Demand, Supply and Market Equilibrium

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CONTENTS:

1.   **LEARNING OUTCOME**

      After reading this chapter you will be able to know:

      I.   The concept of demand, determinants of demand, demand schedule and how to draw demand curve, law of demand, change in demand and change in quantity demanded. Individual and market demand.

      II.   The concept of supply, determinants of supply, supply schedule and how to draw supply curve, law of supply, change in supply and change in quantity supplied. Individual and market supply.

      III.   Concept of equilibrium, concept of shortage and surplus, impact of change in demand and supply on the equilibrium.

2.   **CONCEPT OF DEMAND**

When we say that a consumer demands a good like a car it implies that she is willing to pay a 'certain' price in return for a pre-determined amount of the good. This 'willingness 'lies at the heart of the demand theory. In economics, this willingness is expressed in terms of Desire, Ability and Willingness.

Consider a BMW sports car with a price tag of Rs. 25 lac . A 18 year girl student would like to own this car. However, she would not constitute demand for this car because she lacks to ability to pay the stated price of the car. She has the desire to drive and the willingness to pay for it (she does not want it for free), but lacks the ability to pay the stated price since she is a student with no income. Thus, demand is not just willingness to pay for a good at a stated price but also the desire and ability to pay for it. However, she may be willing to pay a lower price of Rs. 5 lacs. If this price is acceptable to the makers of BMW then she constitutes demand for the car.

Assuming that desire and ability exist we can say that demand for a good is equivalent to willingness to pay for a good. This explains why the terms 'demand curve' and ' willingness to pay' curve are used interchangeably.

2.1.   **DEMAND SCHEDULE AND DEMAND CURVE**

A consumer demand schedule gives the various combinations of price and demand of a good for a consumer in a table form. For example, it tells us the willingness of a consumer to pay for oranges at certain prices. The relationship between price and quantity is shown using specific values in the table below. At a price of Rs.10/dozen, the consumer is willing to consume/purchase 4dozen. At a price of Rs 30/dozen the demand falls to 2 dozen.

 A demand curve is a graphical representation of the demand schedule. The demand curve slopes downwards to show that as price rises, the demand for a good falls, assuming all other factors remain constant. A demand curve can be drawn using a demand schedule or a demand function (see section IV). A demand function is a mathematical relation between price and quantity demanded.
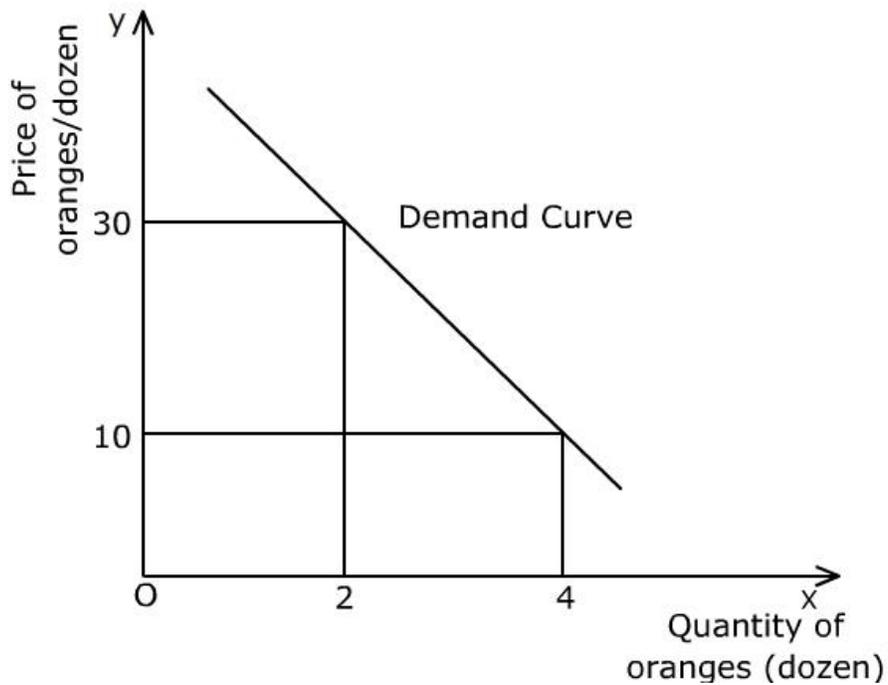
DEMAND SCHEDULE FOR ORANGES

PRICE (Rs per dozen)	QUANTITY DEMANDED (dozens)
10	4
30	2

If this relationship can be expressed in a mathematical expression then this expression is called a demand function. For example demand for oranges is denoted by Qd; where

$Qd = 5 - 0.1P$

Notice that the sign for P is negative, which indicates that demand curve is downward sloping. Another way of saying this is that slope of demand curve is negative.

When P= 10 then Qd= 5 –.1*10 =4

When P = 30 then Qd = 5 –.1*30 = 2

3. **DERIVATION OF MARKET DEMAND SCHEDULE AND MARKET DEMAND CURVE**

The market demand schedule provides the total demand for a good in the market. It represents the sum of demand by all consumers. It is the horizontal summation of all individual demand curves.

