fish (kilograms)		Fruit (kilograms)
0	0		0
1	4.0	or	8
2	7.5	or	15
3	10.5	or	21
4	13.0	or	26
5	15.0	or	30
6	16.5	or	33
7	17.5	or	35
8	18.0	or	36

1. Robinson Crusoe, the pioneer of the television program *Survivor*, lived alone on a deserted island. He spent his day fishing and picking fruit. He varied the time spent on these two activities and kept a record of his production. Table 1 shows the numbers that Crusoe wrote in the sand. Use these numbers to make Crusoe's *PPF* if he can work only 8 hours a day.
2. Which combinations (in kilograms) are attainable and which are unattainable: (i) 10 fish and 30 fruit, (ii) 13 fish and 26 fruit, (iii) 20 fish and 21 fruit?
3. Which combinations (in kilograms) use all of Crusoe's available 8 hours a day: (i) 15 fish and 21 fruit, (ii) 7 fish and 30 fruit, (iii) 18 fish and 0 fruit?
4. Which combinations (in kilograms) provide Crusoe with a free lunch and which confront him with a tradeoff when he increases fruit by 1 kilogram: (i) 18 fish and 0 fruit, (ii) 15 fish and 15 fruit, (iii) 13 fish and 26 fruit?

Opportunity cost

The opportunity cost of a bottle of water

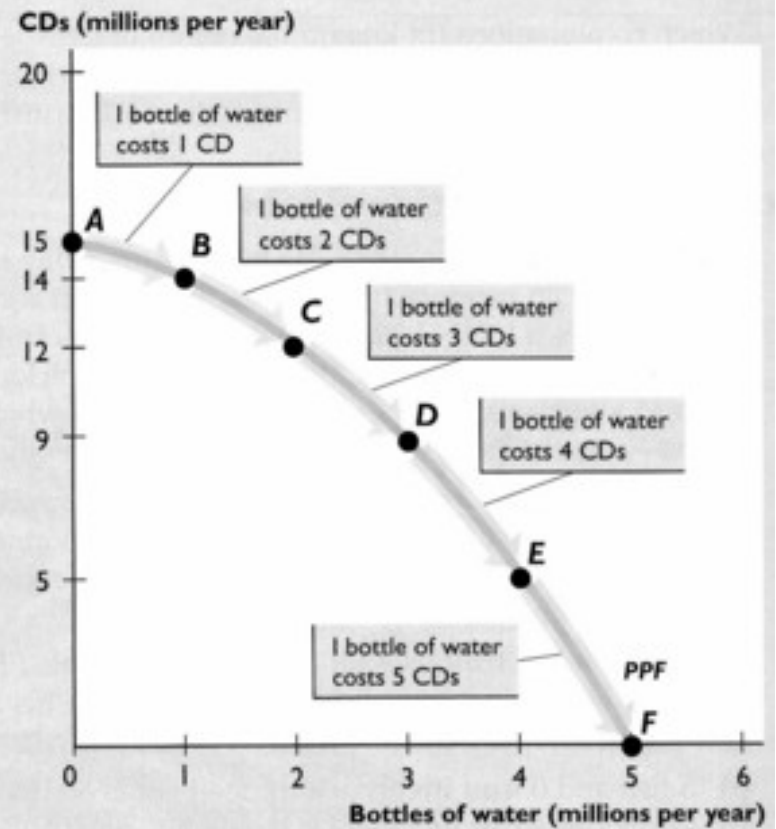
The opportunity cost of a bottle of water is the decrease in the quantity of CDs divided by the increase in the number of bottles of water as we move down along the PPF.

The the opportunity cost of a CD

The opportunity cost of a CD is the decrease in the quantity of water divided by the increase in the quantity of CDs as we move up along the PPF.

