

## THEORY OF CONSUMER BEHAVIOUR

### TOPIC STRUCTURE

1. Learning Objectives
2. Introduction
3. Utility measurement: Cardinal and Ordinal Approaches
4. The Cardinal Utility Theory
5. The Indifference Curve Technique/ Ordinal approach
6. Price Effect, Substitution Effect and the Income Effect
7. Possible Questions

### OBJECTIVES

**After going through this topic, you should be able to:**

- a. understand the difference between cardinal and ordinal utility
- b. explain the concepts of indifference curve and the budget line
- c. derive the equilibrium of the consumer under both the cardinal and ordinal approach
- d. Derive the price consumption curve, income consumption curve, and the angel curve.
- e. Indicate the price effect and split it up into substitution effect and income effect

### **INTRODUCTION**

The theory of consumer behavior studies how a consumer spends his income so as to attain the highest satisfaction or utility. Utility maximization behaviour of the consumer is subject to the constraint imposed by his limited income and the prices of the various commodities he desires to consume. The consumer compares the different “bundles of goods” that he can consume given his income and the prices of the goods in the bundles. And in the process, he attempts to determine the bundle that will give him the maximum satisfaction.

## CONSUMERS

Consumers are the end users who seek products to consume and satisfy their needs and wants. From consuming products, they derive utility or satisfaction. However, a consumer is limited with funds available and therefore she has to maximize her satisfaction while not spending more than she has. The limitation of total funds available to an individual defines the **budget constraint**.

## UTILITY

This is the satisfaction one gets from consuming a commodity. Utility is difficult to quantify since it is a psychological feeling. It is subjective and its perception varies from one individual to another. The satisfaction MARY derives from eating a mango is different from the satisfaction MICHAEL from eating a similar mango.

## MARGINAL UTILITY

This refers to the addition satisfaction derived from consuming an additional unit of a commodity.

### Utility measurement

This is the quantification of the satisfaction of wants and needs achieved through the consumption of goods and services. In principle, the behaviour of a consumer the measurement of utility can be achieved using the following approaches:

1. **Cardinal Approach, which is based on numerical values (1, 2, 3, etc.) and;**
2. **Ordinal Approach, which is based on rankings (first, second, third, etc.).**

### Cardinal Utility

Cardinal utility Approach was put forward by the neo-classical economists like Alfred Marshall, Pigou and others and is based on the measurement of satisfaction in numerical values (1, 2, 3, etc.) in units known as utils. If a consumer imagines that good X has 3 utils and good Y has 2 utils, then good X is found to provide more satisfaction to the consumer.

However, the subjective nature of utility makes cardinal measurement unlikely and thus some economists have suggested that utility is measured in monetary units, by the amount of money offered for a commodity. This implies that utility of a commodity is equal to the money a consumer is willing to pay for it, marginal utility of money remains constant, and one util is equal to one unit of money.

## Assumptions of cardinal utility approach

1. The consumer is *rational* who measures, calculates, chooses, and compares the utilities of different units of the various commodities and aims at the maximization of utility given his income and the prices of the commodities
2. The theory assumes consumption of only one commodity
3. It also assumes that all commodities available to the consumer are perfectly divisible into smaller units.
4. **Utility is measurable**; that the utility/ level of satisfaction derived from a commodity is measurable, the most convenient measure being money. The Cardinalists assumed that one util=1 unit of money. Utility therefore is denoted by the monetary units that the consumer is willing to pay for another unit of the commodity.
5. **Utility is additive**; Cardinalists believe that utility derived from various goods and services consumed by a consumer can be added together to get the total utility.
6. **Constant Marginal Utility of money**; this approach assumes that the MU of money remains constant whatever the level of a consumer's income. This is important because if money is to be used as a measure of utility, it should be a standard value in order to yield meaningful results. The essential feature of a standard measure is that it should be constant e.g., a meter, mile etc.
7. **Diminishing MU**; utility gained from successive units of a commodity diminishes i.e., the MU diminishes as the consumer acquires larger and larger quantities of it.

**The law of diminishing marginal utility states that “as more and more of a single commodity is consumed, each additional unit consumed provides the consumer with less additional satisfaction than the preceding unit such that total utility will increase up to a maximum level then it will fall when marginal utility becomes negative.**

8. The consumer's decision to consume is not influenced by other consumers but depends entirely on personal preferences i.e., the consumers utility function is independent of other consumers' utility functions

### **Total utility (TU)**

This is the total amount of satisfaction or pleasure derived from consumption of a given quantity of commodity.

For example, if a consumer consumes 4 units of a commodity (cookies) and derives U1, U2, U3, and U4 utils from the four units eaten, then  $TU = U1 + U2 + U3 + U4$ . The general total utility function is given by;  $TU = U1 + U2 + U3 + \dots + Un$



consumer will get total utility from consuming these four cookies.

If one consumes a commodity, total utility increases as consumption increases BUT up to a certain point, from which further consumption instead leads to its decline.

