Managerial Economic (MBEV1001)

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Module-I

Demand, Elasticity of Demand and Elasticity of Supply

The price of a good or service is the rate at which it is exchanged for anything else. This price is determined by the interaction of the demand and the supply. While the demand is determined by the needs and wants of the human beings, the supply is determined by the scarce resources available in the economy. To analyse the changes in price, it is necessary to analyse the demand and the supply.

DEMAND
What Is Demand?

In economics, demand means the wants for goods which are backed up by the sufficient money to be able to pay for the goods which are demanded. Thus, the quantity demanded of a good is the amount of that good demanded at a particular price over a certain time.

There are four characteristics of the demand:

Quantity demanded of a good is the amount of that good demanded at a particular price over a certain time.

1. Demand for a good or service always exists at a particular price.
2. Demand is always with reference to a certain time. Thus, the demand for good or service is a flow concept.
3. The demand for a good depends on the utility of the good. Only those goods, which give the consumers a utility, are demanded by the consumers.
4. Demand for a good should always be backed up by the ability to buy the good, or in other words, purchasing power. Willingness alone is not sufficient for a good to be demanded.

Individual demand is the quantity of a good that an individual is willing to purchase at a certain price over a given time.

It is important to distinguish between the individual demand and the market demand. Individual demand is the quantity of a good that an individual is willing to purchase at a certain price over a given time.

Market demand is the total quantity of a good that is demanded by all the individuals in the market at a certain price over a given time. Hence, it is the aggregate demand by all the consumers of the product.

Demand Function

The demand for a good by an individual depends on many factors. These include the own price (price of the good itself), price of other related goods (substitutes and complements), income of the consumer, tastes and preferences of the consumer, income and wealth distribution and others.

The demand function for a good can be expressed as:

$Dd_x = f(P_x, P_o, Y, T)$

where Dd_x is demand for good x, P_x is price of good x, P_o is price of other goods, Y is income of the consumer and T is tastes and preferences of the consumer.

To analyse the demand function, we examine the relationship of demand to one factor at a time, using the Latin phrase, *ceteris paribus*, which means 'other things remaining the same'.

Demand and Price of Good *x*: Law of Demand

$Dd_x = f(P_x)$

The above function shows that there exists a relationship between the demand for a good and the price of the good, *ceteris paribus*. This relationship is called the law of demand. According to this law, other things remaining the same, an individual demands more of the good (and service) at a lower price than at a higher price. Hence, there exists a negative relationship between the quantity demanded of a good and the price of the good, assuming that the price of the other goods, income of the consumer and tastes and preferences of the consumer remain the same.

According to the law of the demand, there exists a negative relationship between the quantity demanded of a good and the price of the good, assuming that the price of the other goods, income of the consumer and tastes and preferences of the consumer remain the same.

Demand Schedule

A demand schedule depicts the quantity of the good which is demanded at each price, assuming that the price of the other goods, income of the consumer and tastes and preferences of the consumer remain the same *(ceteris paribus* assumption).

Illustration 1: Suppose an individual's demand function for good *x* is $Dd_x = 10 - P_x$. Determine the individual's demand schedule and the demand curve.

Individual's Demand Schedule

By substitution of different prices of good *x* into this equation, we can obtain the individual's demand schedule as in Table 3.1.

Table 3.1 Individual's Demand Schedule: $Dd_x = 10 - P_x$

P_x	Dd_x	Points on Demand Curve in Figure 3.1
8	2	A
7	3	B
6	4	C
5	5	D
4	6	E

The demand schedule of an individual shows the alternative quantities of the good *x* demanded by the individual at different prices, *ceteris paribus*.

Individual's Demand Curve

By plotting the different pairs of values on a graph and then by joining the points so obtained, we can get the individual's demand curve for good *x* as in Figure 3.1.

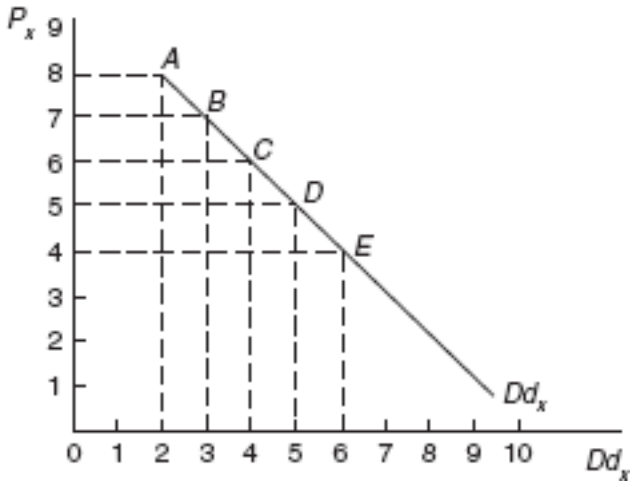

Figure 3.1 Individual's Demand Curve

Thus, the demand curve is a graphical representation of the demand schedule. It is downward sloping showing the inverse relationship between the price and the quantity demanded of a good. The demand curve in Figure 3.1 depicts that at a particular point in time if the price of good *x* is ₹8 the individual's demand for the good is two units over time (for example, for a month or for an year). This is represented by point *A* on the demand curve. If the price of good *x* falls to ?₹7, the individual's demand for the good increases to three units represented by point *B* on the demand curve.

The demand curve is a graphical representation of the demand schedule.

If the price of good *x* further falls to ₹4, the individual's demand for the good increases to six units represented by point *E* on the demand curve.

Market Demand

The market demand schedule shows the alternative quantities of the good *x* demanded per time period by all the individuals in a market at different prices, *ceteris paribus*.

Thus, the market demand for good *x* will depend on P_x, price of good *x*; P_o, price of the other goods; *Y*, income of the consumers; *T*, tastes and preferences of the consumers; the number of consumers of good *x* in the market and the distribution of income.

Illustration 2: There are two individual's in the market with identical demand schedules for good *x*, $Dd_x = 10 - P_x$. Determine the market demand schedule and the market demand curve.

Table 3.2 and Figure 3.2 show the construction of the market demand schedule and market demand curve for the five individual's in the market.

Table 3.2 Market Demand Schedule: A Construction

P_x	Dd_{1x}	Dd_{2x}	DD_x
8	2	2	4
7	3	3	6
6	4	4	8
5	5	5	10
4	6	6	12

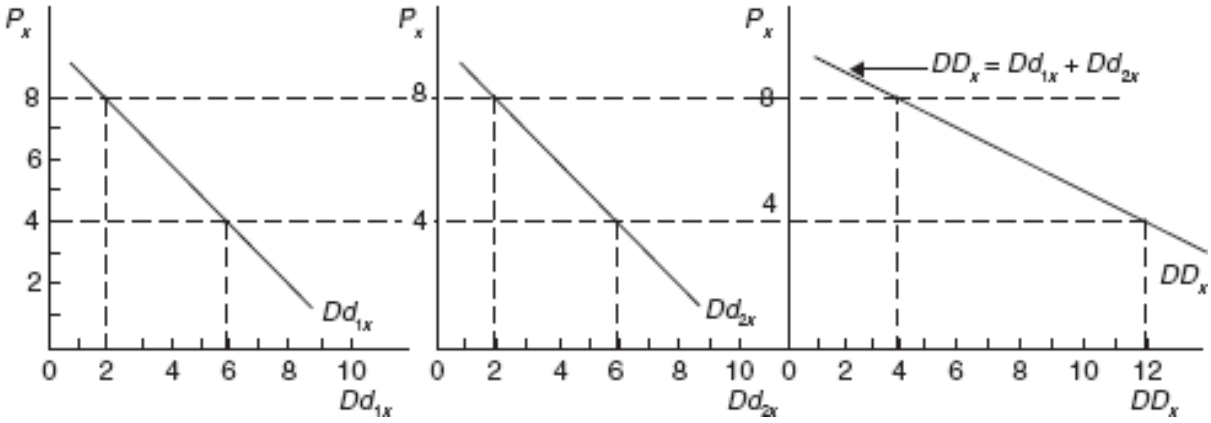

Figure 3.2 Market Demand Curve: A Construction

Illustration 3: There are 1000 individuals in the market with the identical demand schedules for good x, $Dd_x = 10 - P_x$. Determine the market demand schedule and the market demand curve.

Market demand curve for good x (if there are 1000 individuals in the market who are identical):

Individual demand schedule: $Dd_x = 10 - P_x$

Market demand schedule: $DD_x = 1000\ (Dd_x)$

$= 1000\ (10 - P_x)$

$= 10{,}000 - 1000\ P_x$

Table 3.3 and Figure 3.3 depict the market demand schedule and market demand curve, respectively, for the 1000 individuals in the market.

Table 3.3 Market Demand Schedule

P_x	Dd_x	Points on Demand Curve in Figure 3.3
1	9000	A
2	8000	B
3	7000	C
4	6000	D

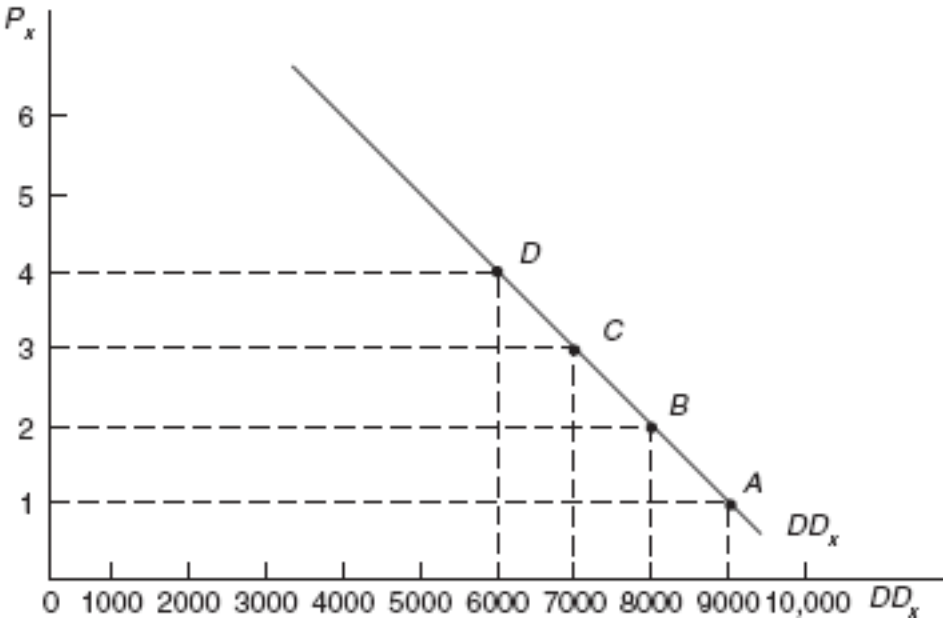

Figure 3.3 Market Demand Curve

Why Does the Demand Curve Slope Downwards?

According to the law of demand, the demand curve is downward sloping showing the inverse relationship between the price and the quantity demanded of a good. The reasons behind the inverse relationship between the price and the quantity demanded of a good are as follows:

1. **Income Effect and Substitution Effect:** As far as the income effect is concerned, when the price of a good falls, there is an increase in the real income of the consumer. Hence, his demand for the good increases.

   As far as the substitution effect is concerned, when the price of a good falls, there is an increase in the relative price of the other goods. Hence, the consumer's demand for the good increases as the price of the good falls.

2. **Law of Diminishing Marginal Utility:** According to the law of diminishing marginal utility as a consumer consumes additional units of a good, the additional utility that he gets from consuming the good goes on decreasing. Thus, he is willing to pay a lower price for the additional units of the good. Hence, the demand curve is downward sloping.

3. **Effect of Price on Demand:** When the price of a good increases, the consumer uses the good for the most essential purposes. Thus, at high prices, the demand for the commodity is low. However, when the price of a good decreases, the consumer uses the good for the less essential purposes. Thus, at low prices, the demand for the commodity is high, for example, water and electricity.

It is important to note that it is not necessary that the law of demand will apply in all cases. Though the law applies in the case of normal goods, exceptions may exist. For example, in the case of Giffen goods (named after Sir Robert Giffen), which are inferior goods, the demand curve slopes upwards. In addition, if the price of a good is rising and, in the future also, the consumer expects the price to increase, then in that case he will buy more of the good at higher prices.

Demand for Good *x* and Price of Other Goods

$Dd_x = f(P_o)$

The above function shows that there exists a relationship between the demand for a good and the price of other goods, for example, good *z*, *ceteris paribus*. As far as the other goods are concerned, there can be two cases.

When Goods x and z Are Complements

Goods are complements when they are used jointly in satisfying a want, for example, printer and print cartridge and coffee and sugar. Hence, they are consumed together and their consumption increases or decreases simultaneously. When the price of good *z* (for example, sugar) increases, the demand for good *x* (coffee) will decrease.

Figure 3.4 depicts the effect of a change in the price of the complementary good *z* on the demand for the good *x*. Figure 3.4(a) shoWs An Increase In The price of good *z* from P_z to P'_z(for example, sugar), *ceteris paribus*. This is shown by an upward movement along the demand curve DD_z. Since good *x* and *z* are complements, in Figure 3.4(b), there will occur a downward shift of the demand curve for good *x* (coffee) from DD_x to DD'_x. At the price P'_x, the consumer's demand for good *x* will decrease from Q_x to Q'_x.

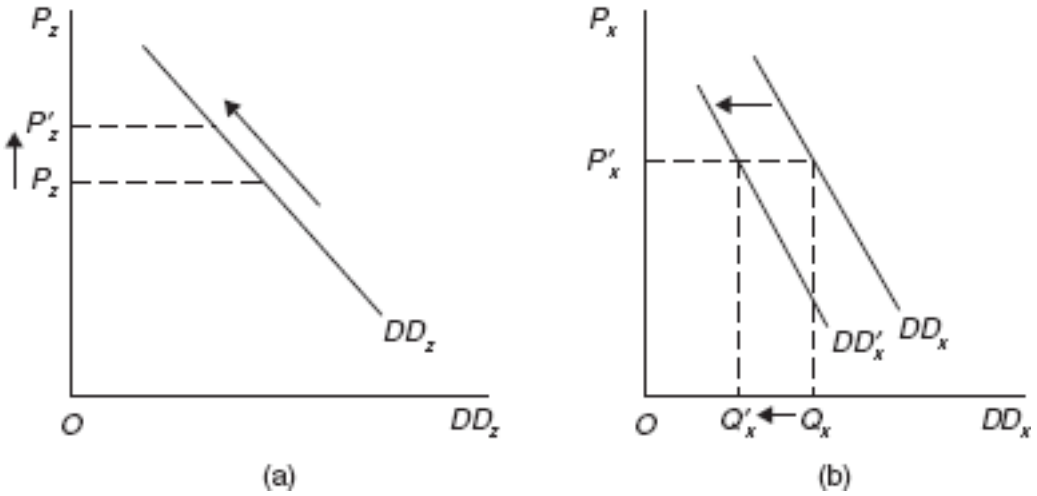

Figure 3.4 Effect of a Change in the Price of the Complementary Good *z* on the Demand for the Good *x*

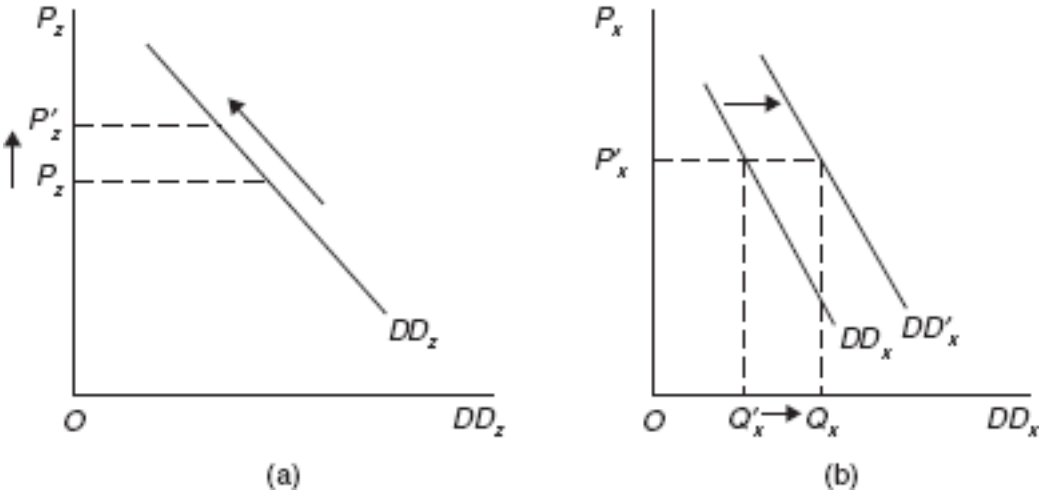

Figure 3.5 Effect of a Change in the Price of the Substitute Good *z* on the Demand for the Good *x*

When Goods x and z Are Substitutes

Goods are substitutes when they can replace each other in consumption, for example, tea and coffee, butter and margarine. As far as consumption is concerned, they serve the same purpose. When the price of good *z* (for example, tea) increases, the demand for good *x* (coffee) will increase.