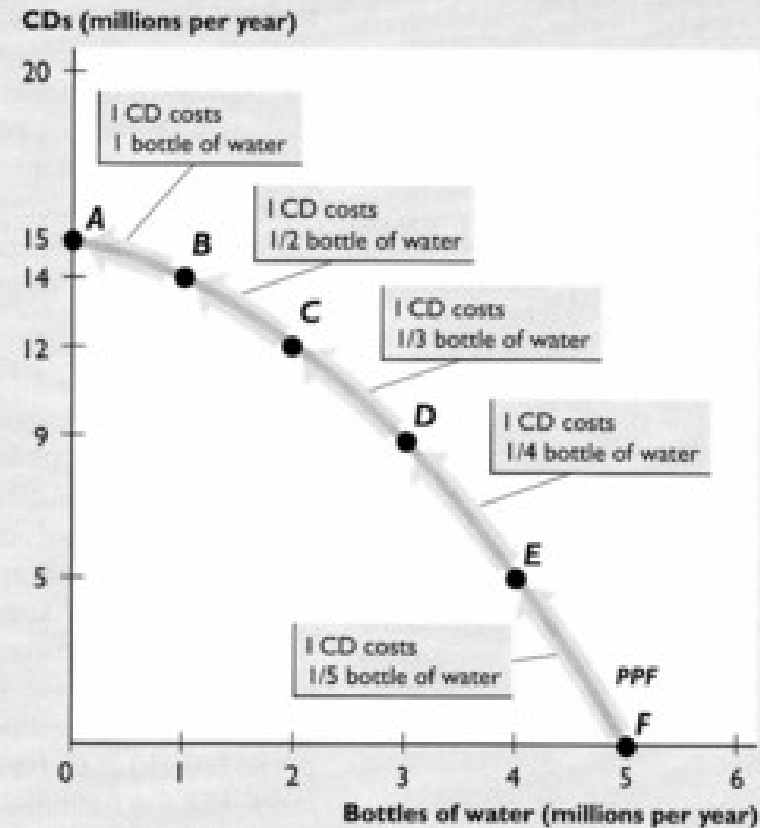
Movement along PPF	Decrease in quantity of CDs	Increase in quantity of bottled water	Decrease in CDs divided by increase in bottled water
A to B	1 million	1 million	1 CD per bottle
B to C	2 million	1 million	2 CDs per bottle
C to D	3 million	1 million	3 CDs per bottle
D to E	4 million	1 million	4 CDs per bottle
E to F	5 million	1 million	5 CDs per bottle

Moving down the PPF from A to F, the opportunity cost of bottled water increases as the quantity of bottled water produced increases.



Movement along PPF	Decrease in quantity of bottled water	Increase in quantity of CDs	Decrease in bottled water divided by increase in CDs
B to A	1 million	1 million	1 bottle per CD
C to B	1 million	2 million	1/2 bottle per CD
D to C	1 million	3 million	1/3 bottle per CD
E to D	1 million	4 million	1/4 bottle per CD
F to E	1 million	5 million	1/5 bottle per CD

Moving up the PPF from F to A, the opportunity cost of a CD increases as the quantity of CDs produced increases.



Opportunity Cost is a ratio

To calculate the opportunity cost of a bottle of water, we divide the quantity of CDs forgone by the increase in the quantity of water.

To calculate the opportunity of a CD, we divide the quantity of bottled water forgone by the increase in the quantity of CDs.

Increasing opportunity cost

The phenomenon of increasing opportunity cost is reflected in the shape of the PPF. It is bowed outward.

The PPF is bowed outward because resources are not equally productive in all activities.

Practice problem

TABLE 1

Possibility	Fish (kilograms)	Fruit (kilograms)
A	0	36
B	4.0	35
C	7.5	33
D	10.5	30
E	13.0	26
F	15.0	21
G	16.5	15
H	17.5	8
I	18.0	0

Use Robinson Crusoe's production possibilities shown in Table 1 to calculate his opportunity cost of a kilogram of fish. Make a table that shows Crusoe's opportunity cost of a kilogram of fish as he increases the time he spends fishing and decreases the time that he spends picking fruit.

