

# Microeconomics with Ethics

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## Chapter 6

### Comparative Advantage And Economic Growth

A number of important production relationships can be demonstrated by constructing an economy-wide PPF out of the PPFs of two or more individuals. In the following example we consider an economy comprised of three sisters; Olga, Maria, and Irina. As before we assume that these individuals can choose to devote their work effort to the production of either oranges, apples, or some combination. We will assume, though, that the productive capabilities differ between the sisters.

#### 6.1 Production Possibilities with More than Two Individuals

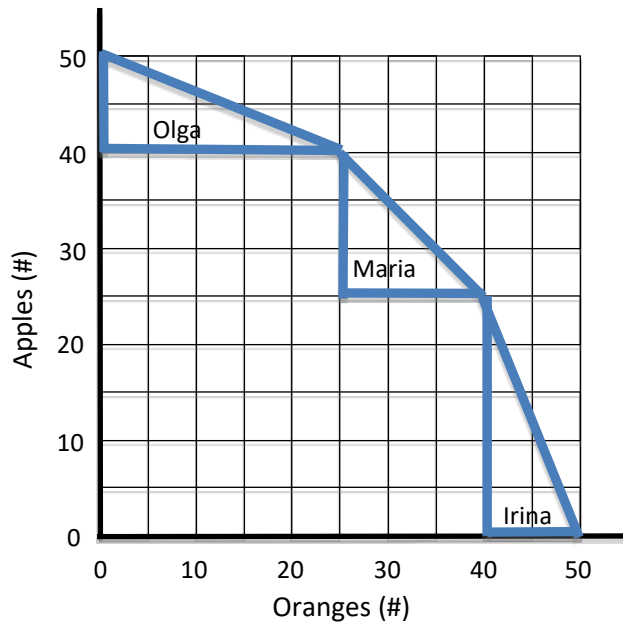
##### Learning Objectives

1. Learn to construct and interpret a multiple-person production possibility frontier.

In Figure 6.1 the individual PPF for each sister is displayed as the triangle surrounding each sister's name. Thus, Olga's PPF indicates that if she devotes all of her daily work effort to apple production, she can produce  $(50-40 = 10)$  10 apples. If instead she specializes in orange production she can produce 25 oranges. She can also produce any combination in between the two endpoints. Similarly, Maria can produce 15 oranges, 15 apples, or some combination in between. Irina can produce 10 oranges, 25 apples or some combination in between.

Each sister's opportunity cost of orange production is given by the slope of her indifference curve. Thus, Olga's opportunity cost for oranges is  $10/25 = 2/5 = 0.4$  apples/orange. Maria's opportunity cost for oranges is  $15/15 = 1$  apple/orange and Irina's opportunity cost for oranges is  $25/10 = 2.5$  apples/orange. This implies that Olga has the comparative advantage in oranges, Irina the comparative advantage in apples, while Maria is intermediate between the two.

