CHAPTER 4

THE THEORY OF THE FIRM UNDER PERFECT COMPETITION

❖ Concept of Revenue

Revenue is the money income of the firm, which it receives from the sale of goods produced, i.e., sales proceeds or sales receipts.

Revenue = Cost + Profit.

❖ Types of Revenue

There are three types of revenue:

1) Total Revenue

2) Average Revenue

3) Marginal Revenue

❖ Total Revenue (TR)

It is defined as the total sales proceeds of a producer by selling corresponding level of output. It can also be defined as price times the quantity of output sold.

TR = Price × Quantity of output sold

$TR = P \times Q$

$TR = PQ$

❖ Average Revenue (AR)

It is defined as the revenue per unit of output sold. In other words, AR is same as the price of the good.

$$AR = \frac{TR}{Q}$$

❖ Marginal Revenue (MR)

It is defined as the change in the total revenue which occurs due to sale of one more unit of output.

$$MR = \frac{\text{Change in Total Revenue}}{\text{Change in Quantity sold}}, \quad MR = \frac{\Delta TR}{\Delta Q}$$

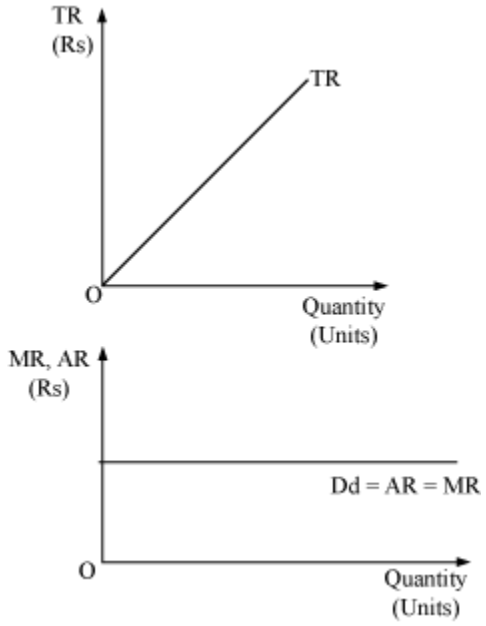
OR

$MR_n = TR_n - TR_{n-1}$

❖ **Relationship between TR, AR and MR**

1) ***Under Perfect Competition Market***

TR curve is an upward sloping curve which starts from origin, and AR and MR are same and remains a horizontal line parallel to output-axis.



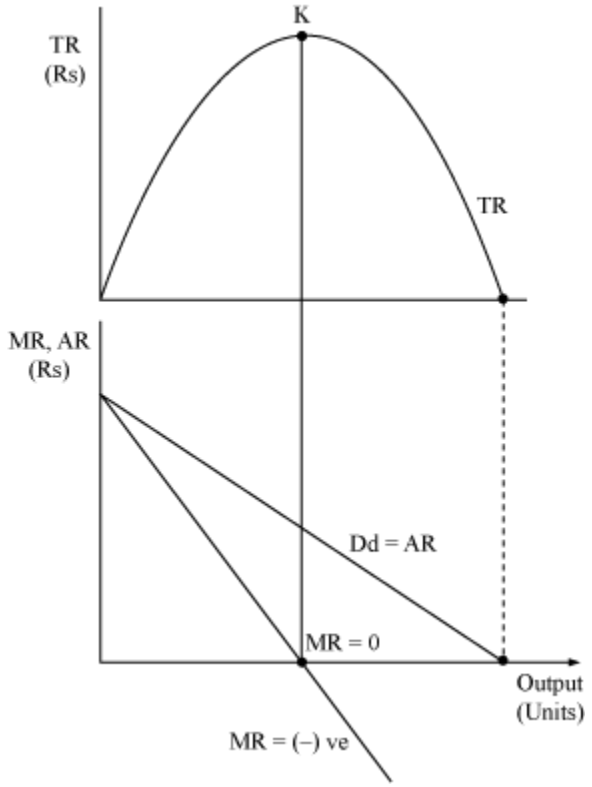
a) AR = MR, throughout all output levels.

b) TR curve is a linear positively sloped line which starts from the origin.

c) The increase in TR is in same proportion to the increase in output sold.

d) MR curve is a straight horizontal line parallel to *x-axis* and coincides with the AR curve.