If Crusoe increases his production of fruit from 21 kilograms to 26 kilograms and decreases his production of fish from 15 kilograms to 13 kilograms, what is his opportunity cost of a kilogram of fruit? Explain your answer.

If Crusoe is producing 10 kilograms of fish and 20 kilograms of fruit, what are his opportunity costs of a kilogram of fruit and a kilogram of fish? Explain your answer.

Specialization and exchange

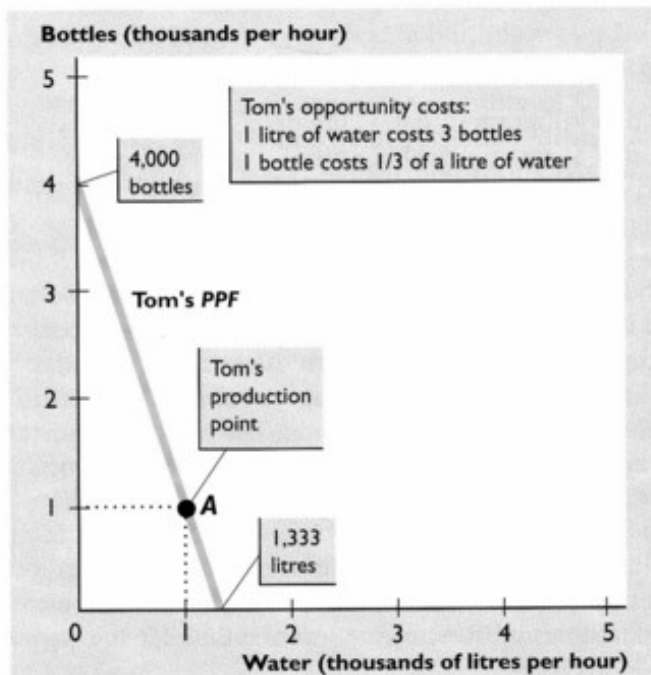
People can produce several goods, or they can concentrate on producing one good and then exchange some of their won good for those produced by others.

Concentrating on the production of only one good is called specialization.

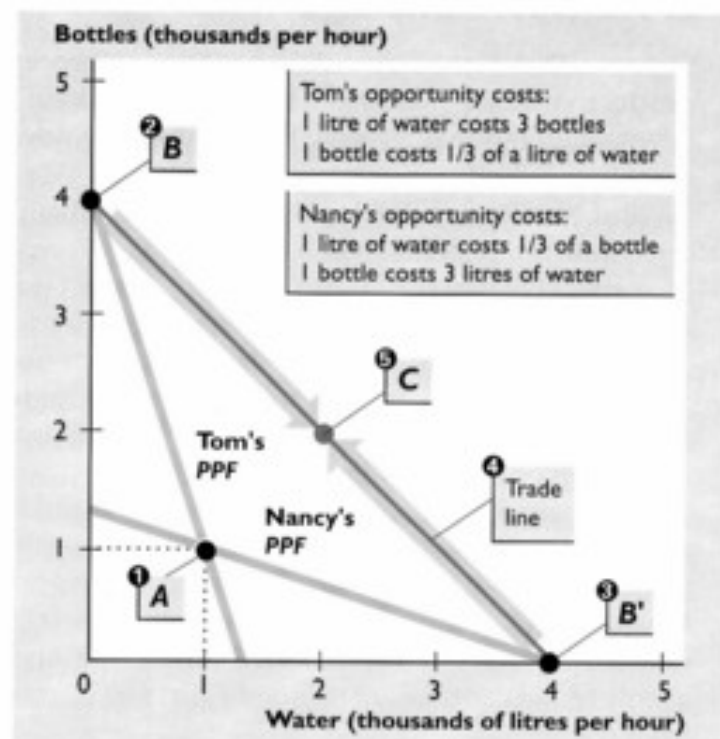
Comparative advantage: that person or firm can produce at a lower opportunity cost than someone else.

