Lesson-2

Scarcity, Choice and Efficiency

Slide 1

Production Possibilities Frontier

- Suppose there are only two goods...
  
  ... a production possibility frontier is a graph showing the various combinations of the output that can be produced when all resources are being utilized in the most (productively) efficient manner possible, given the current level of technology

Slide 2

Production Possibilities in a Two-Good Economy

- Consider an economy that produces computers and cars
- How can one illustrate the production possibilities for this economy using a graph?
Slide 3

**Attainable and Unattainable**

- All points on or inside the frontier are attainable
- Point A is attainable, so is point B. In fact B is better
- Point C is unattainable

![Diagram showing production possibilities frontier with points A, B, and C]

Slide 4

**Illustrating Concepts Using a Production Possibility Frontier**

- Scarcity
- Efficiency, Inefficiency and Unemployment
- Opportunity Cost
- Economic Growth

Slide 5

**Scarcity**

- All points on or inside the frontier are attainable
- Points A and B are attainable
- At point C, more cars and computers are being produced than at A or B
- But point C is unattainable, why?
- Scarcity
  - Production possibilities are bounded

![Diagram showing production possibilities frontier with points A, B, and C]
Slide 6

Efficiency, Inefficiency and Unemployment

- All points on the PPF are attainable if the society uses all of its resources in a productively efficient manner.
- But point A, which is not on the frontier, is also attainable.
- What is happening at A?
  - Waste
  - Unemployment
  - Inefficiency

Slide 7

Opportunity Cost

- Start at B1, 800 cars and 1500 computers.
- Suppose, you need to increase the number of computers to 2000.
- At point B1, you are producing
  - 800 cars
  - 1500 computers
- To increase computer production by 500, you will have to give up car production by 200.
- The negative slope of the PPF implies that whenever you increase production of one good, you will have to give up some of the other good.

Slide 8

Economic Growth-- Long Run

- Over time an economy can grow.
  - More labor and capital
  - Technological progress.
- What happens to the PPF?
  - Shifts outward
  - Previously unattainable levels of production...
  - ...now become attainable.
Economic Growth-- Short Run

- Consider an economy at point A
- Recession
- High unemployment
- Suppose the central bank cuts interest rates to bring the economy out of recession
- The economy moves to B
  - Unemployment falls, output increases
  - But production possibilities are unaffected

Why does the PPF bow outward?

- PPF does not necessarily have to be concave
- But it is reasonable assumption Why?
  - Because not all resources are equally suited at producing the same good
  - Computer manufacturers make poor car makers and vice-versa
  - Suppose, if more and more resources were diverted into the production of cars say, computer manufacturers would find themselves on the automobile assembly line but their productivity would be low

Illustrating the Point

- Suppose, one goes from A to B. production of cars is virtually unaffected but production of computers falls by 750
- Computer manufacturers are lousy at making computers
- Suppose, one goes from C to D. production of computers is virtually unaffected but production of cars falls by 250
- Car makers are lousy at making computers
- PPF is flat
### Slide 12

**Linear PPFs**

- The slope of the PPF measures the opportunity cost of producing good X (in this case cars) in terms of good Y (in this case computers).
- If the PPF is linear, the opportunity cost of producing X in terms of Y is constant at all levels of production.
- This is unrealistic but linear PPFs are easier to deal with.

![Linear PPFs Diagram](image)

### Slide 13

**Marginal Rate of Transformation**

- The slope of the PPF is sometimes called the marginal rate of transformation of good X (in this case cars) for good Y (in this case computers).
- For linear PPFs, the MRT<sub>XY</sub> is constant.
- For concave PPFs, the MRT<sub>XY</sub> (O/C of X in terms of Y) increases with X.

![Marginal Rate of Transformation Diagram](image)

### Slide 14

**Measuring the Opportunity Cost**

What is the opportunity cost of producing cars?
- Pick any two points on the PPF.
- As one move from A to B:
  - ΔY = -1800
  - ΔX = 600
- Slope = -1800 / 600 = -3
- O/C of 1 car is 3 computers.

![Measuring the Opportunity Cost Diagram](image)
Slide 15

True or False

- Because resources are scarce, society always faces tradeoffs, consequently the PPF should have a negative slope
- This question is tricky
- If a society faces tradeoffs, the PPF should have a negative slope (and vice-versa)
- But even if resources are scarce, a society needs not to face tradeoffs (see next slide)

Slide 16

Positively Sloped PPF

Consider an island economy, with limited land. The entire island is covered by a forest. The island produces two goods:
- Houses (made of wood)
- Farm land (clearing forests)
The only way to produce more houses is to clear more farmland and vice-versa. Hence, the PPF has a positive slope. But production possibilities are still bounded.

