Chapter 2

Production Possibility Curves

Objectives

1. To define the implications of scarcity in an economic system.
2. To define the meaning of production possibility curves.
3. To understand the economic implication of the production possibility curve model.
4. To discuss the economic importance of the law of increasing opportunity cost.
5. To understand the application of a production possibility curve in the business world.
Because of **scarcity**, certain economic questions must be answered regardless of the level of affluence of a society or its political structure. Some of the basic questions that an economy faces include the following: (1) What and how much should we produce? (2) How will we produce these goods and services? (3) Who will get the goods and services we produce? (4) How can we use our scarce resources efficiently? (5) Will current sacrifices necessary for more rapid economic growth be worth the gains that growth will offer future generations? These questions are unavoidable under the circumstances of scarcity.

In order to decide what to produce and in what quantities, we use a simple model called a **production possibility curve**. This model illustrates an economy’s potential for allocating its limited resources to producing various combinations of goods.

**Production Possibility Curves (PPC)**

A production possibility curve is a curve showing possible combinations of goods that an economy can produce given a fixed amount of resources, fixed technology, and efficient use of these resources.

Let us assume that the United States produces only two goods: food and clothing. This is one way of simplifying, and it shows how an economy can divide the different modes of production. If we classify the modes of production between different countries, we can separate them into two groups. Either they are producing agricultural products or manufacturing products. Third-world countries generally produce agricultural products. One reason for the focus on agricultural products is a more labor-intensive factor of production. On the other hand, first-world countries generally produce manufacturing products. Most first-world countries are abundant with capital resources. Therefore, it is more efficient for first-world countries to produce capital resources.

Assume that the United States is given the following production possibility schedule:

<table>
<thead>
<tr>
<th>Point</th>
<th>Food</th>
<th>Clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>2.0</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>3.0</td>
</tr>
<tr>
<td>D</td>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Plotting the points, we have a nonlinear curve called a production possibility curve. The shape of the curve is “concave from the point
of origin.” As long as the economy is producing along the curve, we consider each production combination to be efficient. By efficient, we mean that the production mix is such that it is maximizing all the resources available in the economy. If we have a point, say point X, which is inside the production possibility curve, then we consider this point as inefficient. One implication of such a point is that the economy is under-employing its resources. For example, if the United States is producing 30 units of food and 2 units of clothing, it can produce an additional unit of food or clothing without losing any production of either good. Points, such as point Z, which are outside of the production possibility curve, are considered unattainable. This point is unattainable because the United States does not have resources to produce both 40 units of food and 4 of clothing.

In summary, as long as the economy produces along the curve, the economy is maximizing its resources. It is important to **maximize resources** because goods are being produced most efficiently. However, as we move along the curve, there is a cost in obtaining more of one commodity relative to another—that is, as we move along the curve, the cost involved is relative to how much we give up of the other good. The cost related to movement along the production possibility curve is what we call an **opportunity cost**. An opportunity cost is the benefits we forgo for the best alternative resource. In our model, it is what we give up in order to gain some other goods that we wanted to acquire. For example, if the United States is currently producing 50 units of food and 0 clothing (point A) and wishes to produce 2 more units of clothing (point B), it must give up 10 units of food. In order to calculate opportunity cost for clothing, we divide the loss of food by the gain of clothing. In our example we will divide 10 (loss of food) by 2 (gain in clothing), which will give us 5. This means for every one clothing we gain, we lose 10 food.

The fact that the production possibility curve is “concave from the point of origin,” implies that it follows the law of increasing opportunity cost. The law of increasing opportunity cost states that as we gain more of one commodity, we have to give up more of the other commodity. It also implies that there is always a cost in doing something else.

Simply put, opportunity cost is the cost of gaining one commodity relative to another commodity. The concept of opportunity cost can be applied in many contexts. A good example can be the time spent in studying economics. At this point in time, you could be working or watching TV instead of reading your economics textbook. The cost of reading your economics book can be the time not spent elsewhere. One basic assumption in the concept of opportunity cost is the fact that there is always a trade-off in doing anything.

**Opportunity Cost**

The concept of opportunity cost is one of the most important topics in economics. As previously defined, it is the benefits we forgo for
the best alternative resource. In any decision-making process, there will always be some cost involved. For example, a working person can choose between staying at home with the family or working full time. Given the time constraint, the working person can only do so much, so must choose between time spent with the family and full-time work. If he or she chooses to work, the opportunity cost involved is the foregone time spent with the family. If the working person chooses to stay at home to be with the family, the opportunity cost is the foregone time spent building a successful career.

Some people allocate their resources properly in order to maximize production or choices in life. However, not everyone allocates resources properly given whatever constraints they may face. As an example, if a student spends more time partying instead of studying during a semester, the probability of failing the course is much higher. If the student fails the course, his or her opportunity cost is the wasted time spent in attending this particular course.

