UNIT -1

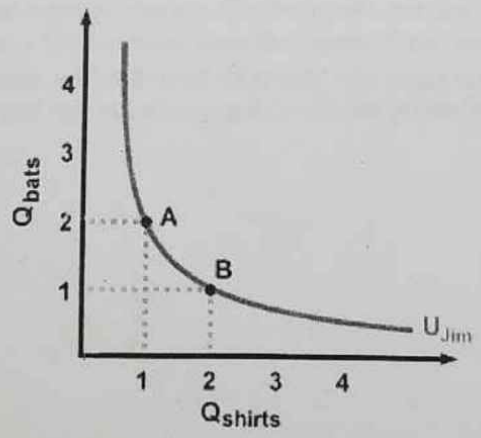
Engineering Economy and Management **highlights the importance of economics and management in engineering and helps engineers in managerial decision making**. It provides comprehensive coverage of the subject from basic principles to state-of-the-art concepts and applications.

Demand and Utility:

People demand goods because they satisfy the wants of the people. The utility means the amount of satisfaction which an individual derives from consuming a commodity. It is also defined as want-satisfying power of a commodity. Utility of a good is the important determinant of demand of a consumer for the good.

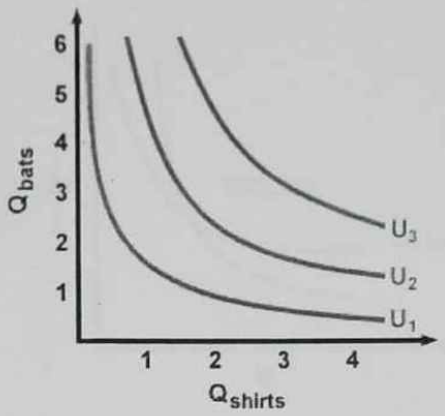
Utility and Indifference Curves

We know how to represent changes in demand as price or income changes on a graph, but how can we show preferences? What makes buyers happy and how can we measure that happiness? Economists use the term utility when referring to the level of happiness or satisfaction that someone experiences from buying (or selling) goods and services: the more utility, the happier the person. Utility is typically represented on a graph in an indifference curve. An indifference curve represents all of the different combinations of two goods that generate the same level of utility. What this means is that each point on an indifference curve represents a combination of goods. All points on one indifference curve give the person the exact same amount of happiness. For instance, if you give Jim a choice between points A and B on this indifference curve, he won't really mind either way, he is indifferent. One shirt and two hats makes him just as happy as two shirts and one hat, which is why both points are on the same indifference curve.



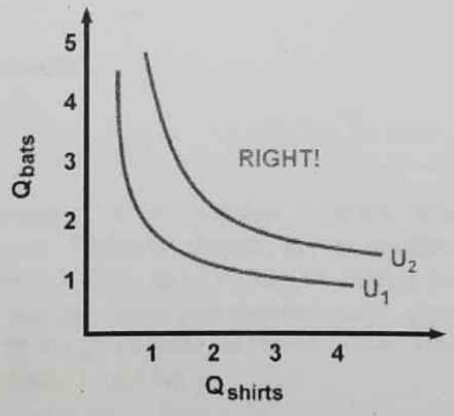
One Of Jim's Indifference Curves For Shirts And Hats

In general, indifference curves bow in towards the origin, rather than being straight lines or outward-bulging curves. The reason for this is that most people do not like extremes: they would rather have a some shirts and some hats than many hats and no shirts. This changing preference results in the traditional inward-curving indifference curves, and illustrates the effects of diminishing returns. In this example, diminishing returns simply means that the first hat Jim gets makes him happier than the second hat, which makes him happier than the third, and so on. His marginal utility--the extra utility he gets with each hat--decreases with the number of hats he gets. After a while, he has had enough of hats, the extra ones don't make him much happier, and he'd rather get a shirt, and might even trade several hats for one shirt. Generally, at the extremes, people are willing to give up many hats to get a few shirts; as the numbers even out, this swapping ratio decreases, and then when they start moving to the other extreme, they want a lot of shirts in exchange for any hats they might give up. Another example that illustrates the principle of diminishing returns would be the case in which you give Thom a choice between gold and steak. We all know that a bar of gold is worth more than a steak, so only a fool would choose the steak over the gold, right? Thom knows this. If you ask Thom to choose between a bar of gold and a steak, he will probably choose the gold, and be very excited to have a bar of gold. The marginal utility of that first bar of gold is quite high. An hour later, he will choose another bar of gold, and he will still be happy to get another bar of gold; the marginal utility he gets from the second bar of gold might not be quite as high as the marginal utility from the first bar, but it's still higher than the marginal utility he would get from a steak. This will continue, bar after bar, with the added utility of each bar of gold being a little lower than the last. Eventually, Thom will start to get hungry, and if he gets hungry enough, then he will choose the steak over the gold, as the marginal utility from the steak will be higher than the marginal utility from a bar of gold. Thom still knows the relative values of gold and steak, and he knows that he is choosing something that is worth less, but in his situation, he has so much gold that more gold makes very little difference, but a steak can make a large difference, as he is very hungry. Different indifference curves represent different levels of utility, and in general, more is better: the more goods you have, the happier you are. On the graph, we see this preference for more as an indifference curve that is further away from the origin. Thus, because curve 2 is further out than curve 1, and represents a higher level of utility, any point on curve 2 will be preferable to any point on curve 1, and any point on curve 3 will be preferable to any point on curves 1 or 2.

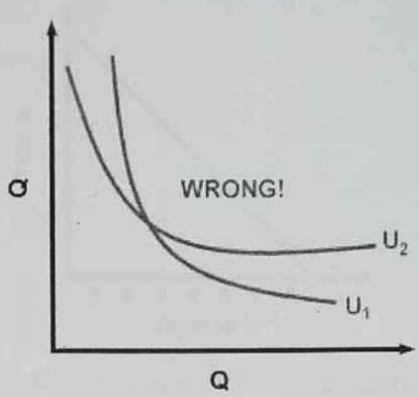


Indifference Curves

A few more important observations about one person's indifference curves: they can never cross. Why is this true? Think about it this way: if curve 2 is supposed to make you happier than curve 1, but curve two crosses curve 1, then that means that at the point of intersection, you are experiencing two different levels of utility, that is, you are both happy and happier at the same time, which makes no sense. Thus, indifference curves never intersect, but move further away from the origin with increased levels of utility.



