

## 2.4 CONSUMER SURPLUS

When people buy something for less than it is worth to them, they receive a consumer surplus. A consumer surplus is the value of a good minus the price paid for it, summed over the quantity bought. It can be simply defined as "a buyer's willingness to pay minus the amount the buyer actually pays"

### Concept of Consumer's Surplus:

Consumer's surplus was introduced in economics by Alfred Marshall, although the use of the concept goes back to the French economist Jules Dupuit in the first half of the nineteenth century. The concept of consumer surplus is derived from the law of diminishing marginal utility. As per the law, as we purchase more of a commodity, its marginal utility reduces. Since the price is fixed, for all units of the goods we purchase, we get extra utility. This extra utility is consumer surplus.

**Example:** Alfred Marshall, British Economist defines consumer's surplus as follows: **"Excess of the price that a consumer would be willing to pay rather than go without a commodity over that which he actually pays."**

Consumer's Surplus = the price a consumer is ready to pay – The price he actually pays

Further, the consumer is in equilibrium when the marginal utility is equal to the price. That is, he purchases those many numbers of units of a good at which the marginal utility is equal to the price. Now, the price is fixed for all units. Hence, he gets a surplus for all units except the one at the margin. This extra utility is consumer surplus. Let us take a look at an example of consumer surplus.

No. of units	Marginal Utility	Price (Rs.)	Consumer's Surplus
1	30	20	10
2	28	20	8
3	26	20	6
4	24	20	4
5	22	20	2
6	20	20	0
7	18	20	–

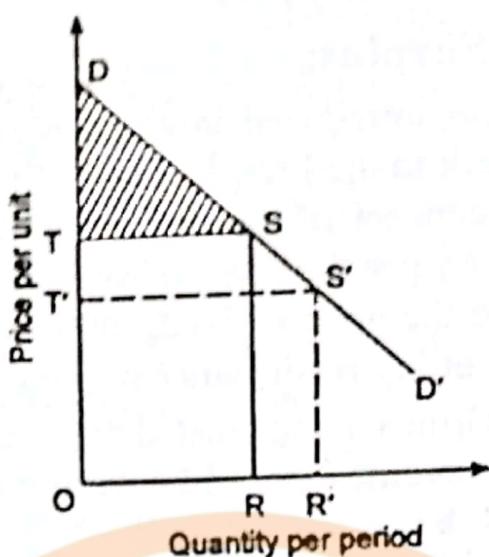
From the table above, we see that as the consumption increase from 1 to 2 units, the marginal utility falls from 30 to 28. This diminishes further as he increases consumption. Now,

- Marginal utility is the price the consumer is willing to pay for that unit.
- The actual price of the unit is fixed.

Therefore, the consumer enjoys a surplus on all purchases until the sixth unit. When he buys the sixth unit, he is in equilibrium, since the price he is willing to pay is equal to the actual price of the unit.

### Alternative explanation

Consumer's Surplus = Total Utility - (Total units purchased x marginal utility of price). In short, consumer's surplus is the positive difference between the total utility from a commodity and the total payments made for it.



In this figure the quality of a particular commodity is measured on the horizontal axis and its marginal utility or production on the vertical axis. Here  $DD'$  is the demand price for it. When a consumer buys all the units ( $OR$ ) at  $RS$  price per unit, he gets a total satisfaction equal to the area  $DORS$ , But, he spends only  $ORST$  amount of money, so his surplus satisfaction is  $DTS$  (i.e., the shaded area). If the price falls to  $R'S'$ , he would buy  $OR'$  and his surplus would increase to  $DTS'$ .

**So, consumer's surplus is measured by the area under the demand curve but above the market price.** A difficulty is that as the price falls, the real income of the consumer increases. To get a more accurate measure of the benefit of the surplus, therefore, an adjustment must be made to offset the effect of the difference in real income at the higher price ( $RS$ ) and the lower price ( $R'S'$ ).

### Limitations

1. It is difficult to measure the marginal utilities of different units of a commodity consumed by a person. Hence, the precise measurement of consumer's surplus is not possible.
2. For necessary goods, the marginal utilities of the first few units are infinitely large. Hence the consumer's surplus is infinite for such goods.
3. The availability of substitutes also affects the consumer's surplus.
4. Deriving the utility scale for prestigious goods like diamonds is very difficult.
5. We cannot measure the consumer's surplus in terms of money. This is because the marginal utility of money changes as a consumer makes purchases and his stock of money diminishes.

6. This concept is acceptable only on the assumption that we can measure utility in terms of money or otherwise. Many modern economists are against the concept.

## IMPORTANT CONCEPTS

**Demand :** the amount of a good that buyers are willing and able to purchase

**Demand Schedule:** a table that shows the relationship between the price of a good and the quantity demanded

**Individual Demand Curve:** a graph of the relationship between the price of a good and the quantity demanded by an Individual

**Market Demand Curve:** the aggregate demand of a good in the market at various prices is called market demand and if it is drawn graphically is called Market demand curve which is generally obtained by horizontal summation of all the individual demand curves

**Demand function:** An equation which shows the mathematical relationship between the quantity demanded of a good and the values of the various determinants of demand

**Ceteris Paribus:** a Latin phrase, translated as “other things being equal,” used as a reminder that all variables other than the ones being studied are assumed to be constant

**Change in demand:** The term used for a shift in the demand curve. It occurs when a determinant of demand other than price changes.

**Change in the quantity demanded:** The term used for a movement along the demand curve to a new point. It occurs when there is a change in price

**Price effect:** The effect of a change in the price on the quantity of a good consumed, other things remaining the same

**Income effect:** The effect of a change in income on consumption, other things remaining the same

**Substitution Effect:** The effect of a change in price of one good or service on a consumer's consumption of goods and services when the real income of the consumer is held constant. OR When the price of a good raises, other things remaining the same, its relative price (opportunity cost) rises people buy less of that good and more of its substitutes.

**Surplus:** a situation in which quantity supplied is greater than quantity demanded

**Shortage:** a situation in which quantity demanded is greater than quantity supplied

**Normal Good:** a good for which, other things equal, an increase in income leads to an increase in demand.

**Inferior Good:** a good for which, other things equal, an increase in income leads to a decrease in demand

**Giffen good:** a good for which an increase in the price raises the quantity demanded

**Substitutes:** two goods for which an increase in the price of one leads to an increase in the demand for the other

**Complements:** two goods for which an increase in the price of one leads to a decrease in the demand for the other

**Consumer surplus:** The excess of what a person would have been prepared to pay for a good (i.e. the utility) over what that person actually pays.

**Engel curve:** A line showing how much of a good people will demand at different levels of income

### IMPORTANT QUESTIONS

1. Explain law of demand with suitable examples
2. Explain the assumptions and limitations of the law of demand
3. What are the demand schedule and the demand curve, and how are they related? Why does the demand curve slope downward?
4. What are the shifting factors of the demand curve? Explain using examples
5. Explain the difference between the terms change in demand and change in quantity demanded by practical examples
6. What is Engel Curve, what it shows? Explain its use and importance in economics.
7. What is consumer surplus? Explain using schedule and table. Also enlist its limitations
8. Explain law of demand with suitable examples
9. Explain the difference between the terms change in demand and change in quantity demanded by practical examples



### A Change in the Quantity Supplied versus a Change in Supply

Changes in the factors that influence producers' planned sales cause either a change in the quantity supplied or a change in supply. Equivalently, they cause either a movement along the supply curve or a shift of the supply curve. A point on the supply curve shows the quantity supplied at a given price. A movement along the supply curve shows a change in the quantity supplied. The entire supply curve shows supply. A shift of the supply curve due to other factors shows a change in supply.

#### Activity

Lumber companies make timber beams from logs. In the process of making beams, the mill produces sawdust, which is made into pressed wood. In the market for timber beams, the following events occur one at a time:

- The wage rate of sawmill workers rises.
  - The price of sawdust rises.
  - The price of a timber beam rises.
  - The price of a timber beam is expected to rise next year.
  - A new law reduces the amount of forest that can be cut for timber.
  - A new technology lowers the cost of producing timber beams.
1. Explain the effect of each event on the supply of timber beams.
  2. Use a graph to illustrate the effect of each event.
  3. Does any event (or events) illustrate the law of supply?