Production Possibilities at Tom's Water-Bottling Plant

Tom can produce bottles and water along the production possibility frontier PPF. For Tom, the opportunity cost of 1 litre of water is 3 bottles and the opportunity cost of 1 bottle is $\frac{1}{3}$ of a litre of water. If Tom produces at point A, he can produce 1,000 litres of water and 1,000 bottles an hour.



- 1 Tom and Nancy each produce at point A on their respective PPFs. Tom has a comparative advantage in bottles, and Nancy has a comparative advantage in water.
- 2 If Tom specializes in bottles, he produces at point B on his PPF.
- 3 If Nancy specializes in water, she produces at point B' on her PPF.



- 4 They exchange water for bottles along the red "Trade line." Nancy buys bottles from Tom for less than her opportunity cost of producing them, and Tom buys water from Nancy for less than his opportunity cost of producing it.
- 5 Each goes to point C—a point outside his or her individual PPF—where each has 2,000 bottles of water an hour. Tom and Nancy increase production with no change in resources.

Achieving the gains from trade

If Tom specializes in bottles, he can produce 4 000 bottles an hour—point B in his PPF. If Nancy specializes in water, she can produce 4 000 litres an hour—point B on her PPF.

By specializing, Tom and Nancy together can produce 4 000 litres of water and 4 000 bottles an hour, which is double their total production without specialization.

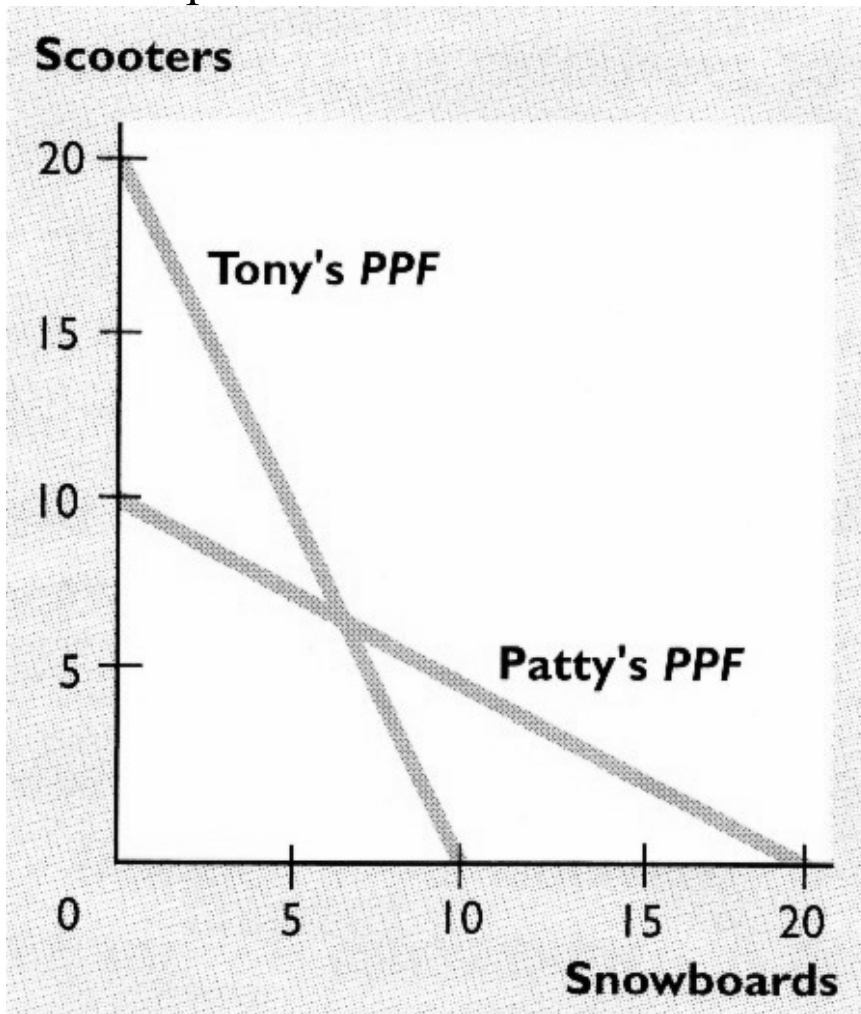
Absolute advantage.