A Correct Set Of Indifference Curves



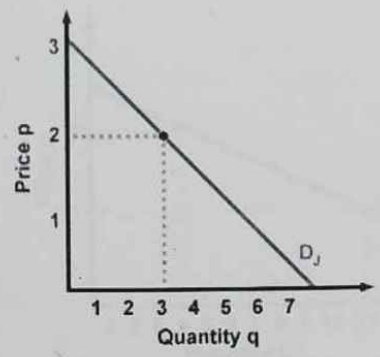
An Incorrect Set Of Indifference Curves

The indifference curves we have been considering are for normal goods. How can we tell? Because more of either good increases utility. Starting on curve 1 and moving outwards (increasing the number of hats) or upwards (increasing the number of shirts) lands us on curve 2, representing a higher level of utility. Using different types of goods changes what indifference curves look like.

Approach to analysis of demand-

The Graphical Approach-

Economists graphically represent the relationship between product price and quantity demanded with a demand curve. Typically, demand curves are downwards sloping, because as price increases, buyers are less likely to be willing or able to purchase whatever is being sold. Each individual buyer can have their own demand curve, showing how many products they are willing to purchase at any given price, as shown below. This graph shows what Jim's demand curve for graham crackers might be:

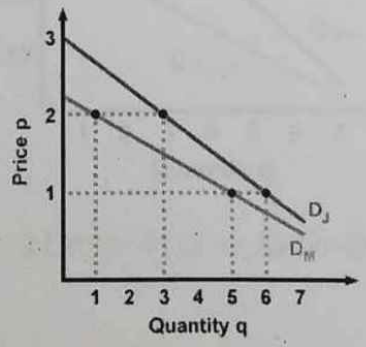


Jim's Demand Curve for Graham Crackers

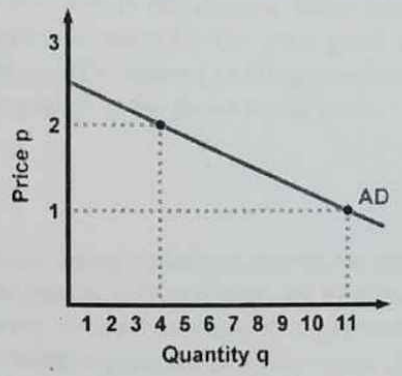
To find out how many boxes of graham crackers Jim will buy for a given price, extend a perpendicular line from the price on the y-axis to his demand curve. At the point of intersection, extend a line from the demand curve to the x-axis (perpendicular to the x-axis). Where it intersects the x-axis (quantity) is how many boxes of graham crackers Jim will buy. For instance, in the graph above, Jim will buy 3 boxes when the price is $2 a box.

Aggregate Demand and Horizontal Addition

Typically, economists don't look at individual demand curves, which can vary from person to person. Instead, they look at aggregate demand, the combined quantities demanded of all potential buyers. To do this, add the quantities which buyers are willing to buy at different prices. For instance, if Jim and Marvin are the only two buyers in the market for graham crackers, we would add how many they are willing to buy at price p=1 and record that as aggregate demand for p=1. Then we would add how many they are willing to buy at price p=2 and record that as aggregate demand for p=2, and so on. This results in the following graph of aggregate demand for graham crackers:

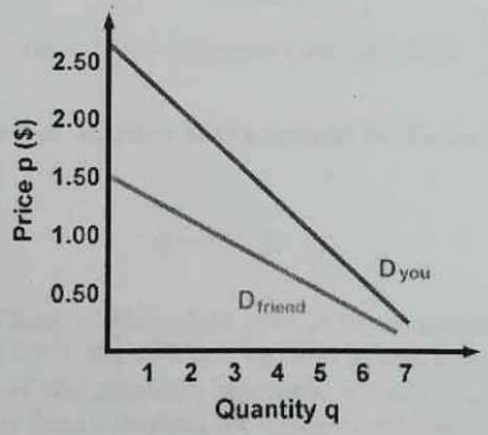


Jim and Marvin's Demand Curves for Graham Crackers



Aggregate Demand Curve for Graham Crackers

This method is called horizontal addition because you look at a price level, and add the separate quantities demanded across that price level, giving you total quantity demanded for that price. There are many factors that can affect demand quantity, including income, prices, and preferences. Let's look at one good to see how this works. How much are you willing to pay for a cold soda? If you recently got a raise at your job, you might not mind buying a pricier soda, even if you don't need it. Your friend who has less money, however, might pick a generic brand, or they might stick with tap water. Below are possible demand curves for you (with your big raise) and your friend (without your big raise). Note that you are willing to buy more soda than your friend is:



2 Demand Curves for Soda

What if soda cost a dollar yesterday and costs two dollars today? That might make you think twice about getting the same soda you drank yesterday. Likewise, if it cost two dollars yesterday and a dollar today, you might be more willing to buy the soda than usual. We can see this on the graph on a single demand curve. When the price is a dollar, the quantity

demanded is higher than when the price is two dollars. What this means in the real world is that if two companies charge different prices for the same good, the company that charges a lower price will get more customers. (Exceptions to this general rule may occur when there is a real or perceived difference in quality of the goods being sold).

The Algebraic Approach

It is also possible to model demand using equations, known as demand equations or demand functions. While these equations can be very complex, for now we will use simple algebraic equations. We have been showing demand as straight, downward-sloping lines, which can easily be translated into mathematical equations, and vice versa. Just as the graphs provide a visual guide to consumer behavior, demand functions provide a numerical guide to consumer behavior. For example, if Sean's demand curve for T-shirts looks like this:

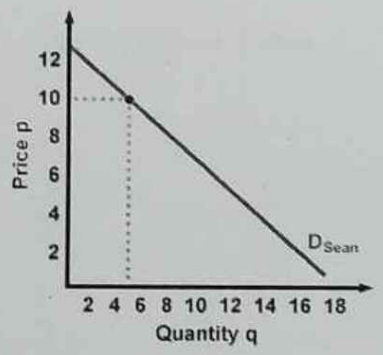


Figure 8. Sean's Demand Curve for T-Shirts

The corresponding equation that describes Sean's demand for T-shirts is simply the equation for the line on the graph, or:

$$Q = 25 - 2P$$

If we want to see how much Sean will buy if the price is 10, we plug 10 in for P and solve for Q. In this case, [25 - 2(10)] = 5 T-shirts. When we want to find aggregate demand using the algebraic approach instead of the graphical approach, we just add the demand equations together. So, if we're adding Sean's demand for T-shirts to Noah's demand for T-shirts, it looks like this

$$\begin{array}{rl} & Q = 25 - 2P \\ +) & Q = 40 - 3P \\ \hline & Q^* = 65 - 5P \end{array}$$

Figure %: Aggregate Demand

If price for T-shirts is still equal to 10, we find out that together, Sean and Noah will buy

[65 - 5(10)] = 15 T-shirts.

One Caveat in this method is that you can only add the equations together when both will result in positive demand. For example, if the price of a T-shirt is $13, Sean would supposedly want to buy [25 - 2(13)] = -1 T-shirts. Obviously that is impossible, and Sean will buy 0 T-shirts. But because Sean's demand equation would yield the answer –1, adding the demand equations together would result in a wrong answer. When using this method, always check to make sure that there will be no negative demand for the given price before adding equations together. To find how many T-shirts Sean and Noah would buy in this case, you would only look at Noah's demand,

[40 - 3(13)] = 1 T-shirt.