EXAMPLE:

Assume 3 consumers in the market, whose demand schedules are given below. Let us graphically and numerically show the market demand; we assume the following demand functions:

Ravi: Q1= 10-P

 Chavi: Q2= 12-2P

Pami: Q3= 8-4P

Market demand is the horizontal summation of individual demand curves. It is derived by adding the demand at given price P.
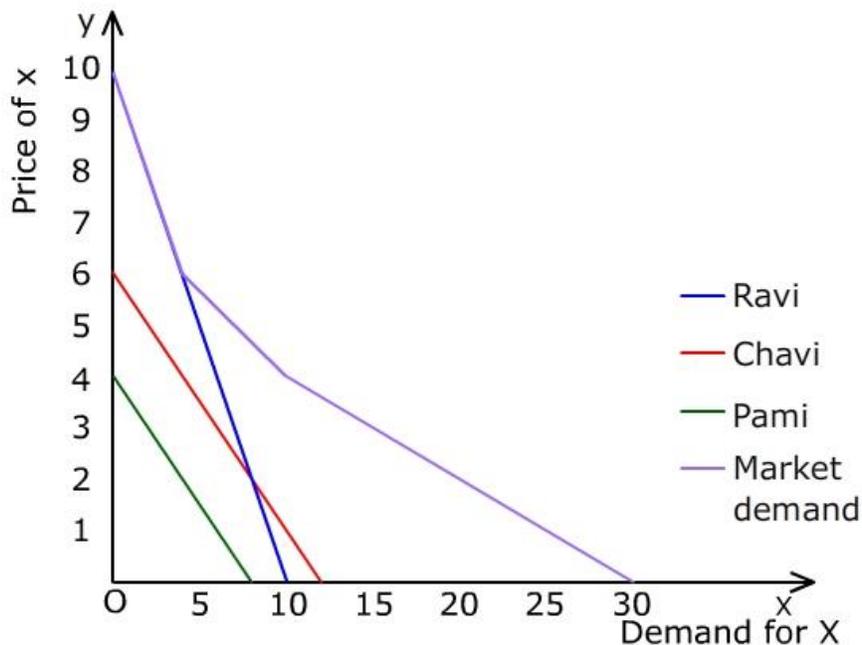
Market demand = Q*= Q1+Q2+Q3= 10-P +12-2P +8-4P = 30-7P

Q*=30-7P

P	Ravi	Chavi	Pami	Total demand
1	2	5	4	2+5+4=11
2	1	3	3	1+3+3=7
3	0	1	2	0+1+2=3

Market demand schedule

P	Total demand=market demand
1	2+5+4=11
2	1+3+3=7
3	0+1+2=3

4. DETERMINANTS OF DEMAND

Demand for a good is determined by monetary and nonmonetary factors. These can be expressed using the demand function Qd where

Qd= f(Px, Py, M, F)

- ✓ Qd or demand for good X is a function (f) of

- ✓ Px: price of the good,

- ✓ Py: price of good Y that is related in some way to good X,

M: income of the consumer and F: non-monetary factors like season, fashion, etc. The last factor is subjective and can't be defined in a mathematical expression. We now examine the relation between demand for a good with each determinant separately.

Demand and Px: The relation between demand and price of a good is based on the law of demand. As price rises, the demand for a good will fall, ceteris paribus (assuming all other factors – Py, M, F are unchanged) . This explains the negative slope of a demand curve. In some cases this law may not be obeyed and there can be a positive relation between price and demand. Such goods are exceptions to the law of demand and called GIFFEN goods.

Demand and Py: there can be two types of relation between X and Y. The first is that they are complements to each other. This means they are always consumed together and it is not useful to consume them alone. A rise in price of Y will cause a fall in demand for both X and Y. The common examples include a mobile phone and a SIM card (a mobile phone is useless without a SIM card) , shoes

and socks(it is not comfortable to wear shoes without socks). The other relation is that of substitutes. As price of Y rises, the demand for X will increase as the demand for Y declines; X substitutes for Y. Common examples include a laptop and a personal computer, a WIFi connection and a data card for use on a mobile phone. (a phone that needs Internet connectivity need to use only 1 of these- WiFi or a data card).

Demand and M: most goods are 'normal' as their demand rises with rise in income levels. Therefore, the relation is positive. For some 'inferior 'goods the relation is negative. Take the case of a non-branded shoe bought from the local market. As income rises, a consumer may not opt for a similar shoe, and may want to buy a branded shoe like Nike/ Adidas. Therefore, the non-branded shoe sees a decline in demand even when income of the consumer rises. This non-branded local shoe is an inferior good.

Note that when we examine the relation between demand and each determinant, we assume that all other determinants are unchanged. So when income changes Px and Py are unchanged. This is also referred to as 'ceterius paribus' condition. It can be translated to mean that all other things remain constant.

5.   **CONCEPT OF SUPPLY OF A GOOD**

5.1.   **SUPPLY SCHEDULE AND SUPPLY CURVE**

A firm's supply schedule gives the various combinations of price and output of a good for a firm in a table form. For example, it tells us the ability and willingness of a firm to produce a certain amount of output of a good at a certain price. The relationship between price and quantity is shown using specific values in the table below. At a price of Rs.10/dozen, the orange seller (firm) is willing to sell 4dozen. At a price of Rs 30/dozen the supply rises to 8 dozen.