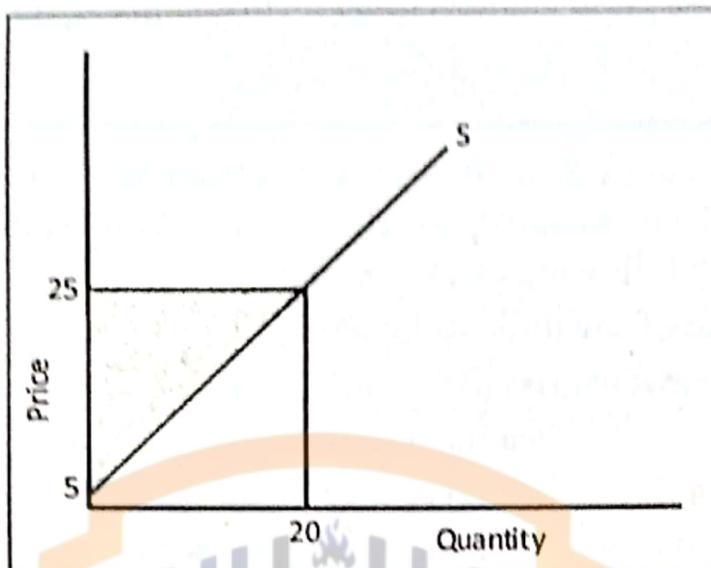
## 3.5 PRODUCER SURPLUS

When firms earn profit, they receive more (or at least receive no less) for the sale of a good or service than the cost of producing it. Just as consumers distinguish between value and price of a good, so does producers between cost and price of a good. Cost is what a producer gives up and price is what a producer receives. The cost of producing one more unit of a good or service is its marginal cost. The marginal cost is the minimum price that producers must receive to induce them to produce another unit of the good or service. This minimum acceptable price determines the quantity supplied. The supply curve shows the quantity supplied at each price. Hence if the price producers receive exceeds the cost they incur, they earn a producer surplus.

In simple words "**Producer surplus is the difference between the price which a firm is willing to receive for its product and what it actually receives**". In another way, producer surplus is measured as the difference between the market price and the cost of production, as shown on the supply curve. By using supply curve it is measured "**as the area above the supply curve and below the price level**" That difference is the

amount that the producer receives as a result of selling the good within the market. In other words, the producer surplus actually measures producer welfare.

The producer surplus derives from a situation when market prices are greater than the absolute least amount that producers are prepared to take in exchange for their goods. When prices are higher, there is profit motive—a greater incentive to supply more goods to the market.



## Calculation of Producer Surplus

In the graph above, the producer surplus is  $= \frac{1}{2}$  base x height. Let's plug the specific numbers into that equation:

$$\frac{1}{2} (20) \times (25 - 5) = \$200$$

The market price is \$25 with quantity supplied at 20 units (what the producer actually ends up producing), while \$5 is the minimum price the producer is willing to accept for a single unit. The base is \$20.

## Producer Surplus Formula

Referring to a graph like the one shown above, the formula for calculating producer surplus is  $\frac{1}{2}$  the length of the base multiplied by height.

In addition, more generally, here is the formula for producer surplus:

$$\text{Producer surplus} = \text{Total revenue} - \text{Total cost}$$

In this formula, total revenue refers to the revenue received from selling a particular number of units of a good. Meanwhile, the total cost refers to the cost of producing the number of units of the good. When you subtract the total cost from the total revenue, you discover the producer's total benefit, which is otherwise known as the producer surplus. When the price for the good on the market increases, the producer surplus also increases. When the price of the good on the market decreases, the producer surplus likewise decreases.

## IMPORTANT CONCEPTS

**Supply curve:** A graph showing the relationship between the price of a good and the quantity of the good supplied over a given period of time.

**Supply schedule:** A table showing the different quantities of a good that producers are willing and able to supply at various prices over a given time period. A supply schedule can be for an individual producer or group of producers, or for all producers (the market supply schedule).

**Joint supply goods:** These are two goods where the production of more of one leads to the production of more of the other.

**Change in the quantity supplied:** The term used for a movement along the supply curve to a new point. It occurs when there is a change in price.

**Change in supply:** The term used for a shift in the supply curve. It occurs when a determinant other than price changes.

**Producer Surplus:** The price of a good minus the opportunity cost of producing it, summed over the quantity sold OR the amount a seller is paid for a good minus the seller's cost

## IMPORTANT QUESTIONS

1. What is law of supply explain with the help of diagram. Also explain its limitations and why it is positively sloped.
2. What determines the quantity of a good that sellers supply?
3. Logically explain the difference between changes in supply and changes in quantity supplied with the help of diagrams.
4. Explain the difference between the supply and stock
5. What is producer surplus, how it is calculated with alternative methods explain.
6. Explain how sellers' costs, producer surplus, and the supply curve are related.
7. What are the supply schedule and the supply curve, and how are they related? Why does the supply curve slope upward?



## Explanation:

There are four indifference curves IC<sub>1</sub>, IC<sub>2</sub>, IC<sub>3</sub> and IC<sub>4</sub> which indicate various pairs of X and Y goods. The pairs at one IC yield same level of satisfaction and a consumer becomes indifferent w.r.t. to these pairs. At the other hand each indifference curve shows different level of satisfaction. IC<sub>1</sub> shows highest and IC<sub>4</sub> yields lowest level of satisfaction. So, the consumer prefers IC<sub>4</sub> to IC<sub>3</sub> and IC<sub>3</sub> to IC<sub>2</sub> and IC<sub>2</sub> to IC<sub>1</sub>. But a consumer becomes indifferent w.r.t. to different pairs at the same curve because it yields same level of satisfaction.

## MARGINAL RATE OF SUBSTITUTION

Marginal rate of substitution is basically the slope of indifference curve which measures the rate at which good Y is substituted with good X. Now for example if, one unit of x commodity and 10 units of y commodity give same level of satisfaction as 2 units of x and 6 units of y commodity and consumer becomes indifferent between both the pairs. It shows that first combination consists of one unit of x and 10 units of y whereas, second combination consists of 2 units of x and 6 units of y commodity. It shows that one unit of x is equal to 4 units of y, and a consumer substitutes 4 units of y to 1 unit of x and remains at the same level of satisfaction. This ratio is called "Rate of Substitution". It is explained with the help of following table:-

Pairs of goods	Good X	Good Y	MRS
1 <sup>st</sup>	1	10	-
2 <sup>nd</sup>	2	6	1:4
3 <sup>rd</sup>	3	3	1:3
4 <sup>th</sup>	4	1	1:2

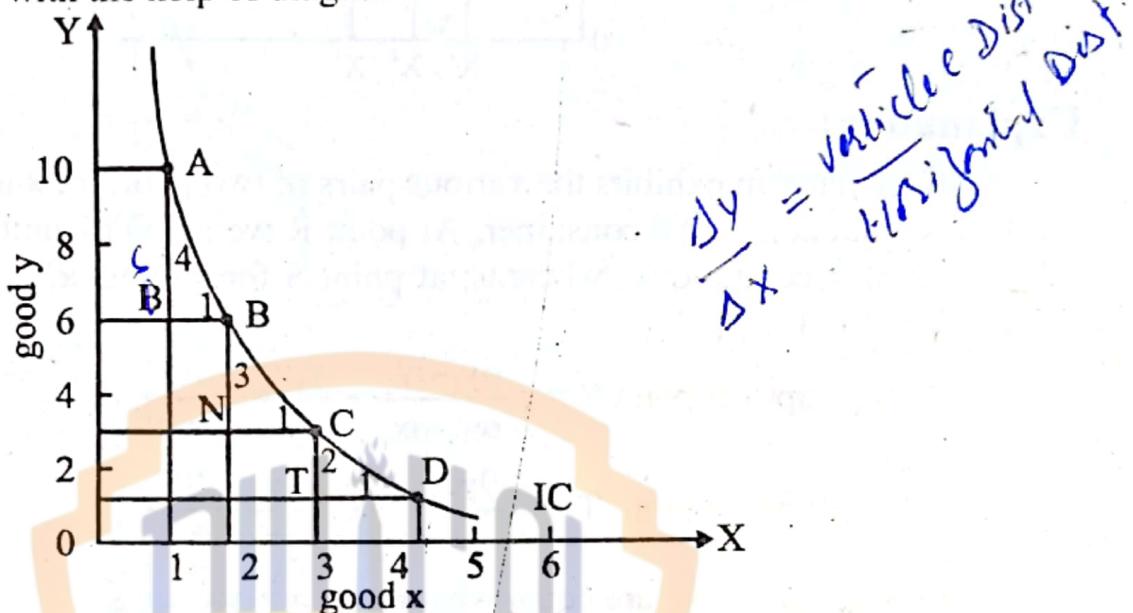
There are four columns in the table. In first column we put different pairs of goods. In second we have x and in third column we have units of y commodity. Fourth column shows marginal rate of substitution (MRS). All the pairs indicate same level of satisfaction, and consumer does not prefer to any of the pair, consumer substitutes an additional unit of x with four units of y, then 3 units of y with one additional unit of x, and 2 units of y are substituted with another unit of x, and it is called MRS. It can be defined as "The amount of one good (Y) that a consumer is prepared to give up in order to obtain one extra unit of another good (X): i.e.  $\Delta Y / \Delta X$ ".

### Diminishing marginal rate of substitution

Above mentioned table shows that marginal rate of substitution diminishes as a consumer substitutes y commodity with x. At 2<sup>nd</sup> pair he exchanges 1 unit of x with 4 units of y and further for 1 unit of x he sacrifices 3 units of y and at fourth pair he exchanges 1 unit of x with 2 units of y. It shows that MRS diminishes and that's why it is called Diminishing Marginal Rate of Substitution (DMRS).