Suppose that Nancy invents a production process that makes her four times as productive as she was before. Now she has an absolute advantage—she is more productive than Tom in both activities.

But she does not have a comparative advantage in both goods. She can produce four times as much of both, but her opportunity cost of 1 bottle is still 3 litres of water. Her opportunity cost is higher than Tom's.

So gains from specialization and trade are always available when opportunity costs diverge.

Practice problem



Calculate Tony's opportunity cost of a snowboard.

Calculate Patty's opportunity cost of a snowboard.

Who has a comparative advantage in producing snowboards?

Who has a comparative advantage in producing scooters?

If they specialize and trade, how many snowboards and scooters will they produce?

Expanding production possibilities

Three key factors influence economic growth: technological change, the expansion of human capital, and capital accumulation.

Technological change is the development of new goods and services and of better ways of producing existing goods and services.

Expansion of human capital is the improvement in the quality of labour that comes from education, on-the-job training, and work experience.

Capital accumulation is the growth of capital resources. (machinery)

When we use resources to develop new technologies, educate and train people, and produce new capital equipment, we must decrease our current production of consumption goods and services. This decrease in the current production of consumption and services is the opportunity cost of economic growth.



Economic Growth in Canada and Hong Kong

Canada and Hong Kong provide a striking example of how the choices that countries make affect the expansion of their production possibilities. In 1960, the production possibilities per person in Canada were three times those in Hong Kong (see the figure). Canada devoted one-fifth of its resources to accumulating capital and the other four-fifths to consumption. In 1960, Canada chose point A on its