Figure 6.1 A Three-person PPF

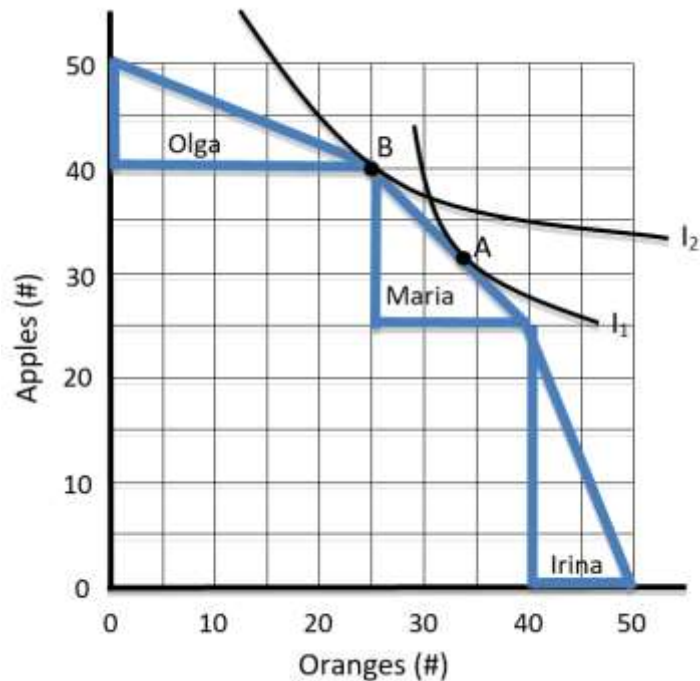


In Figure 6.1 the sister's PPFs are positioned in a way that plots the household production frontier, made up of the summation of the three individual PPFs. Notice that if all three specialized in apples, the total household apple production would be  $10 + 15 + 25 = 50$ . If all three specialized in orange production total household production would be  $25 + 15 + 10 = 50$ . That defines the endpoints of the household PPF. To determine the interior segments we order the PPFs according to increasing opportunity cost of oranges moving from left to right along the frontier. This will enable us to extend the PPF as far outward as possible.

To see how the most efficient production may be chosen from the set of production possibilities we can superimpose on the PPF diagram a set of household indifference curves. In Figure 6.2 we depict two examples using two separate indifference curves. If preferences are like those depicted with indifference curve  $I_1$ , then the utility maximizing household production and consumption occurs at point A. Note that to produce at A, Olga must specialize in producing her comparative advantage good (oranges), Irina must specialize in her comparative advantage good (apples), and Maria produces a little of both.

If instead the household had a stronger desire for apples, their indifference curves might be represented by  $I_2$ . In this case utility maximizing consumption and production would occur at point B. To produce at B, Olga still specializes in orange production, however Irina and Maria both specialize in apples production.

Figure 6.2 Comparing production outcomes with different community preferences



### Key Takeaways

1. A many-person PPF displays maximum production of both goods when producers are moved into the production of a good from lower to higher opportunity cost for that good.
2. A community set of indifference curves can be used to identify the optimal production point on the production possibility frontier.

## 6.2 Classification of Production Possibilities

### Learning Objective

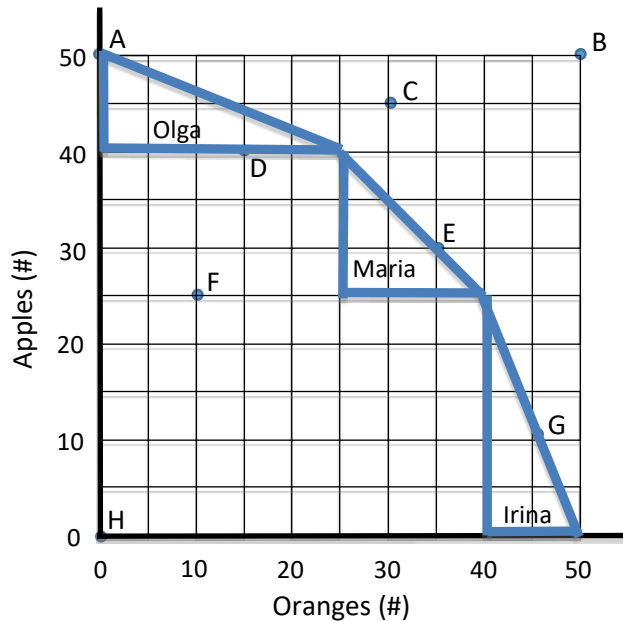
1. Learn to classify different types of production points.

The PPF drawn in Figure 6.3 can be used to classify several different types of dichotomies in production. The first dichotomy is the distinction between *feasible and infeasible* production points.

A feasible production possibility is any combination of oranges and apples that CAN be produced in the economy because there is sufficient resources and technological knowledge to do so. Feasible production points are those contained either on, or inside the PPF diagram. The entire collection of feasible production points is called the production possibility set. Points E and F are clear examples of feasible production points and are contained within the production possibility set.

In contrast, infeasible production points are those combinations of oranges and apples for which there is insufficient resources or lack of technical knowledge to produce. Infeasible production points are those located beyond (up or to the right) of the PPF. Point C in Figure 6.3 is an example of an infeasible production possibility.

Figure 6.3 Classifying Production Points in a PPF Diagram



The second production dichotomy is between efficient and inefficient production points. This dichotomy is only relevant for production points that are feasible to produce.