Now question arises why this rate diminishes? It is obvious from Law of diminishing marginal utility that the more of a good we have the lesser is the satisfaction derived from it and similarly the more of the good that we forgo or losses the more of its importance increases it means utility is a function of quantity with negative relationship. The good whose quantity is decreasing, its marginal utility increases and we forgo less of it because consumer want to have both of these goods in his basket to maximize utility.

It is explained with the help of diagram.



### Explanation:

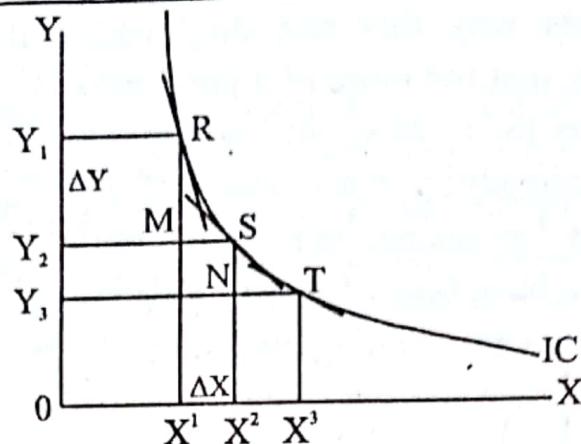
We put x commodity along X-axis and Y commodity on y-axis. The Points A, B, C, D show different combination of two goods X and Y on indifference curve giving same level of satisfaction to the consumer. Point A to B, (MRS) the substitution ratio between x and y commodity shows the slope at point B.

$$\text{Slope of Point B} = \frac{AS}{SB} = \frac{4}{1} = 4$$

$$\text{Slope of Point C} = \frac{BN}{NC} = \frac{3}{1} = 3$$

$$\text{Slope of Point D} = \frac{CT}{TD} = \frac{2}{1} = 2$$

MRS is respectively 4, 3, 2 at second, third and fourth pair, second unit of x is substituted with 4 units of y, third unit of x is substituted with 3 units of y and fourth unit of x with 2 units of y. Though all units of x and y are equivalent. The reason is that as the quantity of x commodity increases its marginal utility decreases and on the other hand as quantity of y commodity decreases its utility increases. This tendency is called "Law of diminishing Marginal rate of substitution"(DMRS).



### Explanation:

IC in diagram exhibits the various pairs of two goods of x and y which yield same level of satisfaction to the consumer. At point R we get OY<sub>1</sub> units of Y commodity and OX<sub>1</sub> units of x commodity, whereas; at point S for getting x<sub>1</sub>x<sub>2</sub> more units of x, y<sub>1</sub>y<sub>2</sub> units of Y are left.

$$\text{MRS (Slope) at point S} = \frac{Oy_1 - oy_2}{ox_2 - ox_1} = \frac{y_1 y_2}{x_1 x_2} = \frac{RM}{MS}$$

$$\text{MRS (Slope) at point T} = \frac{oy_2 - oy_3}{ox_3 - ox_2} = \frac{y_2 y_3}{x_2 x_3} = \frac{SN}{NT}$$

As x<sub>1</sub>x<sub>2</sub> and x<sub>2</sub>x<sub>3</sub> are equal where y<sub>1</sub>y<sub>2</sub> > y<sub>2</sub>y<sub>3</sub>

So at point T slope is steeper than at point S, and MRS is decreasing,

$$\text{As } MRS_{x,y} = -\frac{dy}{dx}$$

So, The MRS of X for Y shows the amount of Y that must be substituted for an additional unit of X for the consumer to remain indifferent to the two combinations of x and y. It can be written in the form of an equation.

$$MRS_{xy} = \frac{\text{Loss of } y}{\text{Receipt of } x} = \frac{-\Delta Y}{\Delta X}$$

This ratio  $\frac{-\Delta Y}{\Delta X}$  is MRS of x for y.

## 6.7 PROPERTIES OF INDIFFERENCE CURVES

Properties of IC are as under:

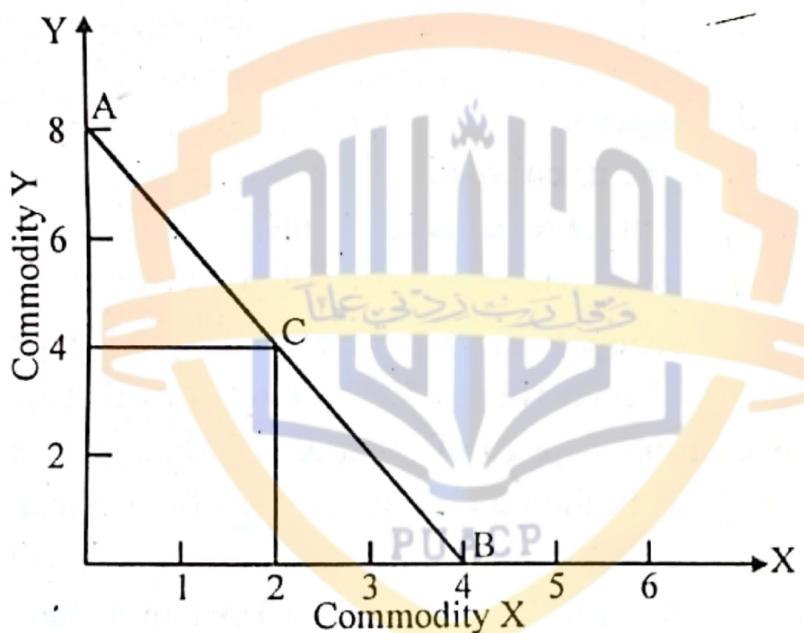
- An indifference curve slope from left to right, downwardly.
- Two indifference curves do not intersect each other.
- It is convex to the origin.
- Higher IC gives more level of satisfaction than the lower IC.
- An IC does not touch any axis.
- All IC's are not necessarily parallel to each other.

## 6.8 CONSUMER'S PRICE OR BUDGET LINE

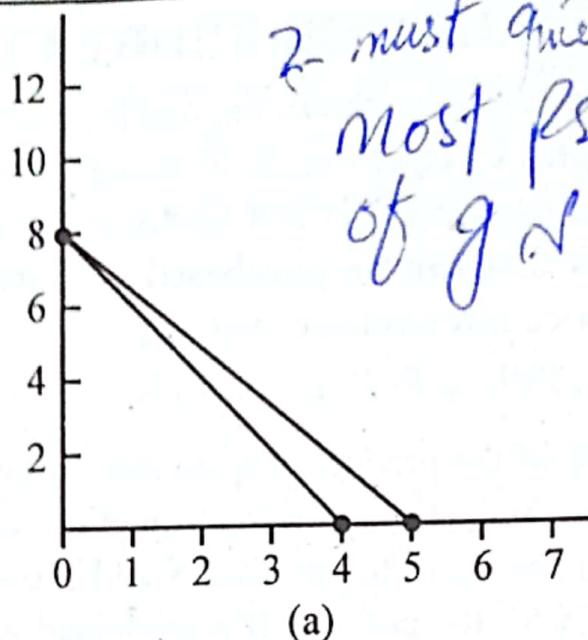
The budget line of the consumer shows the real income of the consumer given the prices of goods and his nominal income. In simple words it shows the purchasing power of the consumer. Hence budget line is defined as "**A curve showing all the possible combinations of two goods that can be purchased at given prices and for a given budget**". A Consumer has price and income constraint.

$$Y = P_1 q_1 + P_2 q_2 + P_3 q_3 + \dots + P_n q_n$$

As income is the sum of the product of quantities of goods and their prices. This curve is called price lines, budget line or consumption opportunity line. Suppose consumer has total 40 Rs. and he wants to purchase X and Y commodities. The price of X is 10/- Rs. while price of Y is 5/- Rs. per unit. It is explained with the help of diagram as under:-



We put X commodity along X-axis and Y commodity on Y-axis. Consumer can either buy 4 units of X commodity and he will be at point B. In such a way, he does not have a single penny to spend on Y commodity, while at point A he can get 8 units of Y commodity in his total income of 40 Rs. The AB line is consumer's price line or consumption possibility curve. At this line any pair of X and Y will cost Rs.40. For Example at point C he will spend 20 Rs. on the purchase of 2 units of X commodity ( $2 \times 10 = 20$ ), and 20 Rs. on 4 units of Y commodity ( $5 \times 4 = 20$ ). Price line changes due to change in the price of one or both commodities or due to the change in consumer's income. There are two types of effects i.e. Rotation of Price line and Shifting of Price line. It can be explained with the help of graph given below:-