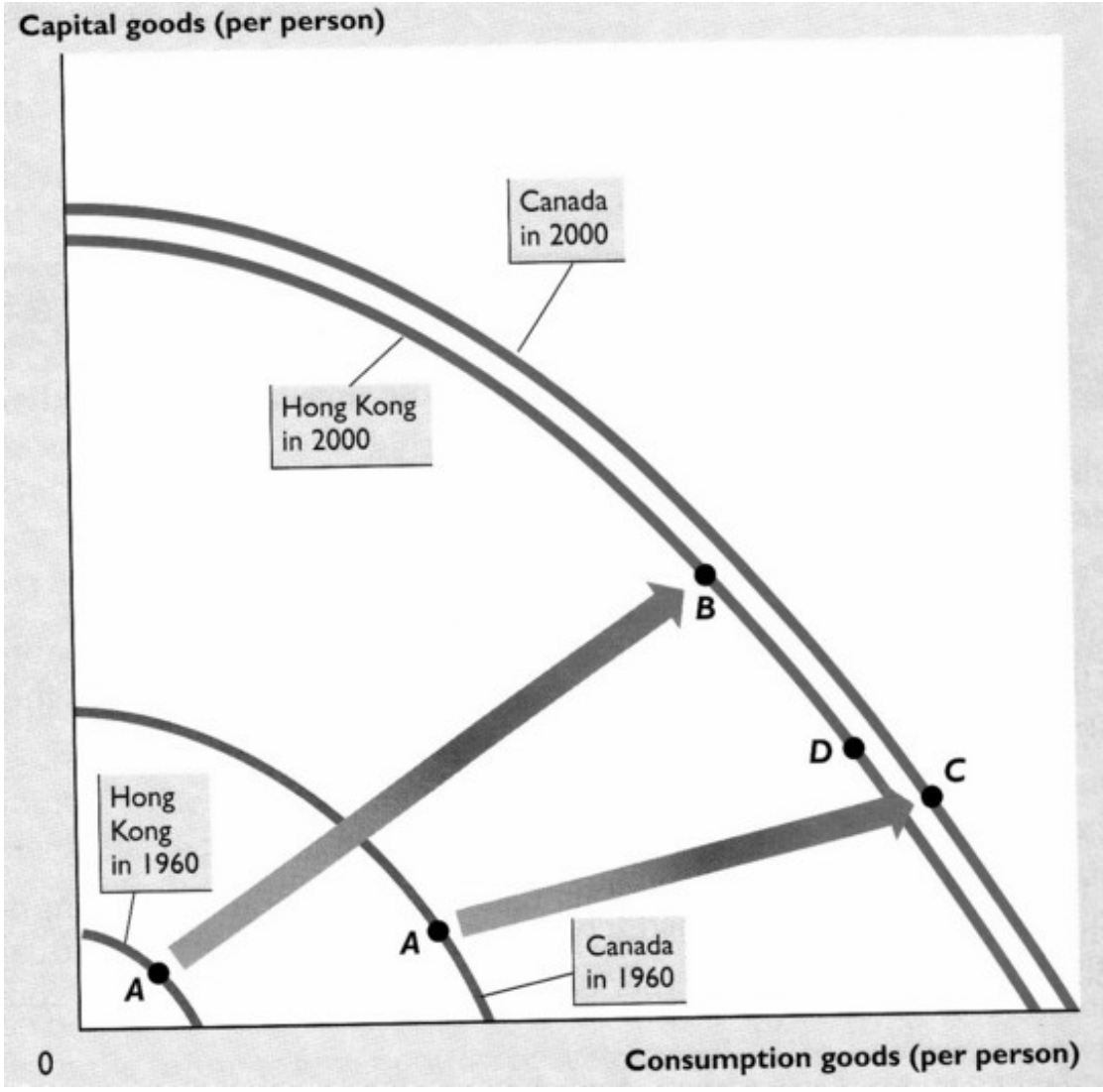
PPF. Hong Kong devoted two-fifths of its resources to accumulating capital and three-fifths to consumption. In 1960, Hong Kong chose point A on its PPF.

Since 1960, both countries have experienced economic growth, but growth in Hong Kong has been more rapid than in Canada. Because Hong Kong devoted a bigger fraction of its resources to accumulating capital, its production possibilities have expanded more quickly than those in Canada.

By 2000, the production possibilities per person in Hong Kong and Canada were similar. If Hong Kong (at point B on the 2000 PPF) continues to devote more resources to accumulating capital than does Canada, Hong Kong will continue to grow more rapidly than Canada and its PPF will

move out beyond our own. But if Hong Kong increases consumption and decreases capital accumulation (for example, moving to point D on its 2000 PPF), its rate of economic growth will slow.

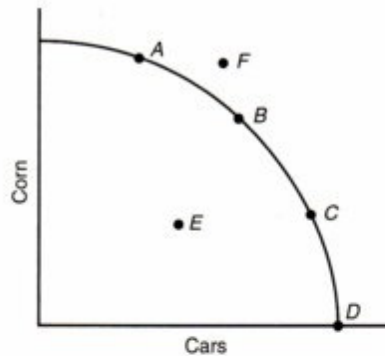
Canada is typical of the rich industrial countries, which include the United States, Western Europe and Japan. Hong Kong is typical of the fast-growing Asian economies, which include Taiwan, Thailand, South Korea, and China. Growth in these Asian countries slowed during the Asia crisis of 1998, but quickly rebounded. Production in these countries expands by between 5 percent and almost 10 percent a year. If these high growth rates are maintained, these countries will eventually close the gap on Canada.