 A supply curve is a graphical representation of the supply schedule. The supply curve slopes upwards to show that as price rises the supply of a good rises, assuming all other factors remain constant. A supply curve can be drawn using a supply schedule or a supply function (see section VII). A supply function is a mathematical relation between price and quantity supplied.
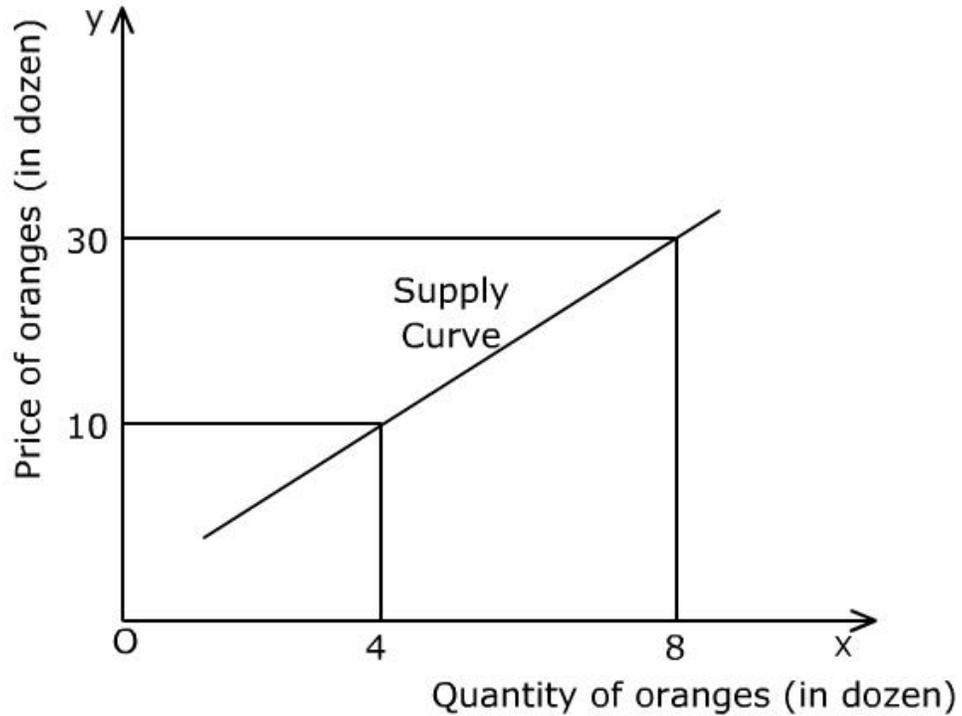
SUPPLY SCHEDULE FOR ORANGES

PRICE (Rs per dozen)	QUANTITY DEMANDED (dozens)
10	4
30	8

If this relationship can be expressed in a mathematical expression then this expression is called a supply function. For example supply for oranges is denoted by Qs where

Qs = 2 + 0.2P

Notice that the sign for P is positive, which indicates that supply curve is upward sloping. Another way of saying this is that slope of supply curve is positive.

When P= 10 then Qs= 2 +.2*10 =4

When P = 30 then Qs = 2 +.2*30 = 8

6.   **DERIVATION OF MARKET SUPPLY SCHEDULE AND MARKET SUPPLY CURVE**

The market supply schedule provides the total supply for a good in the market. It represents the sum of supply by all firms for a good. It is the horizontal summation of all individual supply curves.

EXAMPLE:

Assume 2 firms in the market, whose supply schedules are given below. Let us graphically and numerically show the market supply; we assume the following functions:

Firm ABC : $Qs1= 2 +3P$

Firm XYZ: $Qs2= 1 +2P$

Market supply = Qs^* is the horizontal summation of individual demand curves. It is derived by adding the demand at given price P.
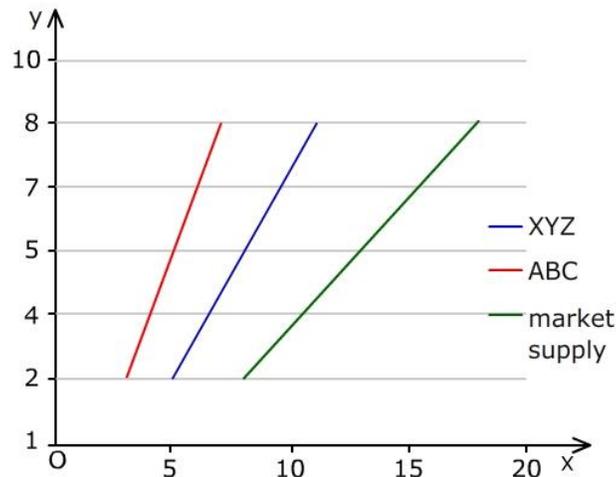
Market supply = $Qs^*= Qs1+Qs2= 2+3P +3+2P = 5+6P$

$Q^*=5+5P$

P	XYZ	ABC	Total supply
1	5	3	5+3=7
2	8	5	8+5=13
3	11	7	11+7=18

Market supply schedule

P	Total demand=market demand
1	5+3=7
2	8+5=13
3	11+7=18

7.   **DETERMINANTS OF SUPPLY**

Supply of a good is determined by the costs involved in producing the good and non cost factors as well. These can be expressed using the supply function Qs where

$Qs = f(P_x, P_{inputs}, T, F)$

Qs or supply for good X is a function (f) of

✓ P_x: price of the good,

✓ P_{inputs}: price of inputs that are used to produce the good.

✓ T: technology involved in production

✓ F: Non-monetary factors like expectations among firms about future demand, season, fashion, cyclical factors, the stage of business cycle, etc. This factor is subjective and can't be defined in a mathematical expression.   We now examine the relation between supply of a good with each determinant separately.

Supply and Px: The relation between supply and price of a good is based on the law of supply. As price rises, the supply of a good will rise, ceteris paribus (assuming all other determinants unchanged) . This explains the positive slope of a supply curve.