**Total utility curve (illustration)**

**Marginal Utility (MU)**

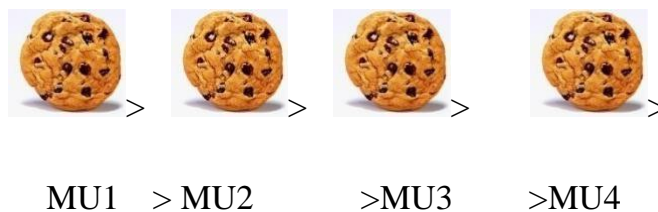
This is the additional satisfaction a consumer derives from an additional unit of a given commodity consumed. In other words, it is the change in Total Utility as quantity consumed changes. MU is given as a change in total utility divided by a change in the amount of the commodity consumed. That is;

$$MU = \frac{\Delta TU}{\Delta Q}$$

Where  $\Delta TU$  = change in total utility and  $\Delta Q$  = change in quantity of a commodity consumed thus giving us change in consumption by one unit.

Change in TU from zero cookies to one cookie is the MU of the first cone. Change in TU from the first cookie to the second cookie is the MU of the second cookie etc...

Every successive unit of a commodity gives a consumer less and less additional satisfaction, that is MU keeps on falling for every additional unit of a commodity that one consumes.



Note: MU is also the slope of the TU curve at any point of the TU curve

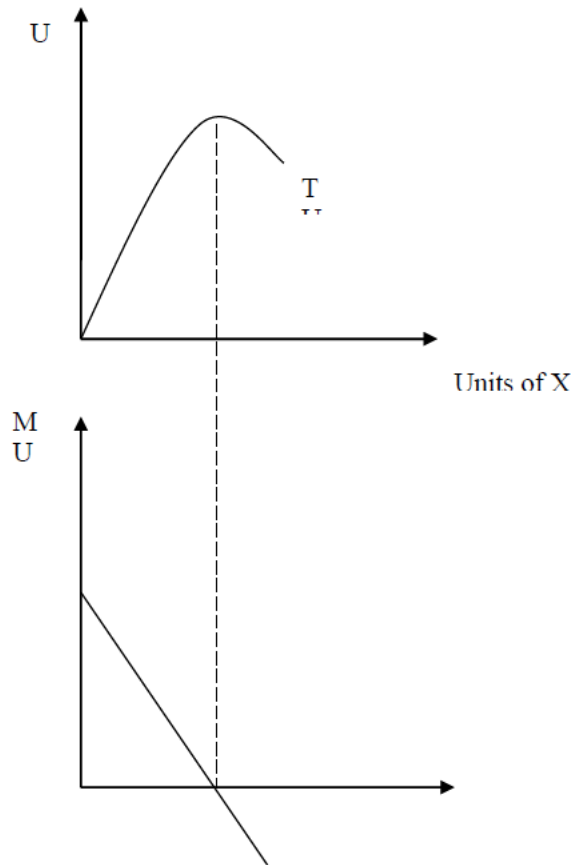
*Marginal utility curve (illustration)*

**Calculation MU from TU and Q.**

No. of cookies	Total utility (utils)	Marginal utility
0	0	
1	10	
2	19	
3	26	
4	30	
5	35	
6	39	
7	42	
8	44	
9	45	
10	45	
11	44	
12	42	

From the table above, the relationship between TU and MU can be illustrated graphically as below:

**illustration**



From the Illustration above we note that;

- When TU is rising, MU is positive
- When TU reaches maximum, MU reaches zero
- When TU is diminishing, MU is negative
- The highest point of the TU curve is known as the point of satiety.
- The slope of the TU and MU curves is due to **the law of diminishing MU**.

### **Equilibrium of a consumer under the cardinal utility approach**

How does a consumer maximize utility or how does a consumer achieve the highest possible satisfaction. The principle of equi-marginal utility explains the equilibrium of a consumer. A consumer has a given income to spend on various goods he wants. The question is how he would allocate his given income among the various goods, --what would be his equilibrium position in respect to the purchases of the various goods. His behaviour will be governed by the marginal utilities from the goods and their prices. The law of equi-marginal utility states that a consumer will distribute his money income between goods in such a way that the utility derived from the last shilling spent on each good is equal for all the commodities.

**Equilibrium when consumes a single commodity**

Marginal utility shows the value a consumer places on each unit of a commodity and this value is reflected by the price a consumer is willing to pay for a unit of a commodity. A utility maximizing consumer will adjust his purchases of a commodity until the marginal utility from the last unit purchased (measured in money units) is equal to the price of that unit.

$$MUX = PX$$

The additional utility from an extra unit must be equal to the price of that unit.

**Illustration: Consumer’s equilibrium**

**Equilibrium for two commodities (apples and bananas)**

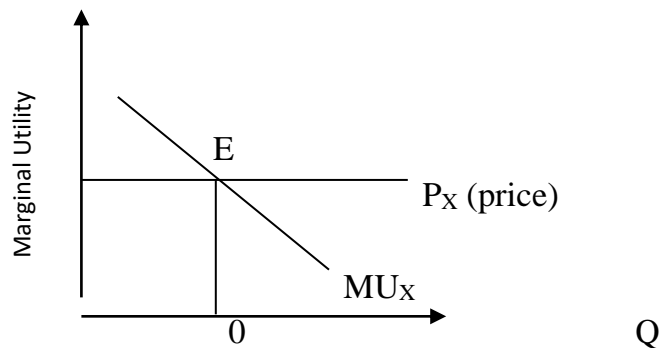
The consumer will allocate his expenditure until the utility gained from the last shilling spent on each commodity is equal.

$$\frac{MU_X(\text{apples})}{P_X(\text{of apples})} = \frac{MU_Y(\text{bananas})}{P_Y(\text{of bananas})}$$

If there are many commodities then we have;

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} = \dots = \frac{MU_n}{P_n}$$

**Illustration: Consumer’s equilibrium**



**DIY:** what are the drawbacks of cardinal utility approach as a measure of utility?

Although cardinal utility approach provides a sound basis for analyzing consumer behaviour, economists have pointed out the drawbacks of this approach.