Efficient production points are those in which all available resources are fully employed and for which there is no possible way to increase production of both goods simultaneously. Because additional production is not possible at an efficient production point, it represents a production maximum, given the full use of the resources used in the production process. On the diagram the efficient production points will lie on the production possibility frontier, or the outermost boundary of the feasible production set. An example of an efficient production point is point E in Figure 6.3.

Inefficient production points are feasible points such that there is at least one other feasible point that has higher production of both goods, or, if all available resources are not employed. If either of these two conditions are fulfilled, the production point is inefficient. Inefficient points do not maximize production for a given set of resources, it is possible to do better. Point F in Figure 6.3 is an example of an inefficient production point.

## Key Takeaways

1. Feasible production points are those contained either on, or inside the PPF diagram.
2. The entire collection of feasible production points is called the production possibility set.
3. Infeasible production points are those located beyond (up or to the right) of the PPF.
4. Infeasible production points are not contained with the production possibility set.
5. Efficient production points are those in which all available resources are fully employed *and* for which there is no possible way to increase production of both goods simultaneously.
6. Inefficient production points are feasible points such that there is at least one other feasible point that has higher production of both goods, *or*, if all available resources are not employed.

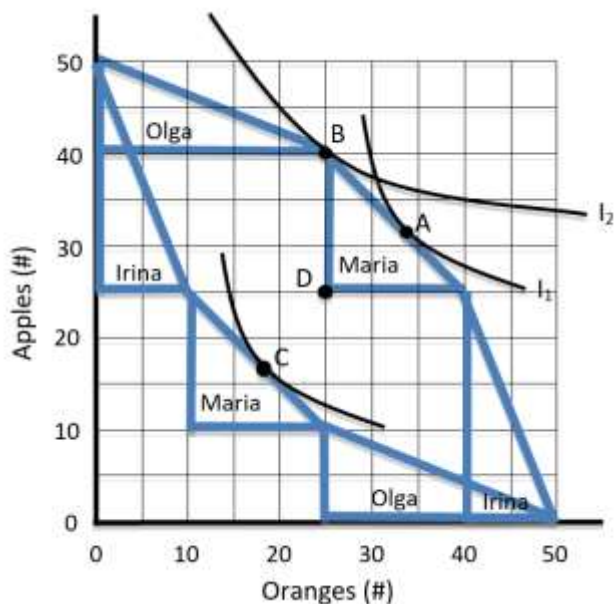
## 6.3 Production Possibilities and Comparative Advantage

### Learning Objectives

1. Learn the importance of comparative advantage and full employment is achieving economic efficiency.
2. Learn the shape of a many-person PPF and the reasons it displays increasing opportunity costs.

Next let's consider how inefficiencies can arise when the principle of comparative advantage is not followed. For example, suppose this household did not function like a free market in which each sister produced that which would maximize her own utility. Suppose the household is instead headed by a dictatorial father who is not interested in freedom or comparative advantage. For some unspecified reason, he imposes constraints and demands that Irina produce only oranges and Olga produce only apples. Given this new assumption, the constrained PPF is plotted in Figure 6.4 along with the original, and more efficient PPF.

Figure 6.4 Production NOT based on Comparative Advantage



Notice that when Irina and Olga are forced to produce the good that they do not have a comparative advantage, the constrained PPF is shifted inward. If the household maximizes utility under preferences like those depicted with  $I_1$ , then consumption and production would occur at point C. Notice that at C all three sisters produce on their individual production frontiers. That means they are each using their labor input fully. Despite being fully employed, point C represents a significant reduction in apple and orange production and consumption for the household, relative to the unconstrained case. For this reason we would say point C is inefficient, despite the fact that all three sisters are fully employed. As such, the example displays quite vividly the kind of losses that will occur when the principle of comparative advantage is not followed.