Measure of demand elasticity-
Method # 1. Price Elasticity of Demand:

Price elasticity of demand is a measure of the responsiveness of demand to changes in the commodity's own price. It is the ratio of the relative change in a dependent variable (quantity demanded) to the relative change in an independent variable (Price). In other words, price elasticity is the ratio of a relative change in quantity demanded to a relative change in price. Let 'e' stand for elasticity.

Then:

$$e_p = \frac{\text{Relative change in quantity demanded}}{\text{Relative change in price}} \qquad ...(1.1)$$

Also, elasticity is the percentage change in quantity demanded divided by the percentage in price.

Symbolically, we may rewrite the formula:

$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \qquad ...(1.2)$$

If percentages are known, the numerical value of elasticity can be calculated. The coefficient of elasticity of demand is a pure number i.e. it stands by itself, being independent of units of measurement. The coefficient of price elasticity of demand can be calculated with the help of the following formula.

$$e_p = \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P} \qquad ...(1.3)$$

Where,

Q is quantity, P is price, $\Delta Q/Q$ relative change in the quantity demanded and $\Delta P/P$ Relative change in price.

It should be noted that a minus sign (-) is generally inserted in the formula before the fraction with a view to making the coefficient of elasticity a non-negative value.

The price elasticity can be measured between two finite points on a demand curve (called arc elasticity) or on a point (called point elasticity).

Arc Elasticity:

Any two points on a demand curve make an arc. In the words of Baumol, "Arc elasticity is a measure of the average responsiveness to price changes exhibited by a demand curve over

some finite stretch of the curve". The measure of elasticity of demand between any two finite points on a demand curve is known as arc elasticity.

The elasticity coefficient can be calculated with the help of the following formula:

$$e_p = \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P} \qquad ...(1.4)$$

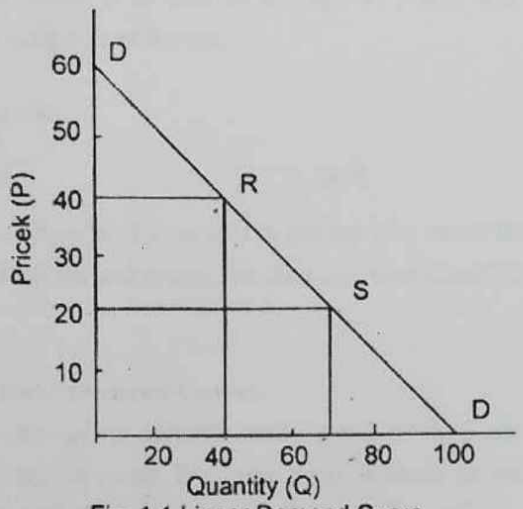


Fig. 1.1 Linear Demand Curve

For example, in Fig. 1.1 two finite points R and S are taken to measure the arc elasticity. First we move to measure elasticity for a fall in the price of the commodity from Rs. 40 to 20. ΔP is $40 - 20 = 20$. This decrease in price causes an increase in demand from 40 units to 70 so that ΔQ is $40 - 70 = -30$.

These values can be put in the formula so that:

$$e_p = \frac{-30}{20} \cdot \frac{20}{20} = -1.5 \qquad ...(1.5)$$

This implies that a one percent fall in price of commodity X causes a 1.5 per cent increase in demand for it.

In the measurement, interpretation and use of arc elasticity, the business executives need take adequate care as the elasticity coefficient may differ depending upon the direction of movement. In this case we have measured the elasticity coefficient while moving down from point R to S.

The coefficient will be different while moving upward from point S to R (increase in price from Rs. 20 to 40 and quantity demanded is reduced from 70 to 40 units giving an elasticity

coefficient of – 0.42 implying that one per cent increase in price will reduce the quantity by 0.42 percent. Thus the elasticity depends on the direction of change in price. Therefore, measuring elasticity through arc method, the direction of price change should be kept in mind.

The way out of this difficulty is to take an average of prices and quantities and thus to measure elasticity at the midpoint of the arc.

The formula then becomes:

$$\frac{1}{2}\frac{\Delta Q}{(Q_1+Q_2)^{1/2}} / \frac{\Delta P}{(P_1+P_2)} \qquad ...(1.6)$$

Although the ½ cancels out in the formula, it is put there to stress the fact that by using the average values of the quantities and prices, the elasticity coefficient is the same whether price goes up or goes down.

Point Elasticity on a Linear Demand Curve:

Point elasticity is the ratio of an infinitesimally small relative change in quantity to an infinitesimally small change in price. If a price range is made as small as possible, that is, shrunk to a point- then the relative changes must be made as small as possible- infinitesimally small.

Point elasticity is the ratio of an infinitesimally small relative change in quantity to an infinitesimally small change in price. Point elasticity of demand is defined as the - proportionate change in the quantity demanded resulting from a very small proportionate change in price. Fig. 1.2 shows how to find the elasticity at a point on a demand curve.

Let us take a point such as R on the demand curve DD. For measuring elasticity at a point the following formula may be used.

$$e_p = \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P} \qquad ...(1.7)$$

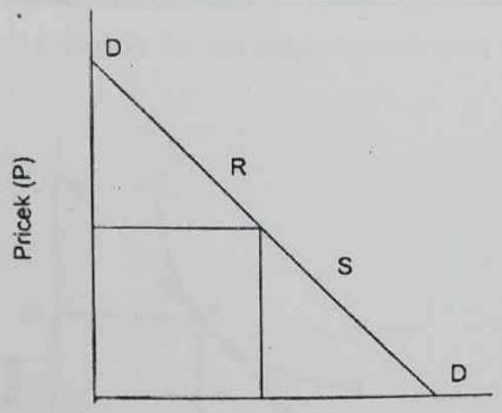


Fig. 1.2 Linear Demand Curve

Point elasticity is the product of price-quantity ratio (P/Q) at a particular point (R) on the demand curve (DD) and the reciprocal of the slope of the demand line. The slope of the demand slope is defined by RQ/QD. The reciprocal of the slope of the demand line is QD/RQ.

$$e_p = \frac{\partial Q}{\partial P} = \frac{QD}{RQ} \qquad \ldots(1.8)$$

At point R, price P = RQ and Q = OQ

If we substitute these values in equation 1.8, what we get is

$$e_p = \frac{RQ}{OQ} \cdot \frac{QD}{RQ} = \frac{QD}{OQ} \qquad \ldots(1.9)$$

If the numerical values for QD and OQ are available, elasticity at point R can be calculated.