Slide 17

Summary

- A PPF shows all combinations of goods and services that can be produced given available resources and technology.
- The PPF is used to illustrate concepts such as scarcity and opportunity cost.
- The slope of the PPF measures the o/c of producing good X in terms of good Y.
- The curvature of the PPF reflects increasing opportunity cost when substituting one type of production for another.
Scarcity

Economics is the study of how economic agents or societies choose to use scarce productive resources that have alternatives to satisfy wants which are unlimited and of varying degrees of importance. The main concern of economics is the identification, description, explanation and solution (if possible) of an economic problem. The source of any economic problem is scarcity. Scarcity of resources forces the economic agents to choose among alternatives. Therefore, an economic problem can be said to be a problem of choice and valuation of alternatives. The problem of choice arises because limited resources with alternative uses are to be utilized to satisfy unlimited wants which are of varying degrees of importance. Had the resources like human, natural, capital, etc not been scarce, there would have been no problem of choice and hence no economic problem at all. Therefore, the root cause of all the economic problems is scarcity.

In other words, scarcity means wanting more than what is available. Scarcity limits us both as individuals and as a society. As an individual, limited income, time and ability keep one off from doing and having all that one might like. As a society, limited resources such as manpower, machinery and natural resources fix a maximum on the amount of goods and services that can be produced for you.

Scarcity is a central concept in economics. Resources scarcity is defined as a difference between the desire and the demand for a good. This means that the collective desire of individuals for goods and services exceeds the productive resources (natural, human and capital) available to satisfy those desires. It means that scarce is good if people would consume more of it if it were free. In other words, the things of value that people want are virtually unlimited while the productive resources necessary to produce these things are limited. Every society, rich or poor, should determine how to use the best of its scarce productive resources to produce goods and services. This is the basic economic problem.

Following could be a suggestive list of desired goods and limited resources:

<table>
<thead>
<tr>
<th>Economic goods (wants)</th>
<th>Limited resources (scarcity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Land</td>
</tr>
<tr>
<td>Clothing</td>
<td>Cotton &amp; other resources</td>
</tr>
<tr>
<td>National defense</td>
<td>Human resource</td>
</tr>
<tr>
<td>Education</td>
<td>No. of institutes, fee you can afford</td>
</tr>
</tbody>
</table>

Table 2.1

For example, you may want to own gold jewelery. However, the amount of gold available is limited, so it is necessary to make choices as to how it should be allocated. In a market economy, this is achieved by trade. Individuals trade resources between themselves to reallocate resources to where they are most wanted. In a smoothly operating market system, the rate of exchange between different resources, or price are adjusted accordingly so that the demand is equal to the supply. One of the roles of the economist is to discover the relationship between demand and supply and develop
mechanisms, such as pricing, incentives or penalties to achieve an optimal outcome in terms of consumer welfare between supply and demand.

Scarcity is a relative concept. It can be defined as an excess demand, i.e. demand more than the supply. For example, unemployment is essentially the scarcity of jobs. Inflation is essentially scarcity of goods.

**Choice**

Because goods and services are scarce, choices have to be made. Scarcity is universal. All individuals, households, business firms, communities and nations confront scarcity. The fundamental economic problem is the inappropriate use of the limited resources to produce the goods and services that are very valuable. Economics, therefore, can be defined as the study of the choices which people make in order to cope with scarcity. Economists study among other things that how societies perform the optimal allocation of these resources.

Scarcity requires choice. People should choose which of their desires they will satisfy and which they will leave unsatisfied. When a person, either an individual or as a society, choose more of something, scarcity forces him/her to take less of something else. Economics is sometimes called the study of scarcity because economic activity would not exist if scarcity did not force people to make choices.

The resources (also called inputs or factors of production) that can be used to produce goods and services are divided into four main categories which are as follows:

1. **Land**

   The gifts of nature such as air, water, land surface and minerals lie beneath the earth’s surface.

2. **Labor**

   It is the time and physical or mental effort devoted to producing goods and services.

3. **Capital**

   These are the goods made by people that are used to produce other goods and services (factories, tractors, buildings, power plants, hand or power tools, machinery, equipment, transportation networks, etc). Human capital is the knowledge and skill people possess from education and vocational training. You are building human capital right now as you work toward your degree.

4. **Entrepreneurial Ability**
It is the resource that organizes land, labor and capital. An entrepreneur is a person who sets up a firm by combining all the factors of production in order to produce a good or service. While labor receives wages or salaries for the work, an entrepreneur expects to receive profits for his/her efforts.