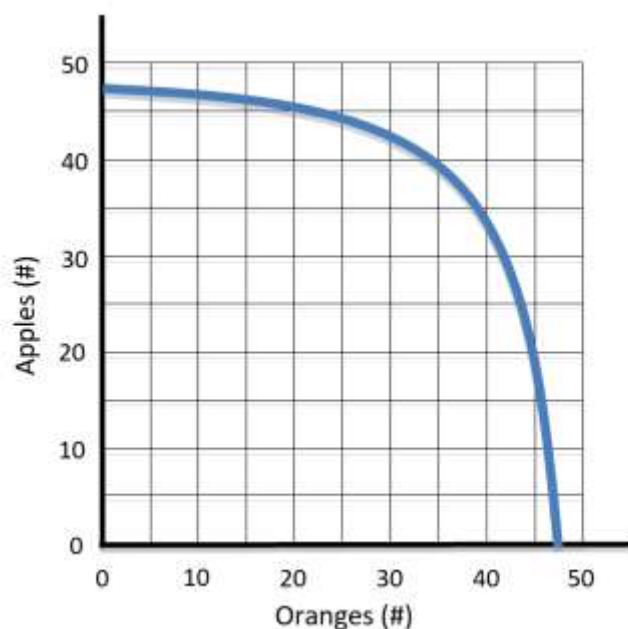
This is what economists mean when they talk about inefficiencies in production. It means that the economy is not achieving its fullest productive potential and therefore cannot obtain the greatest possible utility for its citizens. Happiness is not at a maximum given the constraint of limited resources and a given production technology.

There are really two ways for an economy to produce inside its unconstrained PPF and thus exhibit inefficiencies. First when some producers do not produce according to comparative advantage as at point C and second when some resources are unemployed. For an example of the second condition, consider point D in Figure 6.4. The household could achieve production at D if Olga produces 25 oranges according to her comparative advantage, Irina produces 25 apples according to her comparative advantage, and Maria sleeps all day! Curiously, point D generates more oranges and apples than point C. This means that in this example, shifting Olga and Irina to their comparative advantage activities creates enough extra production to compensate for all of Maria's work effort. This example can also illustrate why an economy can grow while its unemployment rate increases. If efficiency improvements occur among those who are working, it can offset the losses caused by rising unemployment.

Lastly, the efficient PPF displays a relationship that is likely to hold for much more complex PPFs. As we move to the right along the efficient frontier, thereby producing more oranges and fewer apples, the opportunity cost of orange production increases. This pattern is sometimes referred to as the *principle of increasing costs*. What this implies is that it costs less to produce the first few oranges than it does to produce the last few oranges. Here's why.

To maintain efficiency it is best to move those resources that are most useful in producing oranges, and thus least useful in producing apples, into orange production first. In the example above, that means first moving Olga into orange production because her opportunity cost of oranges is the lowest, which also implies that she is the most productive individual in orange production. Next, it is best to move Maria into orange production because her opportunity cost is intermediate between the other two. Once Maria is producing only oranges, the only resource left to move over is Irina, who is the least productive in oranges and therefore must give up the greatest number of apples to produce each additional orange.

Figure 6.5 A PPF with Numerous Individual Producers



If we had 100 individuals, or a thousand, or a million, each with the ability to produce apples, oranges or a combination, then the efficient production frontier would be derived by ordering the individual PPFs from the lowest to the highest opportunity cost of oranges, just like we ordered the three sister's PPFs. Under these assumptions the PPF would look like that in Figure 6.5. Here, the slope of a tangent line at each point on the PPF represents the opportunity cost at that point. Since the slope of a tangent line increases (in absolute value terms) moving to the right along the curve, the opportunity cost is increasing. Thus, in general, an economy's efficient frontier in two goods is negatively sloped and bowed out, or convex to the origin, reflecting an increasing opportunity cost of oranges (that is, it is the OC of the good plotted on the horizontal axis).

## Key Takeaways

1. Efficient production on the PPF requires full employment of resources and production organized on the basis of comparative advantage.
2. If production is not based on comparative advantage, resources may be fully-employed but it will still be possible to increase production of both goods.
3. If an economy does not employ all of the resources, its production is inefficient and it will be possible to increase production of both goods.
4. A many-person PPF displays maximum production of both goods when producers are moved into the production of a good from lower to higher opportunity cost for that good, implying increasing opportunity costs.