Price Elasticity at Different Points on a Non-Linear Demand Curve:

The method used to measure point elasticity on a linear demand curve cannot be applied straightway to measure point elasticity on a non-linear demand curve. In order to measure point elasticity on a non-linear demand curve, we first draw a tangent to the selected point and bring it on a linear demand curve. Fig. 1.3 illustrates how we can measure point elasticity on a non-linear demand curve at point R.

For this purpose, we draw a tangent AB through point R. Since demand curve DD and the line AB pass through the same point R, the slope of the demand curve and that of the tangent is the same. Therefore, the elasticity of demand curve at point R will be the same as the elasticity on point R on line AB. The formula applied to measure the elasticity on a linear

demand curve can now be used as the non-linear demand curve has been changed into a linear demand curve.

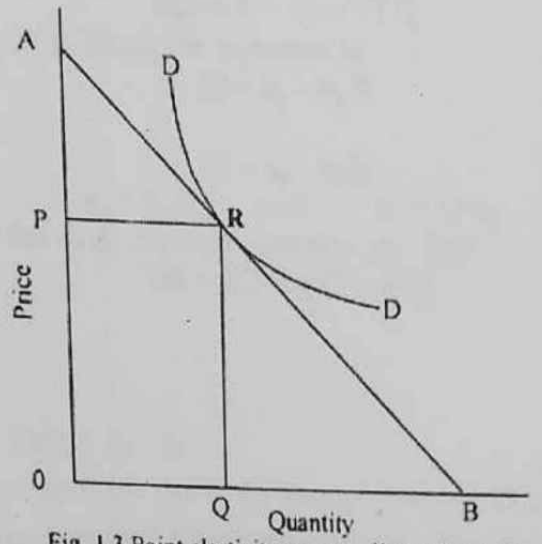


Fig. 1.3 Point elasticity on non - linear demand curve

Price Elasticity and Total Revenue:

One important application of elasticity is to clarify whether a price increase will raise or lower total revenue. Many business executives are concerned with the issue whether it is worthwhile to raise prices and whether the higher prices make up for lower demand.

Total revenue is equal to price times quantity (TR = P.Q).

If we know the price elasticity of demand, we may know what will happen to total revenue when price changes:

(1) If price elasticity ($e_p > 1$), reducing the price will increase the total revenue.

(2) When demand is perfectly inelastic $e_p = 0$, there is no decrease in quantity demanded when price is raised. Therefore, a rise in price increases the total revenue and vice versa.

(3) In case of an inelastic demand ($e_p < 1$), the total revenue falls when the price is decreased. The total revenue increases when the price is increased.

(4) When the demand for a product is unitary elastic ($e_p = 1$) quantity demanded increases or decreases in the proportion of increases or decrease in the price. Hence total revenue remains unaffected.

To make this point more clear, we require total and marginal revenue function and price-elasticity of demand.

$$TR = P.Q \quad \ldots(1.10)$$

The marginal revenue (MR) is the derivative of the TR function

$$MR = \Delta(TR)/\Delta Q = \Delta(PQ)/\Delta Q \quad \ldots(1.11)$$

or
$$MR = P + Q.\Delta P/DQ \quad \ldots(1.12)$$

If the demand curve is linear its equation is

$$Q = b_0 - b_1 P \quad \ldots(1.13)$$

Solving for P

$$P = a_0 - a_1 Q$$

where $a_0 = b_0/b_1$ and $a_1 = 1/b_1$

Substituting P in the total revenue function we find

$$TR = PQ = a_0 Q - a_1 Q^2 \quad \ldots(1.14)$$

The MR is then

$MR = \Delta(TR)/\Delta Q = a_0 - 2a_1 Q \ldots (1.15)$

It can be seen from the figure 1.4 that if the demand curve is falling the TR curve initially increases, reaches a maximum, and then starts declining. The derived relationship between MR, P and e can be used to establish the shape of the total- revenue curve.

The total revenue curve reaches its maximum level at the point where $e_p = 1$, because at this point its slope, the marginal revenue, is equal to zero.

$MR = P(1 - 1/1) = 0$

If $e_p > 1$ the total revenue curve has a positive slope. It is still increasing and has not reached its maximum point. If $e_p < 1$ the total-revenue has a negative slope and is falling.

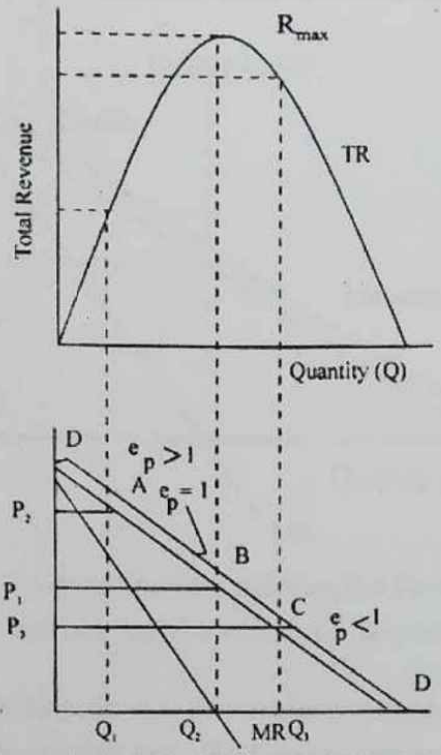


Fig. 1.4 Price elasticity and total revenue

The following can be summarized:

1. If the $e_p < 1$, the demand is inelastic, an increase in price leads to an increase in total revenue, and a decrease in price leads to a fall in total revenue.
2. If $e_p > 1$, the demand is elastic, and increase in price will cause a decrease in the total revenue and a decrease in price will lead to an increase in the total revenue.
3. If $e_p = 1$, the demand is unitary elastic, total revenue is not affected by changes in price because MR has reached zero.

Price Elasticity and Marginal Revenue:

Demand and marginal revenue curves show where demand is elastic, unitary elastic and inelastic. It is clear that demand becomes less elastic at lower prices. This is a characteristic of linear demand curves because the curve is linear dQ/dP is a constant. Thus price elasticity is determined by the value of P/Q. But as price decreases, P/Q also decreases.