**How Trade-offs Apply from a Management Point of View**

Trade-offs—giving up something in order to get something else—are the mother of all opportunity costs. They lay at the heart of the executive’s job. And they are something of a paradox. The more successful you are, the greater the opportunity costs you face. In fact, success is measured by how well executives handle trade-offs, the very thing that haunts and torments them.

Every executive faces two tasks. First up is to work with courage, skill, perseverance, and creativity to create trade-offs where none presently exist. If you face no trade-offs, then your company is poorly managed. If you don’t have to settle for less of one thing to get more of another, then it follows that you could have more of everything if you just managed or organized your affairs better. That, in turn, means that there is much fat and slack in the system that needs to be eliminated. Second up is to manage those trade-offs in the best possible way, balancing gain and pain in a manner that leaves your business best off, with the most gain for the least pain.

Managing trade-offs can involve painful decisions about other people’s lives, and can require rapid changes in perspectives and ways of thinking. Consider, as an example, the once-vaunted Japanese efficiency. As a matter of management policy Japanese firms have been reluctant to lay off workers during hard times. They have traded the inflexibility of “lifetime” employment for the greater loyalty and motivation it creates. As a result, by one estimate Japanese companies currently harbor a million hidden unemployed—meaning workers who add nothing to company output but nonetheless draw pay. Many of
those million workers are in Japan’s least-efficient sectors: banking, finance, and real estate. Some are in management jobs and are called madogiwa-zoku—those who stare out the window.

Our previous example of the U.S. production possibility schedule illustrates trade-offs. In order to gain more food, the United States must give up clothing and vice versa. This exists because resources are limited. Decisions need to be made for how these resources are allocated. If no trade-offs exist, then the United States is operating below the production possibilities curve, which is considered to be inefficient. As the United States maximizes its resources and produces on the production possibility curve, it then needs to decide how many of each good to produce.

**Economic Growth**

At any particular point in time, an economy cannot be outside its production possibilities curve. Over time, however, expanding output potential is possible for an economy. This occurs through economic growth, which refers to increased productive capabilities of an economy made possible by either an increasing resource base or technological advances.

We have to remember that the assumption in this model is that all factor resources and technologies are fixed. However, if there is a change in technology, then the production possibilities curve will shift. An improvement in technology will shift the production possibility curve to the right (as seen in the diagram). A recession, on the other hand, can shift the production possibility curve to the left. If the technology helps improve the production for, say, clothing, then the production possibilities curve will pivot to the right. Furthermore, if the technology is only for improving the production for food, then the production possibilities curve will pivot to the left.
Efficiency in Production

The fact that plants can operate below capacity suggests that it is not just labor resources that should be effectively used. All resources entering into production must be used effectively. For example, an engineering college graduate driving a taxicab may be inefficient because he is not fully utilizing all his resources and capacity. In this example, there is some form of underemployment of resources.

The task of creating trade-offs and managing them are related to the economic notion of efficiency. Each task involves a different concept of efficiency, focusing on a different sort of management skill. For economists, efficiency is the ratio of what an organization—which could be a group of workers, a production line, a factory, a company division, or a whole firm—actually produces, and what it could feasibly produce with its existing resources, knowledge, and ability.

One reason for inefficiency is when actual output may fall short of full potential output. One is simply waste; resources are wasted when more of something can be produced without making less of anything else. Economists sometimes call this technical inefficiency, or, more often, “X-inefficiency.” The late Harvard professor, Harvey Leibenstein, who coined the term “X-inefficiency,” wrote a classic article in 1966 in which he made a key observation: Many developing countries hired management consultants at high cost to help them perform better. Most of those consultants’ reports gathered dust in a drawer and their recommendations were never implemented. If even some of those reports could have improved performance, then that meant countries who failed to use them were not employing their resources as well as they could. He called this “X-inefficiency”—“X” for unknown, as in algebra—because it was not entirely clear what the precise sources of this type of waste were. A generation later, it is apparent that there are a great many causes of X-inefficiency, some of them related to shortcomings in decisions executives make (Maital, 1994).

Reference

Name ________________________________

**Definitions**

1. Production possibility curves

2. Opportunity cost

3. Trade-offs

4. Underemployment of resources

5. Efficiency

6. X-inefficiency

7. Scarcity

8. Maximize resources

9. Law of increasing opportunity cost

10. Concave from the origin
Multiple Choice

1. Which statement concerning opportunity costs is not true?
   a. Every decision involves opportunity costs.
   b. Opportunity costs are the highest-valued alternatives that must be foregone when a choice is made.
   c. The full cost of an item includes the opportunity costs.
   d. Opportunity costs always can be expressed in money.
   e. Economists refer to foregone opportunities and foregone benefits as opportunity costs.

2. The opportunity cost of studying for physics tonight at the library may include
   a. the good time you could be having by going out with your friends.
   b. time that you could be spending studying for your history class.
   c. lost sleep.
   d. time you could be spending listening to music or watching television.
   e. all of the choices are correct.