## Rotation of Price or Budget Line

### Conditions

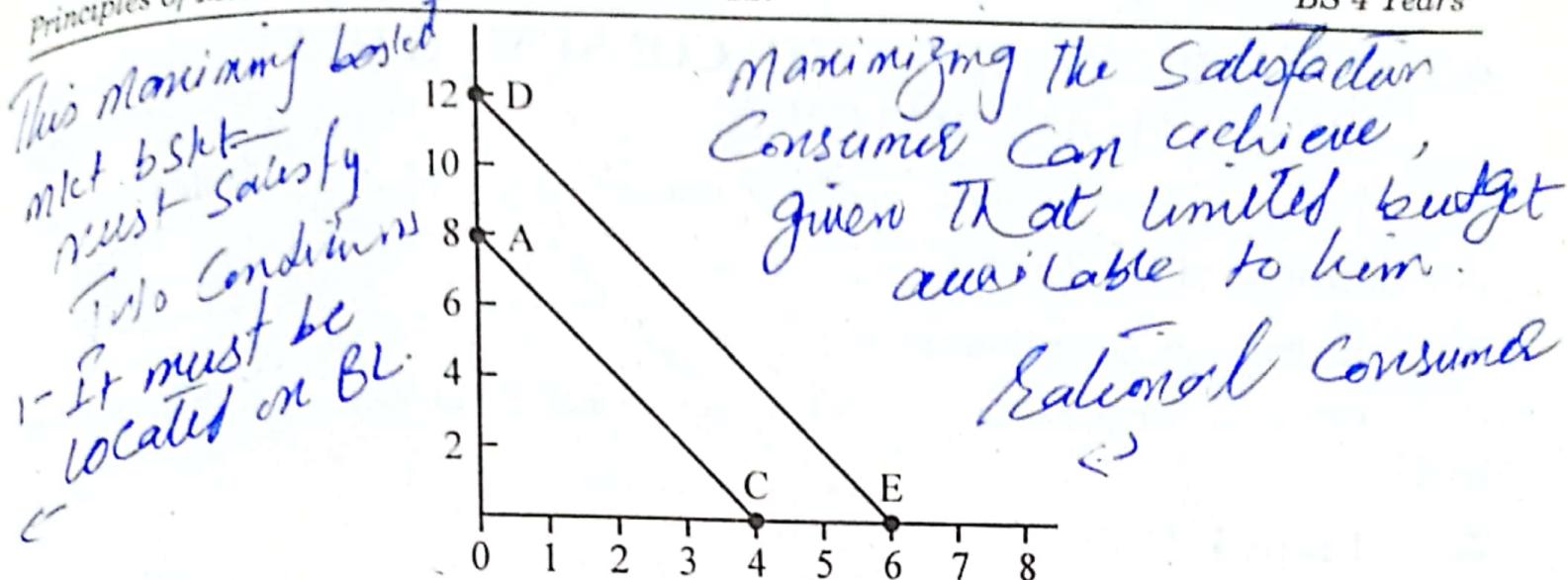
- (i) Price of one good changes
- (ii) Price of other good remains constant
- (iii) Money income of consumer remains constant.
- (iv) Real income of consumer changes in terms of good whose price has changed.

If price of one good changes, while Price of other good and money income of the consumer remains unchanged then Budget line rotate from that axis of a good whose price has changed. For example if price of good X falls budget line will rotate outward from X-axis showing increase in the purchasing power of consumer in terms of good X. Suppose, Initially budget line is AB and if the price of Y remains at 5/- per unit and the price of X commodity decreases to Rs.8 from Rs.10 per unit then consumer can get 5 units of X commodity instead of 4 and his price line rotates outwards and becomes AC. As shown in diagram (a) Hence the budget line will rotate outward in case of price fall and rotate inward in case of price rise. Similarly if price of good Y changes budget line will rotate from Y axis, inward or outward depending upon price rise or fall.

## Shifting of Price or Budget line

### Conditions

- (i) Price of goods remains constant
- (ii) Money income of consumer changes
- (iii) Real income in terms of both good changes



*Maximizing the Satisfactor  
Consumer can achieve,  
given that limited budget  
available to him.*

*Economic Consumer*

If the prices of both commodities remain constant but consumer's money income increases from 40 Rs. to 60 Rs. then consumer can have more quantities of both goods X and Y such as he can get 12 units of Y commodity instead of 8 units and 6 units of X commodity instead of 4 units. In this case the budget line shifts outward parallel and new price line becomes DE. Every point on this new budget line shows more quantities of both X and Y as compared to earlier. For Example; at point F buyer will spend 10 Rs. on the purchase of one out of x commodity and 50 Rs. on 10 units of Y commodity, and total expenditure will be ( $50+10=60$  Rs.). Changes in price line due to change in price of goods is called "Price Effect", as price line shifts upward AB to AC. At the other hand shifting of curve is due to change in income that is called "Income Effect" as the price line AC shifted upwards as DE.

The slope of the budget line is shown by the relative prices of two goods i.e. =

$$\frac{\text{Rise}}{\text{Run}} = -\frac{P_x}{P_y} = -\frac{8}{4} = -2$$

If the price of either good changes, the slope of the budget line also changes it means if the price of X falls keeping price of Y constant the slope of the budget line will become flatter towards good X showing that more of X can be purchased now.

### Activity

1. What does a household's budget line show?
2. How do the relative price and a household's real income influence its budget line?
3. If a household has an income of Rs.40 and buys only bus rides at Rs.2 each and magazines at Rs.4 each, what is the equation of the household's budget line?
4. If the price of one good changes, what happens to the relative price and the slope of the house-hold's budget line?
5. If a household's money income changes and prices do not change, what happens to the household's real income and budget line?

## 6.9 EQUILIBRIUM OF THE CONSUMER UNDER ORDINAL APPROACH

Before explaining equilibrium of the consumer we explain its assumption

### Assumptions of the Theory

#### 1. Consumer is Rational:

Consumer is rational and spends his income carefully to maximize his satisfaction level.

#### 2. Utility is Ordinal:

Consumer can rank his preferences according to the satisfaction means he can order his preferences.

#### 3. Constant Prices:

Consumer is well aware of the prices and these remains constant during the purchase of goods.

#### 4. Axiom of Consistency:

Consumer is consistent. If he prefers one thing on other, then he will not prefer the 2<sup>nd</sup> on first thing e.g. If  $A > B$  then  $B \not> A$ .

#### 5. Axiom of Transitivity:

If, consumer sees that;  $A > B$  and also  $B > C$  then definitely  $A > C$

#### 6. Diminishing Marginal Rate of Substitution:

When good is exchanged for another good then the rate of substitution declines because the good which consumer gives away causes his utility to rise.

#### 7. More quantity is preferred:

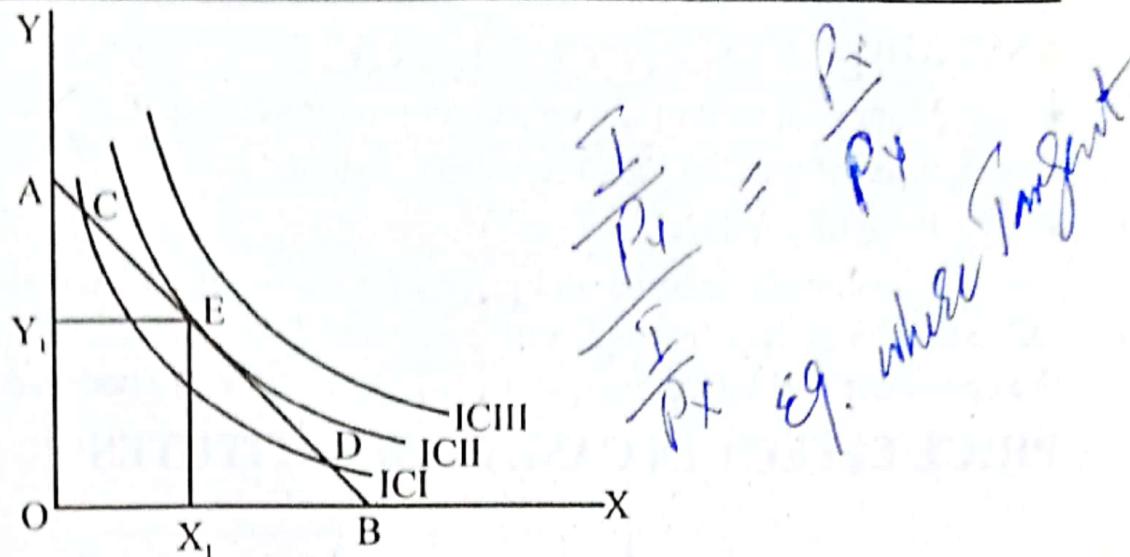
Consumer prefers more quantity than less; because Higher IC gives higher level of satisfaction.

#### 8. Consumer is one among many:

There are many consumers in a market and everyone wants to maximize his satisfaction.

#### 9. Taste and habits remain unchanged:

Analyzing consumer's behavior it is assumed that consumers taste habit and income do not change.