2) ***Under Imperfect Competition***



a) When TR increases at a diminishing rate, MR falls and remains positive.

b) When TR attains its maximum point K, MR equals zero.

c) When TR starts falling, MR becomes negative.

d) AR curve is downward sloping and is falling throughout. AR is above MR.

e) When AR is equal to zero, TR also becomes zero and MR becomes negative.

❖ **Concept of Market**

Market acts as a medium which provides a platform where buyers and sellers are brought into contact with each other, in order to exchange (buy and sell) goods and services.

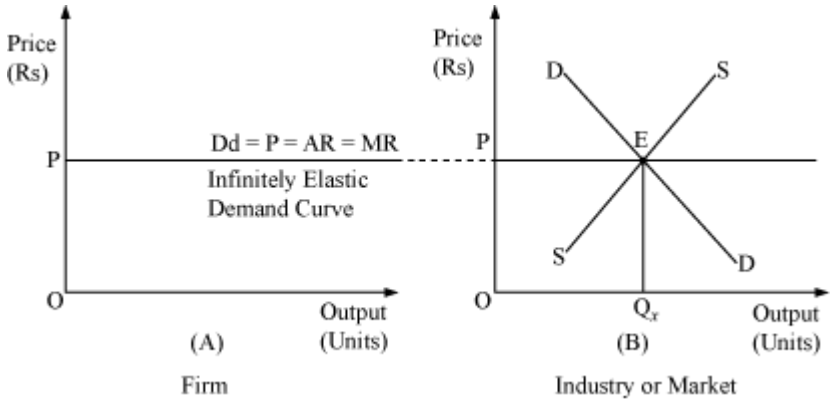
❖ **Forms of Market**

1) Perfect competition
2) Monopoly competition
3) Monopolistic completion } Imperfect competitions
4) Oligopoly market

❖ **Perfect Competition and its Features**

1) A large number of buyers and sellers
2) Homogenous product
3) Free exit and entry for firms
4) Perfect knowledge among buyers and sellers
5) No transport costs
6) Perfect mobility of factors of production
7) No promotional and selling costs

❖ **Firm is a Price Taker and not a Price Maker**



The number of sellers is so large that no individual firm owns control over the market price of the commodity. The firm acts as a price-taker while the price is determined by the demand for and supply of the goods. If an individual firm raises its price, it fears losing all its consumers to other firms or vice-versa. Thus, firm has no role to play other than supplying the required output at the existing market price. Therefore, **a firm is a price taker and not a price maker.**

❖ **Pure Competition v/s Perfect Competition**

Pure competition and perfect competition are differentiated on the basis of difference of degree. According to Prof. Chamberlin, the following four conditions of perfect competition are necessary for pure competition:

1) Large number of buyers and sellers

2) Homogeneous products

3) Free entry and exit for firms

4) Independent decision making

NOTE: *The conditions and features of perfect competitions are very rare to found in the real world and therefore, is a myth. On the other hand, pure competition is more lenient than perfect competition.*

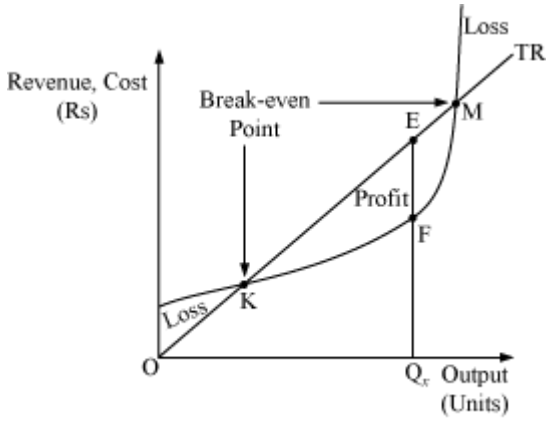
❖ **Profit Maximisation Conditions and Producer's Equilibrium**

Producer's Equilibrium is defined as the state where producer is earning maximum profit by producing at a particular level of output.