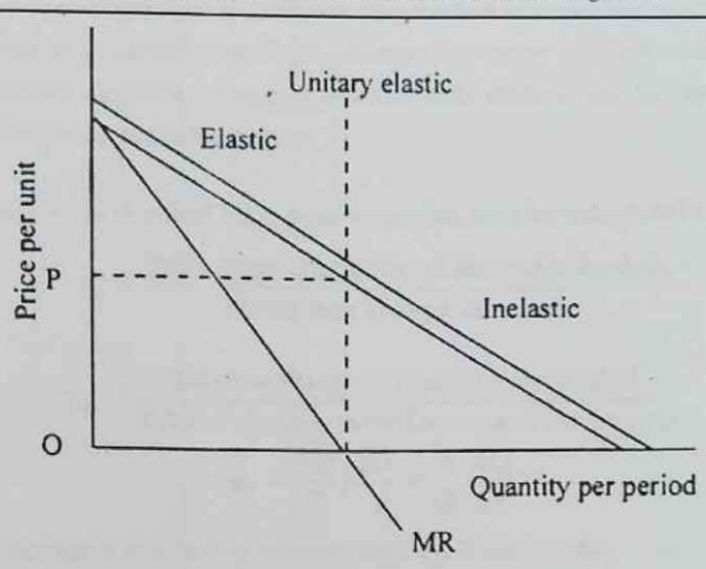


Fig. 1.5 Price Elasticity and Marginal Revenue

Consequently, the absolute value of e becomes smaller and demand becomes less elastic.

The figure 1.5 illustrates that the point of unitary elasticity corresponds to the point where the marginal revenue crosses the quantity axis. The marginal revenue is zero where demand is unitary elastic. Unitary elasticity means that a 1 percent increase in price causes quantity demanded to decrease by 1 percent and the increase in price is exactly offset by the decrease in quantity demanded. Consequently, there is no change in total revenue as the marginal revenue is zero.

The marginal revenue is positive where demand is elastic and negative when demand is inelastic. Note that these relationships are also true for nonlinear demand curves. The point where marginal revenue is zero always divides the elastic and inelastic regions of the demand curve.

In case of a vertical demand curve, quantity demanded is not affected by changes in price as dQ/dP is zero and price-elasticity is also zero. For a horizontal demand curve, quantity demanded is highly responsive to changes in price as even a very small change in price can lead to an infinitely large change in quantity demanded as dQ/dP and price elasticity being infinite. Horizontal demand curves are said to be infinitely elastic. The cases of infinitely elastic or completely inelastic demand curves are rare to find in real life, but an understanding of these is useful for economic analysis.

Method # 2. Income Elasticity of Demand:

The responsiveness of quantity demanded to changes in income is called income elasticity of demand. With income elasticity, consumer incomes vary while tastes, the commodity's own price, and the other prices are held constant.

The income elasticity of demand for a good or service may be calculated by the formula:

or
$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

$$e_p = \frac{\text{Relative change in quantity demanded}}{\text{Relative change in the incomes of the buyers}}$$

$$e_y = \frac{\Delta Q}{Q} / \frac{\Delta Y}{Y} = \frac{Y}{Q} \cdot \frac{\Delta Q}{\Delta Y} \qquad \ldots(1.16)$$

where- e_y stands for the coefficient of income elasticity, Y for income.
Whereas price-elasticity of demand is always negative, income-elasticity of demand is always positive (except for inferior goods) as the relationship between income and quantity demanded of a product is positive. For inferior goods the income elasticity of demand is negative because as income increases, consumers switch over to the consumption of superior substitutes.

The degree of income elasticity varies in accordance with the nature of commodities:

1. In case of all normal goods, the income elasticity is positive

2. For essential goods, the income elasticity is less than one. This means that quantity demanded increases less than proportionately as income increases. Soap, salt, match, newspapers have low income- elasticity of demand.

3. For goods of comfort, the income-elasticity coefficient is equal to unit which results in proportionate change in quantity demand.

4. Luxury goods have income elasticity greater than unity implying more than proportionate change in quantity demanded. Jewelry, automobiles are goods of this category.

Income elasticity of demand can be useful in the following business decisions:

1. Income-elasticity can be helpful in production planning and management in the long run, particularly during the period of business cycle.

2. It can be used for demand forecasting with given rate of increase in income.

Income Sensitivity:

The income elasticity of demand measures the degree of responsiveness of physical quantities of consumption of a good as income changes. If we measure consumption by consumer expenditures rather than by physical quantities of a good, the phenomena may be described as income sensitivity. An income- sensitivity may be defined as the percentage change in expenditures on a good divided by the percentage change in income of the consumers.

The income sensitivity may be measured with the help of following formula:

$$Y_s = \frac{\text{Percentage change in expenditure}}{\text{Percentage change in income}}$$

$$Y_s = \frac{\Delta R/R}{\Delta Y/R} \qquad \ldots(1.17)$$

where: Y_s measures the income sensitivity, ΔR measures change in consumer expenditure and ΔY measures change in income.

Suppose a 10 percent increase in income causes consumer expenditure on a good to increase by 12 percent, the income sensitivity of that good is 1.2.

Method # 3. Cross Elasticity of Demand:

Demand is also influenced by prices of other goods and services. The cross elasticity measures the responsiveness of quantity demanded to changes in price of other goods and services. Cross elasticity of demand is defined as the percentage change in quantity demanded of one good caused by a 1 percentage change in the price of some other good.

$$e_c = \frac{\%\Delta Q_x}{\%\Delta P_y} \ldots(1.18)$$

Cross elasticity is used to classify the relationship between goods. If cross elasticity is greater than zero, an increase in the price of y causes an increase in the quantity demanded of x, and the two products are said to be substitutes. When the cross- elasticity is greater than zero, the goods or services involved are classified as complements Increases in the price of y reduces the quantity demanded of that product. Diminished demand for y causes a reduced demand for x. Bread and butter, cars and tires, and computers and computer programs are examples of pairs of goods that are complements.

The coefficient is positive if A and B are substitutes because the price change and the quantity change are in the same direction. The coefficient is negative if A and B are complements, because changes in the price of one commodity cause opposite changes in the

quantity demanded of the other. Other things such as consumer taste for both commodities, consumer incomes and the price of the other commodity are held constant.

Many companies produce several related products. Where a company's products are related, the pricing of one good can influence the demand for other products. Gillette makes both razors and razor blades. Ford sells several competing makes of automobiles. Gillette probably will sell more razor blades if it lowers the price of its razors.

The closer two commodities are as substitutes for each other, the greater is the size of the cross elasticity coefficient. Close substitutes have high cross elasticity of demand; poor substitutes have low cross elasticity.

In general, a rise in the price of a commodity increases the demand for its substitutes and diminishes the demand for its complements.

Method # 4. Advertisement or Promotional Elasticity of Sales:

The advertisement expenditure helps in promoting sales. The impact of advertisement on sales is not uniform at all level of total sales. The concept of advertising elasticity is significant in determining the optimum level of advertisement outlay particularly in view of competitive advertising by rival firms. An advertising elasticity could be defined as the percentage change in quantity demanded for a percentage change in advertising. Advertising might be measured by expenditure.

Advertising elasticity may be measured by the following formula:

$$e_A = \frac{\Delta S}{\Delta A} \cdot \frac{A}{S} \qquad ...(1.19)$$

where: S = sales; ΔS= increase in sales; A = initial advertisement outlay; and ΔA = increased advertising outlay.