Concept of Cost

One should be careful about utilization of each and every unit of scarce resources. To decide whether to use an additional unit of resource, one needs to know the additional output expected therefrom. Economists use the term marginal for such additional magnitude of output. Therefore, marginal output of labor is the output produced by the last unit of labor. Marginal revenue is the additional revenue generated by an additional unit sold and marginal cost of production is the cost incurred for producing an additional unit of output. While using the marginal concept, one should be careful of the nature of relationship between the variables. In the above situation, labor, sales and output produced are independent variables and output, revenue and cost are dependent variables. In the same way, if sales depend on advertisement, you talk of “marginal sales of advertisement” but if the advertisement depends on the sales revenue, you talk of “marginal advertisement of sales.”

The concept of marginalize assumes that an independent variable changes by a single unit. In practice, an independent variable may be subjected to “chunk changes” rather than unit changes. A contractor working on a turnkey project may change the labor employed not by one, but by tens and hundreds. Similarly, the costs and benefits of computerization are not subject to marginal analysis. In such situations, the concept of incrementalism is more useful. In the above situations, we talk about incremental output of labor and incremental costs and benefits of computerization respectively. In fact, incrementalism is more general whereas marginalize is more specific. All marginal concepts are incremental concepts but all incremental concepts need not be confined to marginal concepts alone.

When there is scarcity and choice, there are costs. The cost of any choice is the option or options that a person gives up. For example, if you gave up the option of playing a computer game to read this text, the cost of reading this text is the enjoyment which you would have received playing the game. Most of the economics is based on a simple idea that people make choices by comparing the benefits of option A with the benefits of option B (and all other options that are available) and choosing the one with the highest benefit. Alternatively, one can view the cost of choosing option A as the sacrifice involved in rejecting option B. One chooses option A when the benefits of A outweigh the costs of choosing A which are the benefits one loses when one rejects option B.

The true cost of anything that is scarce is its opportunity cost, what is given up to get it. In other words, the opportunity cost of an action is the highest valued alternative forgone.
Scarcity and Choice for a Single Firm

The Production Possibilities Frontier (PPF) shows the different combinations of various goods that can be produced with the help of given available resources and existing technology. The PPF marks the boundary between combinations of goods and services that can be produced and combinations that cannot.

Different resources are not equally effective in producing different goods. Thus, along the PPF, producing more quantity of one good has increased opportunity costs. Most of the activities in the real world are subject to increase opportunity costs.

The opportunity cost of an action is the highest valued alternative forgone. On the PPF, the opportunity cost of producing more of one good (e.g., soybeans) is the output of the other good that needs to be forgone (e.g., wheat). The opportunity cost of a bushel of soybeans is the number of bushels of wheat that should be forgone per bushel of soybeans. Therefore, opportunity cost is a ratio. The opportunity cost of a bushel of wheat is the inverse of the opportunity cost of a bushel of soybeans. The following table shows the opportunity cost of producing wheat in the place of soybeans and vice-versa.

<table>
<thead>
<tr>
<th>Point</th>
<th>Soybeans</th>
<th>Wheat</th>
<th>Opportunity cost of Soybeans</th>
<th>Opportunity cost of Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>0</td>
<td>(38 - 0 / 40 - 30) = 38/10</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>38</td>
<td>(52 - 38 / 30 - 20) = 14/10</td>
<td>(40 - 30 / 38 - 0) = 10/38</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>52</td>
<td>(60 - 52 / 20 - 10) = 12/10</td>
<td>(30 - 20 / 52 - 38) = 10/14</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>60</td>
<td>(65 - 60 / 10 - 0) = 5/10</td>
<td>(20 - 10 / 60 - 52) = 10/12</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>65</td>
<td>-</td>
<td>(10 - 0 / 65 - 60) = 10/5</td>
</tr>
</tbody>
</table>

Table 2.2 Calculation of the opportunity cost

Scarcity and Choice for the Entire Society

Economic growth is the expansion in production. Two factors that cause economic growth are as follows:

- Technological progress is the development of new goods and services and better ways to produce goods and services
- Capital accumulation refers to the growth in a society’s capital resources

The greater the rate of capital accumulation and/or technological process, the more rapidly the PPF expands, i.e. the more rapid is economic growth. The economic growth is
costly. The opportunity cost is incurred because resources are devoted to manufacture capital goods and to develop new technologies rather than to produce goods for current consumption. Nations that incur the cost of devoting more of their resources to capital accumulation or technological change grow more rapidly than nations that choose not to pay the cost and thus, devote fewer resources to such purposes.

The success of an individual, a firm or the entire nation depends on the effective utilization of the resources.