Supply and P_{inputs}: It is common sense that price at which a firm is willing to sell the good will depend on the cost of producing it. This cost depends on the cost and availability of inputs. Higher is the input higher will be the price of a good. A common example is the local fruit seller who increases the prices of his fruits whenever the price of petrol is increased. Petro/ diesel is used to transport fruits from the grower to reach the final consumer through the fruit seller. The transport costs are therefore part of producing the fruits until they reach the consumer, which is you. Thus, higher price of inputs will decrease supply.

T and F: these are non-mathematical determinants of supply. In general, a change towards more efficient technology will lead to higher supply, as the firm is able to produce more with same inputs. In the same way positive consumer and business expectations about the economy or/and a general boom period is associated with higher supply.

Note that when we examine the relation between supply and each determinant, we assume that all other determinants are unchanged. So when input prices change Px, F and T are unchanged. This is also referred to as 'ceterius paribus' condition. It can be translated to mean that all other things remain constant.

8.   **FACTORS THAT DETERMINE SHIFTS IN DEMAND CURVE**

The shifts in the demand curve are based on the determinants of demand. We can distinguish between two types of shifts of the demand curve based on the cause of the shift

MOVEMENTS ALONG THE DEMAND CURVE: As the word 'along' suggests we need to move on a demand curve in response to a change in price. When price falls we move from A to B, showing that quantity of X demanded has risen. A fall in quantity demanded is shown as a movement from C to D.

Movements Along Demand Curve
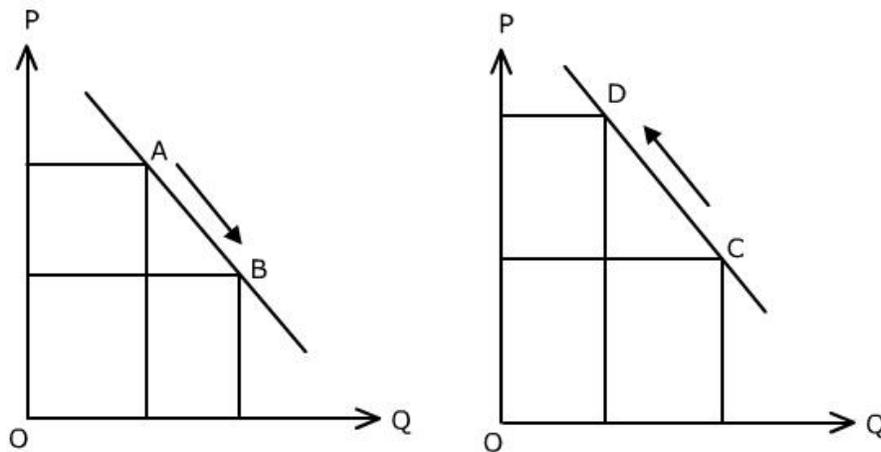
SHIFTS OF DEMAND CURVE: These are shown as an upward shift or downward shift of the demand curve. Assume that income of a consumer rises. Initially the consumer was at point A on demand curve D1, demanding Q1 at price P1. Now with price unchanged at P1his demand rises to Q2, shown on D2 at point B. The movement from A to B in response to an income increase is shown as a shift of the demand curve to the right.
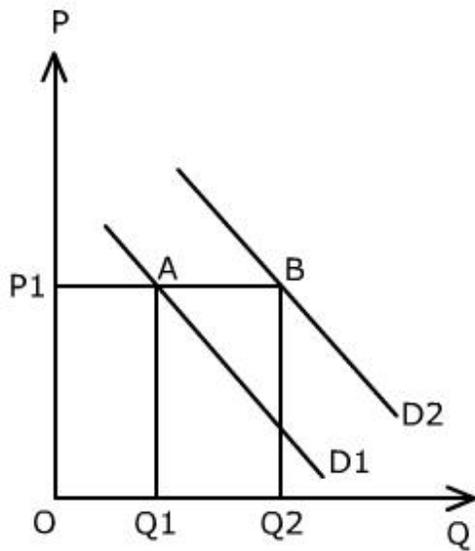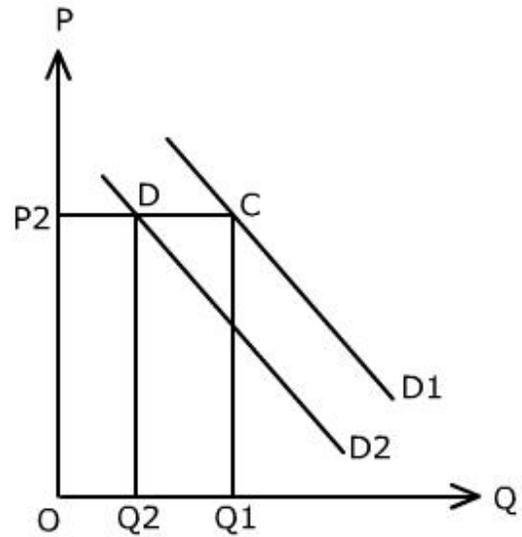
Increase in Demand   Decrease in Demand

A similar shift occurs when price of the good Y, which is a complement to X falls. This fall causes an increase in the demand for X shown as a movement from D1 to D2. Some other examples are listed in the table below:

CAUSE	EFFECT ON DEMAND	EFFECT ON DEMAND CURVE (right/ left shift)
Rise in income	Increase	Right
Fall in income	Decrease	Left
Rise in price of complementary good	decrease	Left
Fall in price of complementary good	Increase	Right
Rise in price of substitute good	increase	Left
Fall in price of substitute good	decrease	right
Positive Change in fashion	increase	right

♦   Note that shift of the demand curve is caused by changes in non-price factors (Py, M, F) alone.