**Limitations of the cardinal utility approach**

1. The very first assumption of cardinal utility approach that utility is cardinally (or objectively) measurable is untenable. Utility is a subjective concept which cannot be measured objectively or quantifiably.

2. Cardinal utility approach assumes that MU of money remains constant and serves as a measure of utility. Money is not a good measure of utility because it changes value over time and its MU is not constant as well. Poor people get more utility from a unit of shilling compared to rich people.
3. The consumer's utility function is not independent of the utility functions of other consumers. A consumer may consume under the influence of other consumers.
4. The assumption of diminishing marginal utility is also not a must for all commodities. For some commodities, the consumer may derive more satisfaction as he consumes more and therefore, he may be willing to pay more.
5. Not all commodities are perfectly divisible as the theory assumes.
6. The theory assumes consumption of one commodity, which is not always the case.

### **Ordinal Utility Approach (OUA)/Indifference Curve Approach**

Modern economists e.g. Hicks have used this approach to analyze consumer behavior. They argued that it may not be possible for a consumer to express his utility in quantitative terms but it is always possible for him to tell which of any two goods he prefers.

A consumer can list all the commodities he consumes in the order of his preference (scale of preference).

The basic tool of analysis is an "indifference curve". An indifference curve refers to a locus of points showing all possible combinations of two commodities that yield the same level of satisfaction to a consumer. The consumer is expected to be indifferent among the different combinations that lie on the same indifference curve

### **Assumptions**

1. **Rationality**; the consumer is assumed to be rational- he aims at maximization of his utility, given his income and market prices. It is assumed that he has full knowledge of all relevant information
2. **Utility is ordinal**; it is taken that the consumer can rank his preferences according to satisfaction of each basket of goods.
3. At least two commodities are consumed.

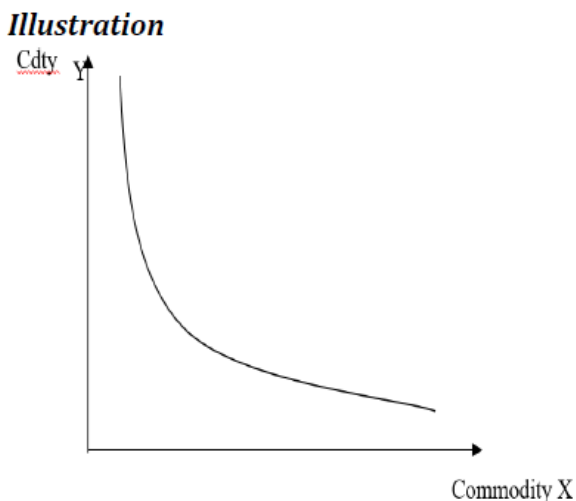


4. **Diminishing marginal rate of substitution;** this is the slope of an indifference curve. It's the rate at which one commodity is substituted for another and it diminishes as more of one good and less of the other are consumed.
5. **Transitivity and consistency;** the consumer's choices are assumed to be transitive. Transitivity means that if a consumer prefers A to B and B to C, he must prefer A to C, or, if he treats A=B and B=C, he must treat A=C. consistency on the other hand means that if he prefers A to B in one period, he will not prefer B to A in another period or even treat them as equal.
6. **Non-satiety;** a consumer is never satisfied, always prefers more to less.

How is utility measured under this approach? It is measured using indifference curves.

### An Indifference Curve

#### *Illustration*



The slope of an indifference curve is known as the marginal rate of substitution (MRS). The MRS measures the rate at which one commodity is substituted for another for a consumer to maintain the same level of satisfaction. Thus, MRS gives the number of units of commodity Y that must be given up.

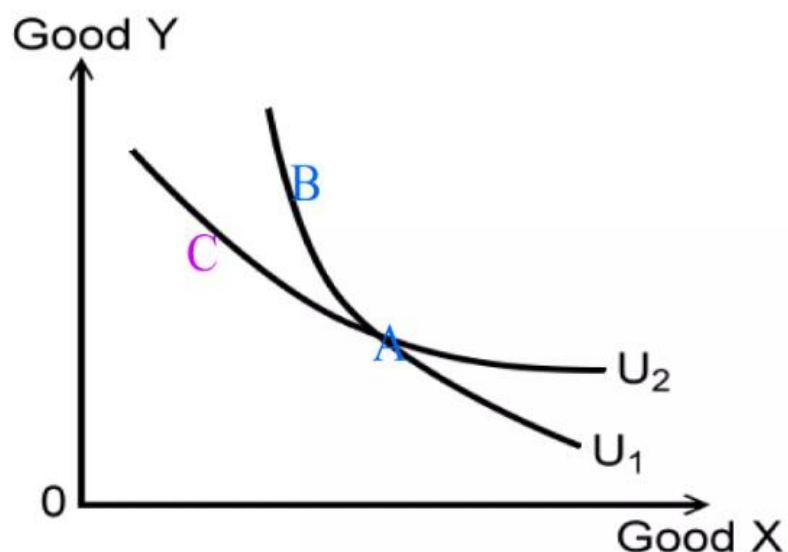
In order to get an extra unit of commodity X so that the consumer remains at the same level of satisfaction