Suppose there are three Indifference curves  $IC_1$ ,  $IC_2$  and  $IC_3$  shown in the above diagram.  $IC_1$  shows lowest level of satisfaction and  $IC_3$  shows the highest level of satisfaction. AB is the price line which becomes tangent with the indifference curve  $IC_2$  at point E which is the equilibrium point of the consumer. Here consumer purchases  $X_1 Y_1$  bundle of goods. The point C and D are not equilibrium points because here budget line intersects and do not make tangency with  $IC_1$ . In order to understand why point E is the equilibrium point of consumer there are two conditions of equilibrium which should be studied. One is necessary condition i.e. slope of the budget line must be equal to the slope of indifference curve which occurs at point E where both lines make tangency. Second condition is sufficient condition which states that IC must be convex to origin at the time of equilibrium, this also happens at point E because point C and D are not convex to origin. Hence  $IC_2$  is the highest possible indifference curve which satisfies these two conditions and  $IC_3$  is unattainable because it is out of reach of the consumer.

### Conditions for consumer's equilibrium

#### (1) Necessary Condition:

MRS should be equal to the ratio of relative prices.

$$MRS_{xy} = -\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$$

$$\begin{aligned} MRS_{xy} &= \frac{\partial Y}{\partial X} \cdot \frac{dU}{dU} \\ &= \frac{\frac{\partial Y}{\partial U}}{\frac{\partial X}{\partial U}} = \frac{MU_x}{MU_y} \end{aligned}$$

#### (2) Sufficient Condition:

IC should be convex to the origin at equilibrium point. Consumer's equilibrium point E in the above diagram satisfies both these conditions.

### PRICE EFFECT ON CONSUMER'S EQUILIBRIUM

"The effect on consumer's equilibrium with the change price of commodity is known as price effect."

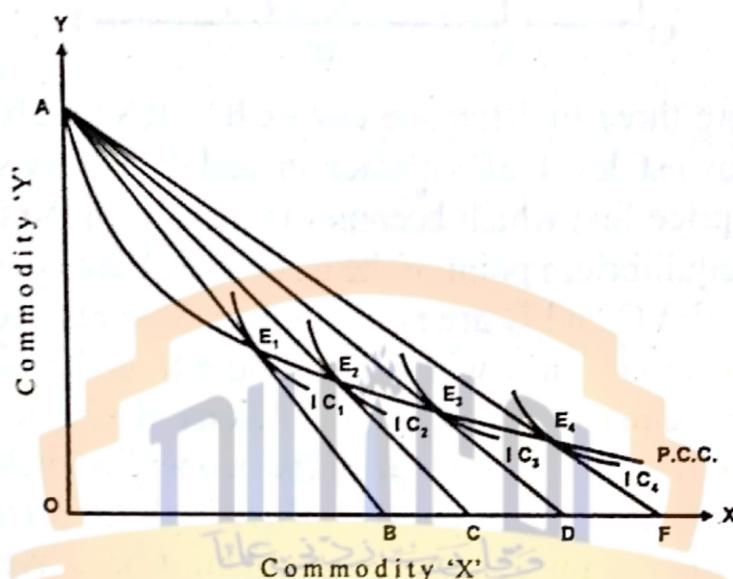
To examine the Price Effect on Consumer's Equilibrium, we have to make following assumptions.

## ASSUMPTIONS

- Money income of the consumer remains constant.
- Price of good 'Y' also remains constant.
- Price of good 'X' changes.

Consumer's income and price of commodity 'Y' remaining the same, if price of 'X' falls, the budget line will rotate outward from AB to AC to AD to AF showing that the consumer will buy more quantity of 'X' than before because 'X' has become cheaper.

## PRICE EFFECT IN CASE OF SUBSTITUTES



Consumer will choose the combination where his/her budget line is tangent on indifference curve. Movement from E<sub>1</sub> to E<sub>2</sub> to E<sub>3</sub> to E<sub>4</sub> is called Price Effect. The line passing through equilibrium points is called Price-Consumption-Curve.

## PRICE-CONSUMPTION-CURVE (P.C.C.)

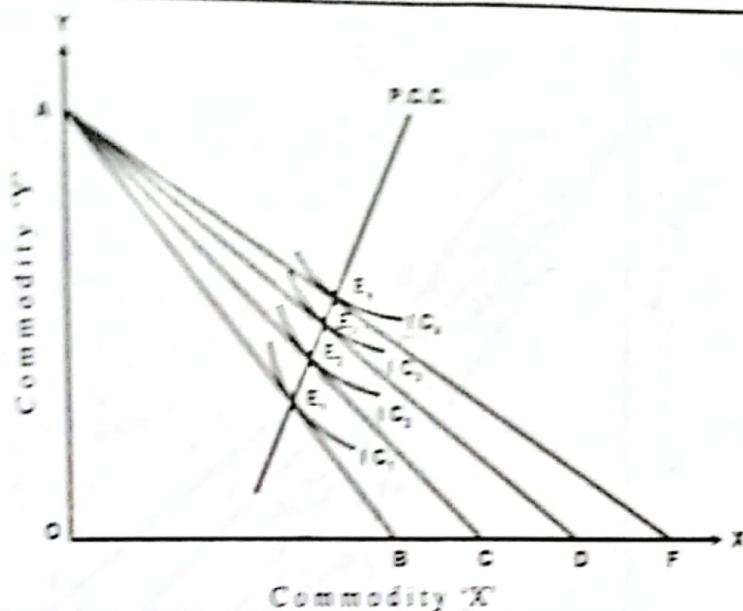
P.C.C. for good 'X' shows how changes in the price of 'X' affect the quantity of 'X' purchased while the price of 'Y' and money income remain the same.

P.C.C. starts from the pivot point 'A'. It means that when price of 'X' increases, consumer wants to buy lesser quantity of the good. Finally the price of 'X' becomes so high that consumer cannot afford and does not wish to buy any unit of 'X', so he spends all his income on 'Y' and none on 'X'.

If the price of 'X' falls, the budget line rotates outward to the original budget line AB. The fall in price of 'X' will lead to the rotation of the budget line to from AB to AC to AD to AF. In case of substitutes the shape of P.C.C. would be downward sloping as is shown in the above diagram.

## PRICE EFFECT IN CASE OF COMPLEMENTARY GOODS

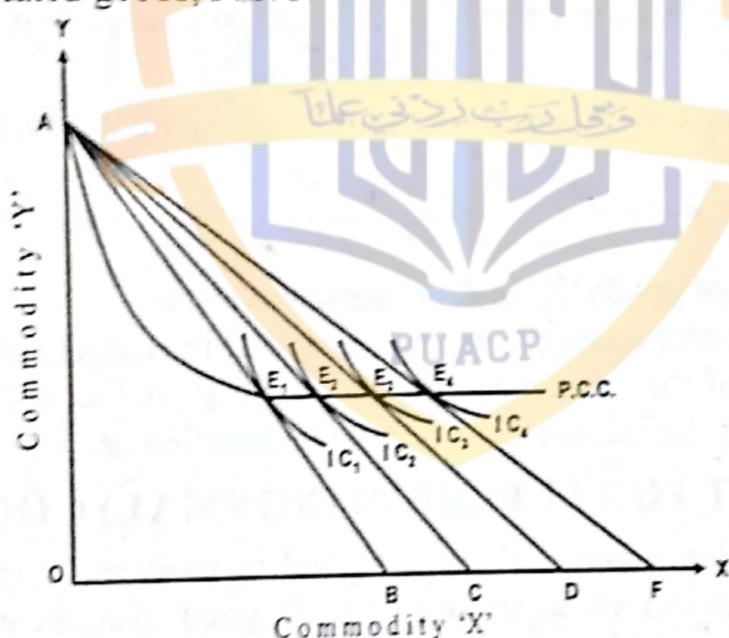
In case of jointly demanded goods, P.C.C. slopes upward.



In this diagram, P.C.C. slopes upward. It means that consumer purchases more quantities of goods 'X' and 'Y' at points  $E_2$ ,  $E_3$  and  $E_4$  respectively. This shows that 'X' and 'Y' are complementary/jointly demanded goods.

### PRICE EFFECT IN CASE OF UNRELATED GOODS

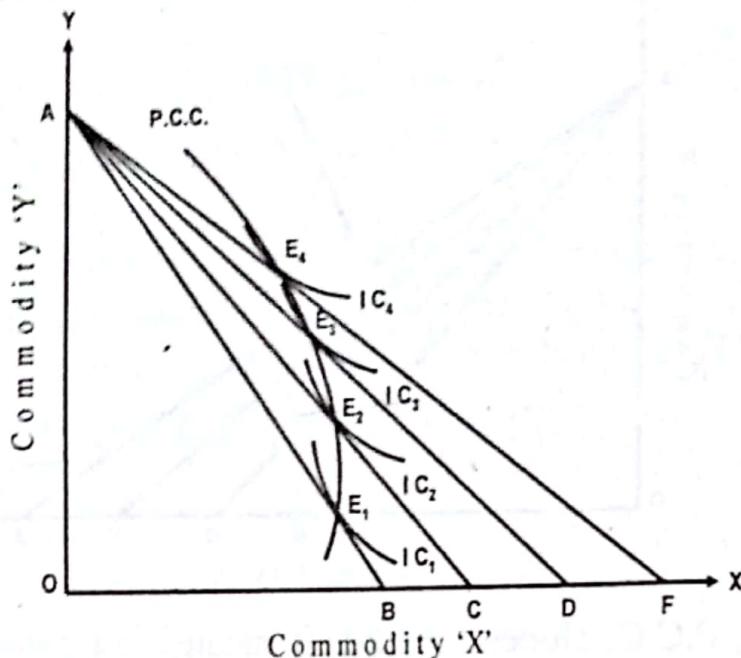
In case of unrelated goods, P.C.C. will be horizontal.