Exercises

Questions 3 to 6 refer to Figure 1-3:

Figure 1-3



3. If the market economy moves from Point A to Point C
- there is unemployment in the corn industry.
 - the opportunity cost of the marginal car increases.
 - technological change has made the production of cars more efficient.
 - the central planner values cars more than corn.
 - All of the above are true.
4. Point E represents a situation that
- is currently unattainable and can be expected to remain so.
 - will be attainable only if there is economic growth.
 - results from inefficient use of resources or failure to use all available resources.
 - has a higher opportunity cost than points on the boundary itself.
 - can never occur in a market economy.
- *5. With currently available resources, point F represents a situation that
- results if resources are not fully employed.
 - can be achieved if consumers demand fewer cars than at point C.
 - is currently attainable.
 - can be achieved if all resources were allocated to the production of cars.
 - None of the above.

Corn (bushels)	Beef (kilograms)
10 000	0
8 000	900
6 000	1 200
4 000	1 400
2 000	1 475
0	1 500

- *7. What would be the opportunity cost of producing 200 additional kilograms of beef if the current production were 4000 bushels of corn and 1200 kilograms of beef?
- (a) 6000 bushels of corn. (b) 175 kilograms of beef.
(c) 2000 bushels of corn. (d) Zero.
(e) None of the above.
8. What would be the opportunity cost of producing 2000 additional bushels of corn if the current production were 6000 bushels of corn and 1200 kilograms of beef?
- (a) 900 kilograms of beef. (b) 1200 kilograms of beef.
(c) 300 kilograms of beef. (d) Zero.
(e) None of the above.
9. Which of the following combinations represent unattainable production levels with the current tract of land?
- (a) 8000 bushels of corn and 500 kilograms of beef.
(b) 8000 bushels of corn and 1200 kilograms of beef.
(c) 2000 bushels of corn and 1475 kilograms of beef.
(d) 6000 bushels of corn and 1300 kilograms of beef.
(e) Both (b) and (d).
10. The production possibilities shown for corn and beef mean
- (a) the PPB is a straight line because the change in corn is 2000 bushels all along.
(b) is concave because the total amount of beef increases as less corn is produced.
(c) is concave because the opportunity cost of beef increases as more beef is produced.
(d) is concave because the opportunity cost of corn falls as more corn is produced.
(e) Both (b) and (d) are true.
- *11. The opportunity cost of increasing corn production from 4000 to 6000 is
- (a) the same as the opportunity cost of increasing corn production from 8000 to 10 000.
(b) the same as the opportunity cost of increasing corn production from 2000 to 4000.
(c) 0.1 kilograms of beef per bushel of corn.
(d) 1200 kilograms of beef.
(e) None of the above.

1. **Country X has an absolute advantage over country Y in the production of widgets if**
 - (a) fewer resources are required in X to produce a given quantity of widgets than in Y.
 - (b) a given amount of resources in X produces more widgets than the same amount of resources in Y.
 - (c) relative to Y, more widgets can be produced in X with fewer resources.
 - (d) All of the above.
 - (e) None of the above.

2. **If, given the same amount of inputs, Canadian farmers produce 2 tons of rice per hectare while Japanese farmers produce 1 ton of rice per hectare, we can be certain that**
 - (a) Canada should export rice to Japan.
 - (b) Canada has a comparative advantage in rice production.
 - (c) Canada has an absolute advantage in rice production.
 - (d) Japanese rice farmers must be paid twice as much as Canadian farmers.
 - (e) Both (a) and (b) are correct.

3. **Comparative advantage is said to exist whenever**
 - (a) one country can produce a given level of output with fewer resources compared to another country.
 - (b) a given amount of resources produces more output in one country compared to another.
 - (c) one country has an absolute advantage over another country in the production of all goods.
 - (d) different countries have different opportunity costs in production.
 - (e) two countries are of different sizes.

4. **If there are two countries A and B, and two goods X and Y, and if A has a comparative advantage in the production of X, it necessarily follows that**
 - (a) A has an absolute advantage in the production of X.
 - (b) B has an absolute advantage in the production of X.
 - (c) A has a comparative disadvantage in the production of Y.
 - (d) B has an absolute advantage in the production of Y.
 - (e) B has a comparative disadvantage in the production of Y.