Figure 3.5 depicts the effect of a change in the price of the substitute good *z* on the demand for the good *x*. Figure 3.5(a) shows an increase in the price of good *z* from P_z to P'_z (for example, tea), *ceteris paribus*. This is shown by an upward movement along the demand curve DD_z. Since goods *x* and *z* are substitutes, in Figure 3.5(b), there will occur an outward shift of the demand curve for good *x* (coffee) from DD_x to DD'_x. At the price P'_x, the consumer's demand for good *x* will increase from Q_x to Q'_x.

Demand for Good *x* and the Consumer's Income

$Dd_x = f(Y)$

The above function shows that there exists a relationship between the demand for a good and the money income of the consumer, *ceteris paribus*. As far as the type of the good is concerned, there can be two cases.

When Good x Is a Normal Good

A normal good is one, where with an increase in income more of the good is bought and with a decrease in income less is bought by the consumer. For example, the consumer may buy more of clothes with an increase in his income, even when the price of clothing remains the same.

Figure 3.6 depicts the effect of a change in the income of consumer on the demand for the good *x*, *ceteris paribus*. Figure 3.6(a) shows an upward shift of the demand curve from Dd_x to Dd'_x. Since *x* is a normal good at the price P_x, the consumer's demand for good *x* will increase from Q_x to Q'_x.

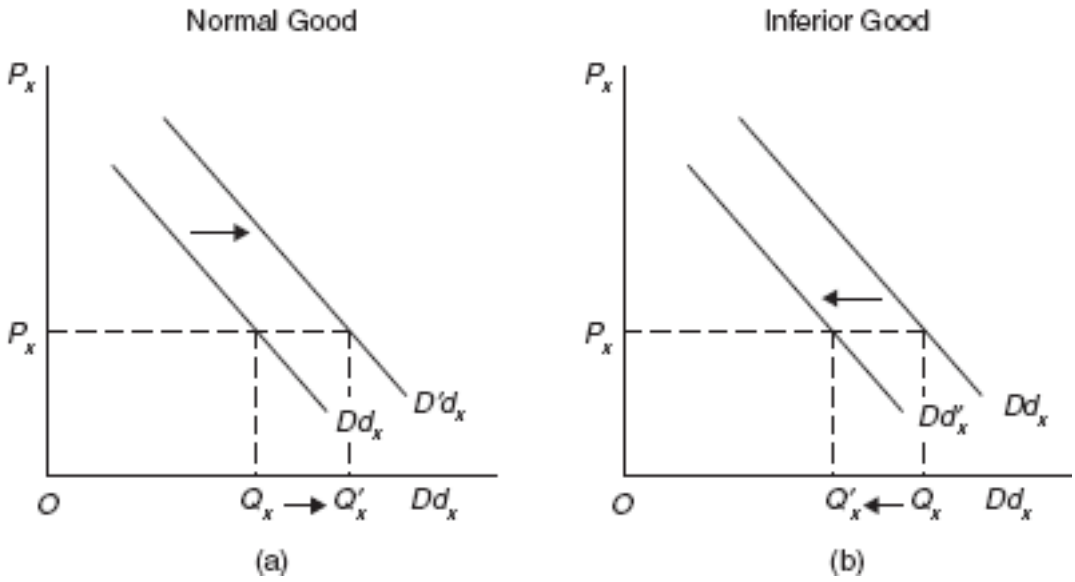

Figure 3.6 Effect of a Change in Income of the Consumer on the Demand for Good *x*

When Good x Is an Inferior Good

An inferior good is one, where with an increase in income less of the good is bought and with a decrease in income more of the good is bought by the consumer. In Figure 3.6(b), there is a downward shift of the demand curve from Dd_x to Dd'_x. Since *x* is an inferior good, at the price P_x, the consumer's demand for good *x* will decrease from Q_x to Q'_x.

Demand, and Tastes and Preferences of the Consumer

$Dd_x = f(T)$

The above function shows that there exists a relationship between the demand for a good and the tastes of the consumer, *ceteris paribus*. As far as the tastes are concerned, there can be two cases:

When Tastes Change in Favour of Good x

In this case, the consumer shows more preference for the good. Figure 3.7 depicts the effect of a change in the preferences of the consumer on the demand for the good *x*. It shows an increase in the consumer's preference for the good, *ceteris paribus*. This is shown by an upward shift of the demand curve from Dd_x to Dd_1. At the price P_x, the consumer's demand for good *x*will increase from Q to Q_1.

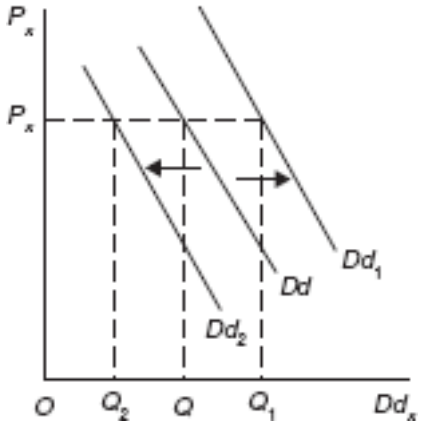

Figure 3.7 Effect of a Change in Tastes and Preferences of the Consumer on the Demand for Good *x*

When There Is a Change in Tastes Which Are Not in Favour of Good x

In this case, the consumer shows less preference for the good. Figure 3.7 depicts the effect of a change in the preferences of the consumer on the demand for the good *x*. It shows a decrease in the consumer's preference for the good, *ceteris paribus*. This is shown by a downward shift of the demand curve from Dd_x to Dd_2. At the price P_x, the consumer's demand for good *x* will decrease from *Q* to Q_2.

Change in Demand versus Shifts in Demand

Change in Demand

A change in demand or a change in the quantity demanded of the good is a movement which occurs along the demand curve and is caused by a change in the price of the good, *ceteris paribus*. It is important to note that there is only a movement along the demand curve. The change in demand can be of two types:

1. **Expansion of Demand:** An expansion or extension of demand is a rise in the demand for the good as a result of a fall in the price of the good.

   Figure 3.8 depicts the effect of a change in demand. Initially, the consumer is on the demand curve Dd_x at point *A* demanding *OQ* units of good *x* at price *OP*. With a fall in the price of the good to OP_1, the consumer is at point *B* increasing the quantity demanded of the good to OQ_1. This is called an expansion of demand.

2. **Contraction of Demand:** A contraction of demand is a fall in the demand for the good as a result of a rise in the price of the good.

In Figure 3.8, initially the consumer is on the demand curve Dd_x at point A demanding OQ units of good x at price OP. With an increase in the price of the good to OP_2, the consumer is at point C decreasing the quantity demanded of the good to OQ_2. This is called a contraction of demand.

Shifts In Demand

A shift in the demand curve is caused by a change in any of the factors, which influence the demand other than the price of the good itself. These factors include the price of other goods, P_o, income of the consumer, Y and the tastes and preferences of the consumer, T. It is important to note here that there is a shift of the demand curve. The shift in demand can be of two types:

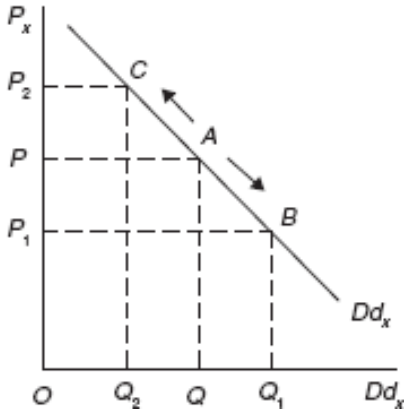

Figure 3.8 A Change in Demand for Good x

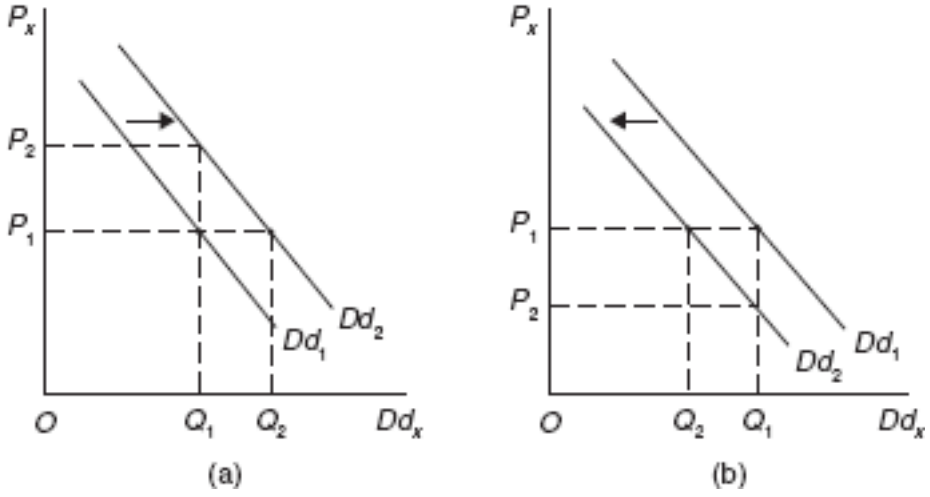

Figure 3.9 Shifts in Demand for Good x

1. **Increase in Demand:** An increase in demand is an increase in the demand for the good as a result of a change in any of the factors which influence the demand other than the price of the good itself, for example, an increase in the price of the substitute good or a rise in the consumer's income.

Figure 3.9(a) shows an increase in demand. Initially, the consumer is on the demand curve Dd_{x1} consuming OQ_1 units of the good at the price P_{x1}. An increase in demand leads to an upward movement in the demand curve from Dd_{x1} to Dd_2. An increase in demand implies that

— the same quantity of the good OQ_1 is now demanded at a higher price P_2 or

— at the same price P_{x1} a larger quantity of the good is demanded, which has increased from OQ_1 to OQ_2.

2. **Decrease in Demand:** A decrease in demand is a decrease in the demand for the good as a result of a change in any of the factors which influence demand other than the price of the good itself, for example, a decrease in the price of the substitute good or a decrease in the consumer's income.

Figure 3.9(b) shows a decrease in demand. Initially, the consumer is on the demand curve Dd_{x1} consuming OQ_1 units of the good at the price P_{x1}. A decrease in demand leads to a downward movement in the demand curve from Dd_{x1} to Dd_2. A decrease in demand implies that

— the same quantity of the good OQ_1 is now demanded at a lower price P_2 or

— at the same price P_{x1} a smaller quantity of the good is demanded, which has decreased from OQ_1 to OQ_2.

RECAP

- The quantity demanded of a good is the amount of that good demanded at a particular price over a certain time.
- Individual demand is the quantity of a good that an individual is willing to purchase at certain price over a given time.
- Market demand is the total quantity of a good that is demanded by all the individuals in the market at certain price over a given time.
- The demand for a good by an individual depends on many factors: own price, price of other related goods, income of the consumer, tastes and preferences of the consumer, income and wealth distribution and others.

- A change in demand is a movement which occurs along the demand curve and is caused by a change in the price of the good, *ceteris paribus*.
- A shift in the demand curve is caused by a change in any of the factors, which influence the demand other than the price of the good itself. It is important to note here that there is a shift of the demand curve.

SUPPLY

What Is Supply?

While understanding the demand, we focused on consumers. To understand the supply, we now examine the producer. The supply of a good is the total amount of a good, which the producer is willing to produce and supply at a particular price over a certain time.

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Law of the Supply

$Ss_x = f(P_x)$

The above function shows that there exists a relationship between the supply of a good and the price of the good, *ceteris paribus*. This relationship is called the law of supply. According to the law of supply, other things remaining the same, the quantity supplied of a good increases when the price of the good increases and decreases when the price decreases. Hence, there exists a direct and positive relationship between the quantity supplied of a good and the price of the good, assuming that the other things remain the same.

According to the law of supply, other things remaining the same, the quantity supplied of a good increases when the price of the good increases and decreases when the price decreases.

Supply Function

The supply of a good depends on many factors. These include the own price (price of the good itself), price of the other related goods, changes in technology, price of the inputs or the factors of production, government policies and taxes and others.

The supply function of a good can be expressed as

$Ss_x = f(P_x, P_o, P_I, T, G_T)$

where Ss_x is supply of good x, P_x is price of good x, P_I is price of the inputs or the factors of production, P_o is price of other related goods, T is changes in technology and G_T is government policies and taxes.

Supply Schedule and Supply Curve

A supply schedule depicts the quantity of the good, which is supplied at each price, assuming that other things remain the same (*ceteris paribus* assumption).

Illustration 4: Suppose the supply function of a single producer for good x is $Ss_x = -20 + 20\ P_x$. Determine the supply schedule and the supply curve.

Single Producer Supply Schedule

By substitution of different prices of good x into this equation, we can obtain the supply schedule as in Table 3.4.

Table 3.4 Single Supply Schedule: $Ss_x = -20 + 20\ P_x$

P_x	Ss_x	Points on Supply Curve in Figure 3.10
6	100	A
5	80	B
4	60	C
3	40	D
2	20	E

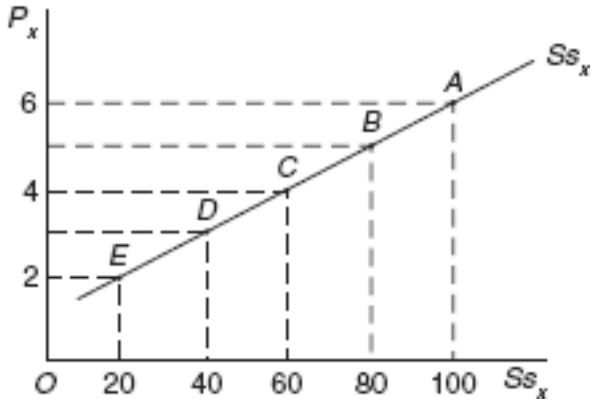

Figure 3.10 Single Producer's Supply Curve

The supply schedule shows the different quantities of the good *x* supplied by the producer at different prices, *ceteris paribus*.

By plotting the different pairs of values on a graph and then by joining the points so obtained, we can get the supply curve for good *x* as in Figure 3.10.

Thus, the supply curve is a graphical representation of the supply schedule. It is upward sloping showing the positive relationship between the price and the quantity supplied of a good.

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Market Supply Schedule

The market supply schedule shows the different quantities of good *x* supplied, per time period, by all the producers of good *x* in the market at different prices, *ceteris paribus*. Hence, it is the aggregate of the supply of the entire producers of good *x* in the market. The market supply of a good depends on all the factors, which determine the single producer's supply curve and also on the number of producers of good *x*.