The Concept of Efficiency

Efficiency is a relative term. It is never absolute. It is always relative to some criterion. This can be seen when one asks if farms are more efficient in the United States or China. The farming techniques in China are more efficient than those in the United States when measured in terms of output per unit of land, output per unit of fossil fuel, or output per unit of machinery. The farms in the United States are far more efficient in terms of output per man-hour. The statement that farms in one country are more efficient than farms in another makes no sense unless the criterion on which efficiency is measured is given. In other words, “efficiency is the relationship between what an organization or an economy produces and what it could feasibly produce.”

The criterion for economic efficiency is value. A change that increases value is an efficient change and any change that decreases value is an inefficient change. A situation that is economically efficient may be inefficient when judged on different criterion.

Value is subjective. A thing has value only if someone wants it. How can we know if value is maximized? If there is some change that makes someone feel better off, but making this change does not make anyone feel worse off, the original situation was not one of highest value. Improvement was possible. When the highest value is reached, any possible change that helps anyone harms someone else. This way of defining economic efficiency called “pareto optimality” or “pareto efficiency” is named after Vilfredo Pareto, an early mathematical economist.

Economists are interested in economic efficiency for two reasons, one positive and the other normative. The positive reason is based on the observation that people search for value. This search for value is vividly illustrated in the occupations of pimp, drug pusher, and hit man. Any occupation, no matter how immoral or risky, if gives enough money, it will attract people. On the theoretical level, this search for value is used in discussing utility maximization and profit maximization. The search for value is the driving force of market (and perhaps most non-market) economies. If there are situations in which there is unexploited value, i.e. the value that is possible but which no one obtains, an economist needs to explain why someone does not find a way to capture this value.

The normative reason stems from a desire to make policy recommendations. It is possible to discuss some aspects of policy without normative assumptions. An economist can predict, for example, whether a policy will or will not achieve the set goals. But
economists often want to do more. They often want to compare two policies or two situations and decide which is better. To decide which is better requires some sort of basis for ranking situations. Thus, if they want to ask whether government regulation of utility prices, a tariff on steel, or a program to train unskilled workers helps society, the economists need a criterion to base their answer. Economists generally use the criterion of economic efficiency to evaluate situations, though they often supplement it with other considerations because economic efficiency is not the only way to judge the relative merits of two situations.

The value maximized in the notion of economic efficiency reflects the goals which people have. The concept of economic efficiency treats all goals as equally valid. No goals are considered better than other goals with one exception and that is “envy.” Judging goals has been a central feature of the Judeo-Christian tradition. Generally, this tradition has condemned as immoral goal seeking that emphasizes the narrowest individualism such as hedonism. To be moral, people should take into consideration the well being of some others as a goal, including family members and others who are members of a community group.

Production efficiency means that more of one good cannot be produced without decreasing the production of another good. Production efficiency occurs only when production takes place on the frontier line. Because another good should be given up, there is a tradeoff. If you are at a point 1 on table 2.2, production is inefficient because there are unused or misallocated resources.

Resources are unused when they lie idle but could be working. For example, you can leave some of the land used for the cultivation of soybeans idle or some workers might be unemployed. Resources are misallocated when they are assigned to tasks for which they are not suitable. For example, you can assign land best suited to soybean cultivation to wheat cultivation, or assign skilled soybean workers to work in wheat cultivation. But you can get more soybeans and more wheat from the same inputs (i.e. land and/or labor), if you reassign them to tasks that closely match their skills.

If you produce at a point 2, 3 or 4, you can use your resources more efficiently to produce more soybeans and more wheat or more of both soybeans and wheat.

Any individual, organization or an economy should know the answer to the five big questions which are as follows:

**The Five Big Questions**

Every society needs to figure out what is referred in economics as the “how,” “what,” “when,” “where” and “for whom” to produce.

1. How to produce or how to utilize its resources efficiently-- It is the choice among different resource combinations and techniques used in the production of a good or service. A good or service can be produced with different resource combinations and
techniques. The problem is which of these to use. Since resources are limited, when a
greater quantity is used to produce a particular good or service, less quantity is available
for the production of another good or service. The problem facing society is choosing the
right resource combination and production techniques so that the cost in terms of the
resources used for each unit of the good or service it decides to produce will be minimal.
“How to produce?” Because the price of a resource reflects its relative scarcity. The best
way to produce goods or service is to ensure the least money cost of production. If the
price of a resource rises relative to the price of others used in the production of the
particular good or service, producers will switch to another production technique-- the
one that uses less of the more expensive resource. The opposite holds true when the price
of resource falls relative to the price of others.