**Properties of indifference curves (illustrations to be done in class)**

- An IC has a negative slope, which implies that as the quantity of one commodity (Y) decreases; the quantity of the other (X) must increase, if the consumer is to remain on the same level of satisfaction.
- An IC higher and to the right of another represents a higher level of satisfaction
- ICs are convex to the origin which implies a diminishing marginal rate of substitution
- ICs do not touch either of the axes
- Between any two points on an IC, there exists many other points
- Between any two ICs there are several other ICs
- A collection of ICs forms an indifference map
- Indifference curves do not intersect, if they did, their point of intersection would imply same level of satisfaction on two different ICs, which is impossible. This would also violate the assumptions of transitivity and consistency as illustrated below.

### *Illustration*

- **(iii) Indifference curves can never intersect each other:**



Points A and B lie on IC1 hence  $A=B$ , but also A and C lie on IC2 hence  $A=C$  this implies that  $B=C$  but this cannot be the case since B lies on a higher IC than C which violates the assumption of transitivity. It also violates the assumption of consistency i.e.  $A=B$ , and  $A=C$

which means that he should also treat  $B=C$  in all periods but  $B>C$  because it lies on a higher IC

**The Budget line (Iso- expenditure)**

This is a line that shows combinations of two commodities a consumer can afford with a given level of income, given the prices of these commodities. A budget schedule is a table that shows combinations of two commodities a consumer can afford with a given level of income, given the prices of these commodities. A rational consumer would like to reach the highest possible indifference curve on his indifference map but she/he is limited by income, which acts as a constraint to maximizing utility. The income constraint/budget line for two commodities X and Y can be written as;

$$M = P_X X + P_Y Y$$

Where  $P_X$  and  $P_Y$  are the prices of X and Y respectively; X and Y are their respective quantities and M is the consumer's income.

***Illustration***

Assume that the consumer's income is given as

$$B = 1000$$

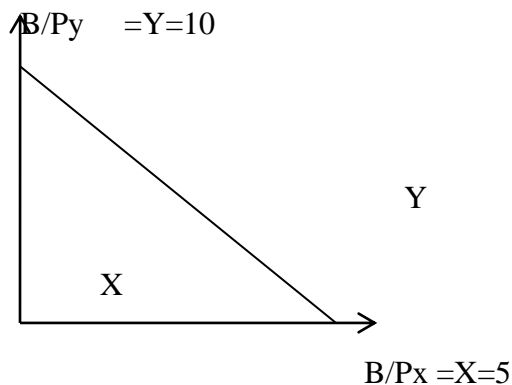
$$P_X = 200$$

$$P_Y = 100$$

A budget schedule may be derived as below

X	0	1	2	3	4	5
Y	10	8	6	4	2	0

If he spends all his income on Y, he buys zero of X and if he spends all his income on X, he buys zero of Y. Joining the above points, we obtain the consumers budget line.



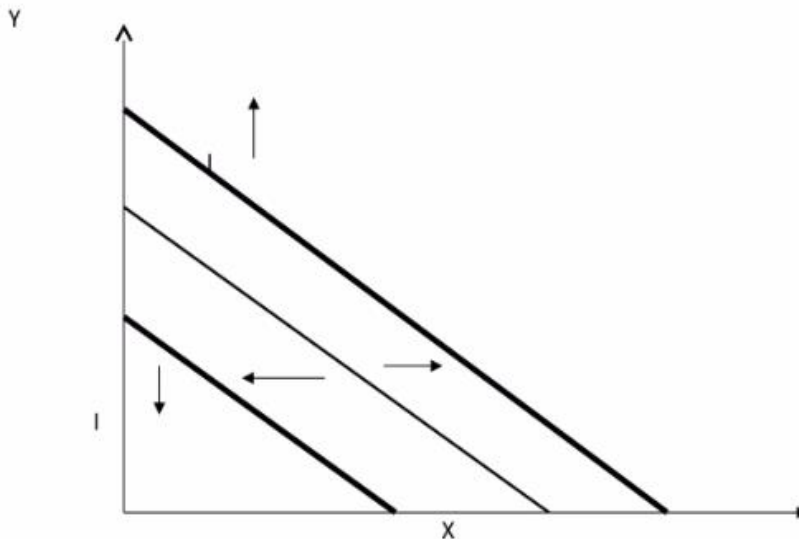
## Shifts and tilts in the budget line (BL)

### A shift in the budget line

The assumption is that only income of a consumer changes and both prices are constant.

This is an inward or outward movement of the BL inwards due to changes in a consumer's income holding price of both commodities constant.