In this diagram P.C.C. curve is horizontal which shows that a fall in the price of 'X', increases the purchase of good 'X' but has no effect on the demand for good 'Y'.

### PRICE EFFECT IN CASE OF GIFFEN GOODS

If the consumption on a good increases with the increase in its price and if the consumption on a good decreases with the fall in its price, that good is called Giffen Good.



In this diagram P.C.C. curve is backward sloping towards the Y-axis.. Demand for 'X' declines with every fall in its price. In this case 'X' is a Giffen Good.

## 14. INCOME EFFECT ON CONSUMER'S EQUILIBRIUM

"The effect on consumer's equilibrium with the change in his income is known as income effect."

In order to study the income effect on consumer's equilibrium, we have to make following assumptions.

### ASSUMPTIONS

- Relative prices of goods 'X' and 'Y' remain constant.
- Consumer's income changes i.e., there is a shift in Budget Line.

If the income of the consumer increases his budget line will shift upward to the right. Similarly a fall in the income will shift the budget line inward to the left.

### INCOME EFFECT FOR SUPERIOR (NORMAL) GOOD

Income effect for superior (Normal) good is positive. It means that if income increases, quantity demand of superior (Normal) good also increases and if income decreases, quantity demand of superior (Normal) good also decreases.

$$\begin{aligned} \text{Income } \uparrow &\rightarrow Qd \uparrow \\ \text{Income } \downarrow &\rightarrow Qd \downarrow \end{aligned}$$

### INCOME EFFECT FOR INFERIOR GOOD

Income effect for Inferior good is negative. It means that if income increases, quantity demand of Inferior good decreases and if income decreases, quantity demand of Inferior good increases.

$$\begin{aligned} \text{Income } \uparrow &\rightarrow Qd \downarrow \\ \text{Income } \downarrow &\rightarrow Qd \uparrow \end{aligned}$$

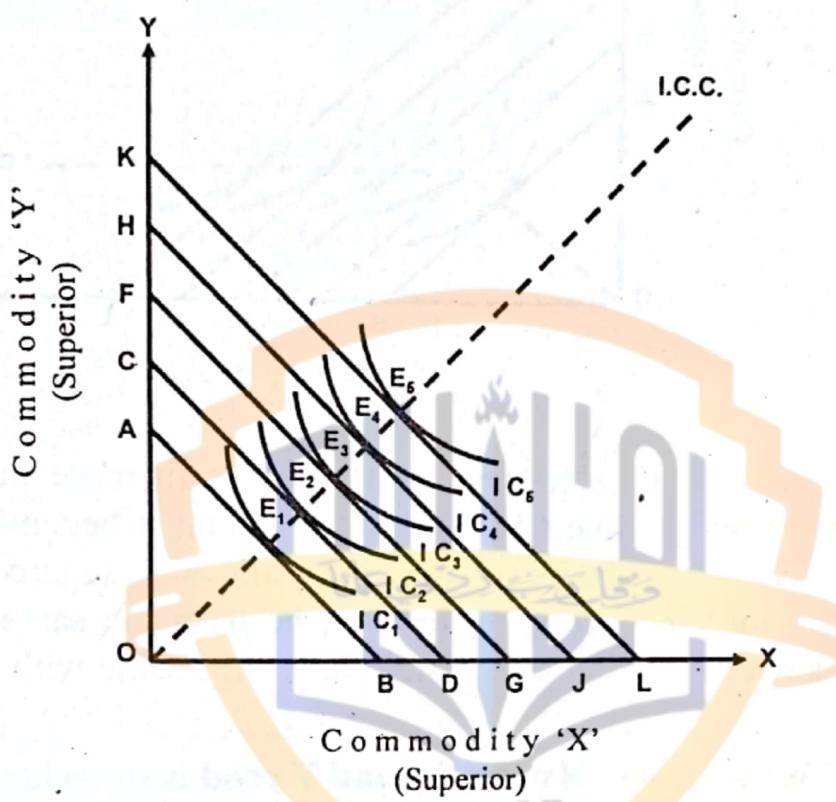
## INCOME EFFECT FOR NECESSITY

Income effect for Necessities is negligible. It means that if income increases or decreases quantity demand of Necessities remains the same.

Income  $\downarrow$  or  $\uparrow \rightarrow Q_d$  almost remains the same

Now we discuss the different cases:

### 1. Income effect if both goods (x & y) are superior (normal goods)



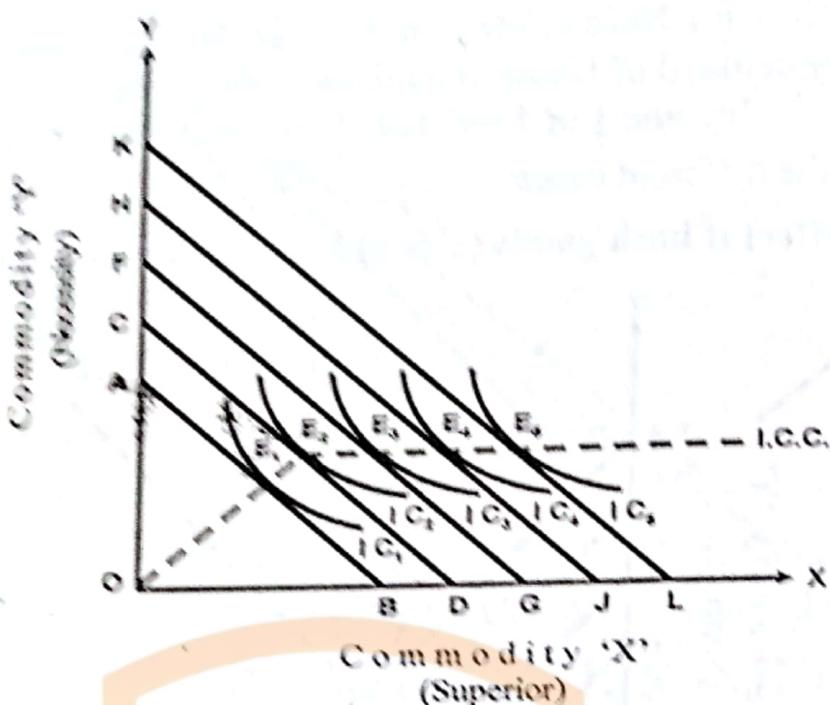
In this figure parallel budget lines indicate that relative prices of goods 'X' and 'Y' remain unchanged. When the budget line is AB, the equilibrium point is E1 where the budget line becomes tangent to the indifference curve IC1. With the increase in income budget line shifts from AB to CD and the new equilibrium is at point E2. Further increase in income shifts the budget line from CD to FG and so on. Shift from E1 to E2 to E3 to E4 to E5 is called income effect. The line passing through these equilibrium points is called Income-Consumption-Curve.

## INCOME CONSUMPTION CURVE (I.C.C.)

I.C.C. shows the effect of changes in consumer's income on the purchases of two goods. I.C.C. begins at the origin. It means that if the consumer has no income, the quantities of 'X' and 'Y', he could command in the market place must be zero.

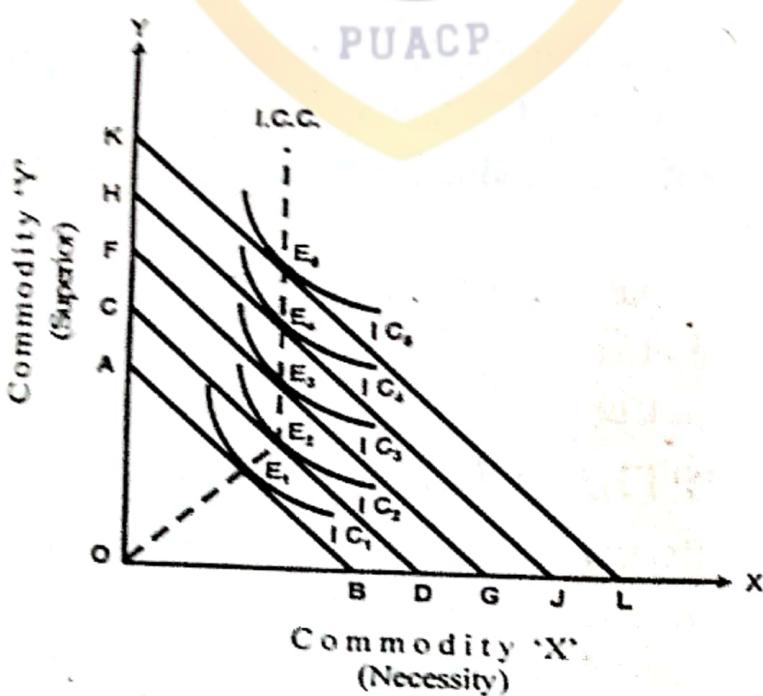
In case of normal goods, I.C.C. is positively sloped. When income increases, the consumer buys larger quantities of the two goods as shown in the above diagram.