3. Because of scarcity,
   a. costs are incurred in making choices.
   b. we attempt to utilize our resources as efficiently as possible.
   c. we must make choices between production possibilities.
   d. we are unable to produce all we would like to produce.
   e. all of the choices are applicable.

4. If you have the choice of consuming either two apples, three oranges, or one candy bar, the opportunity cost of the candy bar is
   a. two apples.
   b. three oranges.
   c. two apples and three oranges.
   d. two apples or three oranges, whichever you prefer.
   e. the difference in the prices of the three options.

5. When an economy is operating on its own production possibilities curve, then more production of one good means less production of another because
   a. resources are limited.
   b. resources are not perfectly adaptable to alternative uses.
   c. wants are limited.
   d. wants are unlimited.
   e. some resources are not employed.

6. Which of the following would shift the production possibilities curve to the right?
   a. An increase in capital
   b. International trade
   c. A change in consumer tastes
   d. All of the above
   e. None of the above
7. When a country is on its PPF, (Production Possibility Frontier)
   a. its resources are fully employed.
   b. it is producing the most desirable combination of the two goods.
   c. it can still increase total production by greater efficiency.
   d. all of the above are true.

8. The production possibilities frontier
   a. represents the trade-offs between all possible goods a society can make.
   b. illustrates the law of increasing marginal returns.
   c. shows that society is limited only by the size of its imagination and spirit.
   d. is a graphical representation of opportunity cost for a society with only two goods.

9. An economy exhibits efficiency if
   a. it is operating on its PPF.
   b. it is producing all it can of one good and none of another.
   c. it is producing at the least possible cost.
   d. all of the above are correct.
   e. answers a and c only.

10. If the unemployment rate decreases from 10 to 8 percent, the economy will
    a. move closer to the PPF.
    b. move away from the PPF toward the origin.
    c. remain on the PPF.
    d. remain on the origin.
True/False

Directions: For the following statements, indicate whether the statement is true or false. If the statement is false, make the necessary change(s) in order for it to be a true statement.

1. A production possibility curve shows all possible combinations of goods that an economy can produce given (1) limited number of resources, (2) government intervention, and (3) competitive markets.

2. An opportunity cost is any choice or alternative given up for a different choice.

3. A production possibility curve illustrates an economy’s potential for allocating its limited resources to producing various combinations of goods.

4. A change in technology will cause a leftward shift of the production possibility curve for an economy.

5. Even when an economy is operating at 100 percent efficiency, there will be cases of underemployment.

6. As long as the economy is producing along or inside the production possibility curve, then each combination of goods and resources is being used efficiently.

7. Two reasons for inefficiency outlined in the chapter are underemployment and the concept of X-inefficiency.

8. A recession will have no effect on an economy’s production possibility curve since the curve is only analyzing two goods, and price is not involved.
Essay Questions

1. What is the difference between a shift in PPC and a pivot in PPC?

2. What is the implication of a production possibility curve that is a straight line and downward sloping?

3. Explain the meaning of why production possibility curves are concave from the point of origin.

4. How are inefficiency and efficiency illustrated with a production possibility curve?

5. Why are we concerned with unemployed or underemployed resources in a society?

6. The table below shows a production possibilities table for steel and automobiles.

<table>
<thead>
<tr>
<th>Production Alternative</th>
<th>Steel (tons)</th>
<th>Automobiles (by thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

a. Plot these production possibilities on a diagram. Upon what assumption is your production possibilities curve drawn?
b. What is the opportunity cost of the first ton of steel? Between which points is the
opportunity cost of a ton of steel the greatest?

c. Explain how this curve reflects the law of increasing opportunity costs.

d. Label a point G inside the curve. Why is this point inefficient? Label a point H outside the
curve. Why is this point unattainable? Why might the production possibilities curve shift
inward? Why might it shift outward?

7. The production possibilities model describes the limit of what a society can produce. Consider
the following possibilities, then plot, label, and connect the points to form a production
possibility frontier (PPF) in the figure:

<table>
<thead>
<tr>
<th>Production</th>
<th>Mangoes</th>
<th>Passion Fruit Possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>C</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>D</td>
<td>200</td>
<td>425</td>
</tr>
<tr>
<td>E</td>
<td>100</td>
<td>475</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>500</td>
</tr>
</tbody>
</table>

a. Draw a production possibility curve that represents the data above.

b. What shape does the production possibility curve have (linear, concave, or convex)?
c. Draw point (300, 300) on your graph. Label the point $G$ in the curve.

d. What can you say about this level of output (obtainable, efficient, or inefficient)?

e. What can you say about the use of resources (unobtainable, efficient, or inefficient)?

f. What is the opportunity cost for passion fruit (in terms of mangoes per passion fruit) for each of the following moves?
   i. 0 to 200?
   ii. 200 to 350?
   iii. 350 to 425?

g. What will happen to the production possibility curve if technology for producing mangoes increases?

8. Explain why the quote “there is no free lunch” illustrates the concept of opportunity cost.