There exist two approaches to explain the equilibrium:

1) **TR-TC Approach**
2) **MR-MC Approach**

Summary of TR-TC approach and MR-MC approach

1)	TR-TC Approach	Profit will be maximised where the vertical distance between TR & TC is maximum.  Under Perfect Competition Market

2)	MR-MC Approach	Profit will be maximised where the necessary and sufficient conditions are fulfilled. 1) First Order Condition (necessary condition) MR = MC, $\frac{d(TR)}{dx} = \frac{d(TC)}{dx}$ 2) Second Order Condition (sufficient condition) slope of MC should be positive, i.e. $\frac{d(MC)}{dx} > 0$

❖ **Profit Maximisation Conditions for firm under Perfect Competition**

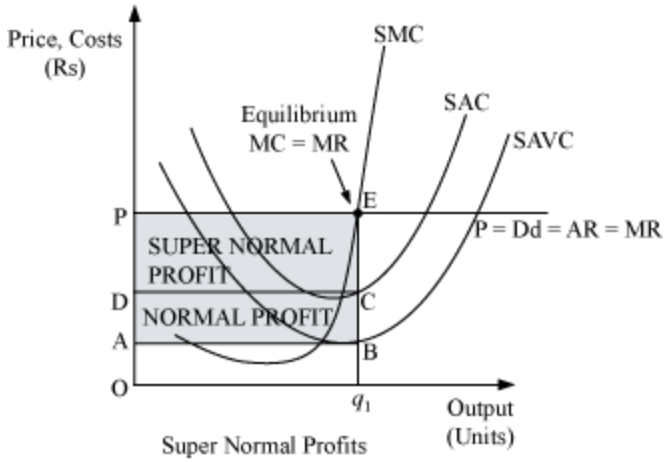
Under perfect competition, a firm will attain equilibrium and maximise its profit when the following three conditions are meet:-

1) Price = MC=MR
2) MC is rising or the slope of MC is greater than the slope of MR at the subsequent output levels beyond the point where MC = MR
3) In short-run– Price must be greater than or equal to AVC, i.e., $P \geq$ minimum of $SAVC$ at the equilibrium output.
4) In long-run– Price must be greater than or equal to minimum of LAC.

❖ **Short-run Equilibrium**

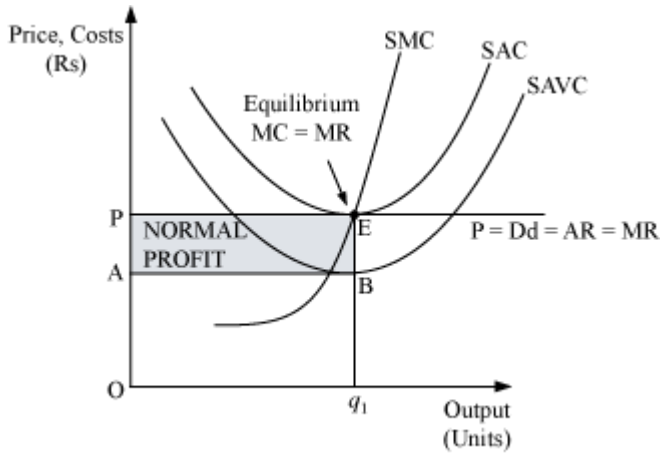
There exist four different situations and accordingly four different profit maximisation situations respectively.