Illustration 5: There are 100 identical producers in the market with identical supply schedules for good *x*, $Ss_x = -20 + 20\ P_x$. Determine the market supply schedule and market supply curve.

Single producer's supply schedule: $Ss_x = -20 + 20\ P_x$.

Market supply curve for good *x* (if there are 100 producers in the market who are identical)

$SS_x = 100\ (Ss_x) = -2000 + 2000\ P_x$.

We can obtain the market supply schedule in Table 3.5 and the market supply curve in Figure 3.11.

Table 3.5 Market Supply Schedule

P_x	SS_x	Points on Supply Curve in Figure 3.11
5	8000	A
4	6000	B
3	4000	C
2	2000	D

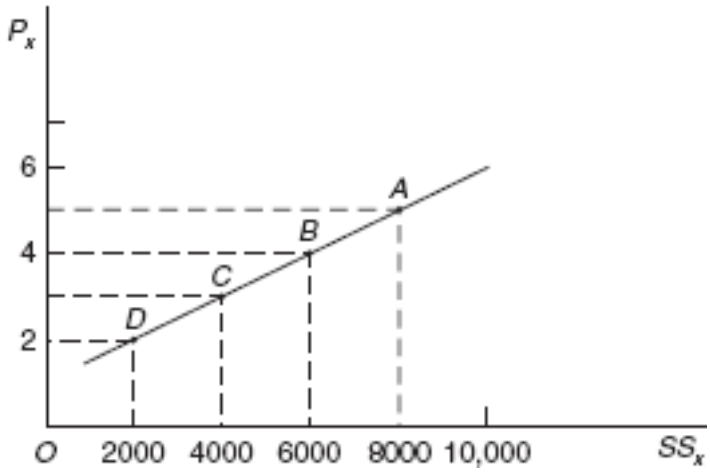


Figure 3.11 Market Supply Curve

Why Does the Supply Curve Slope Upwards?

The reasons behind the positive relationship between the price and the quantity supplied of a good are as follows:

1. An increase in production and thus an increased supply can only occur at a higher price because of the law of diminishing returns.
2. By selling at a higher price, the producer is able to make greater profits. Thus with an increase in price, he increases the quantity supplied.

Change in Supply versus Shifts in Supply

Change in Supply

A change in supply or a change in the quantity supplied of the good is a movement, which occurs along the supply curve and is caused by a change in the price of the good, *ceteris paribus*. It is important to note that there is only a movement along the supply curve. The change in supply can be of two types:

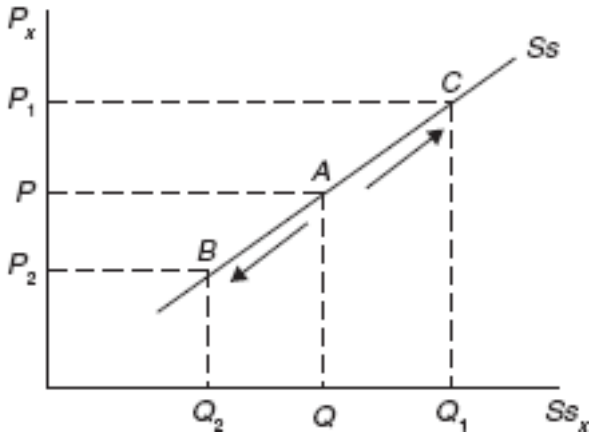


Figure3.12 A Change in Supply of Good *x*

1. **Expansion of Supply:** An expansion or extension of supply is a rise in the supply of the good as a result of an increase in the price of the good.

   Figure 3.12 depicts the effect of a change in supply. Initially, the producer is on the supply curve Ss_x at point *A* supplying *OQ* units of good *x* at price *OP*. An increase in the price of the good to OP_1 leads to an increase in the quantity supplied of the good to OQ_1. This is called an expansion of supply.

2. **Contraction of Supply:** A contraction of supply is a decrease in the supply of the good as a result of a fall in the price of the good.

   In Figure 3.12, initially the consumer is on the supply curve Ss_x at point *A* supplying *OQ*units of good *x* at price *OP*. A fall in the price of the good to OP_2 leads to a decrease in the quantity supplied of the good to OQ_2. This is called a contraction of demand.

A change in supply or a change in the quantity supplied of the good is a movement, which occurs along the supply curve and is caused by a change in the price of the good, *ceteris paribus*.

Shifts in Supply

A shift in supply curve is caused by a change in any of the factors, which influence the supply other than the price of the good itself. These factors include changes in technology and in government policies. It is important to note here that there is shift of the supply curve. The shift in supply can be of two types.

A shift in supply curve is caused by a change in any of the factors, which influence supply other than the price of the good itself. It is important to note here that there is shift of the supply curve.

1. **Increase in Supply:** An increase in supply is an increase in the supply of the good as a result of a change in any of the factors, which influence the supply other than the price of the good itself.

Figure 3.13(a) shows an increase in supply. Initially, the producer is on the supply curve Ss_1 supplying OQ_1 units of the good at the price P_1. An increase in supply leads to an outward movement in the supply curve from Ss_{x1} to Ss_{x2}. An increase in supply implies that

— the same quantity of the good OQ_1 is now supplied at a lower price P_2 or

— at the same price P_{x1}, a larger quantity of the good is supplied which increases from OQ_1 to OQ_2.

2. **Decrease in Supply:** A decrease in supply is a decrease in the supply of the good as a result of a change in any of the factors, which influence the supply other than the price of the good itself.

Figure 3.13(b) shows a decrease in supply. Initially, the producer is on the supply curve Ss_{x1} supplying OQ_1 units of the good at the price P_{x1}. A decrease in supply leads to an inward movement in the supply curve from Ss_{x1} to Ss_{x2}. A decrease in supply implies that

— the same quantity of the good OQ_1 is now supplied at a higher price P_{x2} or

— at the same price P_{x1}, a smaller quantity of the good is supplied, which decreases from OQ_1 to OQ_2.

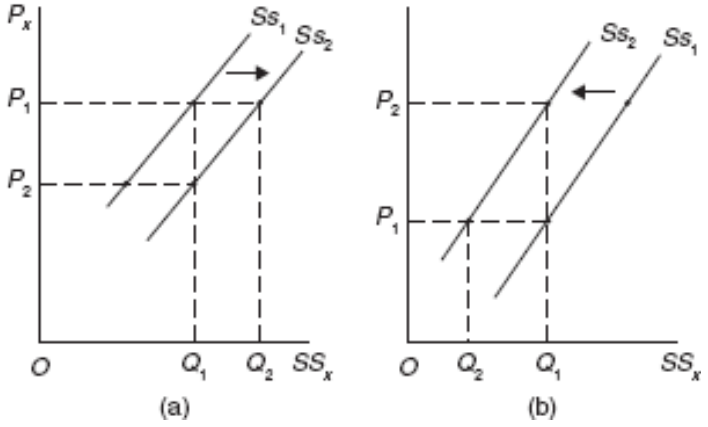


Figure 3.13 Shifts in Supply of Good *x*

RECAP

- The supply of a good is the total amount of a good which the producer is willing to produce and supply at a particular price over a certain time.
- According to the law of supply, other things remaining the same, the quantity supplied of a good increases when the price of the good increases and decreases when the price decreases.
- A supply schedule depicts the quantity of the good which is supplied at each price, assuming that other things remain the same (*ceteris paribus* assumption).
- The supply curve is upward sloping showing the positive relationship between the price and the quantity supplied of a good.
- The market supply schedule shows the different quantities of good *x* supplied, per time period, by all the producers of good *x* in the market at different prices, *ceteris paribus*.

EQUILIBRIUM

Equilibrium occurs when the quantity demanded of a good in the market over a certain time is equal to the quantity supplied of the good over the same time. Graphically, equilibrium occurs at the point of intersection of the market demand and the supply curves of the good. The equilibrium price is that price at which the equilibrium exists. The equilibrium quantity is that quantity at which the equilibrium exists.

Equilibrium occurs when the quantity demanded of a good in the market over a certain time is equal to the quantity supplied of the good over the same time.

Illustration 6: There are 1000 individuals in the market with identical demand schedules for good *x*, $Dd_x = 10 - P_x$ and 100 identical producers in the market with the identical supply schedules for good *x*, $Ss_x = -20 + 20\ P_x$. Determine the equilibrium price and equilibrium quantity for good *x*.

Market demand schedule:

$$DD_x = 1000\ (Dd_x)$$
$$= 1000\ (10 - P_x)$$
$$= 10{,}000 - 1000\ P_x$$

Market supply curve for good *x*:

$Ss_x = 100\ (Ss_x) = -2000 + 2000\ P_x$.

Table 3.6 depicts the market demand and supply schedules while Figure 3.14 shows the equilibrium.

Table 3.6 Market Demand and Supply Schedules

P_x	Dd_x	Points on Demand Curve in Figure 3.1
5	5000	8000
4	6000	6000
3	7000	4000
2	8000	2000

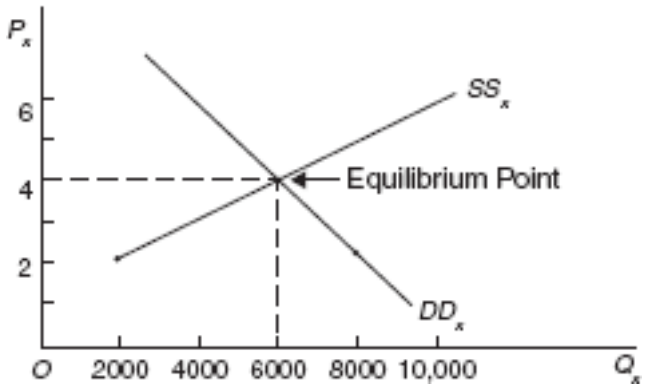


Figure 3.14 Determination of Equilibrium

Graphically, equilibrium occurs at the price P_x equal to ₹ 4 and quantity Q_x equal to 6000.
Mathematically to determine the equilibrium:

$DD_x = SS_x$

$10{,}000 - 1000\ P_x = -2000 + 2000\ P_x$

$3000\ P_x = 12{,}000$

$P_x =$ ₹ 4

Substituting the equilibrium price into the demand or supply equations:

$Dd_x = 10{,}000 - 1000\ P_x$

$= 10{,}000 - 1000\ (4)$

$= 6000$

Or

$Ss_x = -2000 + 2000\ P_x$

$= -2000 + 2000\ (4)$

$= 6000$

Alfred Marshall was a prominent figure in British economics from 1890 till his death in 1924. He specialized in microeconomics. One of the most important books written by him was the *Principles of Economics*, where Marshall laid emphasis on the fact that the output and the price of a good are determined by both the demand and the supply of the good. Marshall was responsible for bringing out the concept of price elasticity of demand to show the sensitivity of demand to the changes in the price of the good. He also introduced the concept of the consumer's surplus. The credit goes to Marshall for introducing the three periods in time, the market period, short period and the long period.

- Graphically, equilibrium occurs at the point of intersection of market demand and supply curves of the good.
- The equilibrium price is that price at which the equilibrium exists.
- The equilibrium quantity is that quantity at which the equilibrium exists.

ELASTICITY OF DEMAND

According to the law of demand, when the price of a good increases, the demand for the good decreases, and when the price of a good decreases, the demand for the good increases, *ceteris paribus*. While the law shows the direction of change and depicts the negative relationship between price and quantity, it does not indicate as to how responsive the demand for a good is to its price. In other words, it does not give the magnitude or the degree of the change. This is given by the elasticity of demand.

As already discussed, the quantity demanded of a good is influenced by many factors, for example, price of the good, income, and price of other goods. Hence, we determine the magnitude of the

relationship of these factors to demand by analysing the price elasticity of demand, income elasticity of demand, and the cross price elasticity of demand and others.

Price Elasticity of Demand

What Is Price Elasticity of Demand?

The concept was first discussed by Alfred Marshall. Price elasticity of demand is a measure of the responsiveness of the quantity demanded of a good to a change in the price of the good. Price elasticity of demand can be defined as the ratio of the percentage change in the quantity demanded of a good, per unit of time, to the percentage change in the price of the good.

$$E_p = \frac{\text{Percentage change in the quantity demanded of a good}}{\text{Percentage change in the price of the good}}$$

$$= \text{Change in quantity demanded} - \text{Change in price}$$

$$= \frac{\Delta Q}{Q} - \frac{\Delta P}{P}$$

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where E_P is price elasticity of demand, Q is original quantity demanded, P is original price, ΔQ is change in quantity demanded and ΔP is change in price.

(It is important to note that the coefficient of price elasticity of demand, E_P, is negative since there is an inverse relationship between the price and the quantity demanded.)

Factors Influencing the Price Elasticity of Demand

Price elasticity of demand depends on certain following factors:

1. **Nature of the Good:** Goods can be grouped into necessities, comforts and luxuries. Necessities such as bread, milk and clothes are goods, which are necessary for the survival. Their demand elasticity is low. Comforts are goods, whose demand is more elastic as compared with the luxuries. Luxuries such as LCD and fancy cars are goods, whose demand is highly elastic. An increase in the

price of luxuries leads to a decrease in demand while a decrease in the price leads to an increase in demand.

2. **Availability of Substitutes for the Good:** The elasticity of demand will be higher, the more is the availability of close substitutes for the good. For example, tea and coffee are close substitutes and thus have a high elasticity of demand. An increase in the price of coffee implies that tea is relatively less expensive. Hence, there is an increase in demand for the relatively less expensive tea. For goods such as sugar and salt, in general, the elasticity of demand will be lower since they do not have any close substitutes.

   In addition, the elasticity of demand may be much larger for, the different brands of soap, for example, than for soap itself. This is because each brand of soap is a close substitute of the other brand.

3. **Variety of Uses of the Good:** At a lower price, a good will be used for many purposes, for example, there are many uses of electricity. Thus, if a good has a large number of uses then its elasticity is high for a fall in price as it can be used for the less important tasks. However, at a higher price, the good will be used only to satisfy the more essential demands.

4. **Fraction of the Income Spent on the Good:** If a consumer spends a small fraction of his income on buying a good, then its elasticity will be low, for example, salt, pens and pencils. If the price of any of these goods increases, there will be almost no change in demand since the expenditure on them forms a very small part of the total expenses by a consumer.

   On the other hand, if a consumer spends a large proportion of his income on buying a good, for example, LCD and cars, then an increase in its price may lead to a decrease in demand depicting a high elasticity for the good.

5. **Possibility of Postponement of Consumption:** Goods, where the consumption can be postponed, will have a high elasticity of demand. An increase in the price of durable goods such as televisions will lead to a postponement of demand by the consumers and thus the demand will fall.

6. **Price of the Good:** If the price is high, then the demand for the good is elastic and if the price is low then the demand is inelastic.

All these factors play an important role in determining the elasticity of the demand.

Measurement of Price Elasticity of Demand

The following are different methods of measuring the price elasticity of the demand.

Percentage Method

According to this method, the price elasticity of demand is the ratio of the percentage change in the quantity demanded of a good, per unit of time, to the percentage change in the price of the good.

$$E_p = \frac{\text{Percentage change in the quantity demanded of a good}}{\text{Percentage change in the price of the good}}$$

$$= \text{Change in quantity demanded} - \text{Change in price}$$

$$= \frac{\Delta Q}{Q} - \frac{\Delta P}{P}$$

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where E_P is price elasticity of demand, Q is original quantity demanded, P is original price, ΔQ is change in quantity demanded and ΔP is change in price.

The coefficient of elasticity of demand can take a value between zero and infinity.