### Illustration



## Rotations in the budget line

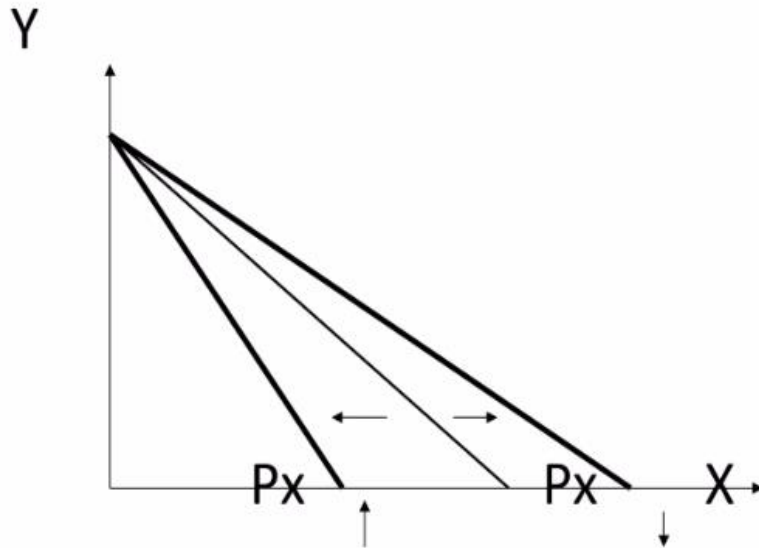
### Assumptions

- Consumer's income remains constant.
- The price of one commodity changes.
- The price of the other commodity remains constant.
- The law of demand is assumed.

A rotation in the budget line is an outward or inward tilt in the budget line along one axis pivoting at one point on the other axis.

When the price for commodity X reduces leaving that of Y and consumers income unchanged, the budget line will rotate outwards.

*Illustration;*

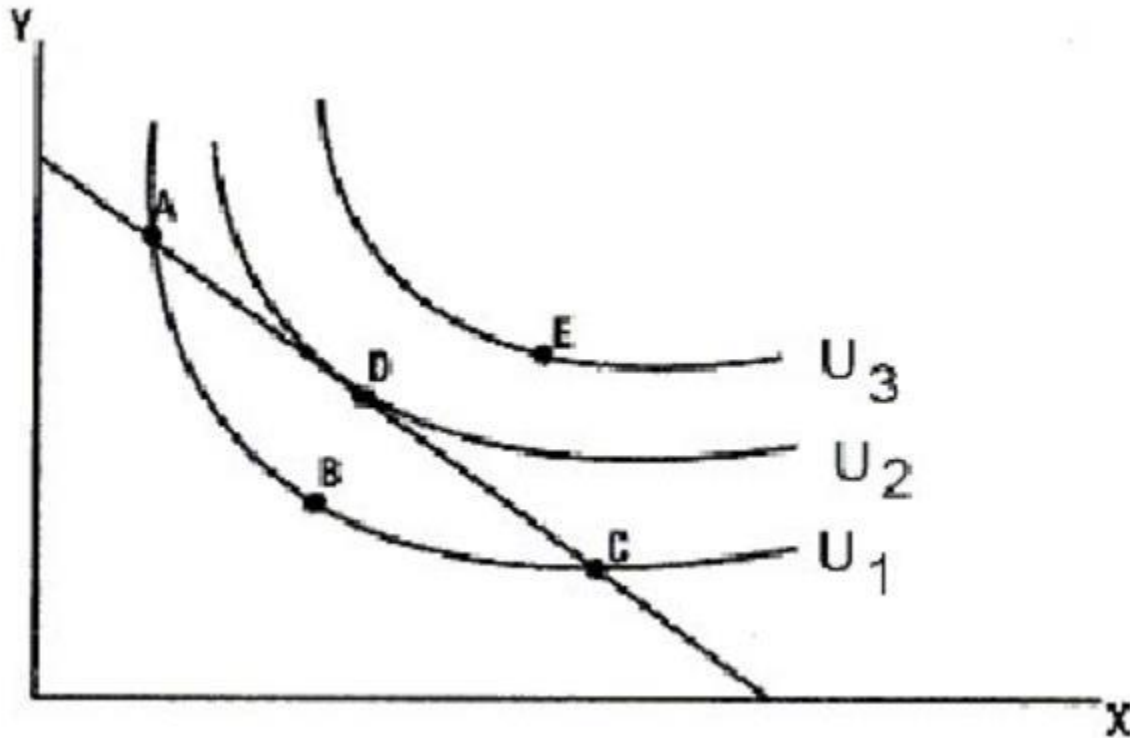


This means that real disposable income available for commodity X has increased giving him/her an opportunity to buy more of X. When the price increases, the line rotates inwards.