Case 1. Supernormal Profit



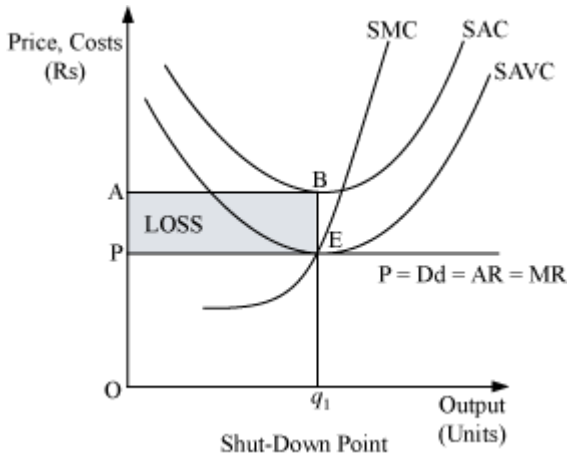
Super Normal Profits

Case 2. Normal Profit



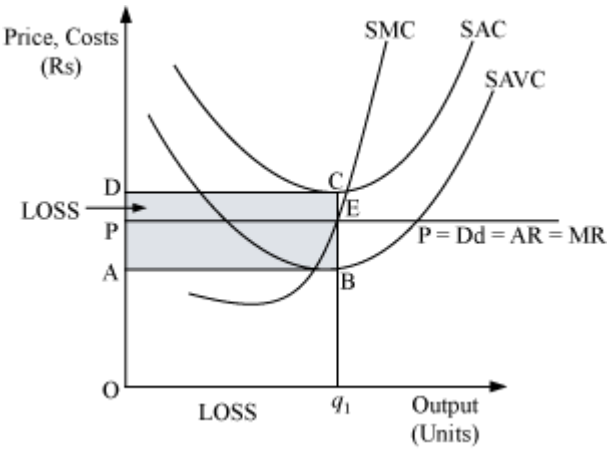
Normal Profits (or Zero–Economic Profit)

Case 3. Loss



Shut-Down Point

Case 4 Shutdown Point



❖ **Long-Run Equilibrium**

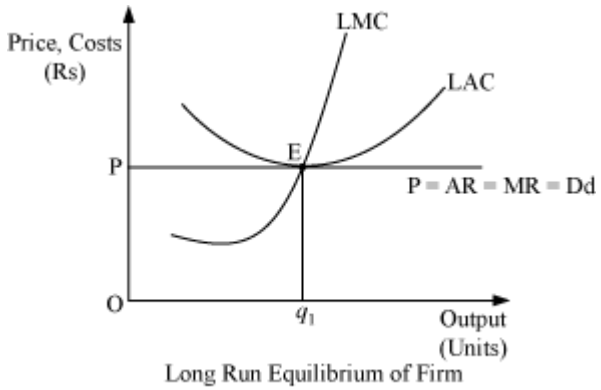
Case1 Abnormal Profits in Short run

If the firms earn supernormal or abnormal profits in the short run then → attract new firms → the total output increases → price continues to fall until it becomes equal to minimum of LAC → leads to normal profits because of which no new firms enter.

Case2 Abnormal Losses in Short run

If the firms incurs loss, then the firms start leaving → the total output falls → price continues to rise until it becomes equal to minimum of LAC → leads to normal profits and no existing firm leaves.

NOTE: *It should not be misunderstood that when the firms earn zero economic profit, they move out of the industry. This situation is not true because when firms earn zero economic profit it implies that they are earning normal profits.*



Long Run Equilibrium of Firm
under Perfect Competition

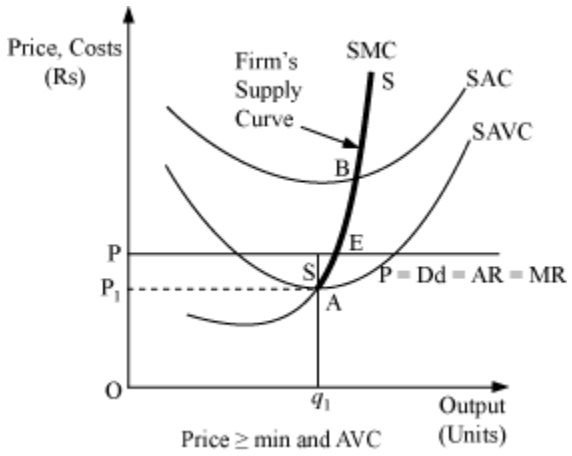
❖ **Firm Supply Curve**

Supply curve of an individual firm depicts the level of output that the firm wants to supply at corresponding different price levels.