## 6.4 Sources of Economic Growth

### Learning Objectives

1. Learn the fundamental reasons for economic growth.

One of the most persistent economic goals in modern society is to increase the amount of goods and services produced by an economy. The reason is because a) we assume that utility is caused by consuming goods and services, b) we assume that more is better than less, and c) we recognize that to consume more requires that we produce more. These are the main reasons we care about promoting economic growth, defined as the growth in the sum total value of goods and services produced in the economy. In this section we will explore the fundamental causes of economic growth.

There are four basic causes of growth: 1) an increase in new resources, 2) a reemployment of unemployed resources, 3) an increase in productivity, and 4) a reallocation of resources on the basis of comparative advantage. The first and third cause represent methods to expand the size of the production possibility set, or to push outward the efficient PPF. The second and fourth causes represent methods to increase inefficient production and move it towards the efficient PPF.

Let's consider first an increase in new resources. Resources refer to the inputs that are used to produce the final goods and services that are consumed. In the more complex real world those resources include human labor, animal labor, land or space, and capital equipment such as machinery. If an economy adds more workers, or equipment or any other resources to the production process, then surely the economy would be able to produce more.

Consider the household economy from before. However let's assume that initially Maria is too young to work and is not considered a part of the work force. In that case, household production will only involve the production of Olga and Irina.

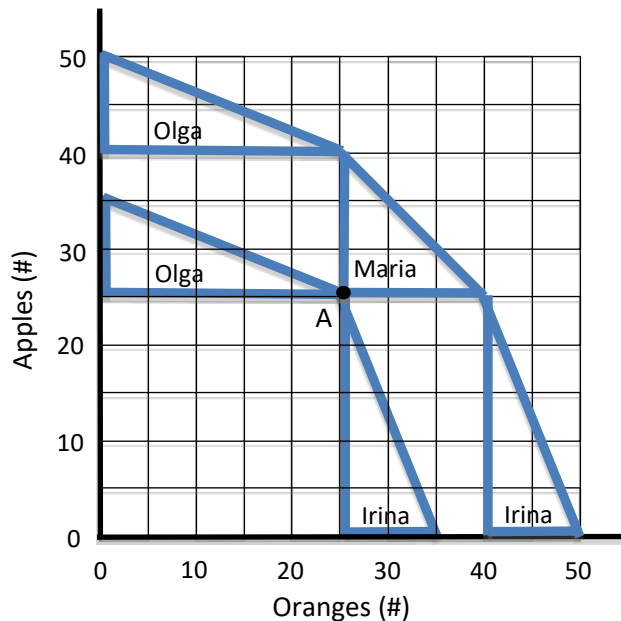
In Figure 6.6, the household PPF using only Olga and Irina's production capability is formed by the outside edges of Olga and Irina's PPFs meeting at point A. Notice that without Maria, household production possibilities are everywhere interior to the PPF formed with Maria included, shown as the outer boundary with the three PPFs combined. The change between the two represents the economic growth that occurs when Maria enters the workforce as a new



productive resource. In other words, when resources are added to the production process, the household PPF shifts outward. This is a visual depiction of potential economic growth. With added labor, the economy can produce more of both goods if it desires.

The same story is told if Maria were originally unemployed rather than being too young to be part of the labor force. If Maria were unemployed for some reason then production would occur along the internal PPF such as at point A. If Maria is reemployed, the production possibilities shift outward thereby inducing potential economic growth.