♦   Note that shift along the demand curve is caused by changes in price of the good alone.

- A shift along demand curve is expressed as a increase/ decrease in quantity demanded, whereas a shift of the demand curve is expressed as increase/ decrease in demand

- A right shift of demand curve shows INCREASE IN DEMAND

- A left shift of demand curve shows DECREASE in demand

- A shift along the demand curve upwards is a DECREASE IN QUANTITY DEMANDED.

- A shift along the demand curve downwards is an INCREASE IN QUANTITY DEMANDED

9. **FACTORS THAT DETERMINE SHIFTS IN SUPPLY CURVE**

The shifts in the supply curve are based on the determinants of supply as was the case for demand. We can again distinguish between two types of shifts of the supply curve based on the cause of the shift.

MOVEMENTS ALONG THE SUPPLY CURVE: As was the case in demand, a change in quantity supplied is caused by a change in the price of the good. It is shown as a move along a given supply curve. When price falls we move from A to B, showing that quantity of X supplied has decreased. An increase in quantity supplied is shown as a movement from C to D, when P_x increases.

Movements Along Supply Curve
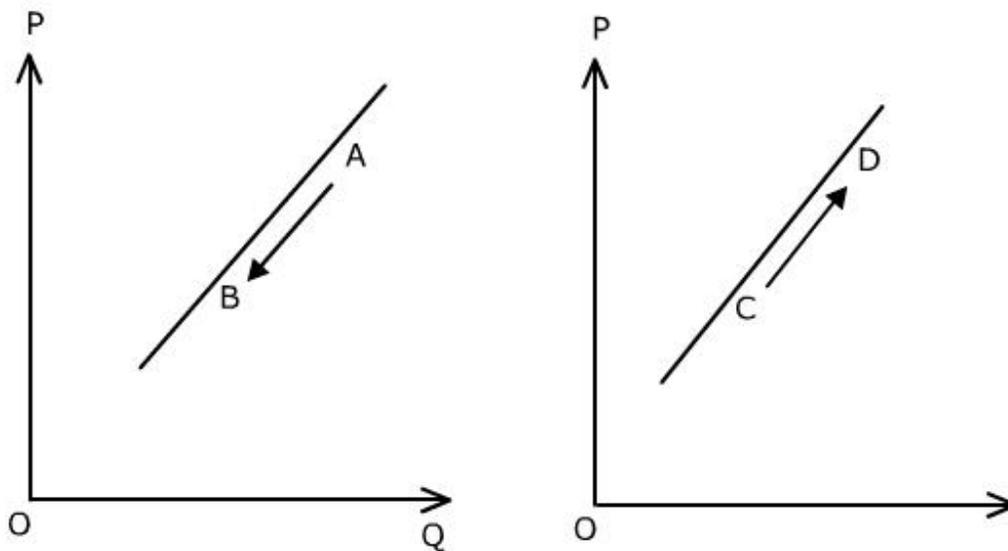
SHIFTS OF SUPPLY CURVE: These are shown as an upward or downward shift of the supply curve due to non price factors- technology, price of inputs, non monetary factors. Initially the firm was at point A on supply curve S1, supplying Q1 at price P1. Assume that a new technology improves the speed of workers. This allows greater supply, and is shown as a shift of S1 to S2. The same price P1 now gets

greater supply of Q2, shown on S2 at point B. The movement from A to B in response to a positive non monetary change and is shown as a shift of the supply curve to the down and right.

Shift of the Supply Curve
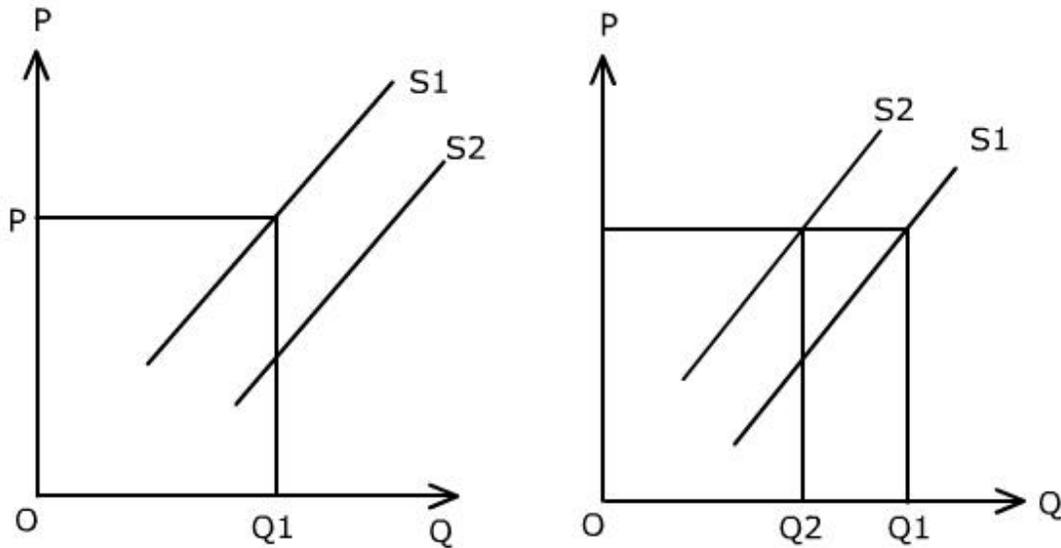
A similar shift occurs when price of an input declines. This fall causes a decline in the cost of production of the good. The savings are used to produce more of X so that we move to point B, without any change in Px. Some other examples are listed in the table below:

CAUSE	EFFECT ON SUPPLY	EFFECT ON SUPPLY CURVE (right/ left shift)
Fall in input prices	Increase	Right
Rise in input prices	Decrease	Left
A negative technical change	decrease	Left
A positive new technology	Increase	Right
Rise in price of substitute good	increase	Left
Fall in price of substitute good	decrease	right
Positive Change in fashion	increase	right

♦ Note that shift of the supply curve is caused by changes in non-price factors (P_{inputs},T, F) alone.