1. **Demand Is Perfectly Inelastic, $E_P = 0$:** In such a situation, the ratio of percentage change in the quantity demanded to the percentage change in the price of the good is zero. This implies that whatever is the price of the good the quantity demanded remains the same. The demand curve is shown in Figure 3.15(a) as a straight line parallel to the *y* axis. *Example:* Medicines.
2. **Demand Is Relatively Inelastic, $E_P < 1$:** In such a situation, the ratio of percentage change in the quantity demanded to the percentage change in the price of the good is < 1. This implies that the percentage change in the quantity demanded is less than the percentage change in the price of the good. The demand curve is shown in Figure 3.15(b). A decrease in the price of the good from P_1 to P_2 leads to an increase in the quantity demanded from OQ_1 to OQ_2. The decrease in the price, ΔP is larger than the increase in the quantity demanded, ΔQ. *Example*: Necessities.
3. **Demand Has a Unitary Elasticity, $E_P = 1$:** In such a situation, the ratio of percentage change in the quantity demanded equals the percentage change in the price of the good. The demand curve is shown in Figure 3.15(c) as a rectangular hyperbola. A decrease in the price of the good from P_1 to P_2 leads to an increase in the quantity demanded from OQ_1 to OQ_2. The decrease in the price, ΔP is equal to the increase in the quantity demanded, ΔQ. *Example*: Normal goods.

4. **Demand Is Elastic, $E_P > 1$:** In such a situation, the ratio of percentage change in the quantity demanded to the percentage change in the price of the good is > 1. This implies that the percentage change in the quantity demanded is more than the percentage change in the price of the good. The demand curve shown in Figure 3.15(d) is relatively flatter. A decrease in the price of the good from P_1 to P_2 leads to an increase in the quantity demanded from OQ_1 to OQ_2. The decrease in the price, ΔP is less than the increase in the quantity demanded, ΔQ. *Example:* Luxuries.

5. **Demand Is Perfectly Elastic, $E_p = \infty$:** In such a situation, any price change, which may be very small, leads to an infinite change in the quantity demanded of good *x*. The demand curve is shown in Figure 3.15(e) as a straight line parallel to the *x* axis. Such a situation exists under the perfect competition.

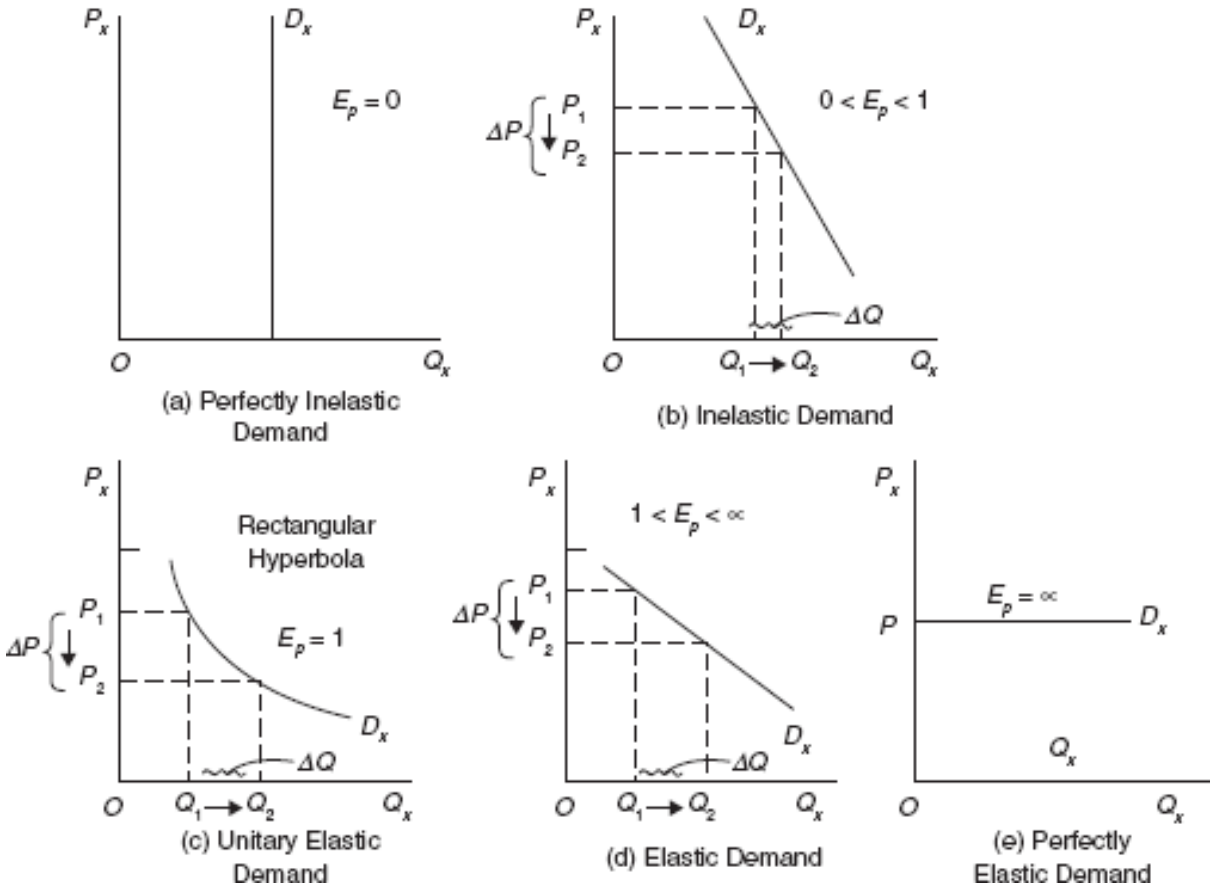


Figure 3.15 Percentage Method of Measuring the Price Elasticity of the Demand

Outlay Method

This is also known as the total expenditure method or the total revenue method. Here, the total outlay of the consumer, on the good, is compared before and after the price change. Given that total outlay is measured by quantity multiplied by the price of the good, there can be three situations:

1. **Demand Is Relatively Inelastic, $E_P < 1$:** When price elasticity of demand is < 1, change in the quantity demanded is less than proportionate to the change in the price of the good. Thus, total expenditure decreases as price decreases (and total expenditure increases as price increases). Quantity demanded increases in a smaller proportion. Price and total expenditure move in the same direction.
2. **Demand Has a Unitary Elasticity, $E_P = 1$:** When price elasticity of demand is equal to one, change in the quantity demanded is in the same proportion to the change in the price of the good. Thus total expenditure does not change as price decreases (or as price increases). Quantity demanded increases in the same proportion.
3. **Demand Is Elastic, $E_P > 1$:** When price elasticity of demand is >1, change in the quantity demanded is more than proportionate to the change in the price of the good. Thus, total expenditure increases as price decreases (and total expenditure decreases as price increases). Quantity demanded increases in a larger proportion. Price and total expenditure move in the opposite direction.

Table 3.7 Total Outlay Method of Measuring the Price Elasticity of Demand

Effect of Decrease in Price on Total Expenditure	Quantity Demanded	E_p	Type of Elasticity
Total expenditure decreases	Quantity demanded increases in a smaller proportion	$E_p < 1$	Inelastic demand
Total expenditure does not change	Quantity demanded increases in the same proportion	$E_p = 1$	Demand is unitary elastic
Total expenditure increases	Quantity demanded increases in a larger proportion	$E_p > 1$	Elastic demand

Point Elasticity of Demand

To measure the point elasticity of demand, the geometrical method is used.

In Figure 3.16, suppose point elasticity is to be determined at point *M* on the demand curve D_x. Take a point *N* as very close to point *M*. (In the figure, the points are shown far so that it is easy to understand.) Now, join points *M* and *N* and extend the line *MN* to meet the *x* axis at point *A* and the *y* axis at point *B*. To determine the elasticity, we use the formula in the percentage method:

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where $Q = OO_1$, $P = OP_1$, $\Delta Q = Q_1Q_2$ and $\Delta P = P_1P_2$.

By substituting in the formula, we get

$$E_p = \frac{Q_1Q_2}{P_1P_2} \times \frac{OP_1}{OQ_1}$$

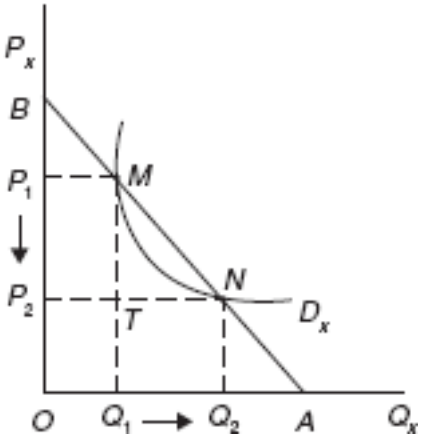


Figure 3.16 Point Elasticity of Demand

But in the figure

$Q_1Q_2 = TN$

$P_1P_2 = MT$

$OP_1 = MQ_1$

Thus, by substituting for these values, we have

$$E_p = \frac{TN}{MT} \times \frac{OP_1}{OQ_1}$$

Comparing triangles MTN and MQ_1A, we find them similar (since each corresponding angle is equal). Thus,

$$\frac{TN}{MT} = \frac{Q_1A}{MQ_1}$$

Thus, by substituting for these values, we have

$$E_p = \frac{Q_1A}{MQ_1} \times \frac{MQ_1}{OQ_1}$$

$$E_p = \frac{Q_1A}{OQ_1}$$

In addition, comparing triangles BP_1M and MQ_1A, we find them similar (since each corresponding angle is equal). Thus,

$$\frac{Q_1A}{P_1M} = \frac{MA}{BM}$$

Also

$P_1M = OQ_1$

Thus,

$$\frac{Q_1A}{OQ_1} = \frac{MA}{BM}$$

$$E_p = \frac{Q_1A}{OQ_1} = \frac{MA}{BM}$$

$$= \frac{Q_1A}{OQ_1} = \frac{\text{Lower segment}}{\text{Upper segment}}$$

If the demand curve is non-linear, then again the geometrical method can be used to measure the elasticity at a point on the demand curve by drawing a tangent at the point and then by applying the formula

$$E_p = \frac{\text{Lower segment}}{\text{Upper segment}}$$

Arc Elasticity

Under the point elasticity of demand, we measured the elasticity at a point on the demand curve, where the change in price is infinitesimally small. To measure arc elasticity, we take two finite points on a demand curve, which are close to each other as in Figure 3.17. Suppose arc elasticity is to be calculated on the demand curve D_x over the arc *MN*.

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{\frac{P_1 + P_2}{2}}{\frac{Q_1 + Q_2}{2}}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{(P_1 + P_2)}{(Q_1 + Q_2)}$$

In Figure 3.17

$$E_p = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{(P_1 + P_2)}{(Q_1 + Q_2)}$$

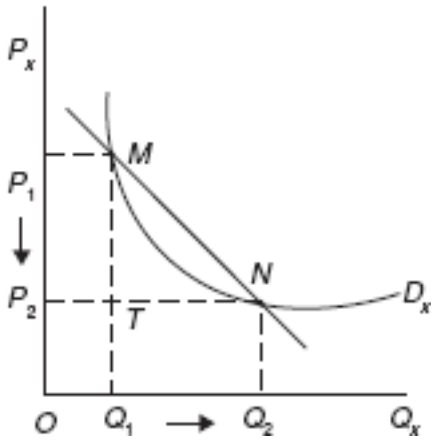


Figure 3.17 Arc Elasticity of Demand

Price Elasticity of Demand on a Linear Demand Curve

Along a linear demand curve, which is downward sloping, price elasticity varies at different points along the demand curve. In Figure 3.18 on the demand curve *DD′*, we can calculate elasticity by the formula

$$E_p = \frac{\text{Lower segment}}{\text{Upper segment}}$$

1. At point *D* on the *y* axis, $E_p = \frac{DD'}{0} = \infty.$
2. At point *M*, the midpoint on the demand curve $DD' E_p = \frac{MD'}{DM} = 1.$
3. At point *D′* on the *x* axis, $E_p = \frac{0}{DD'} = 0.$

Thus, as we move down a demand curve, the price elasticity goes on decreasing.

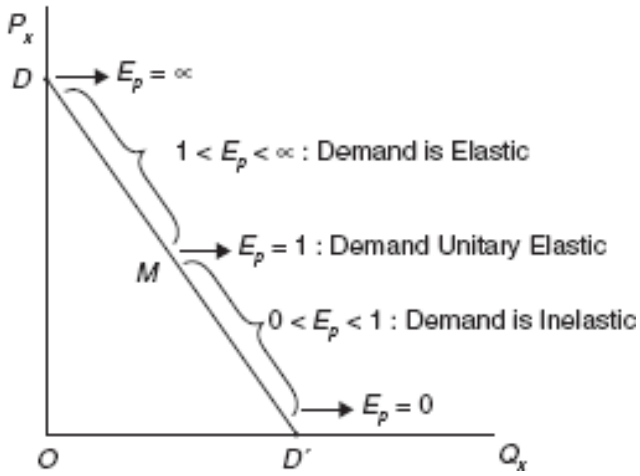


Figure 3.18 Price Elasticity of Demand on a Linear Demand Curve

REVENUE CONCEPTS

We can depict the relationship between average revenue, marginal revenue, total revenue and price elasticity as follows.

Average Revenue, Marginal Revenue and Their Relationship with Price Elasticity

We have

TR = P x Q

$$MR = \frac{\partial TR}{\partial Q}$$

$$MR = \frac{\partial (P \times Q)}{\partial Q}$$

$$MR = P \times \frac{\partial Q}{\partial Q} + Q \times \frac{\partial P}{\partial Q}$$

$$MR = P + Q\frac{\partial P}{\partial Q} \qquad (3.1)$$

But

$$E_P = -\frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Thus,

$$\frac{\partial P}{\partial Q} = -\frac{1}{E_P} \times \frac{P}{Q} \qquad (3.2)$$

Substituting the value of Equation (3.2) in Equation (3.1), we get

$$MR = P + Q\left(-\frac{1}{E_P} \times \frac{P}{Q}\right)$$

$$MR = P - \frac{P}{E_P}$$

$$MR = P\left(1 - \frac{1}{E_P}\right)$$

But *P* and *AR* are the same.

Thus,

$$MR = AR\left(1 - \frac{1}{E_P}\right)$$

Or

$$MR = AR - \frac{AR}{E_P}$$

$$\frac{AR}{E_P} = AR - MR$$

$$E_P = \frac{AR}{AR - MR}$$

The formula shows the relationship between AR, MR and E_P. Table 3.8 shows the different values of AR and MR when E_P lies between zero and infinity.

Figure 3.19 graphically depicts the average revenue, marginal revenue and their relationship with price elasticity.