Figure 6.6 PPF Changes when Workers are Added



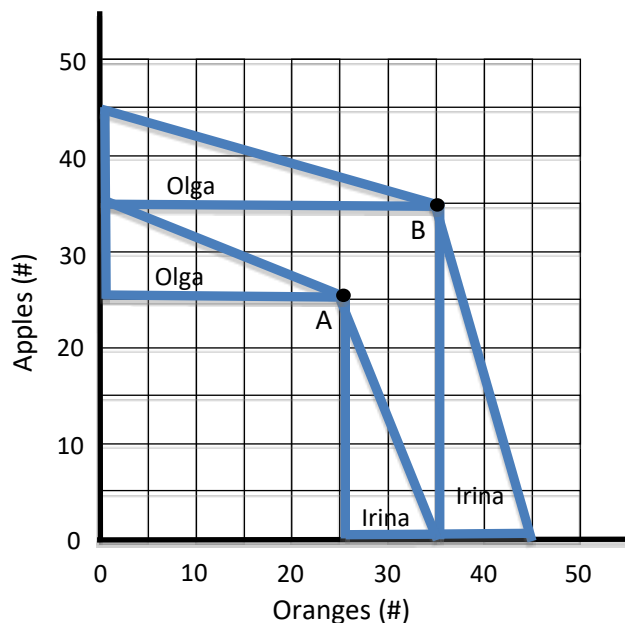
The reverse implication is also true. If economic growth occurs, one possible reason is the expansion of productive resources, as when Maria enters the labor force for the first time. A second reason for economic growth is if unemployed resources become reemployed as when Maria finds a new job.

The third cause of economic growth is productivity improvements. This involves a change in an exogenous variable in the model, namely the unit-labor requirement in production. Any reduction in a unit-labor requirement implies an increase in productivity and an improvement in technology. We also sometimes call this technological change. Technological change is a complex process that would require an entire course to examine in detail. However, it occurs largely because of new inventions or streamlined production techniques or better motivation of workers.

Figure 6.7 illustrates the effects of technological change. Suppose for simplicity the economy consists of just Olga and Irina. Given their original productivities, the household PPF is plotted as before as the external surfaces of their PPFs intersecting at point A. Suppose though that Olga and Irina improve their productivities of orange and apple production respectively. Suppose Olga's orange productivity rises from 25 oranges to 35 oranges per day. Let Irina's apple productivity rise from 25 to 35 apples per day. Suppose their productivities with respect to their non-comparative advantage goods remain the same.

The larger individual PPFs are plotted in Figure 6.7 to form the household PPF given by the exterior segments intersecting at point B. Notice that the increase in productivities for the two sisters has shifted outwards the entire household PPF enabling the household to produce and consume more oranges and more apples, as it would if it were to move from point A to B. Alternatively, one can say that if economic growth occurs, one possible cause is an improvement in technology causing a rise in productivity.

Figure 6.7 PPF Changes when Productivities Rise



A final source of economic growth was already shown earlier in Section 6.1. Recall from Figure 6.4 that if Olga and Irina were forced to specialize in the good in which they did not have a comparative advantage then production might take place at a point such as C. It is worth emphasizing that at point C, all three sisters are fully employed; there is no unemployment of resources. Still production takes place inside the efficient frontier. If starting from point C, the economy could reallocate resources efficiently, meaning Olga and Irina are allowed to produce according to their comparative advantage, then production could expand to points like A or B in which production of both goods increase.

This then offers another source of economic growth. Even if an economy has no unemployed resources to draw on, cannot expand resources further, and cannot improve technology, there is still one outlet for economic growth; namely, efficiency improvements on the basis of comparative advantage.

If we ask how to promote this increase in efficiency, the free market answer is to allow self-interested individuals to seek as much profit as possible. By allowing individuals to use prices as a guide, their desire to make more money will lead them, *as if by an invisible hand*, to specialize in their comparative advantage good and trade it with others. Finally, it is worth noting that even if production occurs inefficiently, like at point C in Figure 6.4, production can be expanded by the other methods; the reemployment of unemployed resources, the expansion of resources and the improvement in technology. Fundamentally, these are the only ways for an economy to grow.

## **Key Takeaways**

1. There are four fundamental sources of economic growth. Two involve shifting the efficient PPF outward and two involve movements towards the efficient PPF.
2. An increase in production resources (labor and capital) shifts the PPF outward and can increase production of both goods.
3. A reemployment of unemployed resources moves production towards the PPF and can increase production of both goods.
4. An improvement in technology (increases in productivity) shifts the PPF outward and can increase production of both goods.
5. A rearrangement of production on the basis of comparative advantage moves production towards the PPF and can increase production of both goods.
6. A rearrangement of production on the basis of comparative advantage occurs in a free market when profit seeking firms try to make more money. (as long as they follow the ethical rules highlighted in module 4).