♦ Note that shift along the supply curve is caused by changes in price of the good (P_x)alone.

♦ A shift along supply curve is expressed as a increase/ decrease in quantity supplied, whereas a shift of the supply curve is expressed as increase/ decrease in demand

♦ A right shift of supply curve shows INCREASE IN SUPPLY

♦ A left shift of supply curve shows DECREASE IN SUPPLY.

♦ A shift along the supply curve upwards is a DECREASE IN QUANTITY SUPPLIED.

♦ A shift along the supply curve downwards is an INCREASE IN QUANTITY SUPPLIED

10.   **CONCEPT OF EQUILIBRIUM**

Equilibrium is a position of 'rest' for all economic agents. At this point no agent will like to change its position in terms of demand, supply or price. To determine equilibrium we need the demand and supply curves. Equilibrium is determined where demand equals supply. Ina diagram it is easy to show that P* and Q* are the equilibrium values of price and quantity. We can easily show how P* is derived.

Consider price P1 where demand = Q2 and supply = Q1. Demand > supply so that we have a position of excess demand which is called a SHORTAGE. Consumers are willing to pay a price of P1 for Q2 while suppliers want to sell Q1 at this price. When suppliers realize that consumers want more than Q1(which they had produced), they increase production in next period, for which they ask for a higher price. The red arrow shows this. As long as a shortage remains, producers will continue to increase production, until demand equals supply. Now there is no reason to change the production levels or the demand levels.
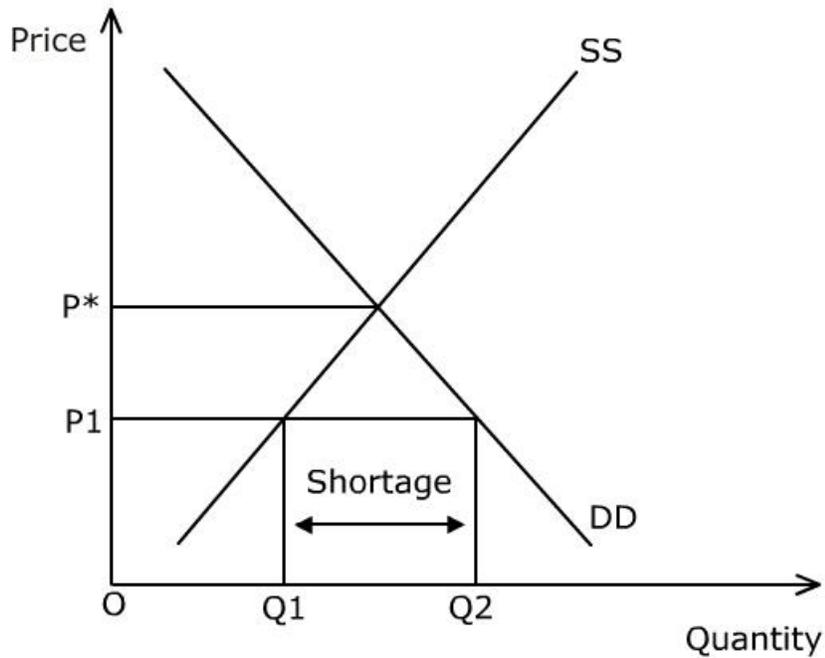
Consider price P2 where demand = Q4 and supply = Q3. Demand < supply so that we have a position of excess supply which is called a SURPLUS. Consumers are willing to pay a price of P2 for Q4 while suppliers want to sell Q3 at this price. When suppliers realize that consumers want less than Q3(which they had produced), they downsize production in next period, and are willing to offer this lower output at a lower price. The blue arrow shows this. As long as a surplus remains, producers continue to decrease production, until demand equals supply. Now there is no reason to change the production levels or the demand levels.
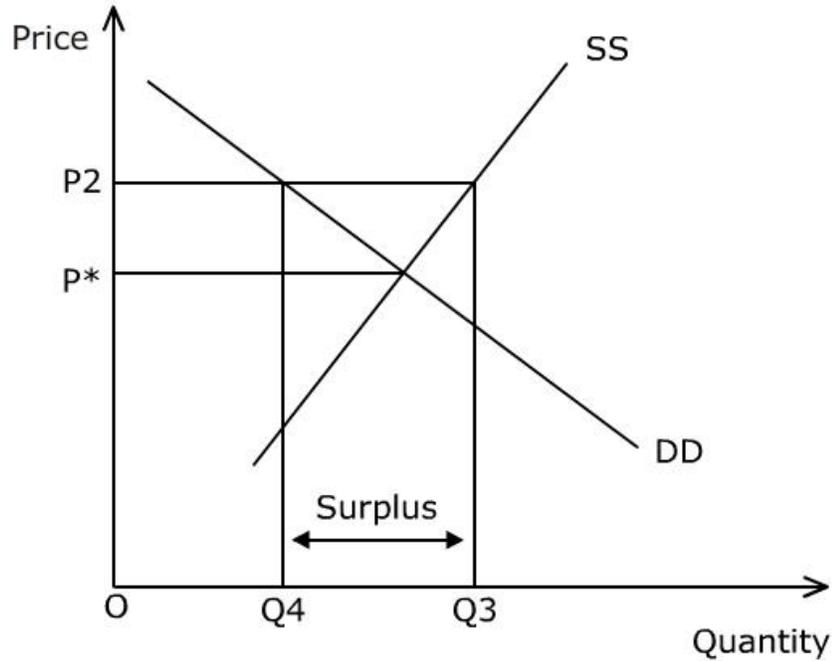
Thus we conclude that a surplus causes prices to fall while a shortage causes prices to rise. At equilibrium there is no shortage and no surplus, since demand = supply. We now investigate the effects of changes in demand and supply on equilibrium price and quantity.