Table 3.8 Average Revenue, Marginal Revenue and Their Relationship with Price Elasticity

E_P	AR	MR
$E_P = \infty$	$AR = MR$	$MR = AR$
$E_P > 1$	$AR > 0$	$MR > 0$
$E_P = 1$	$AR > 0$	$MR = 0$
$E_P < 1$	$AR > 0$	$MR < 0$
$E_P = 0$	$AR = 0$	$MR < 0$

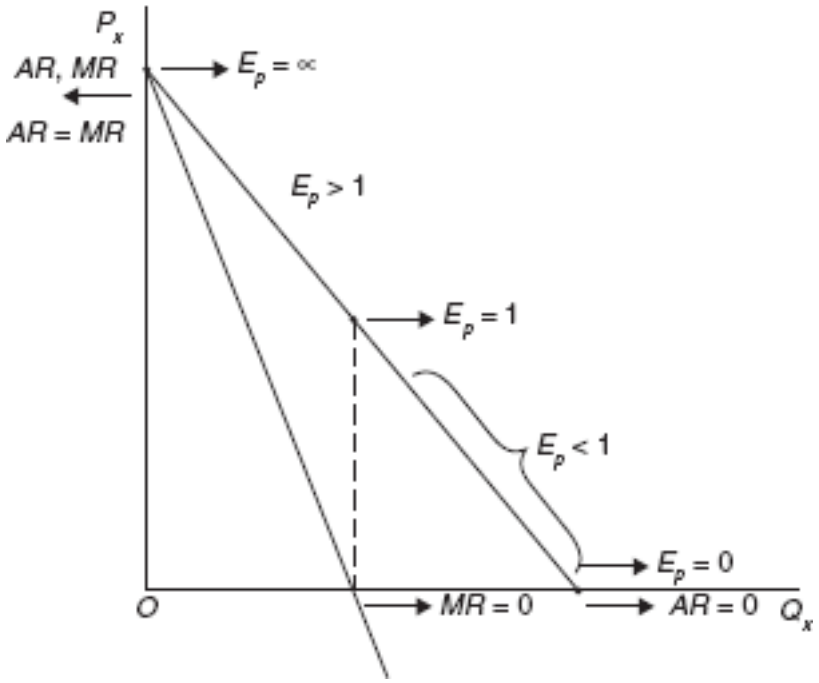


Figure 3.19 Average Revenue, Marginal Revenue and Their Relationship with Price Elasticity

Total Revenue and Its Relationship with Price Elasticity

The relationship between total revenue and price elasticity has been depicted in Figure 3.20.

1. **When Demand Is Elastic, $E_P > 1$:** When price elasticity of demand is > 1, change in the quantity demanded is more than proportionate to the change in the price of the good. Thus, total revenue increases as price decreases. Also, marginal revenue is positive. Thus, a firm will benefit if it reduces its price in this elastic range of the demand curve.
2. **When Demand Has a Unitary Elasticity, $E_P = 1$:** When price elasticity of demand is equal to one, change in the quantity demanded is in the same proportion to the change in the price of the good Thus, total revenue does not change as price decreases. Marginal revenue is zero in this portion of the demand curve.
3. **When Demand Is Relatively Inelastic, $E_P < 1$:** When price elasticity of demand is < 1, change in the quantity demanded is less than proportionate to the change in the price of the good. Thus, total revenue decreases as price decreases. Marginal revenue is negative in this portion of the demand curve.

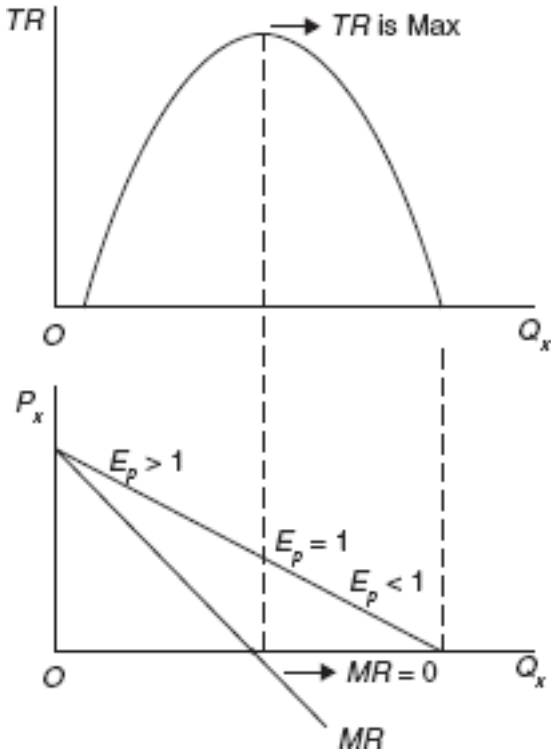


Figure 3.20 Total Revenue and Its Relationship with Price Elasticity

Significance of Price Elasticity of Demand

Price elasticity of demand is often used in making the economic decisions by the business firms, the government and others.

Decisions by the Business Firms

When a firm is in the process of deciding whether to increase the price of the good that it is producing, it is important to consider the price elasticity of the demand. If elasticity of demand is high, then a decrease in price will lead to an increase in the sales of the good. Under the monopoly when a monopolist goes in for price discrimination of charging different prices in different markets, he determines the price in each market by taking into consideration the price elasticity of demand in each market.

Decisions by the Government

Important decisions have to be made by the government in its formulation of policies. These include the following:

1. Fixation of minimum support prices for agriculture. The elasticity of demand for agricultural products including wheat, rice and vegetables is low since they are necessities. A good harvest leads to an increase in supply, and given the demand there occurs a fall in the price. Since the demand is inelastic, a fall in the price does not lead to an increase in demand. Hence, the farmer's income does not increase much in spite of a good harvest. Here, the government plays an important role in formulating the policies relating to minimum support price such that the prices of the agricultural products are stabilized and not subject to the vagaries of nature.
2. While formulating policies relating to taxes, if the government is aiming at maximizing its tax revenues to finance the government expenditures, then it should levy high taxes only on goods with low elasticity of demand. In case the elasticity is high, a tax will lead to an increase in the price of the good leading to a decrease in the demand for the good and thus a fall in the tax revenue. Then, the government will be unable to fill its coffers through the collection of taxes.

Decisions Relating to International Trade

In analysing the issues relating to the international trade, the elasticity of demand plays a very important role. If a country is facing problems on the balance of payments, the situation can be tackled through devaluation. Devaluation leads to an increase in the price of imports and a decrease in the price of exports of the devaluing country. Hence, devaluation can be successful only if the elasticity of demand for the country's imports is high so that an increase in the price of imports leads to a decrease in the demand for imports and the elasticity of demand for the country's exports is low so that a decrease in the price of exports leads to an increase in the demand for exports.

- Price elasticity of demand can be defined as the ratio of the percentage change in the quantity demanded of a good, per unit of time, to the percentage change in the price of the good.
- Price elasticity of demand depends on certain factors: nature of the good, availability of substitutes for the goods, variety of uses of the good, the fraction of the income spent on the good, possibility of postponement of consumption and the price of the good.
- There are many ways by which price elasticity of demand can be measured: percentage method, outlay method, point elasticity of demand and arc elasticity.
- As we move down a demand curve, the elasticity goes on decreasing.

INCOME ELASTICITY OF DEMAND

What Is Income Elasticity of Demand?

An important determinant of demand is the consumer's income.

Income elasticity of demand is a measure of the responsiveness of the quantity demanded of a good to a change in the income of the consumer, *ceteris paribus*. Income elasticity of demand can be defined as the ratio of the percentage change in the quantity demanded of a good, per unit of time, to the percentage change in the income of the consumer.

Income elasticity of demand is a measure of the responsiveness of the quantity demanded of a good to a change in the income of the consumer, *ceteris paribus*.

$$E_Y = \frac{\text{Percentage change in quantity demanded of a good}}{\text{Percentage change in income}}$$

$$= \frac{\text{Change in quantity demanded}}{\text{Change in income}}$$

$$= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta Y}{Y}}$$

$$= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

where E_Y is income elasticity of the demand, Q is quantity demanded, Y is income, ΔQ is change in quantity demanded and ΔY is change in income.

Different Types of Income Elasticity of Demand

The coefficient of income elasticity can take a value, which may be positive or even negative as shown in Table 3.9.

1. **Income Elasticity of Demand Is High: $E_Y > 1$:** In such a situation, the ratio of percentage change in the quantity demanded to the percentage change in the income is > 1. This implies that the

percentage change in the quantity demanded is more than the percentage change in the income. When the consumer's income increases, the quantity demanded of the good increases more than proportionately. *Example:* Luxuries.

2. **Income Elasticity of Demand Is Equal to One or Unitary Income Elasticity: $E_Y = 1$:** In such a situation, the ratio of percentage change in the quantity demanded is equal to the percentage change in the income. When the consumer's income increases, the quantity demanded of the good increases proportionately. *Example*: Comforts.

3. **Income Elasticity of Demand Is Low: $0 < E_Y < 1$:** In such a situation, the ratio of percentage change in the quantity demanded to the percentage change in the income is < 1. This implies that the percentage change in the quantity demanded is less than the percentage change in the income. When the consumer's income increases, the quantity demanded of the good increases less than proportionately. Thus, here income elasticity is positive but < 1. *Example*: Necessities.

4. **Income Elasticity of Demand Is Zero: $E_Y = 0$:** In such a situation, there does not occur any change in the quantity demanded when there is a change in the income. It is very difficult to specify the type of good, which will have zero income elasticity.

5. **Income Elasticity of Demand Is < 0 or Negative Income Elasticity: $E_Y < 0$:** In such a situation, an increase in the income leads to a decrease in the quantity demanded of the good. *Example*: Inferior goods.

Table 3.9 Types of Income Elasticity of Demand

Nature of the Good	Coefficient of Income Elasticity	Effect of Increase in Income on Quantity Demanded of the Good
Luxuries	$E_Y > 1$	Increases more than proportionately
Comforts	$E_Y = 1$	Increases proportionately
Necessities	$0 < E_Y < 1$	Increases less than proportionately
Inferior good	$E_Y < 0$	Decreases in absolute terms

Significance of Income Elasticity of Demand

1. Income elasticity of demand helps classify goods into luxuries, comforts, necessities and inferior goods. This is of great use to a firm when it is making its decision as to which goods to produce.

2. Income elasticity of demand is very useful when forecasts of demand for the different goods are to be made. Thus, it helps the firm in planning its production strategies.

RECAP

- Income elasticity of demand is a measure of the responsiveness of the quantity demanded of a good to a change in the income of the consumer, *ceteris paribus*.
- The coefficient of income elasticity can take a value, which may be positive or even negative.
- Income elasticity of demand helps classify goods into luxuries, comforts, necessities and inferior goods.
- Income elasticity of demand is very useful when forecasts of demand for the different goods are to be made.

CROSS PRICE ELASTICITY OF DEMAND

What Is Cross Price Elasticity of Demand?

Besides the price and the consumer's income, there are many other factors which influence the demand for a good. An important determinant of demand is the price of the related goods.

Cross price elasticity of demand is a measure of the responsiveness of the quantity demanded of a particular good to a change in the price of another good, *ceteris paribus*. Cross price elasticity of demand can be defined as the ratio of the percentage change in the quantity demanded of good *x*, to the percentage change in the price of good *y*.

Cross price elasticity of demand is a measure of the responsiveness of the quantity demanded of a particular good to a change in the price of another good, *ceteris paribus*.

$$E_{xy} = \frac{\text{Percentage change in quantity demanded of good } x}{\text{Percentage change in price of good } y}$$

$$= \frac{\text{Change in quantity demanded of good } x}{\text{Change in price of good } y}$$

$$= \frac{\frac{\Delta Q_x}{Q_x}}{\frac{\Delta P_y}{P_y}}$$

$$= \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

where E_{xy} is cross price elasticity of demand, Q_x is quantity demanded of good x, P_y is price of good y, ΔQ_x is change in quantity demanded of good x and ΔP_y is change in price of good y.

Different Types of Cross Price Elasticity of Demand

The coefficient of cross price elasticity can take a value, which may be between zero and infinity as depicted in Table 3.10.

1. **Cross Elasticity of Demand Is > 0, E_{xy} > 0:** In such a situation, the two goods *x*and *y* are substitutes, for example, tea and coffee. An increase in the price of good *y*leads to an increase in the quantity demanded of good *x*.
2. **Cross Elasticity of Demand Is Equal to Zero, E_{xy} = 0:** In such a situation, the two goods *x* and *y* are independent goods or goods which are not related to each other, for example, car and mobile phones. An increase in the price of good*y* does not lead to any change in the quantity demanded of good *x*.
3. **Cross Elasticity of Demand Is < 0, E_{xy} < 0:** In such a situation, the two goods *x*and *y* are complements, for example, coffee and sugar. An increase in the price of good *y* leads to a decrease in the quantity demanded of good *x*.

Table 3.10 Types of Cross Price Elasticity of Demand

Nature of the Good	Coefficient of Income Elasticity	Effect of Increase in the Price of Good *y* on Quantity Demanded of Good *x*
Substitutes	$E_{xy} > 0$	Increases
Unrelated goods	$E_{xy} = 0$	Does not change
Complements	$E_{xy} < 0$	Decreases

Significance of Cross Price Elasticity of Demand

Most often firms are interested in analysing the cross elasticity of demand for their goods with respect to other goods, especially the complementary and substitute goods. This is important so that the effect of

any changes in the prices can be evaluated and taken into consideration when the firm is planning on its production and pricing strategies.

RECAP

- Cross price elasticity of demand is a measure of the responsiveness of the quantity demanded of a particular good to a change in the price of another good, *ceteris paribus*.
- The coefficient of cross price elasticity can take a value, which may be between zero and infinity.
- Cross elasticity of demand is important in that the effect of any changes in the prices of complementary and substitute goods can be evaluated and taken into consideration when the firm is planning on its production and pricing strategies.

ADVERTISING ELASTICITY

What Is Advertising Elasticity?

Nowadays, most firms spend on sales promotion activities, including advertising, to influence the sales of a good. It is important to note that although advertising does increase the sales, however, the degree to which it does so differs at different levels of the sales. Hence, it is of great importance to determine the optimum level of expenditure that should be incurred on advertising. This is even more important when a firm has to compete with other rival firms who are also involved in advertising their products.

Advertisement elasticity is a measure of the responsiveness of the quantity demanded of a particular good to a change in advertising, ceteris *paribus*.

Advertisement elasticity is a measure of the responsiveness of the quantity demanded of a particular good to a change in advertising, *ceteris paribus*. Advertisement elasticity can be defined as the ratio of the percentage change in the quantity demanded of good or sales to the percentage change in advertising.

$$E_A = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in advertising}}$$

$$= -\frac{\dfrac{\text{Change in quantity demanded or sales}}{\text{Quantity demanded or sales}}}{\dfrac{\text{Change in advertising expenditure}}{\text{Initial advertising expenditure}}}$$

$$= \frac{\dfrac{\Delta Q}{Q}}{\dfrac{\Delta A}{A}}$$

$$= \frac{\Delta Q}{\Delta A} \times \frac{A}{Q}$$

where E_A is advertisement elasticity, Q is quantity demanded or sales, A is initial advertising expenditure, ΔQ is change in quantity demanded or sales and AA is change in advertising expenditure.

If a 10 per cent increase in advertising causes an increase in the sales by 4 per cent, *ceteris paribus*, the advertising elasticity is 0.4.

Factors Influencing Advertising Elasticity

Some of the factors which influence the advertising elasticity are as follows:

1. **Advertisements by Other Competing Firms:** When firms are in a competitive situation, the effectiveness advertisement in influencing the sales of a firm will depend on the advertising expenditures of other firms.
2. **Sale of a Good:** When a new product is launched in a market E_A or the advertisement elasticity for the product may be > 1. However, as the sales of the product go on increasing the advertisement elasticity may decrease once the consumers become aware of the product.
3. **Cumulative Effect of Advertising Expenditure:** In the initial stages of the product, the expenditure on advertising may be insufficient. Hence, the advertising elasticity may be low. However, as the advertising expenditure picks up the advertising elasticity may increase having a cumulative effect.

Types of Advertising Elasticity

The coefficient of advertising elasticity can take a value which may be between zero and infinity as depicted in Table 3.11.

1. **Advertising Elasticity Is Equal to Zero, $E_A = 0$:** In such a situation, an increase in the advertising expenditure does not lead to an increase in sales.
2. **Advertising Elasticity Is > 0 But < 1, $1 < E_A > 0$:** In such a situation, an increase in the advertising expenditure leads to a less than proportionate increase in sales.
3. **Advertising Elasticity Is Equal to Unity, $E_A = 1$:** In such a situation, an increase in the advertising expenditure leads to a proportionate increase in sales.
4. **Advertising Elasticity Is > 1., $E_A > 1$:** In such a situation, an increase in the advertising expenditure leads to a more than proportionate increase in sales.