### 2. Income Effect if Y good is necessity and X good is superior (normal goods)



In this diagram I.C.C. slopes upward with the increase in income up to the equilibrium E<sub>2</sub> at the budget line CD. Beyond this point it becomes horizontal which shows that consumer has reached the saturation point with regard to consumption of good 'Y'. With the further increase in income, he buys the same amount of 'Y'. It means that 'Y' is a necessity whose demand remains the same with the further increase in income.

### 3. Income Effect if X good is necessity and Y good is superior (normal goods)

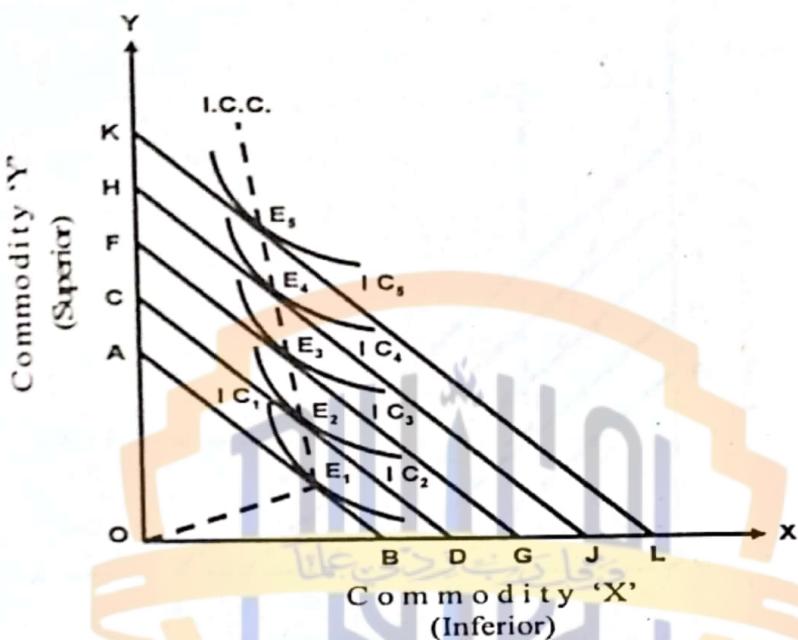


In this diagram we see that when the consumer reaches at the saturation point with regard to the consumption of 'X', with the increase in income, he does not spend any part of his income on good 'X'. In this case I.C.C. is vertical and commodity 'X' is necessity.

In case of necessities, I.C.C. possesses a positive slope in the beginning but beyond a certain point it becomes and stays horizontal or vertical when the consumer's income continues to increase.

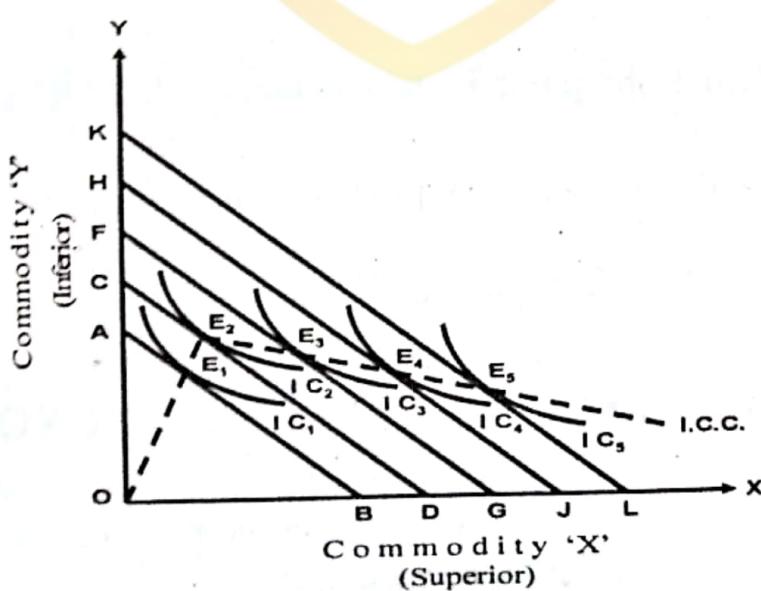
#### 4. Income Effect if Y good is superior (normal goods) and X good is inferior

When consumer's income increases, the demand for inferior goods falls beyond a certain level and he replaces them by superior substitutes.



In this diagram, commodity 'X' is inferior. Beyond the point E<sub>2</sub>, I.C.C. is negative which shows the decreasing demand for commodity 'X' with the increase in income.

#### 5. Income Effect if X good is superior (normal goods) and Y good is inferior

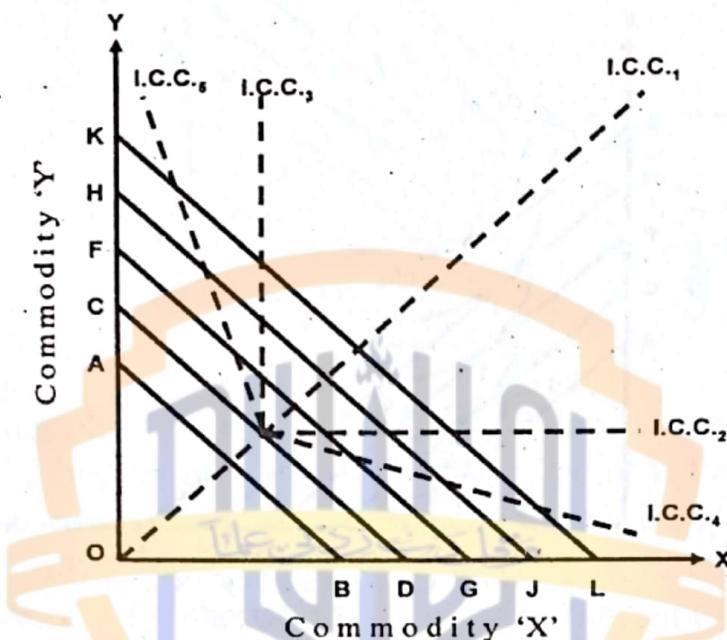


In this diagram commodity 'Y' is inferior, up to point E<sub>2</sub> I.C.C. has a positive slope and beyond this point the slope is negative which shows that the demand for good 'Y' decreases with the increase in income.

In both the cases income effect is negative beyond point E<sub>2</sub>. This type of I.C.C shows that the goods whose consumption decreases with the increase in income are inferior goods.

## 6. Summary Diagram

We can also show the different types of Income-Consumption-Curves in one diagram.



In this diagram

- I.C.C.1 has positive slope and relates to normal goods.
- I.C.C.2 is horizontal from point E, which means that 'Y' is necessity and 'X' is superior good.
- I.C.C.3 is vertical from point E, which means that 'X' is necessity and 'Y' is superior good.
- I.C.C.4 is of negative sloped from point E, which indicates the inferiority of good 'Y'.
- I.C.C.5 also has negative slope from point E and shows commodity 'X' to be an inferior good.

## SUBSTITUTION AND INCOME EFFECTS FOR NORMAL GOODS

A change in the price of a commodity affects its quantity demanded. The change in quantity demanded, that results from a change in the price of a good is actually the sum of two effects, substitution effect and income effect.

$$PE = SE + IE$$

## SUBSTITUTION EFFECT

A reduction in the price of 'X' makes 'X' relatively more attractive than 'Y'. So the consumer has to substitute the less expensive 'X' for the relatively more expensive 'Y'.

"The substitution effect refers to this change in the quantity of 'X' due to change in the price of 'X' while the consumer's real income (purchasing power) and satisfaction level remains the same."