❖ **Short-run Firm's Supply Curve**

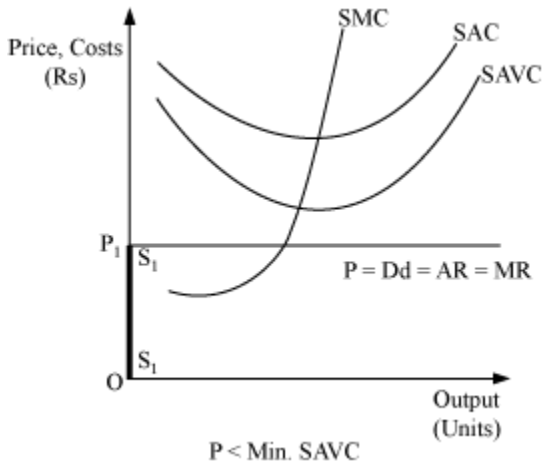
The derivation of a firms supply curve in short run is done in two stages:

Stage 1: When price is greater than or equal to minimum SAVC, i.e., P ≥ min SAVC



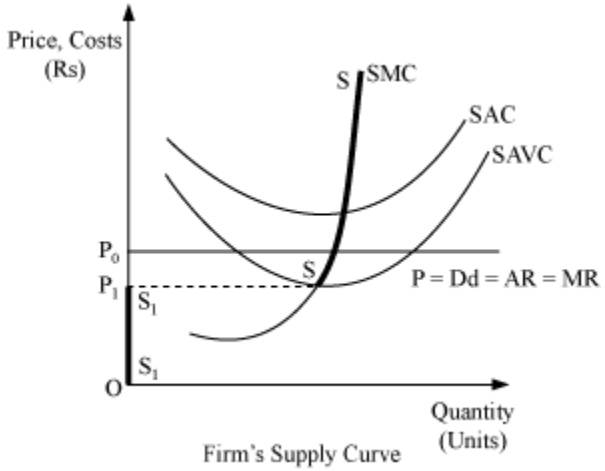
Price ≥ min and AVC

Stage 2 When Price is less than minimum SAVC, i.e., Price < min SAVC



P < Min. SAVC

At Price ≥ min SAVC	Upward sloping curve of SMC above minimum point of SAVC.	When firm operates
At Price < min SAVC	Vertical part of price-axis.	When firm shuts down

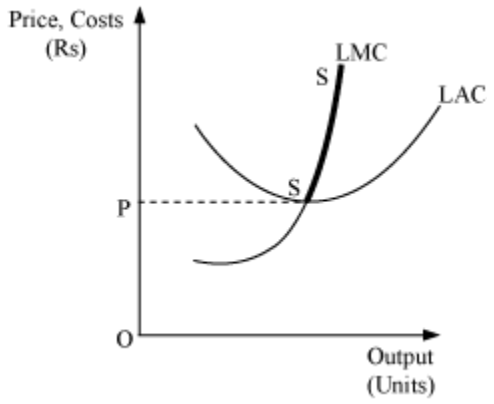


Firm's Supply Curve

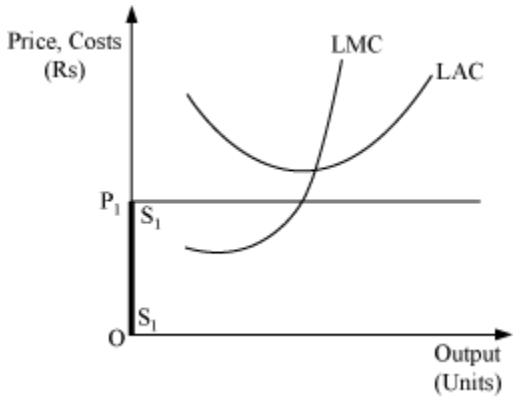
❖ **Long Run Supply Curve of a Firm**

The derivation of firm's long run supply curve is done in two stages:

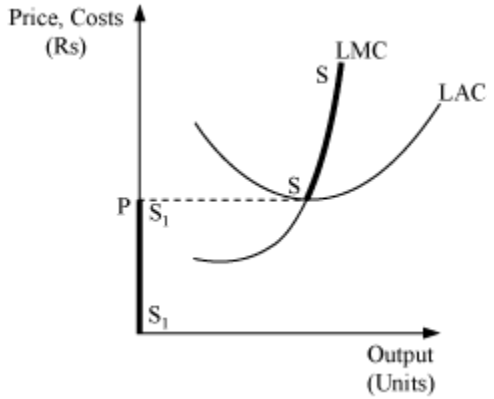
Stage 1: When price is greater than or equal to minimum of LAC



Stage 2 When Price is less than minimum of LAC



At Price ≥ min LAC	Upward sloping part of LMC above minimum point of LAC.
At Price < min LAC	Vertical part of price-axis.



❖ **Determinants of a Firms Supply Curve**

Firm's supply curve is derived from its marginal cost. Therefore, the factors which influence the MC will also affect the supply curve. The supply function can be algebraically presented as:

$S_x = f(P_i, T, G)$

where,

S_x = Supply of output x

P_i = Price of inputs or cost of production

T = State of technology

G = Government policies or tax policies.

1) ***Price of inputs (P_i) /Cost of Production***

If $P_i \uparrow$ Cost of Production $\uparrow$ MC $\uparrow$ and MC curve shift upwards (leftwards) and supply curve also shifts leftwards.

2) ***State of Technology***

If technology appreciates, then more amount of output can be produced by the firm with the given level of capital and labour and $MC\downarrow$**.** Here**,** MC curve shifts downwards (rightwards) and supply curve also shifts leftwards.

3) ***Govt. Polices or Tax Policies***

If high rate of unit tax is levied on the firms, per unit of output sold, then this discourages the firm to supply more and supply reduces.

❖ **Supply**

Supply of a commodity refers to the quantity of the commodity that the producer offers for sale at a given price, at a particular point of time.

❖ **Supply v/s Quantity Supplied**

While supply refers to different quantities of the commodity offered for sale at different prices, the quantity supplied refers to a particular amount offered for sale at any specific price.

❖ Supply Schedule

It is a tabular representation of different quantities of a commodity offered for sale, corresponding to different prices at which these quantities are offered for sale.

There are two types of schedule:

1) ***Individual supply schedule***

   It refers to the supply schedule of an individual producer or a firm. This schedule represents different quantities supplied at different prices by an individual firm or a producer.

2) ***Market supply schedule***

   It refers to the supply schedule of sum total of quantities supplied by all the firms in the market, at different price levels. It represents supply schedule of the market as a whole.

❖ Law of Supply

According to the law of supply, quantity supplied of a commodity is positively related to the price of the commodity, other things remaining constant.

Algebraically, the law of supply can be expressed as

$$Q_x = f\left(P_x, \overline{P}_y, \overline{T}, \overline{P}_i, \overline{G}, G_F, \overline{N}_F\right)$$

Where,

Q_x = quantity supplied of commodity x

P_x = price of commodity x

P_y = price of related goods (Substitutes or complementary goods)

T = State of technology

P_i = Price of inputs, raw materials or cost of production

G = Govt. Policy

N_F = Natural factors

G_F = Goal of firm

NOTE: *The bar on the above variables represents that they are constant, i.e., ceteris paribus.*

❖ Assumptions to the Law of supply

1) Price of related goods (substitute and complementary goods) remains same $(\overline{P}_y)$

2) Price of inputs or cost of production of firms remains constant $(\overline{P}_i)$.

3) State of technology does not change, i.e., there is neither appreciation nor depreciation of technology $(\overline{T})$.

4) Government policies remain unchanged $(\overline{G})$.

5) The objectives of firm remain unchanged.

6) There is no change in the natural factors and no advent of any natural calamity.

❖ **Exception to the law of supply**

1) Artistic goods

2) Perishable goods

3) Law of supply is not applicable in the underdeveloped or backward countries which face lack of sufficient productive resources.

