



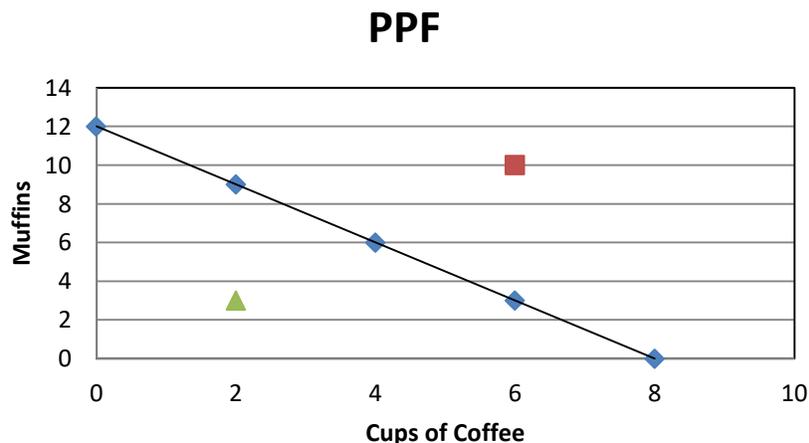
Microeconomics: Scarcity, Opportunity Cost & PPF

Economics is the study of how we allocate scarce resources. The problem with the world is that there will always be UNLIMITED WANTS, but we have LIMITED or SCARCE resources to meet those wants. Therefore, we must make choices about what to produce and what to consume.

Resources include **land** (trees, animals, minerals, oil, actual land for a business, home, etc.), **labour** (the physical and mental skills and effort by humans to produce goods), **capital** (equipment and structures used to produce goods and services), and **entrepreneurship** (the process of combining land, labour, and capital to produce services). These are also called **factors of production**.

In contrast to **direct cost**, which is the price of something, **opportunity cost** is the value of what we give up when we choose something else (i.e. when choosing to purchase 2 CDs instead of a book, the value of the book is the opportunity cost). Opportunity cost is the value of the next best alternative, and it applies to every choice we make. Economists consider the **total cost** of something to be **opportunity cost + direct cost** in contrast to accountants, who only consider direct costs.

A graph of the **production possibility frontier (PPF)** demonstrates the existence of opportunity costs (see below). The PPF is the *boundary line showing what combinations of two goods are possible to produce* given the full employment of resources (the line with the diamonds).



Producing on the PPF means all resources are fully utilized; this is called **productive efficiency**. Any combination of goods below the PPF curve (ex. green triangle) can also be produced, but resources will be underemployed. Any point outside of the PPF (ex. square) represents a combination of goods that is not attainable TODAY.

The slope of the PPF represents the opportunity cost of moving from one combination of goods to another. The slope will always be NEGATIVE, because there is a trade off between the two goods, demonstrating the principles of scarcity and opportunity cost.

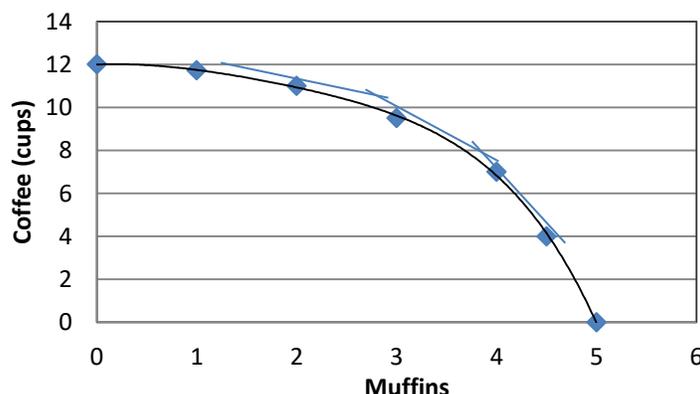
To find the slope using two points on the PPF, you need the x- and y-coordinates of the points. For example, (2, 9) and (4, 6) are two points on the PPF in the graph on the previous page. To find the slope between them, take the change in the y-coordinates divided by the change in the x-coordinates:

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{6 - 9}{4 - 2} = \frac{3}{2} = 1.5 \text{ muffins/coffee}$$

The cost of producing one more coffee is giving up 1.5 muffins.

If the PPF is a STRAIGHT LINE as shown in the first graph, then the slope is CONSTANT. This means the opportunity cost is also CONSTANT. In real life, the PPF will NOT be linear; it will be a downward sloping curve that is bowed outward because of the **law of diminishing marginal returns**.

The law of diminishing marginal returns says that for every unit of increase in input, the increase in output will become smaller than the last unit. As such, if we consider what we have to not produce to produce more of a good, **the opportunity cost of each extra unit of the good is increasing**. We can see this by looking at the slope of the non-linear PPF below. To produce an extra muffin when we are producing 0, it only requires giving up less than half a cup of coffee, but produce an extra muffin when we are already producing 3, it requires giving up about 2.5 cups of coffee.