Case 1: Increase in demand. The demand curve shifts to the right (D1 to D2), leading to higher price and quantity.

Case 2: Decrease in demand. The demand curve shifts to the left (D1 to D3), leading to lower price and quantity.
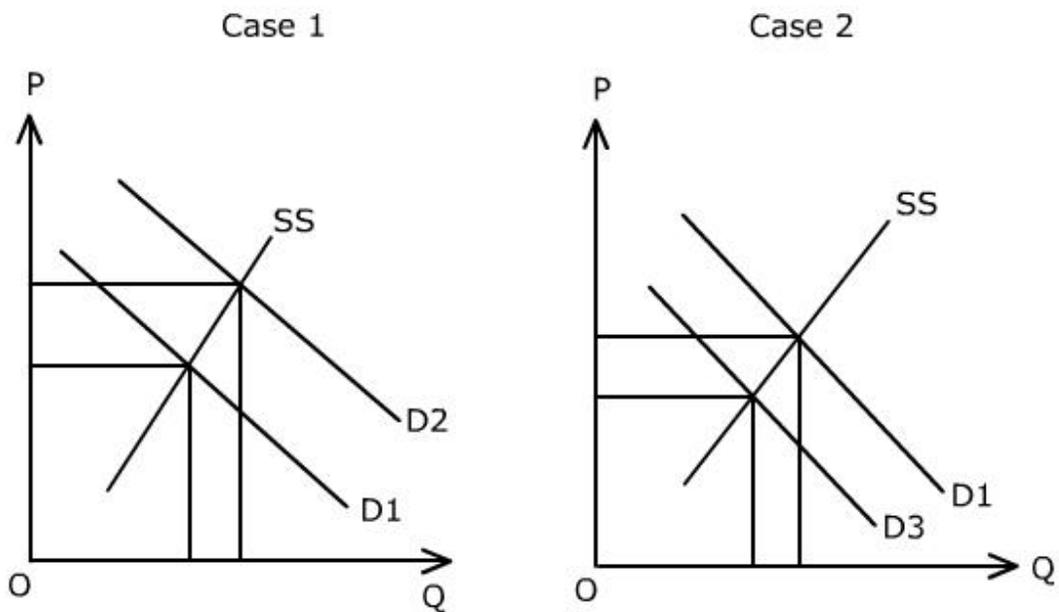
Case 3: Increase in supply. The supply curve shifts to the right, leading to higher quantity and lower price.

Case 4: Decrease in demand. The supply curve shifts to the left, leading to higher price and lower quantity.
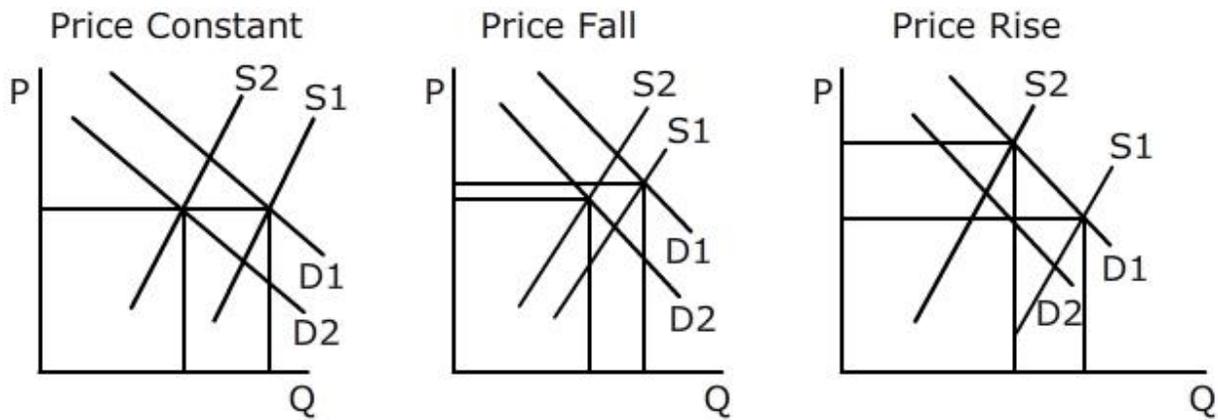