2. What to produce or what combination of goods and services to produce-- Since
resources are scarce, no economy can produce much goods or service as desired by
everyone. More of a good or service means less of others. So, society should choose
which goods and services to produce and in what quantities. “What to produce” is the
price mechanism which ensures that only those goods and services for which consumers
are willing to pay a sufficiently high price to cover at least the full cost of production will
be supplied by producers. A higher price induces producers to increase the quantity
supplied of a good. Alternatively, a fall in price will induce producers to decrease the
quantity supplied of a good.

3. For whom to produce-- The economy will produce those goods and services that
satisfy the wants of those consumers who can afford them. The higher the income of
consumers, the more the economy will be geared to produce those goods and services
they want and are willing to pay for them. “How much of each good to distribute to each
person” is the problem of how to divide up what has been produced among the
consumers, i.e. how many of the consumers’ wants can be satisfied. Scarcity ensures that
society cannot satisfy the wants of all its members.

4. When to produce-- The economy will produce the goods and services when they are
needed most. This is done in order to earn the maximum profit.

5. Where to produce-- This relates to the decision regarding the place of production to
yield maximum profit. For example, if you produce nearer to the raw material, the cost of
inputs will be less. If you produce nearer to the market, the cost of transportation of
output will be less.

All individuals, organizations and nations can produce all the goods and services required
by them but the point is who can produce it with minimum inputs and maximum outputs.
This is where the specialization starts.

**Specialization and Comparative Advantage**

People, businesses and nations can produce for themselves all the goods and services they
consume, or they can concentrate on producing one good or service (or, possibly, a few
goods or services) and then trade with others, i.e. exchange some of their own goods or services for those of others. Specialization is the concentration on the production of only one good or service, or a few goods or services.

The principle of comparative advantage states that each nation (or individual) should specialize in the production of the goods or services in which they are more efficient (or less inefficient). An individual or a nation has a comparative advantage in producing something if he can produce it at a lower opportunity cost than anyone else. This stems from the fact that people’s abilities differ and, as a result, different people have different opportunity costs of producing a particular good or service.

It should be noted that it is not possible for anyone to have a comparative advantage in everything. Thus, gains from specialization and trade are always available when opportunity costs are different. Specialization requires a system of exchange to enjoy the fruits of comparative advantage. A voluntary exchange should yield mutual gains, i.e. to make both parties better off. This concept of exchange is the mother of markets.

**Markets, Prices and the Coordination Tasks**

Markets bring together buyers and sellers of goods and services. A market is any arrangement that enables buyers and sellers to get information and to do business with each other. Prices of goods and of resources, such as labor, machinery and land, adjust to ensure that scarce resources are used to produce those goods and services that society demands.

A large part of economics is devoted to the study of how markets and prices enable society to solve the problems of how, what, when, where and for whom to produce, and this is the coordinate task to find the optimum mix of the following:

1. What?
2. When?
3. Where?
4. How?
5. For whom?

The widespread use of definitions emphasizing on choice and scarcity shows that the economists believe that these definitions focus on a central and basic part of the subject. The emphasis on choice represents a relatively recent insight into what economics is all about. The notion of choice is not stressed in older definitions of economics. Sometimes, this insight yields rather clever definitions. According to James Buchanan, “An economist is one who disagrees with the statement that whatever is worth doing is worth doing well.” Buchanan noticed that time is scarce because it is limited and there are many things one can do with one’s time. If one wants to do all things well, one should devote considerable time to each and thus, should sacrifice other things. Sometimes, it is wise to choose to do something quickly so that one has more time for other things.
**Introduction to Production Possibility Frontiers**

Scarcity necessitates choice. More of one thing means less of something else. The opportunity cost of using scarce resources for one thing instead of something else is often represented in a graphical form as a “production possibility frontier.” The opportunity cost of producing (or consuming) one good is how much of the alternative good needs to be sacrificed. Similarly, the per-unit opportunity cost tells us how much of a good is sacrificed in order to gain one additional unit of an alternative good.

In other words, if a firm can produce two or more outputs or can produce output in two or more periods, a production possibility frontier can describe the possible combinations of output that can be attained for a given set of inputs.

If a firm can produce two or more outputs or can produce output in two or more periods, a production possibility frontier can describe the possible combinations of output that can be attained for a given set of inputs.