Imagine a kitchen with only one stove. Hiring more chefs may increase the



average output for each chef up to a point, but then the chefs will just get in each other's way and end up standing around with nothing to do; the average output per chef will drop. You can also think of it as the most suitable resources for production being used up first, and resources that are less adaptable or suitable for alternative uses being used up last.

Productive efficiency occurs at every point on the PPF curve. BUT, every point on the PPF curve does NOT represent **total efficiency**.

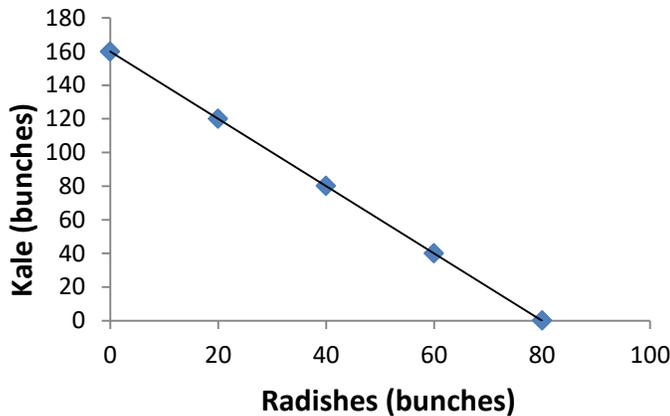
Allocative efficiency occurs at the combination of goods on the PPF that most satisfies us. Allocative efficiency is also defined as the point when marginal cost equals marginal benefit. While it is possible for an individual to achieve total efficiency, it is very difficult for a society to achieve allocative efficiency (and hence total efficiency) because we value different combinations of goods.

Marginal cost is the opportunity cost of consuming an extra unit of a good or activity. **Marginal benefit** is the benefit or happiness, obtained from consuming an extra unit of a good or activity. In general, marginal cost will increase (and marginal benefit will decrease) as we continue to consume extra units of a good or service.



Practice Problems

1. Use the graph below to answer the following questions.
 - a) If Alison is currently growing 80 bunches of kale per period, how many radish bunches is she growing? Assume that resources are fully utilized.
 - b) What is the opportunity cost of one bunch of radishes?
 - c) What is the opportunity cost of one bunch of kale?
 - d) If Alison is currently producing 30 bunches of radishes, what is the opportunity cost of producing another 20 bunches of radishes?
 - e) Is it possible for Alison to produce 120 bunches of kale and 30 bunches of radishes?
 - f) If Alison is producing 60 bunches of radishes and 30 bunches of kale, is she fully utilizing her resources?
 - g) Is the opportunity cost of this PPF constant?



2. A point on the production possibility frontier represents:
 - A. Total efficiency
 - B. Allocative efficiency
 - C. An unattainable combination of goods
 - D. Productive efficiency
 - E. Underemployment of resources
3. Using the non-linear PPF, calculate the opportunity cost of increasing production from 2 to 3 muffins.



4. Identify whether the following items are factors of production. If yes, identify which type of factor they are (land, labour, capital, entrepreneurship):
- a) Oil from the Alberta tar sands
 - b) A bottle of perfume
 - c) A dump truck
 - d) The knowledge to design web sites
 - e) Coal
 - f) The ability to hammer nails
 - g) A drill for wells
 - h) Contracting business to build homes
 - i) An umbrella

Solutions

1. a) 40 bunches of radish b) 2 kale bunches/1 radish bunch d) 0.5 radish bunches/1 kale bunch e) No, that combination is outside the PPF f) No, she is producing at a point inside the PPF & underutilizing resources g) Yes, the curve is linear and slope is the same along the whole curve.
2. D
3. 1.5 cups of coffee
4. a) land b) not a factor of production c) capital d) labour e) land f) labour g) capital h) entrepreneurship i) not a factor of production



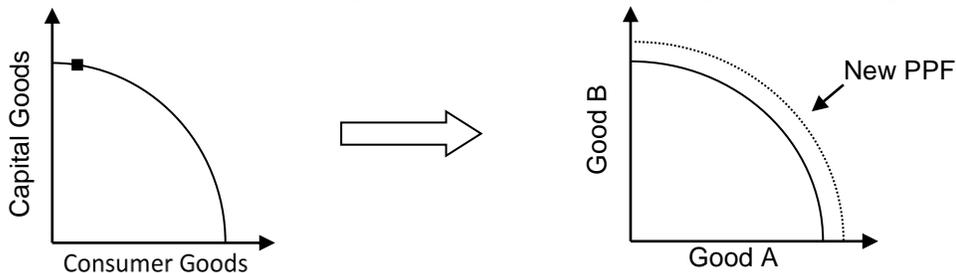
PPF in the Present & Future

The PPF for two goods represents all possible combinations of goods when resources are fully utilized, for an economy at a specific point in time. BUT, if the economy grows, then the PPF can shift (outwards, to the right)! Events that would cause the PPF for two goods to shift to the right include technological advances, improvements in labour productivity (e.g. training workers or educating workers) or discovery of new sources of natural resources.