Table 3.11 Types of Advertising Elasticity

Coefficient of Advertising Elasticity	Effect of Increase in the Advertising Expenditure
$E_A = 0$	No increase in sales
$1 < E_A > 0$	Increases
$E_A = 1$	A proportionate increase in sales
$E_A > 1$	More than proportionate increase in sales

RECAP

- Advertisement elasticity is a measure of the responsiveness of the quantity demanded of a particular good to a change in advertising, *ceteris paribus*.
- Some of the factors which influence the advertising elasticity are: advertisements by other competing firms, sales of a good and the cumulative effect of advertising expenditure.
- The coefficient of advertising elasticity can take a value, which may be between zero and infinity.

ELASTICITY OF PRICE EXPECTATIONS

The concept of elasticity of price expectations was devised by J. R. Hicks. The price expectations of people are influenced by many factors including past prices, current prices, current events on the economic scenario and political events.

The elasticity of price expectations is a measure of the responsiveness of the expected change in the future prices to the change in the current prices of a good. Elasticity of price expectations can be defined as the ratio of the relative change in expected future price of a good to the relative change in the current price of the good.

The elasticity of price expectations is a measure of the responsiveness of the expected change in the future prices to the change in the current prices of a good.

$$E_{PE} = \frac{\frac{\Delta P_F}{P_F}}{\frac{\Delta P_C}{P_C}}$$

$$= \frac{\Delta P_F}{\Delta P_C} \times \frac{P_C}{P_F}$$

where E_{PE} is elasticity of price expectations, P_F is expected future price of a good, P_C is current price of the good, ΔP_C is change in current price of the good and ΔP_F is change in expected future price of the good.

Types of Elasticity of Price Expectations

The coefficient of elasticity of price expectations can take a value, which may be < 0 or even greater than unity as depicted in Table 3.12.

1. **Elasticity of Price Expectations Is > 1, E_{PE} > 1:** In such a situation, the consumers expect that the future prices will increase by a greater percentage than the current prices.
2. **Elasticity of Price Expectations Is Equal to One, E_{PE} = 1:** In such a situation, the consumers expect that the future prices will increase by the same percentage as the current prices.

3. **Elasticity of price expectations Is Smaller Than One, $E_{PE} < 1$:** In such a situation, the consumers expect that the future prices will increase by a lesser percentage than the current prices.

4. **Elasticity of Price Expectations Is Equal to Zero, $E_{PE} = 0$:** In such a situation, the consumers expect that the future prices will not be affected by the current prices.

5. **Elasticity of Price Expectations Is Smaller Than Zero, $E_{PE} < 0$:** In such a situation, the consumers expect that the increase in the current prices will lead to a decrease in the future prices.

Table 3.12 Types of Elasticity of Price Expectations

Elasticity	Coefficient of Elasticity of Price Expectations	Effects of Change in Current Prices
High elasticity	$E_{PE} > 1$	Consumers expect that the future prices will increase by a greater percentage than the current prices
Unitary elasticity	$E_{PE} = 1$	Consumers expect that the future prices will increase by the same percentage as the current prices
Low elasticity	$E_{PE} < 1$	Consumers expect that the future prices will increase by a lesser percentage than the current prices
Zero elasticity	$E_{PE} = 0$	Consumers expect that the future prices will not be affected by the current prices
Negative elasticity	$E_{PE} < 0$	Consumers expect that the increase in the current prices will lead to a decrease in the future prices

The elasticity of price expectations is of great help to the firms when they are planning on the future prices of their goods.

RECAP

- The elasticity of price expectations is a measure of the responsiveness of the expected change in the future prices to the change in the current prices of a good.
- The coefficient of elasticity of price expectations can take a value, which may be < 0 or even greater than unity.

ELASTICITY OF SUPPLY

What Is Elasticity of Supply?

The concept was first discussed by Alfred Marshall. Elasticity of supply is a measure of the responsiveness of the quantity supplied of a good to a change in the price of the good. Elasticity of supply can be defined as the ratio of the percentage change in the quantity supplied of a good, per unit of time, to the percentage change in the price of the good.

Elasticity of supply is a measure of the responsiveness of the quantity supplied of a good to a change in the price of the good.

$$E_s = \frac{\text{Percentage change in the quantity supplied of a good}}{\text{Percentage change in the price of the good}}$$

$$= \frac{\text{Change in the quantity supplied}}{\text{Change in price}}$$

$$= \frac{\frac{\Delta Q_s}{Q_s}}{\frac{\Delta P}{P}}$$

$$= \frac{\Delta Q_s}{\Delta P} \times \frac{P}{Q_s}$$

where E_S is price elasticity of the supply, Q_S is quantity supplied, P_x is price, ΔQ_S is change in the quantity supplied and ΔP is change in the price.

(It is important to note that the coefficient of price elasticity of supply E_S is positive as there is a positive relationship between the price and the quantity supplied.)

Factors Influencing Elasticity of Supply

The factors on which the elasticity of supply depends are as follows:

1. **Time Available:** If the time is very short, then in that case the supply of the good is inelastic as the factors of production are fixed. However, if the period is long enough, then the supply of a good is elastic as the factors of production are variable.
2. **Availability of the Factors of Production:** As already discussed, if the factors of production are available easily and at low prices, then the supply of the good will be elastic.
3. **Expectations Relating to the Future Prices:** If, in the future, firms expect an increase in the prices, they will shift their supplies from the present to the future. In other words, they will cut down the existing supplies of the good. The supply will become less elastic in the present.

Different Types of Elasticity of Supply

The coefficient of elasticity of supply can take a value between zero and infinity as depicted in Table 3.13.

1. **Supply Is Perfectly Inelastic, $E_S = 0$:** In such a situation, the ratio of percentage change in the quantity supplied to the percentage change in the price of the good is zero. This implies that whatever is the price of the good the quantity supplied remains the same.
2. **Supply Is Relatively Inelastic, $0 < E_S < 1$:** In such a situation, the ratio of percentage change in the quantity supplied to the percentage change in the price of the good is < 1. This implies that the percentage change in the quantity supplied is less than the percentage change in the price of the good.
3. **Supply Has a Unitary Elasticity, $E_S = 1$:** In such a situation, the ratio of percentage change in the quantity supplied equals the percentage change in the price of the good.
4. **Supply Is Elastic, $E_S > 1$:** In such a situation, the ratio of percentage change in the quantity supplied to the percentage change in the price of the good is > 1. This implies that the percentage change in the quantity supplied is more than the percentage change in the price of the good.
5. **Supply Is Perfectly Elastic, $E_S = \infty$:** In such a situation, any price change, which may be very small, leads to an infinite change in the quantity supplied of the good.

Table 3.13 Types of Elasticity of Supply

Change in Quantity Supplied to a Percentage Change in Price	E_S	Type of Elasticity
Quantity supplied remains the same	$E_S = 0$	Inelastic supply
Quantity supplied increasE_S in a smaller proportion	$0 < E_S < 1$	Supply is inelastic
Quantity supplied increasE_S in the same proportion	$E_S = 1$	Supply has unitary elasticity
Quantity supplied increasE_S in a larger proportion	$E_S > 1$	Supply is elastic
Infinite change in the quantity supplied of the good	$E_S = \infty$	Supply is perfectly elastic

RECAP

- Elasticity of supply is a measure of the responsiveness of the quantity supplied of a good to a change in the price of the good.
- The factors on which the elasticity of supply depends are: the time available, availability of the factors of production and expectations relating to the future prices.
- The coefficient of elasticity of supply can take a value between zero and infinity.

MODULE-II

Traditional theory distinguishes between the short run and the long run. The short run is the period during which some factors) is fixed; usually capital equipment and entrepreneurship are considered as fixed in the short run.

The long run is the period over which all factors become variable.

A. Short-Run Costs of the Traditional Theory: In the traditional theory of the firm total costs are split into two groups total fixed costs and total variable costs:

TC = TFC + TVC

The fixed costs include:

(a) Salaries of administrative staff

(b) Depreciation (wear and tear) of machinery

(c) Expenses for building depreciation and repairs

(d) Expenses for land maintenance and depreciation (if any).

Another element that may be treated in the same way as fixed costs is the normal profit, which is a lump sum including a percentage return on fixed capital and allowance for risk.

The variable costs include:

(a) The raw materials

(b) The cost of direct labour

(c) The running expenses of fixed capital, such as fuel, ordinary repairs and routine maintenance.

The total fixed cost is graphically denoted by a straight line parallel to the output axis (figure 4.1). The total variable cost in the traditional theory of the firm has broadly an inverse-S shape (figure 4.2) which reflects the law of variable proportions. According to this law, at the initial stages of production with a given plant, as more of the variable factors) is employed, its productivity increases and the average variable cost falls.

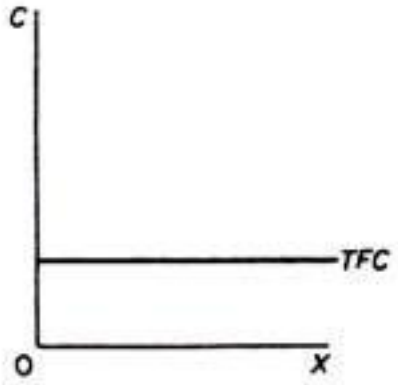


Figure 4.1

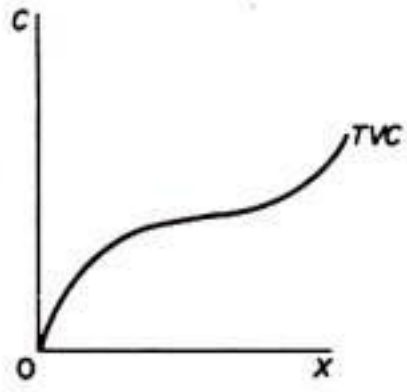


Figure 4.2

This continues until the optimal combination of the fixed and variable factors is reached. Beyond this point as increased quantities of the variable factors(s) are combined with the fixed factors) the productivity of the variable factors) declines (and the A VC rises). By adding the TFC and TVC we obtain the TC of the firm (figure 4.3). From the total-cost curves we obtain average-cost curves.

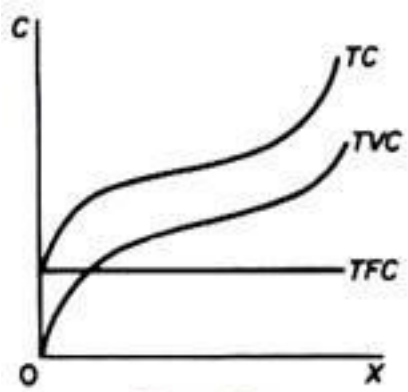


Figure 4.3

The average fixed cost is found by dividing TFC by the level of output:

AFC = TFC / X

Graphically the AFC is a rectangular hyperbola, showing at all its points the same magnitude, that is, the level of TFC (figure 4.4).

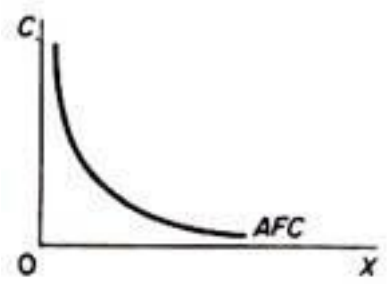


Figure 4.4

The average variable cost is similarly obtained by dividing the TVC with the corresponding level of output:

AVC = TVC / X

Graphically the A VC at each level of output is derived from the slope of a line drawn from the origin to the point on the TVC curve corresponding to the particular level of output. For example, in figure 4.5 the AVC at X_1 is the slope of the ray 0a, the A VC at X_2 is the slope of the ray Ob, and so on. It is clear from figure 4.5 that the slope of a ray through the origin declines continuously until the ray becomes tangent to the TVC curve at c. To the right of this point the slope of rays through the origin starts increasing. Thus the SA VC curve falls initially as the productivity of the variable factors) increases, reaches a minimum when the plant is operated optimally (with the optimal combination of fixed and variable factors), and rises beyond that point (figure 4.6).

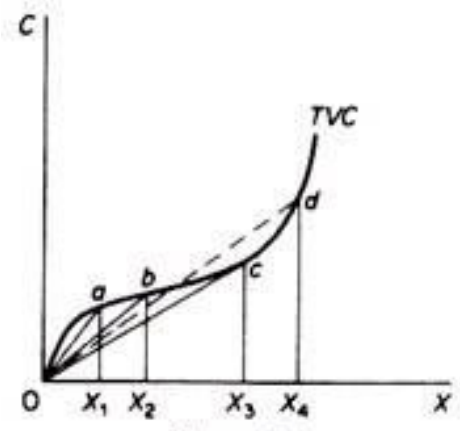


Figure 4.5

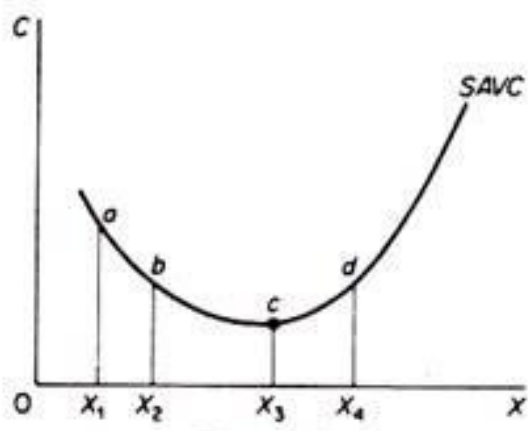


Figure 4.6

The ATC is obtained by dividing the TC by the corresponding level of output:

ATC = TC / X = TFC + TVC / X = AFC + AVC

Graphically the ATC curve is derived in the same way as the SAVC. The ATC at any level of output is the slope of the straight line from the origin to the point on the TC curve corresponding to that particular

level of output (figure 4.7). The shape of the A TC is similar to that of the AVC (both being U-shaped). Initially the ATC declines, it reaches a minimum at the level of optimal operation of the plant (X_M) and subsequently rises again (figure 4.8).

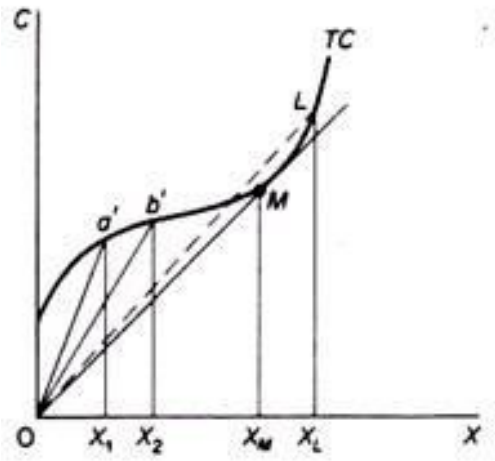


Figure 4.7

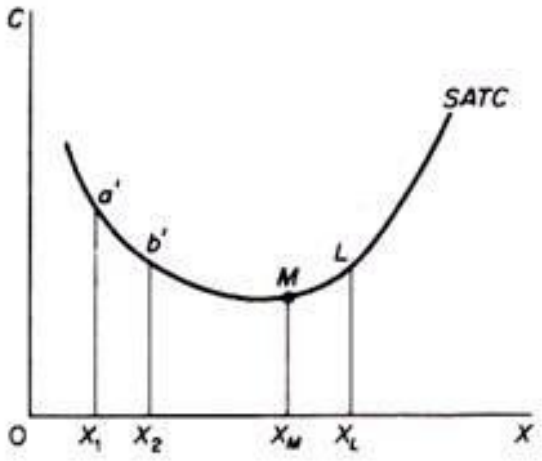


Figure 4.8

The U shape of both the AVC and the ATC reflects the law of variable proportions or law of eventually decreasing returns to the variable factor(s) of production. The marginal cost is defined as the change in TC which results from a unit change in output. Mathematically the marginal cost is the first derivative of the TC function. Denoting total cost by C and output by X we have

$MC = \partial C / \partial X$

Graphically the MC is the slope of the TC curve (which of course is the same at any point as the slope of the TVC). The slope of a curve at any one of its points is the slope of the tangent at that point. With an inverse-S shape of the TC (and TVC) the MC curve will be U-shaped. In figure 4.9 we observe that the slope of the tangent to the total-cost curve declines gradually, until it becomes parallel to the X-axis (with its slope being equal to zero at this point), and then starts rising. Accordingly we picture the MC curve in figure 4.10 as U-shaped.