The Production Possibility Frontier (PPF) is a graphical representation which depicts all the maximum output possibilities of two or more goods given a set of inputs (resources, labor, etc). The PPF assumes that all inputs are used efficiently. It is normally drawn as concave to the origin because the extra output resulting from allocating more resources to one particular good may fall. This is known as the law of diminishing returns. It can occur because factor resources are not perfectly mobile between different uses. For example, re-allocating capital and labor resources from one industry to another may require re-training, added to a cost in terms of time and also the financial cost of moving resources to their new use. This cost is called opportunity cost. The formula for calculating Per Unit Opportunity Cost (PUOC) is as follows:

\[
\text{Per-Unit Opportunity Cost} = \frac{\text{Number of Goods Given Up}}{\text{Units of Good Given Up}} \times \frac{\text{Units of Good Given Up}}{\text{Number of Goods Gained}}
\]

Consider the following hypothetical PPF:

<table>
<thead>
<tr>
<th>Production Point</th>
<th>Good X</th>
<th>Good Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

Using the above formula, the PUOC as we move from point A to point B is as follows:

\[
\text{PUOC} = \frac{\text{Number of Units of Good Y Given Up}}{\text{Units of Good Y Given Up}} \div \frac{\text{Units of Good Y Given Up}}{\text{Number of Units of Good X Gained}} = \frac{\frac{3}{2}}{1.5} = 1.5
\]

Scarcity is the basis of many economic concepts because it constrains or limits the behavior. Let us explore the notion of constrained behavior by starting with the simplest sort of economic structure. Suppose you are alone on an island.
Now, each day you have enough time to produce 15 thousand bottles of wine or 15 thousand bushes of grain. Notice that you cannot have both, i.e. wine and grain. If you use your time to produce wine, you do not have that time to produce grain. If you want both wine and grain, you can devote some time to both. If, for example, you spend half of the day producing wine and the other half for producing grain, you can have 7500 bottles of wine and 7500 bushes of grain.

<table>
<thead>
<tr>
<th>Wine (thousands of bottles)</th>
<th>Grain (thousands of bushels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2.3 Production possibility table

A list of all the possible combinations of wine and grain open to you makes up your production possibilities. The production possibility frontier separates outcomes that are possible for an individual (or a group) to produce from those which cannot be produced. Because you cannot exchange, your production-possibilities frontier is also your consumption-possibilities frontier. The consumption-possibilities frontier (sometimes called the budget constraint) is the line indicating which outcomes are affordable and which are not. Figure 2.1 illustrates the production-possibilities frontier and consumption-possibilities frontier. The information in the table 2.3 is exactly the same as the information in the figure 2.1. These are two different ways of presenting that information.

![Figure 2.1 Production possibility frontier](image)

Figure 2.1 Production possibility frontier

The slope of the frontier in the figure 2.1 measures the costs you are facing. In order to get extra wine, you will have to sacrifice some grain and vice-versa. Notice that there is
no money involved. Cost does not depend on money but rather exists whenever there is scarcity and choice. In economics, the cost of anything refers to whatever is given up in order to get that thing. The cost of going to college, for example, includes not only the money a person spends on tuition (which could be spent on something else) but also includes the time spent in studying and going to classes. The value of this time can be estimated by computing the amount of income a person could earn if he did not go to college.

An example of a conventional PPF in the figure 2.1 shows the potential output of wine and grains from a given stock of labor and capital. Combinations of the two goods that lie within the PPF are feasible but point ‘a’ show an output that under-utilizes existing resources or where resources are being used inefficiently. Combinations of the two goods that lie on the PPF are feasible and can be produced by using all the available factor inputs efficiently. In the figure 2.1, the combination of output shown by point ‘b’ is unattainable as per the given current resources and the productivity of the available factor inputs.

The PPF shows all efficient combinations of output for this island economy when the factors of production are used at their full potential. The economy could choose to operate at less than the capacity somewhere inside the curve, e.g. at point a. But such a combination of goods would be less than what the economy is capable of producing. A combination outside the curve, such as point “b,” is not possible since the output level would exceed the capacity of the economy. The shape of this production possibility frontier illustrates the principle of increasing cost. As more of one product is produced, increasingly larger amounts of the other products should be given up. In this example, some factors of production are suited to produce both wine and grain but as the production of one of these commodities increases, resources better suited to the production of the other should be diverted. Experienced wine producers are not necessarily efficient grain producers and grain producers are not necessarily efficient wine producers, so the opportunity cost increases as one moves toward either extreme on the curve of production possibilities.

If you look at the table 2.3, you will see the importance of scarcity. You can think of the production-possibilities frontier as the way economists visualize scarcity. Which of the options will you choose? The favorite assumption of economists is that the individuals base their actions on the costs and benefits that they see. Benefits depend on the goals you have and the production-possibilities frontier has no information about them.