4) Agricultural sector

❖ **The supply curve slopes upwards** because of the following two reasons:-

1) Law of diminishing marginal productivity

2) Profit maximisation goal of firm

❖ **Determinants of Supply**

$Q_x = f\left(P_x, P_y, P_i, T, G, G_F, N_F\right)$

P_x = Price of commodity x

P_y = Price of related goods (Substitutes or complementary goods)

P_i = Price of inputs, raw materials or cost of production

T= State of technology

G = Government Policy

G_F = Goal of firm

N_F = Natural factors

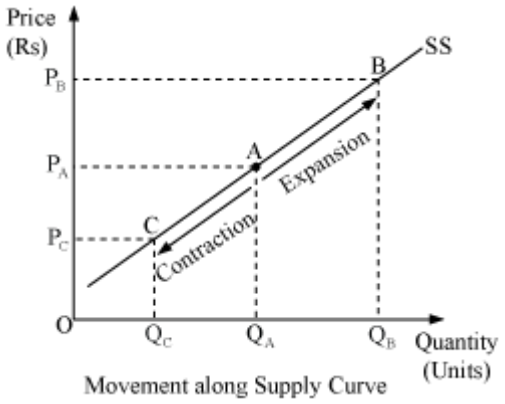
❖ **Change in Quantity Supplied (Movement) and Change in Supply (Shift)**

Movement Along Supply Curve

The change in quantity supplied is associated with the change in the price of good P_x only, assuming that other determinants remain unchanged.

Movement along the supply curve can be either:

1) Expansion of supply which refers to the rise in supply due to rise in price of the good. For example, movement from A to B
2) Contraction of supply which refers to the fall in supply due to fall in price of the good. For example, movement from A to C

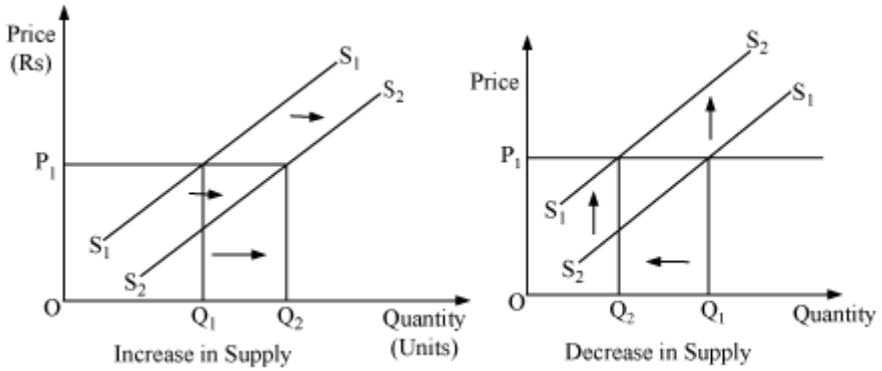


Movement along Supply Curve

Shift in Supply Curve

The change in supply is caused due to change in all variables other than the price of good. The shift in the curve can refer to

1) Increase in supply due to favourable changes in the determinants other than the price of goods.
2) Decrease in supply due to unfavourable changes in the determinants other than price of goods.



Increase in Supply

Decrease in Supply

❖ **Elasticity of Supply (E_s)**

Price elasticity of supply measures the responsiveness of quantity supplied of a commodity to the change in the price of the commodity. This means how slow (sluggish) or how fast (quick) the supply responds to the changes in the price of the good.

It is calculated as

$$E_s = \frac{\text{Percentage Change in Quantity Supplied}}{\text{Percentage Change in Price}}$$

$$= (+)\frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Where,

ΔQ = Change in quantity supplied i.e. $Q - Q_1$

ΔP = Change in price i.e. $P - P_1$

P = initial price

Q = initial quantity supplied

P_1 = final price

Q = initial quantity supplied

Q_1 = final quantity supplied

NOTE: *E_s, unlike E_d (elasticity of demand) does not contain negative sign, due to the law of supply.*

❖ **Measurement of Price Elasticity of Supply**

The price elasticity of supply is measured by two methods, which are:

1) **Proportionate Method**

This method measures elasticity of supply by the ratio of percentage change in quantity supplied and percentage change in price of a commodity. The formula for proportionate method is the same as given above.