### **Consumers Equilibrium (utility maximization under the OUA)**

A consumer is in equilibrium under the OUA when his BL is tangent to the highest possible indifference curve on his indifference map

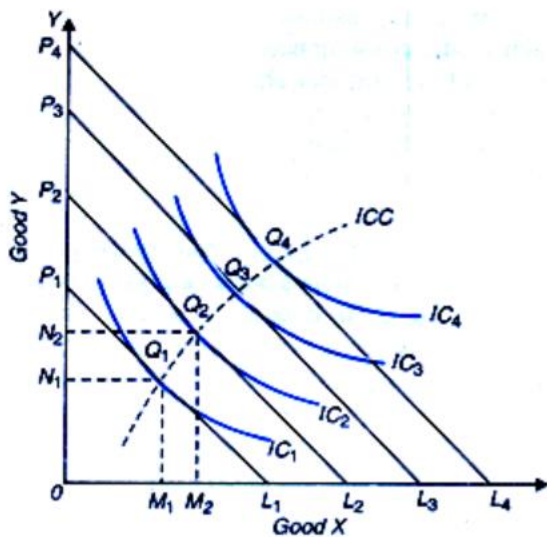
*Illustration*



**THE INCOME CONSUMPTION CURVE**

An YCC is a locus of equilibrium points showing a combination of commodity X & Y a consumer may purchase when his or her income changes while the commodity prices remain constant.

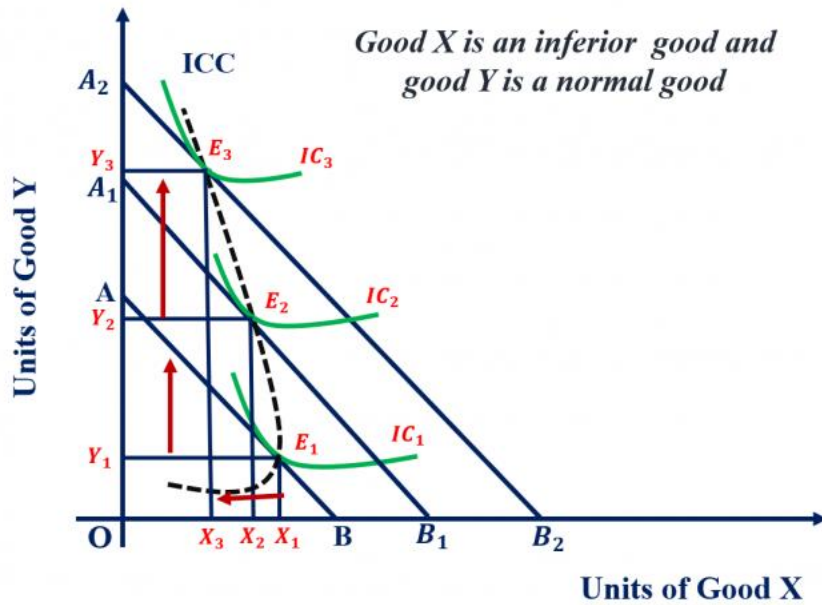
*Diagram*



The slope of the income consumption curve depends upon the nature of the commodities X & Y. i.e. Inferior or Normal good.

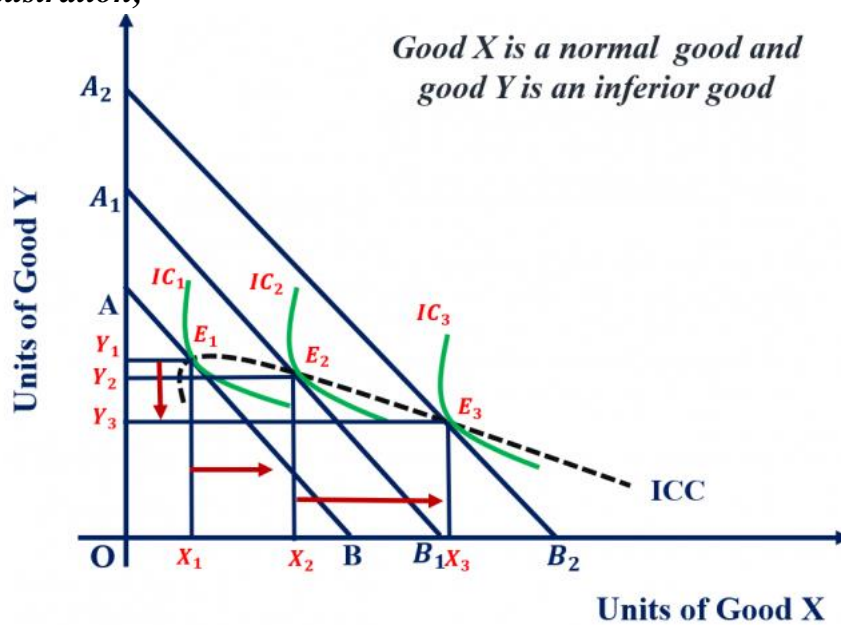
YCC when X is an inferior good and Y a normal good