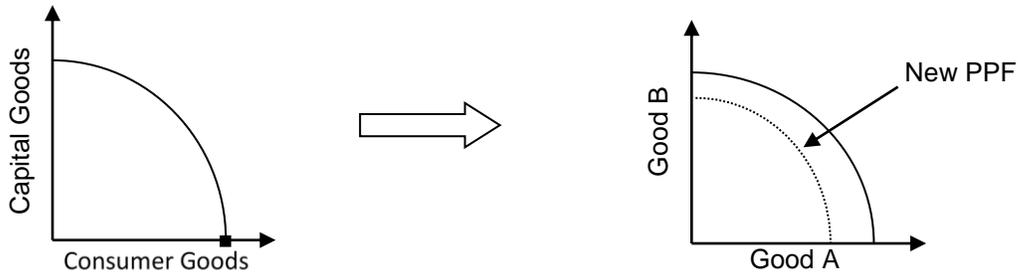
Similarly if the economy shrinks, the PPF will shift in the opposite direction (inwards, to the left). For example, if the population declines (e.g. a plague or virulent disease) or if there is a natural disaster, the PPF will shift inwards.

To ensure that their PPF for goods will keep shifting outwards, countries invest in capital creation and technology. (Examples: higher education of workers, research, improving infrastructure of factories or machines) These types of goods are called capital goods. **Capital goods** are distinct from **consumer goods** in that they are used to produce more goods. Consumer goods are finite and get used up (e.g. pizza, cars, movies).

Investing in capital goods now also means giving up some consumer goods to achieve this. The PPF curve for capital versus consumer goods looks like the figure on the left. If a society chooses more capital goods now, in the future the PPF curve (between two goods) will look like the figure on the right!



By focusing on the development of capital goods, the society or country will ensure a higher standard of living in the future. If a society or country does not allocate ANY resources towards capital goods than, in the future, the PPF curve will shrink inwards. (This should make sense since the cost of living will increase with time, but income will remain the same).



It is also possible to experience an advance in the production technology for only one of the goods in the PPF graph. In this case, only one part of the curve shifts out. For a technological advance in producing Good A, the graph would look like the one on the left. For a technological advance in producing Good B, the graph would look like the one on the right.

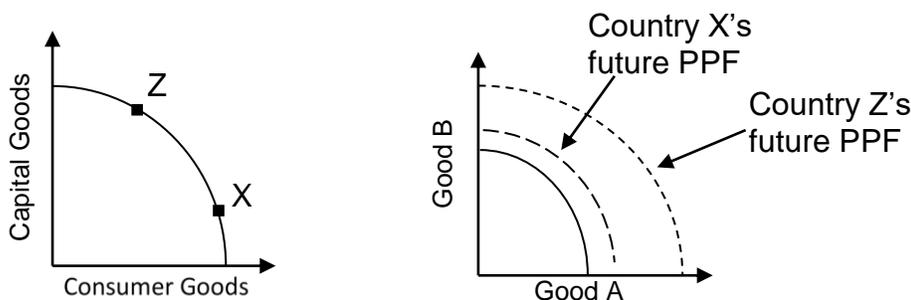


Practice Problems

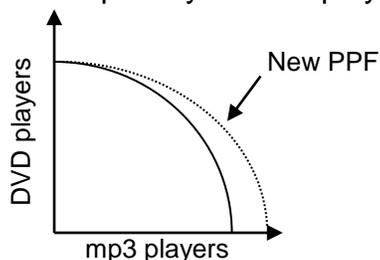
1. Country X's economy produces fewer capital goods and more consumer goods than Country Z's economy. Which country's economy will experience more rapid growth? Draw two production possibilities curves demonstrating your answer.
2. If a production possibilities curve between DVD players and mp3 players exists, how does a technological advance that increases the efficiency of mp3 player production affect the PPF?
3. Which of the following events is the least likely to shift a society's PPF outward?
 - A. Discovery of natural gas
 - B. Training for workers that increases the amount of a good that can be produced per worker
 - C. A shift in preference for one good compared to the other good
 - D. Invention of a new process of production that reduces the resources necessary to produce a good

Solutions

1. Country Z's economy will grow more rapidly since it is investing more in capital goods than consumer goods. Its PPF will shift outwards farther than the PPF for Country X in the same amount of time, starting from the same original PPF.



2. It will shift the PPF just for mp3 players outwards so the curve will become distorted. This means it will be possible to produce more mp3 players at each quantity of DVD players on the PPF.



3. C