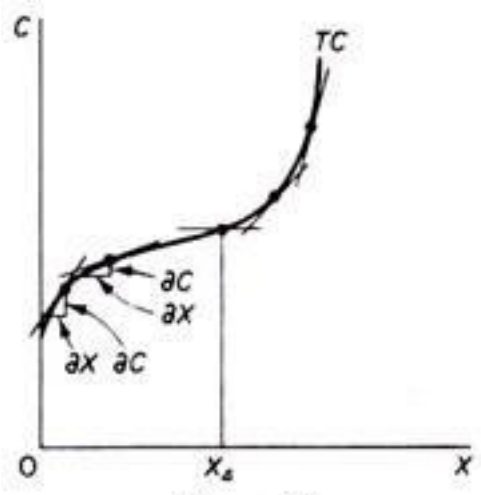


Figure 4.9

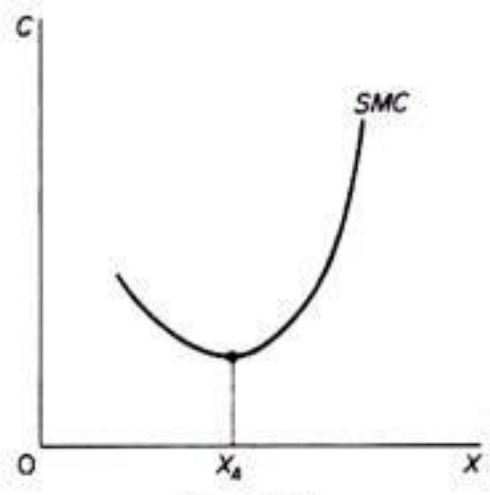


Figure 4.10

In summary: the traditional theory of costs postulates that in the short run the cost curves (AVC, ATC and MC) is U-shaped, reflecting the law of variable proportions. In the short run with a fixed plant there is a phase of increasing productivity (falling unit costs) and a phase of decreasing productivity (increasing unit costs) of the variable factor(s).

Between these two phases of plant operation there is a single point at which unit costs are at a minimum. When this point on the SATC is reached the plant is utilized optimally, that is, with the optimal combination (proportions) of fixed and variable factors.

The relationship between ATC and AVC:

The AVC is a part of the ATC, given ATC = AFC + AVC. Both AVC and ATC are U-shaped, reflecting the law of variable proportions. However, the minimum point of the ATC occurs to the right of the minimum point of the AVC (figure 4.11). This is due to the fact that ATC includes AFC, and the latter falls continuously with increases in output.

After the AVC has reached its lowest point and starts rising, its rise is over a certain range offset by the fall in the AFC, so that the ATC continues to fall (over that range) despite the increase in AVC. However, the rise in AVC eventually becomes greater than the fall in the AFC so that the A TC starts increasing. The A VC approaches the A TC asymptotically as X increases.

In figure 4.11 the minimum AVC is reached at X_1 while the ATC is at its minimum at X_2. Between X_1 and X_2 the fall in AFC more than offsets the rise in AVC so that the ATC continues to fall. Beyond X_2 the increase in AVC is not offset by the fall in AFC, so that ATC rises.

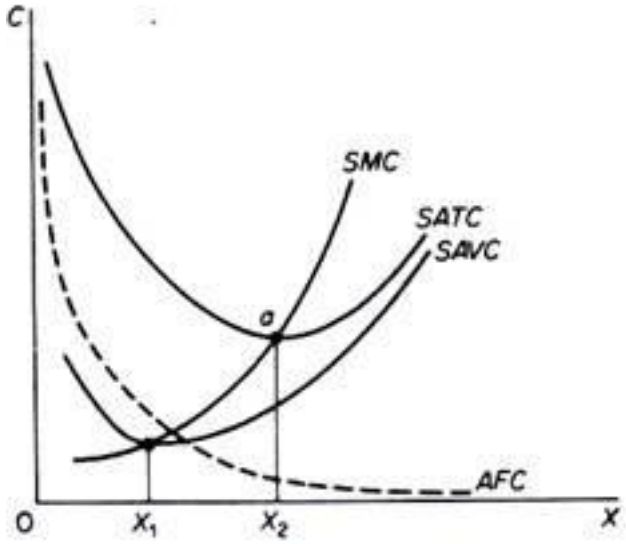


Figure 4.11

The relationship between MC and ATC:

The MC cuts the ATC and the AVC at their lowest points. We will establish this relation only for the ATC and MC, but the relation between MC and AVC can be established on the same lines of reasoning.

We said that the MC is the change in the TC for producing an extra unit of output. Assume that we start from a level of n units of output. If we increase the output by one unit the MC is the change in total cost resulting from the production of the $(n + l)^{th}$ unit.

The AC at each level of output is found by dividing TC by X. Thus the AC at the level of X_n is

$$AC_n = \frac{TC_n}{X_n}$$

and the AC at the level X_{n+1} is

$$AC_{n+1} = \frac{TC_{n+1}}{X_{n+1}}$$

Clearly

$$TC_{n+1} = TC_n + MC$$

Thus:

(a) If the MC of the $(n + 1)^{th}$ unit is less than AC_n (the AC of the previous n units) the AC_{n+1} will be smaller than the AC_n.

(b) If the MC of the $(n + 1)^{th}$ unit is higher than AC_n (the AC of the previous n units) the AC_{n+1} will be higher than the AC_n.

So long as the MC lies below the AC curve, it pulls the latter downwards; when the MC rises above the AC, it pulls the latter upwards. In figure 4.11 to the left of a the MC lies below the AC curve, and hence the latter falls downwards. To the right of a the MC curve lie above the AC curve, so that AC rises. It follows that at point a, where the intersection of the MC and AC occurs, the AC has reached its minimum level.

B. Long-Run Costs of the Traditional Theory: The 'Envelope' Curve:

In the long run all factors are assumed to become variable. We said that the long-run cost curve is a planning curve, in the sense that it is a guide to the entrepreneur in his decision to plan the future expansion of his output. The long-run average-cost curve is derived from short-run cost curves. Each point on the LAC corresponds to a point on a short-run cost curve, which is tangent to the LAC at that point. Let us examine in detail how the LAC is derived from the SRC curves.

Assume, as a first approximation, that the available technology to the firm at a particular point of time includes three methods of production, each with a different plant size: a small plant, medium plant and large plant. The small plant operates with costs denoted by the curve SAC_1, the medium-size plant operates with the costs on SAC_2 and the large-size plant gives rise to the costs shown on SAC_3 (figure 4.12). If the firm plans to produce output X_3 it will choose the small plant. If it plans to produce X_2 it will choose the medium plant. If it wishes to produce X_1 it will choose the large- size plant.

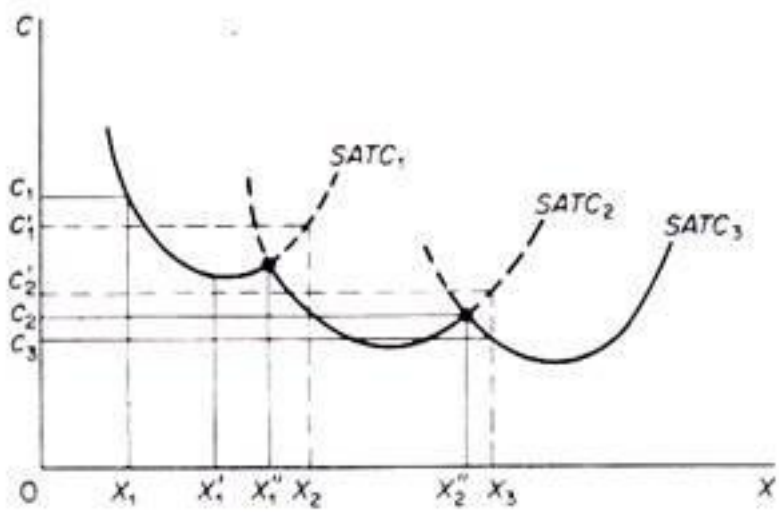


Figure 4.12

If the firm starts with the small plant and its demand gradually increases, it will produce at lower costs (up to level X'_1). Beyond that point costs start increasing. If its demand reaches the level X''_1 the firm can either continue to produce with the small plant or it can install the medium-size plant. The decision at this point depends not on costs but on the firm's expectations about its future demand. If the firm expects that

the demand will expand further than X''_1 it will install the medium plant, because with this plant outputs larger than X'_1 are produced with a lower cost.

Similar considerations hold for the decision of the firm when it reaches the level X''_2. If it expects its demand to stay constant at this level, the firm will not install the large plant, given that it involves a larger investment which is profitable only if demand expands beyond X''_2. For example, the level of output X_3 is produced at a cost c_3 with the large plant, while it costs c'_2 if produced with the medium-size plant ($c'_2 > c_3$).

Now if we relax the assumption of the existence of only three plants and assume that the available technology includes many plant sizes, each suitable for a certain level of output, the points of intersection of consecutive plants (which are the crucial points for the decision of whether to switch to a larger plant) are more numerous. In the limit, if we assume that there is a very large number (infinite number) of plants, we obtain a continuous curve, which is the planning LAC curve of the firm.

Each point of this curve shows the minimum (optimal) cost for producing the corresponding level of output. The LAC curve is the locus of points denoting the least cost of producing the corresponding output. It is a planning curve because on the basis of this curve the firm decides what plant to set up in order to produce optimally (at minimum cost) the expected level of output.

The firm chooses the short-run plant which allows it to produce the anticipated (in the long run) output at the least possible cost. In the traditional theory of the firm the LAC curve is U-shaped and it is often called the 'envelope curve' because it 'envelopes' the SRC curves (figure 4.13).

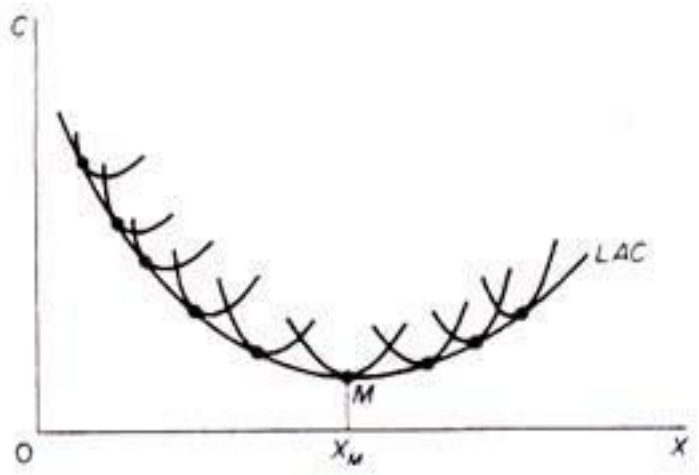


Figure 4.13

Let us examine the U shape of the LAC. This shape reflects the laws of returns to scale. According to these laws the unit costs of production decrease as plant size increases, due to the economies of scale

which the larger plant sizes make possible. The traditional theory of the firm assumes that economies of scale exist only up to a certain size of plant, which is known as the optimum plant size, because with this plant size all possible economies of scale are fully exploited.

If the plant increases further than this optimum size there are diseconomies of scale, arising from managerial inefficiencies. It is argued that management becomes highly complex, managers are overworked and the decision-making process becomes less efficient. The turning-up of the LAC curve is due to managerial diseconomies of scale, since the technical diseconomies can be avoided by duplicating the optimum technical plant size.

A serious implicit assumption of the traditional U-shaped cost curves is that each plant size is designed to produce optimally a single level of output (e.g. 1000 units of X). Any departure from that X, no matter how small (e.g. an increase by 1 unit of X) leads to increased costs. The plant is completely inflexible. There is no reserve capacity, not even to meet seasonal variations in demand.

THE LAWS OF RETURNS TO SCALE

Long run is a period during which all factors of production can vary. Long run relationship between inputs and output of a firm is explained by the Laws of returns to scale. The term returns to scale arises in the context of a firm's Production Function. In the long run production function, all factors are variable. Therefore in the long run output can be changed by changing all the factors of production. A firm's production function could exhibit different types of returns to scale in different ranges of output. Typically, there could be Increasing returns to scale, Constant returns to scale and Diminishing returns to scale. In this section we will use the isoquants to analyse the input output relationships under the condition that both the inputs (labour and Capital) are variable and their quantity is changed proportionately and simultaneously.

Assumptions

1. Returns are measured in physical terms.
2. All units of factors are homogeneous.
3. Techniques of production remains constant.

Stages of Laws of Returns to Scale

1. The Increasing Returns to Scale
2. The Constant Returns to Scale
3. The Diminishing Returns to Scale

Explanation of Different Stages of Laws of Returns to Scale

1. Increasing Returns to Scale:

Increasing returns to scale or diminishing cost refers to a situation when all factors of production are increased, output increases at a higher rate. It means if all inputs are doubled, output will also increase at the faster rate than double. Hence, it is said to be increasing returns to scale. This increase is due to many reasons like division external economies of scale.

Causes of Increasing Returns to Scale:

a.Internal economies of scale
b.Efficiency of labour and capital
c.Improvement in large scale operation
d.Division of labour and specialization
e.Use of better and sophisticated technology
f.Economy of organisation
g.External economies of scale

2.Constant Returns to Scale

Constant returns to scale or constant cost refers to the production situation in which output increases exactly in the same proportion in which factors of production are increased. In simple terms, if factors of production are doubled output will also be doubled.

In this case internal and external economies are exactly equal to internal and external diseconomies. This situation arises when after reaching a certain level of production, economies of scale are balanced by diseconomies of scale. This is known as homogeneous production function. Cobb-Douglas linear homogenous production function is a good example of this kind.

Causes of Constant Returns to Scale:

a) Internal economics of scale are equal to internal diseconomies of scale.

b) Balancing of external economics and diseconomies of scale

c) Factors of production are perfectly divisible substitutable, homogenous and their supply is perfectly elastic at given prices.

3. Decreasing Returns to Scale

Diminishing returns or increasing costs refer to that production situation, where if all the factors of production are increased in a given proportion, output increases in a smaller proportion. It means, if inputs are doubled, output will be less than doubled. If 20 percent increase in labour and capital is followed by 10 percent increase in output, then it is an instance of diminishing returns to scale.

The main cause of the operation of diminishing returns to scale is that internal and external economies are less than internal and external diseconomies.

Causes of Decreasing Returns to Scale

a. Internal diseconomies of scale

b. External diseconomies of scale

c. Increase in business risk

d. Lack of entrepreneurial efficiency

e. Unhealtny management and organization

f. Imperfect factor substitutability

g. Transport bottlenecks and Marketing difficulties.

Law of Variable Proportions (With Diagrams)

Law of Variable Proportions: Assumptions, Explanation , Stages , Causes of Applicability and Applicability of the Law of Variable Proportions!

Law of Variable Proportions occupies an important place in economic theory. This law is also known as Law of Proportionality.

Keeping other factors fixed, the law explains the production function with one factor variable. In the short run when output of a commodity is sought to be increased, the law of variable proportions comes into operation. Therefore, when the number of one factor is increased or decreased, while other factors are constant, the proportion between the factors is altered. For instance, there are two factors of production viz., land and labour.