**Shift in the PPF**

The production possibility frontier will shift when:

a. There are improvements in productivity and efficiency (perhaps because of the introduction of new technology or advances in the techniques of production).
b. More factor resources are exploited (perhaps due to an increase in the available workforce or a rise in the amount of capital equipment available for businesses to use).

In the example illustrated in figure 2.2, one can see the effects of a change in the state of technology that allowed the wine producers to double their output for a given level of resources. Further, suppose that this technique could not be applied to grain production, i.e. resources allocated to grains are same as above. The real cost of wine will fall as there has been a change in the opportunity cost. The impact on the production possibilities is shown in the following diagram:

![Figure 2.2 Shifted production possibility frontier](image)

In the above diagram, the new technique results in wine production that is double of its previous level for any level of grain production. Finally, if the two products are very similar to one another, the production possibility frontier may be shaped more like a straight line. Consider the situation in which only wine is produced. Let us assume that two brands of wine are produced, brand A and brand B. These two brands use the same grapes and production process and differ only in the name on the label. The same factors of production can produce either product (brand) equally efficiently. Then, the production possibility frontier would appear as follows:
It should be noted that to increase production of brand A from 0 to 3000 bottles, the production of brand B has to be decreased by 3000 bottles. This opportunity cost remains the same even at the other extreme where increasing the production of brand A from 12,000 to 15,000 bottles still requires brand B to be decreased by 3000 bottles. Because the two products are almost identical in this case and can be produced equally efficiently by using the same resources, the opportunity cost of producing one over the other remains constant between the two extremes of production possibilities.

The PPF and Economic Efficiency

An efficient production point represents the maximum combination of outputs given resources and technology. The PPF is a useful way of illustrating this idea. The economy efficiency can be classified as follows:

i) Allocative Efficiency

An economy achieves allocative efficiency if it manages to produce a combination of goods and services that people actually want. It is a condition achieved when resources are allocated in a way that allows the maximum possible net benefit from their use. When an efficient allocation of the resources has been attained, it is impossible to increase the well being of anyone person without harming another person. For allocative efficiency to be achieved, one needs to be on the PPF. This is because it is possible to raise output of both goods and improve total economic welfare at points which lie within the frontier. The definition of pareto efficiency is an allocation of output where it is impossible to make one group of consumers better off without making another group at least as worse off.

ii) Productive Efficiency

Productive efficiency is defined as the absence of waste in the production process. It is a condition where any given level of output is produced at minimum cost. When the
production of two goods lies on the frontier or anywhere on the frontier, it is deemed to be efficient production and production inside frontier is inefficient. Productive efficiency requires minimizing the opportunity cost for a given value of output. When there is an outward shift of the PPF perhaps due to improvements in productivity or advances in the state of technology, the opportunity cost of production falls and society becomes more able to produce more from given resources.

**iii) Distributive Efficiency**

Distributive efficiency requires people who value relatively the most (a ratio) of the goods which the society produces to consume them relatively more. For example, if you prefer apples to peanuts while someone else likes peanuts better than apples, your apple-to-peanut consumption ratio should be greater than him/her. Distributive efficiency in financial markets requires asset portfolios to reflect savers’ relative time horizons and willingness to bear risk, and debt structures to reflect the sources and terms of funding relatively best suited to the needs of economic investors, government agencies, or deficit households. When an economy achieves economic growth leading to an outward shift in the PPF, economists have concerns over the distribution of gains in output and whether or not an improvement in average living standards has benefited the majority of consumers or whether there has been an increase in inequality and relative poverty.

**Comparative Advantage**

Comparative advantage addresses a situation where two individuals or (in this case) countries are able to benefit from specialization and trade. Given below is an example involving two countries, country A and country X, where each country (first) attempts to meet domestic demand by producing only what is needed and then another country (second) follows the “Law of Comparative Advantage.”

Country A produces compact cars and luxury cars and is able to achieve the following production possibilities:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
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<tbody>
<tr>
<td>Compact cars</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Luxury cars</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2.4 Ten different production/consumption choices (written as column/choice A through column/choice J)

To meet domestic demand, country A needs to produce at point E (i.e. column E). Moving from point E to point D, country A would have to give up producing two compact cars in order to produce one more luxury car. Because this country is fully
employed, the only way to get more luxury cars is by taking workers out of compact car production and putting them into luxury car production. Doing this between points D and E causes two less compacts to be built. Therefore, the opportunity cost of that additional luxury car is two compact cars.

Moving from point E to point F, country A needs to give up producing one luxury car in order to produce two more compact cars. Therefore, the opportunity cost of each (1) additional compact car is ½ of a luxury car.