The advertising elasticity of sales varies between zero and infinity. If advertising elasticity is zero, sales do not respond to the advertising expenditure. Promotional elasticity coefficient greater than zero but less than 1 ($e_A>0<1$) indicates that sales increase less than proportionate to the increase in advertisement expenditure. The coefficient of equal to 1 means proportionate increase in sales to the increase in expenditure on advertisement. If $e_A > 1$ it interprets that sales increase at a higher rate than the rate of increase of advertisement expenditure.

Determinants of Advertisement Elasticity:

1. The Level of Sales:

The advertising elasticity of sales, particularly in case of products newly introduced into the market, is greater than unity. Sales increase more than proportionately with the increase in advertisement expenditure. As sales increase elasticity begins to decrease. Now the advertisement is done to create new customers to the product. Therefore, demand now increases less than proportionately to increase in advertisement.

2. Competitive Advertising:

The advertising elasticity of a firm will depend not only on the advertisement expenditure incurred by the firm for its product but also on the effectiveness of the competitive advertising by the rival firms

3. Cumulative Effect of Past Advertisement:

In the initial stages the advertisement outlay is not adequate enough to be effective. Therefore, the elasticity may be very low. But in later stages as the cumulative effect of advertisement gather, the advertising elasticity may increase over time.

Change in product's price, consumer's income, increase in the number of substitutes and their prices are other factors that influence the advertising elasticity of a product.

Method # 5. Elasticity of Price Expectations:

People's price expectations also play a significant role as a determinant of demand. J.R. Hicks, the English economist, in 1939, devised the concept of elasticity of price expectations. The elasticity of price expectations may be defined as the ratio of the relative change in expected future prices to the relative change in current prices.

$$e_x = \frac{\text{relative change in expected future prices}}{\text{relative change in current prices}}$$

$$e_x = \frac{\Delta P_f / P_f}{\Delta P_c / P_c} = \frac{\Delta P_f}{\Delta P_c} \cdot \frac{P_c}{P_f} \qquad ...(1.20)$$

where,

P_c Current prices

P_f Future prices

If $e_x > 1$ Buyers expect that future prices will rise by a larger percentage than current prices.

$e_x = 1$ Buyers expect that future prices will rise by the same percentage as current prices.

$e_x < 1$ Buyers expect that future prices will rise by a smaller percentage than current prices.

$e_s = 0$ Buyers expect current rise to have no effect on future prices

$e_s < 0$ Buyers expect that current rise will be followed by a fall in future prices.

The concept of elasticity of price-expectation is very useful in formulating pricing policy.

Factors of Production-

What Are Factors of Production?

Factors of production are the inputs needed for creating a good or service, and the factors of production include land, labor, entrepreneurship, and capital.

Those who control the factors of production often enjoy the greatest wealth in a society. In capitalism, the factors of production are most often controlled by business owners and investors. In socialist systems, the government (or community) often exerts greater control over the factors of production.

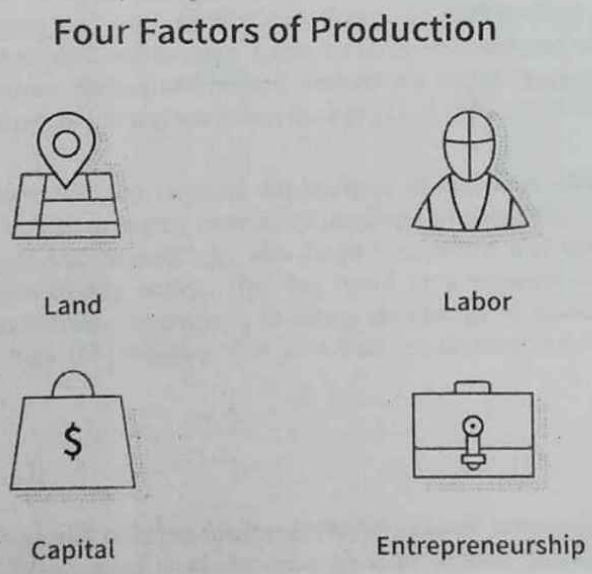
How Factors of Production Work

The modern definition of factors of production is primarily derived from a neoclassical view of economics. It amalgamates past approaches to economic theory, such as the concept of labor as a factor of production from socialism, into a single definition.

Land, labor, and capital as factors of production were originally identified by early political economists such as Adam Smith, David Ricardo, and Karl Marx. Today, capital and labor remain the two primary inputs for processes and profits. Production, such as manufacturing, can be tracked by certain indexes, including the ISM manufacturing index.

The 4 Factors of Production

There are four factors of production—land, labor, capital, and entrepreneurship.



Land As a Factor

Land has a broad definition as a factor of production and can take on various forms, from agricultural land to commercial real estate to the resources available from a particular piece of land. Natural resources, such as oil and gold, can be extracted and refined for human consumption from the land.

Cultivation of crops on land by farmers increases its value and utility. For a group of early French economists called "the physiocrats," who predated the classical political economists, land was responsible for generating economic value.

While land is an essential component of most ventures, its importance can diminish or increase based on industry. For example, a technology company can easily begin operations with zero investment in land. On the other hand, land is the most significant investment for a real estate venture.

Labor As a Factor

Labor refers to the effort expended by an individual to bring a product or service to the market. Again, it can take on various forms. For example, the construction worker at a hotel site is part of labor, as is the waiter who serves guests or the receptionist who enrolls them into the hotel.

Within the software industry, labor refers to the work done by project managers and developers in building the final product. Even an artist involved in making art, whether it is a painting or a symphony, is considered labor. For the early political economists, labor was the primary driver of economic value. Production workers are paid for their time and effort in wages that depend on their skill and training. Labor by an uneducated and untrained worker is typically paid at low prices. Skilled and trained workers are called "human capital" and are paid higher wages because they bring more than their physical capacity to the task.

For example, an accountant's job requires the analysis of financial data for a company. Countries that are rich in human capital experience increased productivity and efficiency. The difference in skill levels and terminology also helps companies and entrepreneurs create corresponding disparities in pay scales. This can result in a transformation of factors of production for entire industries. An example of this is the change in production processes in the information technology (IT) industry after jobs were outsourced to countries with lower salaries.

Capital As a Factor

In economics, capital typically refers to money. However, money is not a factor of production because it is not directly involved in producing a good or service. Instead, it facilitates the processes used in production by enabling entrepreneurs and company owners to purchase capital goods or land or to pay wages. For modern mainstream (neoclassical) economists, capital is the primary driver of value.

It is important to distinguish personal and private capital in factors of production. A personal vehicle used to transport family is not considered a capital good, but a commercial vehicle used expressly for official purposes is. During an economic contraction or when they suffer losses, companies cut back on capital expenditure to ensure profits. However, during periods

of economic expansion, they invest in new machinery and equipment to bring new products to market.