*Illustration;*



YCC when Y is inferior good and X a normal good

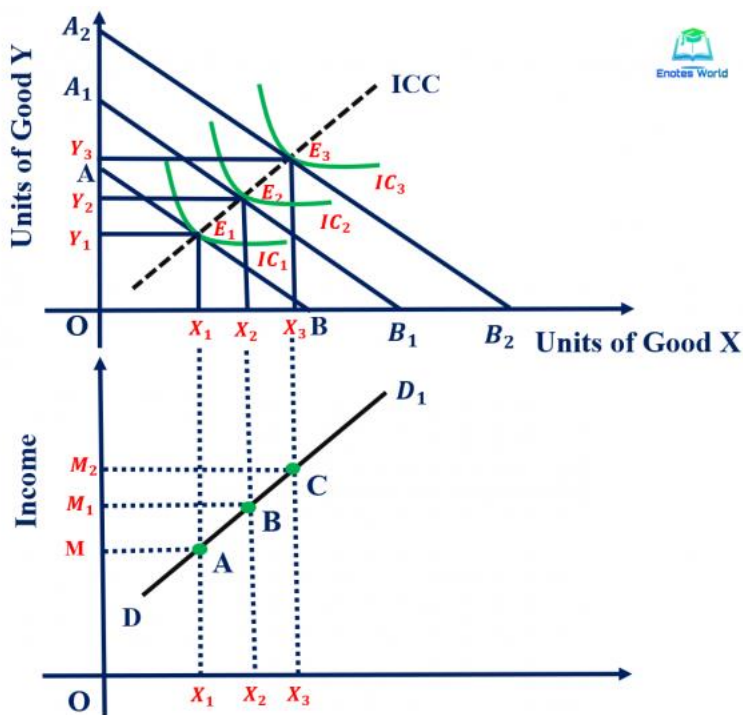
*Illustration;*



### THE ENGEL CURVE

The Engel curve shows the relationship between change in the income of the consumer and resultant change in quantity demanded of a given commodity. It is constructed for the income consumption curve.

Engel curve is derived from the income consumption curve



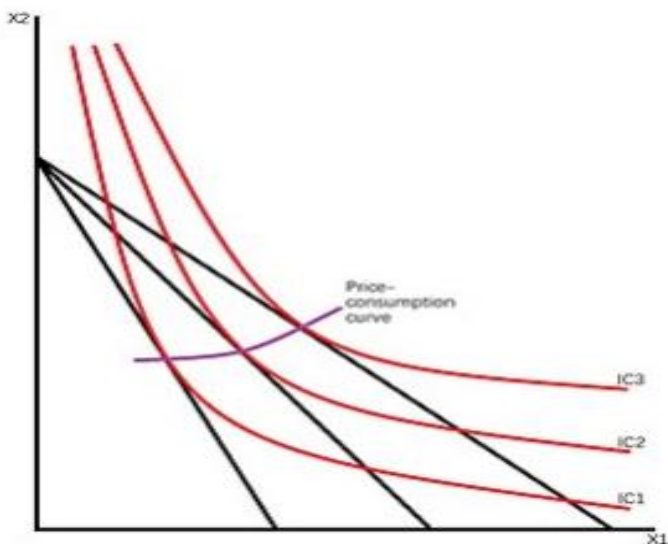
**THE PRICE CONSUMPTION CURVE**

The PCC is a locus of points showing different equilibrium positions of the consumer when the price of one commodity remains constant (Y) while that of the other changes (X).

**Assumptions**

- The price of one commodity remains constant (Y)
- The price of the other commodity changes or falls (X)
- The consumer’s equilibrium is assumed