The value of E_s ranges from zero to infinity, like E_d

a) If $E_s > 1$, then it implies the supply of the commodity is elastic.

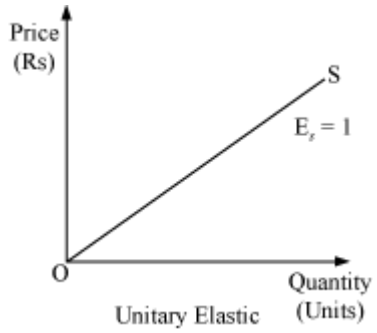
b) If $E_s = 1$, then it implies the supply is unitary elastic.

c) If $E_s < 1$, then it implies the supply is inelastic.

2) **Geometric Method**

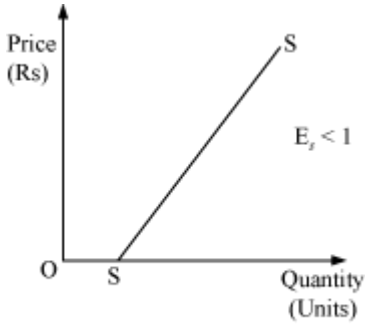
It is a graphical method of estimating elasticity of supply. It depends on the origin position of the supply curve. There are five possible situations, which are:

a) ***Unitary Elasticity of Supply ($E_s = 1$)***



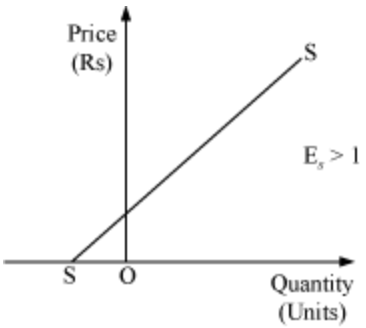
Unitary Elastic

b) Less Elastic Supply ($E_s < 1$)



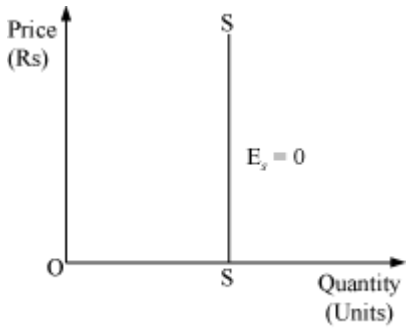
Less Elastic Supply Curve

c) More Elastic Supply ($E_s > 1$)



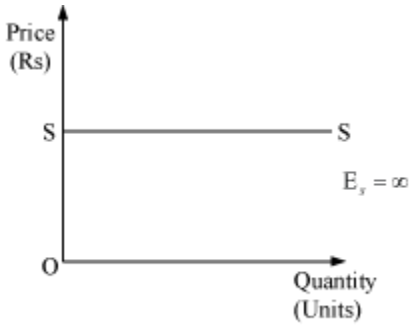
More Elastic Supply Curve

d) Perfectly Inelastic Supply / Zero Elasticity



Perfectly Inelastic Supply Curve

e) Perfectly Elastic Supply / Infinite Elastic Supply Curve



Perfectly Elastic/Infinite Elastic Supply Curve

❖ **Factors Affecting Elasticity of Supply**

1) Nature of the commodity

a) Perishable goods – less elastic supply

b) Durable goods – more elastic supply

2) Production Inputs

a) Common and easily available inputs – more elastic supply

b) Difficult available inputs – less elastic supply

3) Time Factor

a) Long time period – more elastic supply

b) Short time period – less elastic supply

4) Cost Behaviours

a) Decreasing cost of production – more elastic supply

b) Increasing cost of production – less elastic

5) Risk factor

a) Higher risk involved – more elastic supply

b) Lower risk involved – less elastic supply

6) Production Techniques and Method

a) More sophisticated production technique – less elastic supply

b) Easy and simple techniques – more elastic supply

7) Factor Mobility

a) Mobile factors of production – more elastic supply

b) Immobile factors – less elastic supply

8) Price Expectations

a) Future inflation expectation – less elastic supply

b) Future deflation expectation – more elastic supply