An illustration of the above is the difference in markets for robots in China compared to the United States after the 2008 financial crisis. After the crisis, China experienced a multi-year growth cycle, and its manufacturers invested in robots to improve productivity at their facilities and meet growing market demands.1

2 As a result, the country became the biggest market for robots.3 Manufacturers within the United States, which had been in the throes of an economic recession after the financial crisis, cut back on their investments related to production due to tepid demand.4

As a factor of production, capital refers to the purchase of goods made with money in production. For example, a tractor purchased for farming is capital. Along the same lines, desks and chairs used in an office are also capital.

Entrepreneurship As a Factor

Entrepreneurship is the secret sauce that combines all the other factors of production into a product or service for the consumer market. An example of entrepreneurship is the evolution of the social media behemoth Meta (META), formerly Facebook.

Mark Zuckerberg assumed the risk for the success or failure of his social media network when he began allocating time from his daily schedule toward that activity. When he coded the minimum viable product himself, Zuckerberg's labor was the only factor of production. After Facebook, the social media site, became popular and spread across campuses, it realized it needed to recruit additional employees. He hired two people, an engineer (Dustin Moskovitz) and a spokesperson (Chris Hughes), who both allocated hours to the project, meaning that their invested time became a factor of production.5

The continued popularity of the product meant that Zuckerberg also had to scale technology and operations. He raised venture capital money to rent office space, hire more employees, and purchase additional server space for development. At first, there was no need for land. However, as business continued to grow, Meta built its own office space and data centers.6 Each of these requires significant real estate and capital investments.

Connecting the Factors

Another example of entrepreneurship is Starbucks Corporation (SBUX). The retail coffee chain needs land (prime real estate in big cities for its coffee chain), capital (large machinery to produce and dispense coffee), and labor (employees at its retail outposts for service). Entrepreneur Howard Schultz, the company's founder, provided the fourth factor of production by being the first person to realize that a market for such a chain existed and figuring out the connections among the other three factors of production.7

While large companies make for excellent examples, a majority of companies within the United States are small businesses started by entrepreneurs. Because entrepreneurs are vital for economic growth, countries are creating the necessary framework and policies to make it easier for them to start companies.

Ownership of Factors of Production

The definition of factors of production in economic systems presumes that ownership lies with households, who lend or lease them to entrepreneurs and organizations. But that is a theoretical construct and rarely the case in practice. Except for labor, ownership for factors of production varies based on industry and economic system.

For example, a firm operating in the real estate industry typically owns significant parcels of land, while retail corporations and shops lease land for extended periods of time. Capital also follows a similar model in that it can be owned or leased from another party. Under no circumstances, however, is labor owned by firms. Labor's transaction with firms is based on wages.

Ownership of the factors of production also differs based on the economic system. For example, private enterprises and individuals own most of the factors of production in capitalism. However, collective good is the predominating principle in socialism. As such, factors of production, such as land and capital, are owned and regulated by the community as a whole under socialism.

Ownership of the factors of production depends on the type of economic system and society

Factors of Production	Capitalism	Socialism	Communism
Are owned by..	Individuals	Everyone	Everyone (via the government)
Are valued for..	Profitability	Usefulness to people	Usefulness to society

The Role of Technology

While not directly listed as a factor, technology plays a vital role in influencing production. In this context, technology has a fairly broad definition and can refer to software, hardware, or a combination of both used to streamline organizational or manufacturing processes.

Increasingly, technology is responsible for the difference in efficiency among firms. To that end, technology—like money—is a facilitator of the factors of production. The introduction

of technology into a labor or capital process makes it more efficient. For example, the use of robots in manufacturing has the potential to improve productivity and output. Similarly, the use of kiosks in self-serve restaurants can help firms cut back on their labor costs.

The Solow residual, also known as "total factor productivity (TFP)," measures the residual output that remains unaccounted for from the four factors of production and typically increases when technological processes or equipment are applied to production. Economists consider TFP to be the main factor driving economic growth for a country. The greater a firm's or country's TFP, the greater its growth.

What Are the Factors of Production?

The factors of production are an important economic concept outlining the elements needed to produce a good or service for sale. They are commonly broken down into four elements: land, labor, capital, and entrepreneurship. However, commentators sometimes refer to labor and capital as the two primary factors of production. Depending on the specific circumstances, one or more factors of production might be more important than the others.

What Are Examples of the Factors of Production?

Land refers to physical land, such as the acres used for a farm or the city block on which a building is constructed. Labor refers to all wage-earning activities, such as the work of professionals, retail workers, and so on. Entrepreneurship refers to the initiatives taken by entrepreneurs, who typically begin as the first workers in their firms and then gradually employ other factors of production to grow their businesses. Finally, capital refers to the cash, equipment, and other assets needed to start or grow a business.

Are All Factors of Production Equally Important?

Depending on the context, some factors of production might be more important than others. For example, a software company that relies primarily on the labor of skilled software engineers might see labor as its most valuable factor of production. Meanwhile, a company that makes its money from building and renting out office space might see land and capital as its most valuable factors. As the demands of a business change over time, the relative importance of the factors of production will also change accordingly.

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Perfect competition refers to a market situation where there are a large number of buyers and sellers dealing in homogenous products.

Moreover, under perfect competition, there are no legal, social, or technological barriers on the entry or exit of organizations.

In perfect competition, sellers and buyers are fully aware about the current market price of a product. Therefore, none of them sell or buy at a higher rate. As a result, the same price prevails in the market under perfect competition.

Price and Output Determination under Perfect Competition

Under perfect competition, the buyers and sellers cannot influence the market price by increasing or decreasing their purchases or output, respectively. The market price of products in perfect competition is determined by the industry. This implies that in perfect competition, the market price of products is determined by taking into account two market forces, namely market demand and market supply.

In the words of Marshall, "Both the elements of demand and supply are required for the determination of price of a commodity in the same manner as both the blades of scissors are required to cut a cloth." As discussed in the previous chapters, market demand is defined as a sum of the quantity demanded by each individual organizations in the industry.

On the other hand, market supply refers to the sum of the quantity supplied by individual organizations in the industry. In perfect competition, the price of a product is determined at a point at which the demand and supply curve intersect each other. This point is known as equilibrium point as well as the price is known as equilibrium price. In addition, at this point, the quantity demanded and supplied is called equilibrium quantity. Let us discuss price determination under perfect competition in the next sections.

Demand under Perfect Competition:

Demand refers to the quantity of a product that consumers are willing to purchase at a particular price, while other factors remain constant. A consumer demands more quantity at lower price and less quantity at higher price. Therefore, the demand varies at different prices.