Case 3 · Case 4
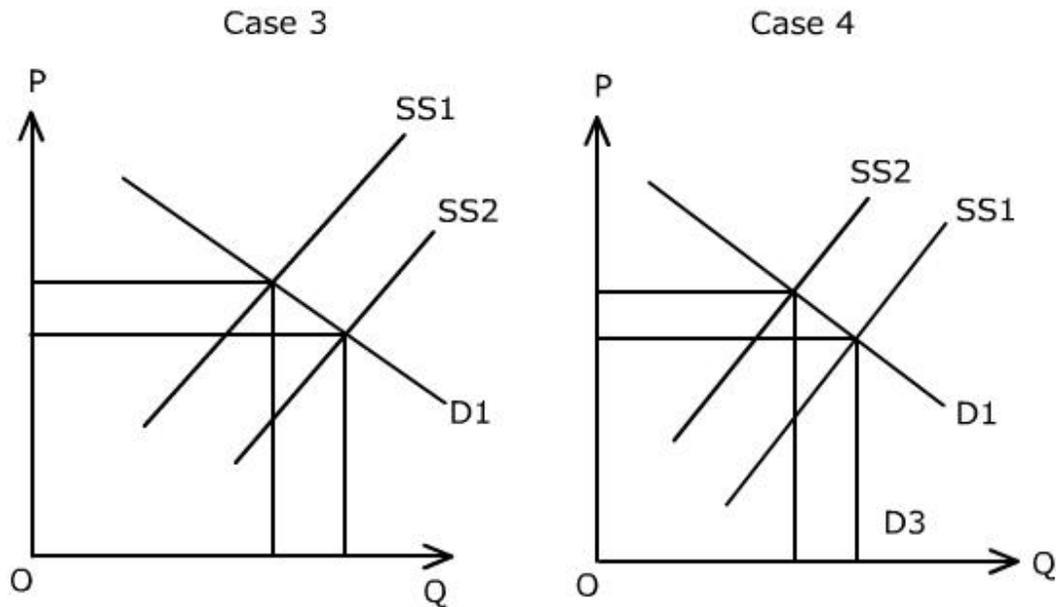
We now determine the effect of simultaneous changes in demand and supply.
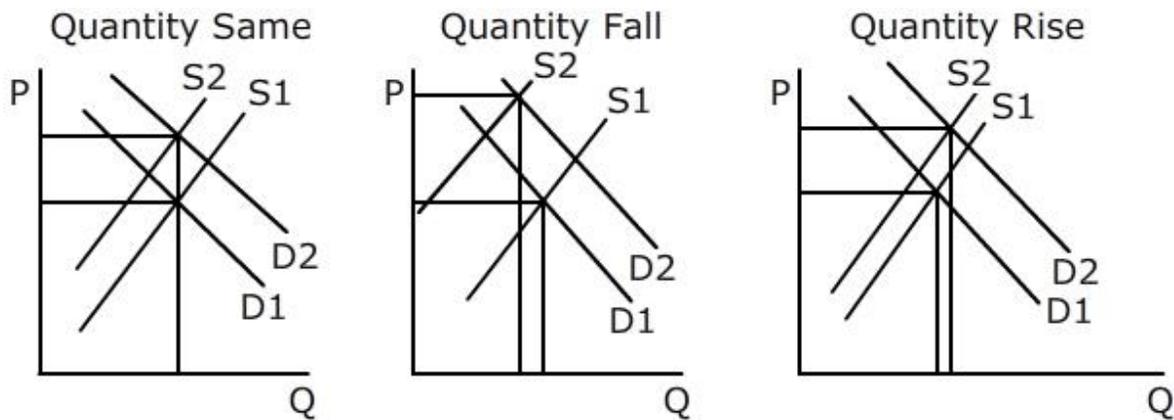
Case 5: Increase in demand and supply. we have three possible cases shown in diagram below. Note that **quantity will always rise** (as shown by the arrow) while the effect on price depends on comparative increase in demand and supply.

Price Constant · Price Rise · Price Fall
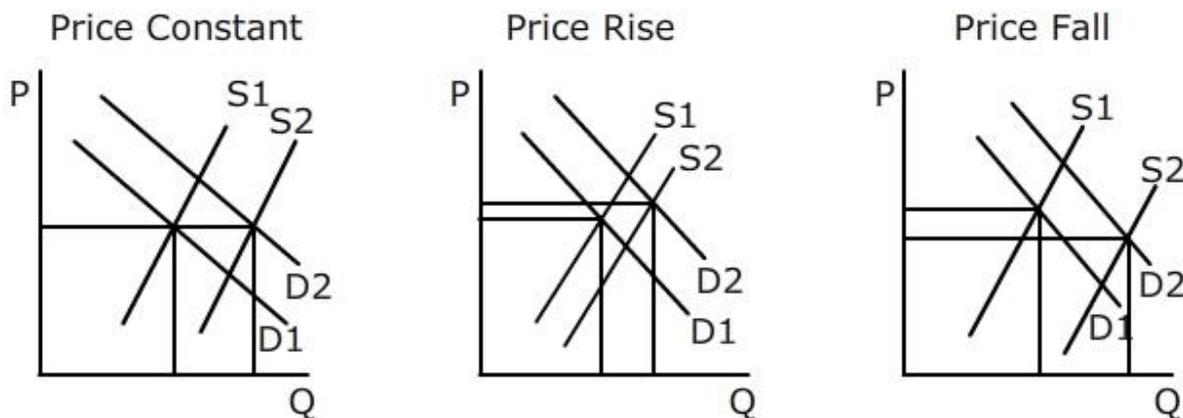
Case 6: Decrease in demand and supply. we have three possible cases shown in diagram below. Note that **quantity will always fall** while the effect on price depends on comparative increase in demand and supply.

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Case 7: Increase in demand and decrease in supply. we have three possible cases shown in diagram below. Note that **price will always rise** while the effect on quantity depends on comparative increase in demand and supply.

Case 8: Increase in supply and decrease in demand. we have three possible cases shown in diagram below. Note that **price will always fall** while the effect on price depends on comparative increase in demand and supply.