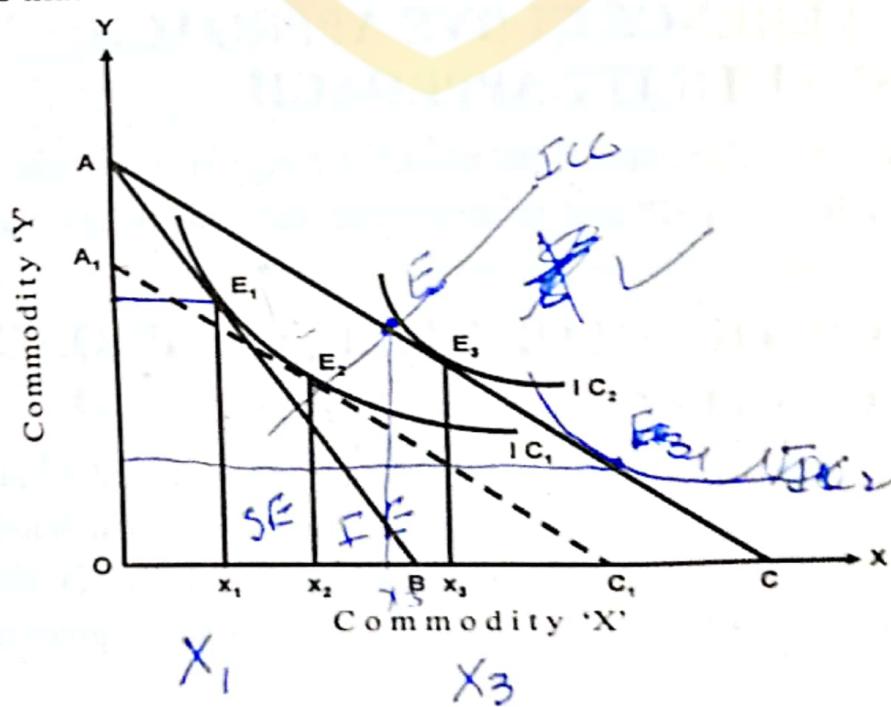
## INCOME EFFECT

When the price of 'X' is reduced, the real income of the consumer increases. The income effect refers to the change in the quantity of 'X' through change in the real income caused by a change in the price of 'X'.

To isolate the income effect we must hold relative prices constant. Both income and substitution effects refer to changes in the quantity of a good demanded initiated by a change in the price of a good. The substitution effect of a price reduction always increases the quantity demanded and the income effect also increases the quantity demanded unless the commodity is inferior.

## SUBSTITUTION EFFECT AND PRICE EFFECT

Substitution effect is similar to the price effect but it has some differences. In price effect, consumer buys the quantity of 'X' more due to the decrease in price of 'X' and he moves on a higher indifference curve. Therefore, in price effect, consumer's real income (purchasing power) and satisfaction level changes (increases). In contrast, in Substitution effect, consumer purchases more of the quantity of 'X' due to the decrease in price of 'X' and while his real income (purchasing power) and satisfaction level remains the same. It means that consumer remains on the same indifference curve.



In this diagram the first equilibrium position of the consumer is E1. When the price of 'X' decreases, budget line rotates outward to the right from AB to AC and the consumer is now on E3, the new equilibrium position. The total effect on the quantity purchased of this price reduction is  $X_1 - X_3$  shows Price Effect.

To isolate substitution effect, we must hold the real income and satisfaction constant. According to J.R.HICKS, "To keep real income constant, take away that amount of money income from the consumer just sufficient to return him to the indifference curve he was on before the price decrease."

Graphically we can show this 'adjustment' or 'compensation' by drawing a compensating budget line A1C1, parallel to the new budget line AC. This line is tangent to the original indifference curve IC1 at new equilibrium point of tangency of E2. AA1 or CC1 is compensating variations.

The movement from E1 to E2 or change in quantity demanded  $X_1 - X_2$  shows Substitution Effect.

The movement from E3 to E2 or the change in quantity demanded  $X_3 - X_2$ , shows Income Effect. This movement involves a change in real income while the relative prices are being held constant.

From the diagram, it is clear that total Price Effect is the sum of substitution and income effects i.e.,

$$PE = SE + IE$$

$$X_1 - X_3 = (X_1 - X_2) + (X_2 - X_3)$$

## 6.10 INDIFFERENCE CURVE APPROACH VERSUS UTILITY APPROACH

By analyzing consumer's behavior keeping in view the both approaches; we can say that IC approach has priority over utility approach due to the following reasons.

### CRITICISM OF UTILITY APPROACH

#### (1) Utility Cannot Be Calculated:

Dr. Alfred Marshall is in favor of cardinal measurement of utility; according to him utility of various goods can be calculated in figures and numbers. But modern Economists negate it. That is why Prof. J.R. Hicks and Prof. R.G.D. Allen are of the view that utility can be ranked i.e. which combination of two goods gives a consumer, equal,

more or less satisfaction. They were regarded the pioneer of ordinal measurement approach. So, the method of ranking the utility seems to be more reasonable and unacceptable than measuring it. Because utility is an additional term and it is related with the mental condition or psychology of the consumer which cannot be measured quantitatively when a consumer is using a glass of water we cannot measure the utility he obtains by using 1<sup>st</sup> glass and then by 2<sup>nd</sup> glass numerically.

## (2) Marginal utility of Money Is Not Constant:

According to Marshall and his contemporaries, marginal utility of money remains constant. In such a way, marginal utility of money is consistent with the law of demand. When consumer wants to spend his income on various goods, then Income Effect which shows changes in purchase due to change in price is being neglected. Similarly he does not discuss PE and SE separately, that's why the clear line of demarcation cannot be drawn between IE and SE.

## (3) Demand Theory:

According to this theory the law of demand is based upon various assumptions which are not practicable e.g. consumer's income; habits, tastes, customs and price of substitutes varies in routine life whereas; in theory these are assumed as Constant.

### Criticism of Indifference Curves Approach:

Here Indifference curve theory has priority over utility approach in some ways, but it is not flawless at all, and according to experts following are the flaws in Indifference curves Approach.

#### (i) Two Goods Model:

The theory shows consumer's behavior in view of two or maximum three goods. Because geometrically consumer's behavior can be judged through figures, whereas; in practical life consumer's view to purchase various goods at different prices in different quantities. In such a way the determination of consumer's equilibrium is not impossible.

#### (ii) Ridiculous Combinations:

According to the theory consumer already has the knowledge of satisfaction which he can attain from various pairs of goods, seems practically incorrect. Moreover, when we plot different pairs on IC graph like 2 pairs of shoes and 60 laces or one pair of shoes and 100 laces seems ridiculous.

### (iii) Old Wine In New Bottle:

According to Robertson the ordinal approach is just like an old wine in a new bottle with an attractive label. As IC approach presents the old concepts with names like of utility, the concept of "satisfaction", and the concept of (DMRS) Diminishing Marginal Rate of Substitution against "DMU" (diminishing Marginal Utility).

### (iv) Marshallian Base:

Prof. Armstrong is of the view that it is not possible to comprehend the concept of MRS (Marginal rate of substitution) without the knowledge of DMU (diminishing marginal utility) Marshallion concept. Because at first when consumer is ready to forego more of B for getting an additional unit of A and afterwards marginal rate of substitution declines for the reason that marginal utility gets smaller and smaller as the consumer gets move of B So he is ready to forego more units of B for getting an additional unit of A and vice versa.

Thus, instead of the above mentioned flaws ordinal measurement approach seems better and appropriate than Marshalling Cardinal Approach.

#### Activity

1. What is an indifference curve and how does a preference map show preferences?
2. Why does indifference curve slope down-ward and why is it bowed toward the origin?
3. What do we call the magnitude of the slope of an indifference curve?
4. What is the key assumption about a consumer's marginal rate of substitution?

#### IMPORTANT CONCEPTS

**Rational consumer:** A person who weighs up the costs and benefits to him or her of each additional unit of a good purchased.

**Total utility:** The total satisfaction a consumer gets from the consumption of all the units of a good consumed within a given time period.

**Marginal utility:** The extra satisfaction gained from consuming one extra unit of a good within a given time period.

**Util:** An imaginary unit of satisfaction from the consumption of a good.

**Principle of diminishing marginal utility:** As more units of a good are consumed, additional units will provide less additional satisfaction than previous units.

This states that a consumer will get the highest utility from a given level of income

**Law of Equi-marginal Utility:** when the ratio of the marginal utilities to the prices of all goods are equal.

**Marginal rate of substitution** (between two goods in consumption): The amount of one good (Y) that a consumer is prepared to give up in order to obtain one extra unit of another good (X); i.e.  $\Delta Y/\Delta X$ .

**Diminishing marginal rate of substitution:** The more a person consumes of good X and the less of good Y, the less additional Y will that person be prepared to give up in order to obtain an extra unit of X; i.e.  $\Delta Y/\Delta X$  diminishes.

**Indifference curve:** A line showing all those combinations of two goods between which a consumer is indifferent; i.e. those combinations that give the same level of utility

**Indifference map:** A graph showing a whole set of indifference curves. The further away a particular curve is from the origin, the higher the level of satisfaction it represents.

**Budget line:** A graph showing all the possible combinations of two goods that can be purchased at given prices and for a given budget.

**Real Income:** it is the amount of goods or services which can be purchased given the prices of goods and money income. It is obtained dividing money income by prices of goods.

**Perfect substitutes:** two goods with straight-line indifference curves

**Perfect complements:** two goods with right-angle indifference curves

**Normal good:** a good for which an increase in income raises the quantity demanded

**Inferior good:** a good for which an increase in income reduces the quantity demanded

**Income effect:** the change in consumption that results when a price change moves the consumer to a higher or lower indifference curve

**Substitution effect:** the change in consumption that results when a price change moves the consumer along a given indifference curve to a point with a new marginal rate of substitution

**Giffen good:** a good for which an increase in the price raises the quantity demanded