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Figure-1 represents the demand curve under perfect competition:

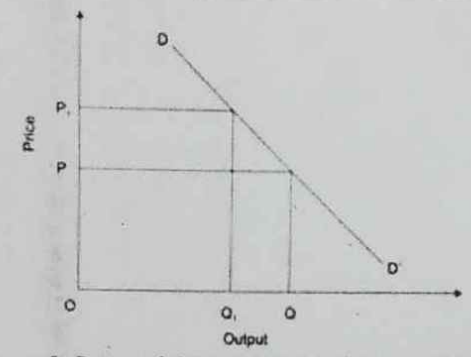

Figure-1: Demand Curve under Perfect Competition

As shown in Figure-1, when price is OP, the quantity demanded is OQ. On the other hand, when price increases to OP1, the quantity demanded reduces to OQ1. Therefore, under perfect competition, the demand curve (DD') slopes downward.

Supply under Perfect Competition:

Supply refers to quantity of a product that producers are willing to supply at a particular price. Generally, the supply of a product increases at high price and decreases at low price.

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Figure-2 shows the supply curve under perfect competition:

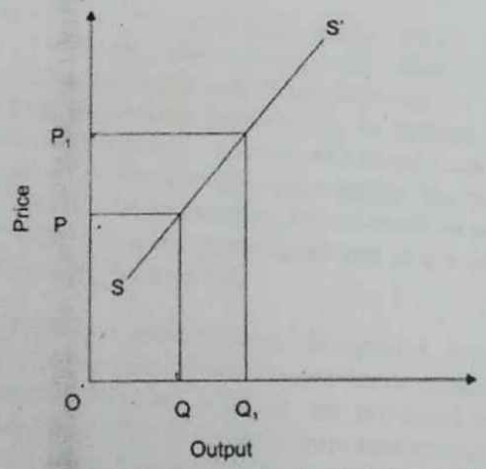

Figure-2: Supply Curve under Perfect Competition

In Figure-2, the quantity supplied is OQ at price OP. When price increases to OP1, the quantity supplied increases to OQ1. This is because the producers are able to earn large profits by supplying products at higher price. Therefore, under perfect competition, the supply curves (SS') slopes upward.

Monopolistic Competition

In monopolistic competition, we still have many sellers (as we had under perfect competition). Now, however, they don't sell identical products. Instead, they sell *differentiated* products—products that differ somewhat, or are *perceived* to differ, even though they serve a similar purpose. Products can be differentiated in a number of ways, including quality, style, convenience, location, and brand name. Some people prefer Coke over Pepsi, even though the two products are quite similar. But what if there was a substantial price difference between the two? In that case, buyers could be persuaded to switch from one to the other. Thus, if Coke has a big promotional sale at a supermarket chain, some Pepsi drinkers might switch (at least temporarily).

How is product differentiation accomplished? Sometimes, it's simply geographical; you probably buy gasoline at the station closest to your home regardless of the brand. At other times, perceived differences between products are promoted by advertising designed to convince consumers that one product is different from another—and better than it. Regardless of customer loyalty to a product, however, if its price goes too high, the seller will lose business to a competitor. Under monopolistic competition, therefore, companies have only limited control over price.

Oligopoly

Oligopoly means few sellers. In an oligopolistic market, each seller supplies a large portion of all the products sold in the marketplace. In addition, because the cost of starting a business in an oligopolistic industry is usually high, the number of firms entering it is low.

Companies in oligopolistic industries include such large-scale enterprises as automobile companies and airlines. As large firms supplying a sizable portion of a market, these companies have some control over the prices they charge. But there's a catch: because products are fairly similar, when one company lowers prices, others are often forced to follow suit to remain competitive. You see this practice all the time in the airline industry: When American Airlines announces a fare decrease, Continental, United Airlines, and others do likewise. When one automaker offers a special deal, its competitors usually come up with similar promotions.

Monopoly

In terms of the number of sellers and degree of competition, monopolies lie at the opposite end of the spectrum from perfect competition. In perfect competition, there are many small companies, none of which can control prices; they simply accept the market price determined by supply and demand. In a monopoly, however, there's only one seller in the market. The market could be a geographical area, such as a city or a regional area, and doesn't necessarily have to be an entire country.

There are few monopolies in the United States because the government limits them. Most fall into one of two categories: *natural* and *legal*. Natural monopolies include public utilities, such as electricity and gas suppliers. Such enterprises require huge investments, and it would be inefficient to duplicate the products that they provide. They inhibit competition, but they're legal because they're important to society. In exchange for the right to conduct business without competition, they're regulated. For instance, they can't charge whatever prices they want, but they must adhere to government-controlled prices. As a rule, they're required to serve all customers, even if doing so isn't cost efficient.

A legal monopoly arises when a company receives a patent giving it exclusive use of an invented product or process. Patents are issued for a limited time, generally twenty years (United States Patent and Trademark Office, 2006). During this period, other companies can't use the invented product or process without permission from the patent holder. Patents allow companies a certain period to recover the heavy costs of researching and developing products and technologies. A classic example of a company that enjoyed a patent-based legal monopoly is Polaroid, which for years held exclusive ownership of instant-film technology (Bellis, 2006). Polaroid priced the product high enough to recoup, over time, the high cost of bringing it to market. Without competition, in other words, it enjoyed a monopolistic position in regard to pricing.

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Equilibrium under Perfect Competition:

As discussed earlier, in perfect competition, the price of a product is determined at a point at which the demand and supply curve intersect each other. This point is known as equilibrium point. At this point, the quantity demanded and supplied is called equilibrium quantity. Figure-3 shows the equilibrium under perfect competition:

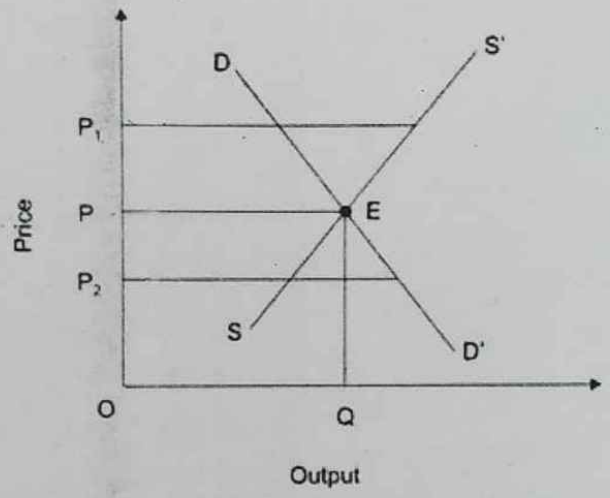

Figure-3: Price and Output Determination under Perfect Competition

In Figure-3, it can be seen that at price OP1, supply is more than the demand. Therefore, prices will fall down to OP. Similarly, at price OP2, demand is more than the supply. Similarly, in such a case, the prices will rise to OP. Thus, E is the equilibrium at which equilibrium price is OP and equilibrium quantity is OQ.