If one considers any other pair of points, one will find that the opportunity is always the same (for each good), no matter where one starts. This implies constant opportunity costs and tells that the PPC here is a straight line.

Country X produces compacts and luxury cars as well. Their PPC relationship is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Q</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact cars</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Luxury cars</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2.5

To meet domestic demand in country X, it is necessary to produce at point W. If one had to illustrate country A and X’s production possibilities on a graph, one would get the following:

Calculating the opportunity cost here, we get:

- Opportunity cost of each (1) additional compact car = 2 luxury cars
- Opportunity cost of each (1) additional luxury car = 1/2 of a compact car
Compare the opportunity costs between countries.

For luxury cars:

(A) Opportunity cost of each 1 luxury car = 2 compact cars
(X) Opportunity cost of each 1 luxury car = 1/2 of a compact car

For compact cars:

(A) Opportunity cost of each 1 compact car = 1/2 of a luxury car
(X) Opportunity cost of each 1 compact car = 2 luxury cars

Country X gives up fewer compact cars when producing an additional luxury car while country A gives up fewer luxury cars when producing an additional compact car. Therefore, the opportunity cost of producing compact cars is lowest in country X and the opportunity cost of producing luxury cars is lowest in country A.

When country A has a lower opportunity cost associated with producing something, A is said to have a comparative advantage in producing that item. Therefore, A has a comparative advantage in producing compacts while X has a comparative advantage in producing luxury cars.

The Law of Comparative Advantage says, “By specializing in the production of a good where a first country has a comparative advantage, the first country can trade with another country (who specializes in something that the first country doesn't have a comparative advantage in) and become better off.”

Suppose countries A and X specialize in where they have comparative advantage. Country A switches from point E to point J while X switches from point W to point Q.

<table>
<thead>
<tr>
<th>Country A</th>
<th>Domestic Demand</th>
<th>Specialize</th>
<th>Country X</th>
<th>Domestic Demand</th>
<th>Specialize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacts</td>
<td>8</td>
<td>18</td>
<td>Compacts</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Luxury cars</td>
<td>5</td>
<td>0</td>
<td>Luxury cars</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>

Table 2.6

Country A now has 10 more compact cars than needed domestically whereas X has 12 more luxury cars than needed domestically. Assume that these countries are willing to trade on a one-for-one basis. Under that, A sends nine compact cars to X in exchange for nine luxury cars as follows:
<table>
<thead>
<tr>
<th>Country A</th>
<th>Before Trade</th>
<th>After Trade</th>
<th>Country X</th>
<th>Before Trade</th>
<th>After Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacts</td>
<td>8</td>
<td>9</td>
<td>Compacts</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Luxury cars</td>
<td>5</td>
<td>9</td>
<td>Luxury cars</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 2.7

Both of the countries got benefit from specialization and trade as they had more of each goods after trade. By specializing and trading, these countries could “consume” compact cars and luxury cars in amounts that would not be possible if these countries tried to meet domestic demand alone. These countries are able to consume outside their PPC even though they cannot produce outside of it. This is illustrated in the figure 2.4.

Figure 2.4

Country A’s PPC and Country X’s PPC are combined on the same graph. Consumption occurs at point M, a point that lies along the (green) dotted consumption-possibilities line. Point M exists outside of each country’s ability to produce. But according to the Law of Comparative Advantage, point M does not exist outside of each country’s ability to consume.

Definitions

1. **Opportunity Cost**

   The opportunity cost of any good or activity is the value of the next best alternative foregone and is also known as alternative costs or economic cost. Opportunity costs include both implicit costs and explicit costs. The idea behind this is that anything which one has to give up in order to carry out a particular decision is a cost of that decision. This concept is applied again and again throughout modern economics.

2. **Scarcity**
According to modern economics, scarcity exists whenever there is an opportunity cost, i.e. wherever a meaningful choice has to be made. Scarcity occurs because resources are limited and cannot accommodate all of our unlimited wants.

3. Production Possibility Frontier

The production possibility frontier is the diagrammatic representation of scarcity in production. A production possibility frontier (PPF) is a curve showing the various combinations of goods that an economy could produce, assuming a fixed technology and full employment and efficient resource utilization. The production possibilities frontier is sometimes referred to as the production possibilities curve.

4. Comparative Advantage

It is a very important principle in itself. The law of comparative advantage is an assertion that mutually beneficial trade can always take place between two countries (or individuals) whose pre-trade cost and price structures differ. This law was first elaborated by David Ricardo [1772-1823].

5. Discounting of Investment Returns

It is another application of the opportunity cost principle that is very important in itself. It tells how to handle opportunities that come at different times.