Land is a fixed factor whereas labour is a variable factor. Now, suppose we have a land measuring 5 hectares. We grow wheat on it with the help of variable factor i.e., labour. Accordingly, the proportion between land and labour will be 1: 5. If the number of laborers is increased to 2, the new proportion

between labour and land will be 2: 5. Due to change in the proportion of factors there will also emerge a change in total output at different rates. This tendency in the theory of production called the Law of Variable Proportion.

Definitions:

"As the proportion of the factor in a combination of factors is increased after a point, first the marginal and then the average product of that factor will diminish." Benham

"An increase in some inputs relative to other fixed inputs will in a given state of technology cause output to increase, but after a point the extra output resulting from the same additions of extra inputs will become less and less." Samuelson

"The law of variable proportion states that if the inputs of one resource is increased by equal increment per unit of time while the inputs of other resources are held constant, total output will increase, but beyond some point the resulting output increases will become smaller and smaller." Leftwitch

Assumptions:

Law of variable proportions is based on following assumptions:

(i) Constant Technology:

The state of technology is assumed to be given and constant. If there is an improvement in technology the production function will move upward.

(ii) Factor Proportions are Variable:

The law assumes that factor proportions are variable. If factors of production are to be combined in a fixed proportion, the law has no validity.

(iii) Homogeneous Factor Units:

The units of variable factor are homogeneous. Each unit is identical in quality and amount with every other unit.

(iv) Short-Run:

The law operates in the short-run when it is not possible to vary all factor inputs.

Explanation of the Law:

In order to understand the law of variable proportions we take the example of agriculture. Suppose land and labour are the only two factors of production.

By keeping land as a fixed factor, the production of variable factor i.e., labour can be shown with the help of the following table:

Table 1.

Units of Land	Units of Labour	Total Production	Average Production	Marginal Production	
10 Acres	0	–	–	–	
"	1	20	20	20	
"	2	50	25	30	1st stage
"	3	90	30	40	MP > AP
"	4	120	30	30	AP = MP
"	5	140	28	20	
"	6	150	25	10	2nd stage
"	7	150	21.3	0	MP=0 and TP Maximum
"	8	140	17.5	–10	3rd stage MP < 0

From the table 1 it is clear that there are three stages of the law of variable proportion. In the first stage average production increases as there are more and more doses of labour and capital employed with fixed factors (land). We see that total product, average product, and marginal product increases but average product and marginal product increases up to 40 units. Later on, both start decreasing because proportion of workers to land was sufficient and land is not properly used. This is the end of the first stage.

The second stage starts from where the first stage ends or where AP=MP. In this stage, average product and marginal product start falling. We should note that marginal product falls at a faster rate than the average product. Here, total product increases at a diminishing rate. It is also maximum at 70 units of labour where marginal product becomes zero while average product is never zero or negative.

The third stage begins where second stage ends. This starts from 8th unit. Here, marginal product is negative and total product falls but average product is still positive. At this stage, any additional dose leads to positive nuisance because additional dose leads to negative marginal product.

Graphic Presentation:

In fig. 1, on OX axis, we have measured number of labourers while quantity of product is shown on OY axis. TP is total product curve. Up to point 'E', total product is increasing at increasing rate. Between points E and G it is increasing at the decreasing rate. Here marginal product has started falling. At point 'G' i.e., when 7 units of labourers are employed, total product is maximum while, marginal product is zero. Thereafter, it begins to diminish corresponding to negative marginal product. In the lower part of the figure MP is marginal product curve.

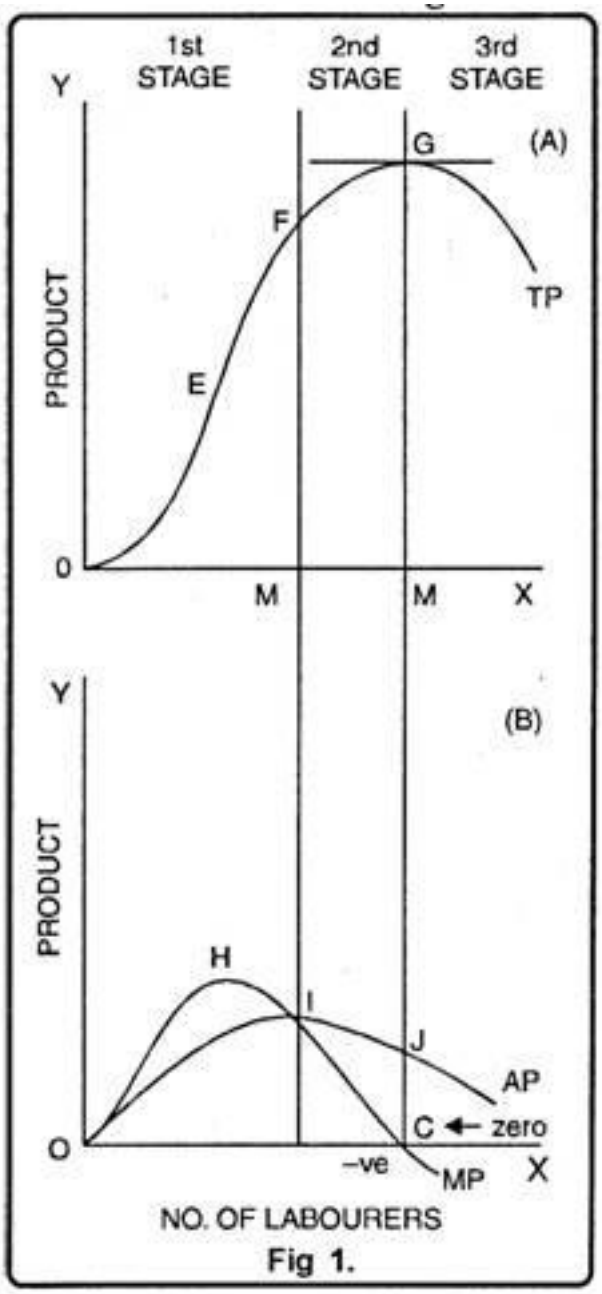


Fig 1.

Up to point 'H' marginal product increases. At point 'H', i.e., when 3 units of labourers are employed, it is maximum. After that, marginal product begins to decrease. Before point 'I' marginal product becomes zero at point C and it turns negative. AP curve represents average product. Before point 'I', average product is less than marginal product. At point 'I' average product is maximum. Up to point T, average product increases but after that it starts to diminish.

Three Stages of the Law:

1. First Stage:

First stage starts from point 'O' and ends up to point F. At point F average product is maximum and is equal to marginal product. In this stage, total product increases initially at increasing rate up to point E. between 'E' and 'F' it increases at diminishing rate. Similarly marginal product also increases initially and reaches its maximum at point 'H'. Later on, it begins to diminish and becomes equal to average product at point T. In this stage, marginal product exceeds average product (MP > AP).

2. Second Stage:

It begins from the point F. In this stage, total product increases at diminishing rate and is at its maximum at point 'G' correspondingly marginal product diminishes rapidly and becomes 'zero' at point 'C'. Average product is maximum at point 'I' and thereafter it begins to decrease. In this stage, marginal product is less than average product (MP < AP).

3. Third Stage:

This stage begins beyond point 'G'. Here total product starts diminishing. Average product also declines. Marginal product turns negative. Law of diminishing returns firmly manifests itself. In this stage, no firm will produce anything. This happens because marginal product of the labour becomes negative. The employer will suffer losses by employing more units of labourers. However, of the three stages, a firm will like to produce up to any given point in the second stage

Total Product	Marginal Product	Average Product
Stage I		
First increases at increasing rate then at diminishing rate.	Increases in the beginning then reaches a maximum and begins to decrease.	First increases, continues to increase and becomes maximum.
Stage II		
Continues to increase at diminishing rate and becomes maximum.	Continues to diminish and becomes equal to zero.	Becomes equal to MP and then begins to diminish.
Stage III		
Diminishes	Becomes negative.	Continues to diminish but will always be greater than zero.

only

In Which Stage Rational Decision is Possible:

To make the things simple, let us suppose that, a is variable factor and b is the fixed factor. And a_1, a_2 , a_3….are units of a and b_1 b_2b_3…… are unit of b.

Stage I is characterized by increasing AP, so that the total product must also be increasing. This means that the efficiency of the variable factor of production is increasing i.e., output per unit of a is increasing. The efficiency of b, the fixed factor, is also increasing, since the total product with b_1 is increasing.

The stage II is characterized by decreasing AP and a decreasing MP, but with MP not negative. Thus, the efficiency of the variable factor is falling, while the efficiency of b, the fixed factor, is increasing, since the TP with b_1 continues to increase.
Finally, stage III is characterized by falling AP and MP, and further by negative MP. Thus, the efficiency of both the fixed and variable factor is decreasing.

Rational Decision:

Stage II becomes the relevant and important stage of production. Production will not take place in either of the other two stages. It means production will not take place in stage III and stage I. Thus, a rational producer will operate in stage II.

Suppose b were a free resource; i.e., it commanded no price. An entrepreneur would want to achieve the greatest efficiency possible from the factor for which he is paying, i.e., from factor a. Thus, he would want to produce where AP is maximum or at the boundary between stage I and II.

If on the other hand, a were the free resource, then he would want to employ b to its most efficient point; this is the boundary between stage II and III.

MODULE-III

PRICE DISCRIMINATION IN MONOPOLY:

Price discrimination may be (a) personal, (b) local, or (c) according to trade or use:

(a) Personal: It is personal when different prices are charged for different persons.

(b) Local: It is local when the price varies according to locality.

(c) According to Trade or Use: It is according to trade or use when different prices are charged for different uses to which the commodity is put, for example, electricity is supplied at cheaper rates for domestic than for commercial purposes.

Some monopolists used product differentiation for price discrimination by means of special labels, wrappers, packing, etc. For example, the perfume manufacturers discriminate prices of the same fragrance by packing it with different labels or brands.

Conditions of Price-Discrimination: There are three main types of situation:

(a) When consumers have certain preferences or prejudices. Certain consumers usually have the irrational feeling that they are paying higher prices for a good because it is of a better quality, although actually it may be of the same quality. Sometimes, the price differences may be so small that consumers do not consider it worthwhile to bother about such differences.

(b) When the nature of the good is such as makes it possible for the monopolist to charge different prices. This happens particularly when the good in question is a direct service.

(c) When consumers are separated by distance or tariff barriers. A good may be sold in one town for Re. 1 and in another town for Rs. 2. Similarly, the monopolist can charge higher prices in a city with greater distance or a country levying heavy import duty.

Conditions making Price Discrimination Possible and Profitable: The following conditions are essential to make price discrimination possible and profitable:

(a) The elasticities of demand in different markets must be different. The market is divided into sub-markets. The sub-market will be arranged in ascending order of their elasticities, the higher price being charged in the least elastic market and vice versa.

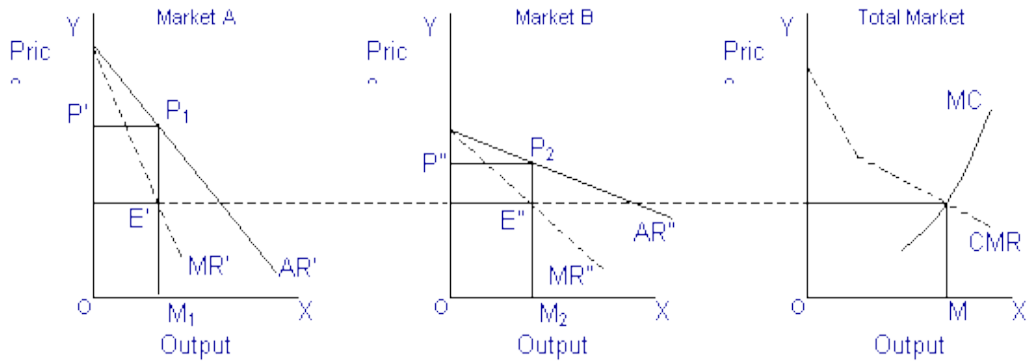
(b) The costs incurred in dividing the market into sub-markets and keeping them separate should not be so large as to neutralise the difference in demand elasticities.

(c) There should be complete agreement among the sellers otherwise the competitors will gain by selling in the dear market.

(d) When goods are sold on special orders because then the purchaser cannot know what is being charged from others.

Price Determination under Price Discrimination:

(i) First of all, the monopolist divides his total market into sub-markets. In the following diagrams, the monopolist has divided his total market into two sub-markets, i.e., A and B:



Price Discrimination in Monopoly

(ii) The monopolist has now to decide at what level of output he should produce. To achieve maximum profit, hence, he will be in equilibrium at output at which MR=MC, and MC curve cuts the MR curve from below. In the above diagram (c) it is shown that the equilibrium of the discriminating monopolist is established at output OM at which MC cuts CMR. The output OM is distributed between two markets in such a way that marginal revenue in each is equal to ME. Therefore, he will sell output OM_1 in Market A, because only at this output marginal revenue MR' in Market A is equal to ME (M_1E' = ME). The same condition is applied in Market B where MR" is equal to ME ($M_2E"$ = ME). In the above diagram, it is also shown that in Market B in which elasticity of demand is greater, the price charged is lower than that in Market B where the elasticity of demand is less.

MODULE-IV

PROPENSITY TO CONSUME

The relationship between consumption and (disposable) income can be further elaborated by studying propensity to consume. Under this we compare the figures of consumption and income in each time period. In order to establish the nature of relationship between them, two important calculations are made in this context. One, Average propensity to consume (APC) and two, Marginal propensity to consume (MPS).

APC (Average Propensity to Consume)

APC is defined as the ratio of consumption to income. This ratio in calculated to know the proportion of income devoted for consumption purposes in the specific period of time for which data is given. So APC

is calculated for each time period. Let consumption for any particular time is denoted as 'C'. Let income of that period is denoted as Y. Then

APC = C/Y

MPC (Marginal propensity to Consume)

MPC is the ratio of change in consumption to change in income between two time periods. Denote "increase in" as "", We can write

MPC= Change in Consumption /Change in Income

Since consumption depends on income, increase in income will bring about increase inconsumption over time period. In this context, MPC measures the increase in the amount of consumption due to increase in the amount of income in the country.

Psychological law of consumption: Let us ask why MPC is less than 1? To answer this question, Keynes has provided the "Psychological law of

consumption."

According to this law, as income increases over time, consumption on also increases, but at a slower rate as compared to that of income.

So the reason behind MPC being a fraction (less than one) is given in terms of psychological behaviour of the individuals taken together in the economy. It is commonly observed that people do not consume the entire part of increase in their income. They, certainly increase the amount of consumption with increase income as they get a scope to increase their level of satisfaction. But, at the same time, they do wish to save a part of the increase in income for future needs. Saving a part of income for future reflects a sense of security which is psychological in nature.

So increase in income is divided between increase in consumption and increase in saving. Symbolically, we can write that

Increase in Y = Increase in C + Increase in S.
i.e. increase in income = increase in consumption + increase in saving. From this

it is clear that C is less than Y. So MPC or in less than one.

PROPENSITY TO SAVE

Saving behaviour of people can be studied by calculating propensity to save in two ways.

1. (i) Average propensity to save (APS)
2. (ii) Marginal propensity to save (MPS).

APS: APS is defined as the ratio of saving and income at any point of time. Symbolically

APS= S/Y

APS gives the idea about the proportion of income devoted towards saving MPS.

MPS

MPS is defined as the ratio of change in saving and change in income. Over a period of time. MPS is a rate of change in saving vis-a-vis income. Symbolically

M P S = Increase in saving/ Increase in Income

Where

Increase in S = current period saving - last period saving

Increase in Y = current income – last period income

MPS in always less than 1.