**Illustration;**

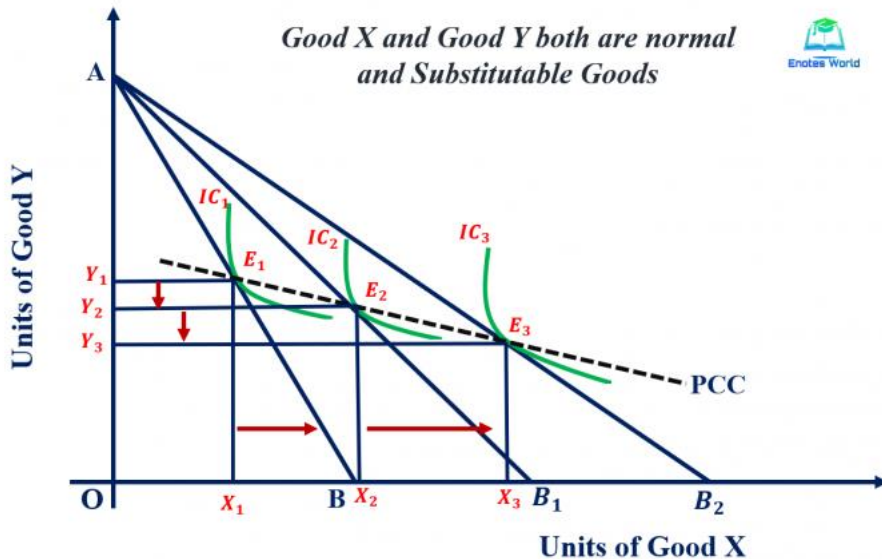




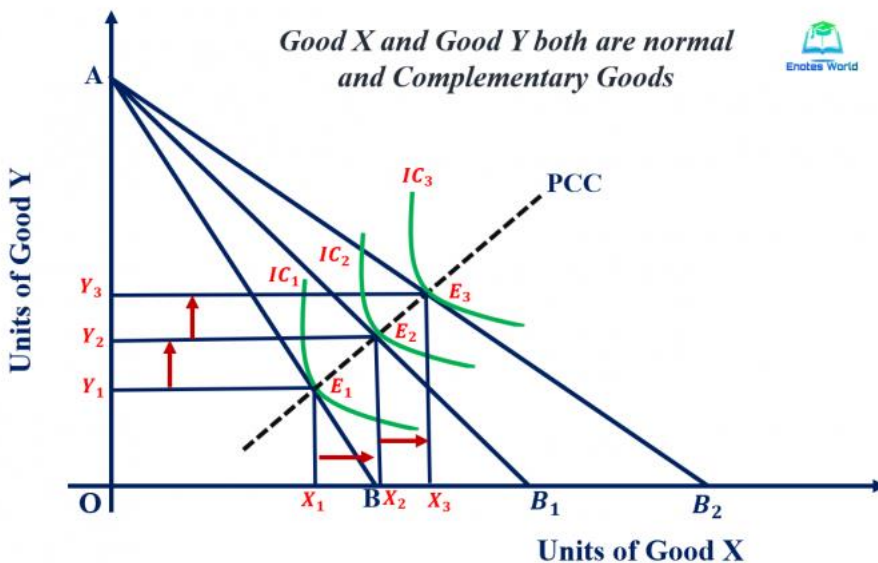
The slope of the P.C.C determines the relationship between the two commodities. I.e. substitutes or complements. Derive the P.C.C when the two commodities in question are substitutes.

*Illustration;*

**Substitutes**



**Complimentary**

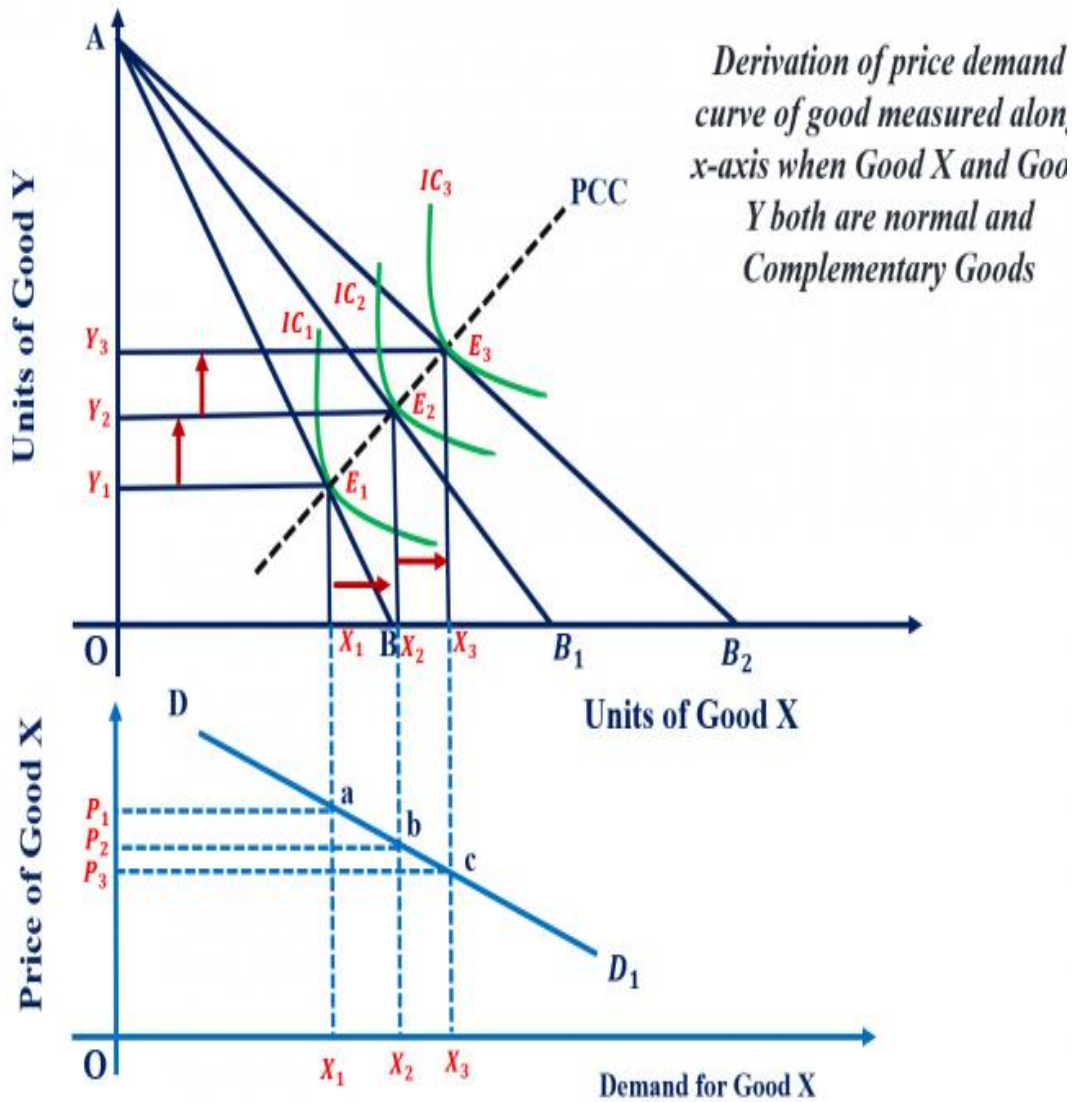


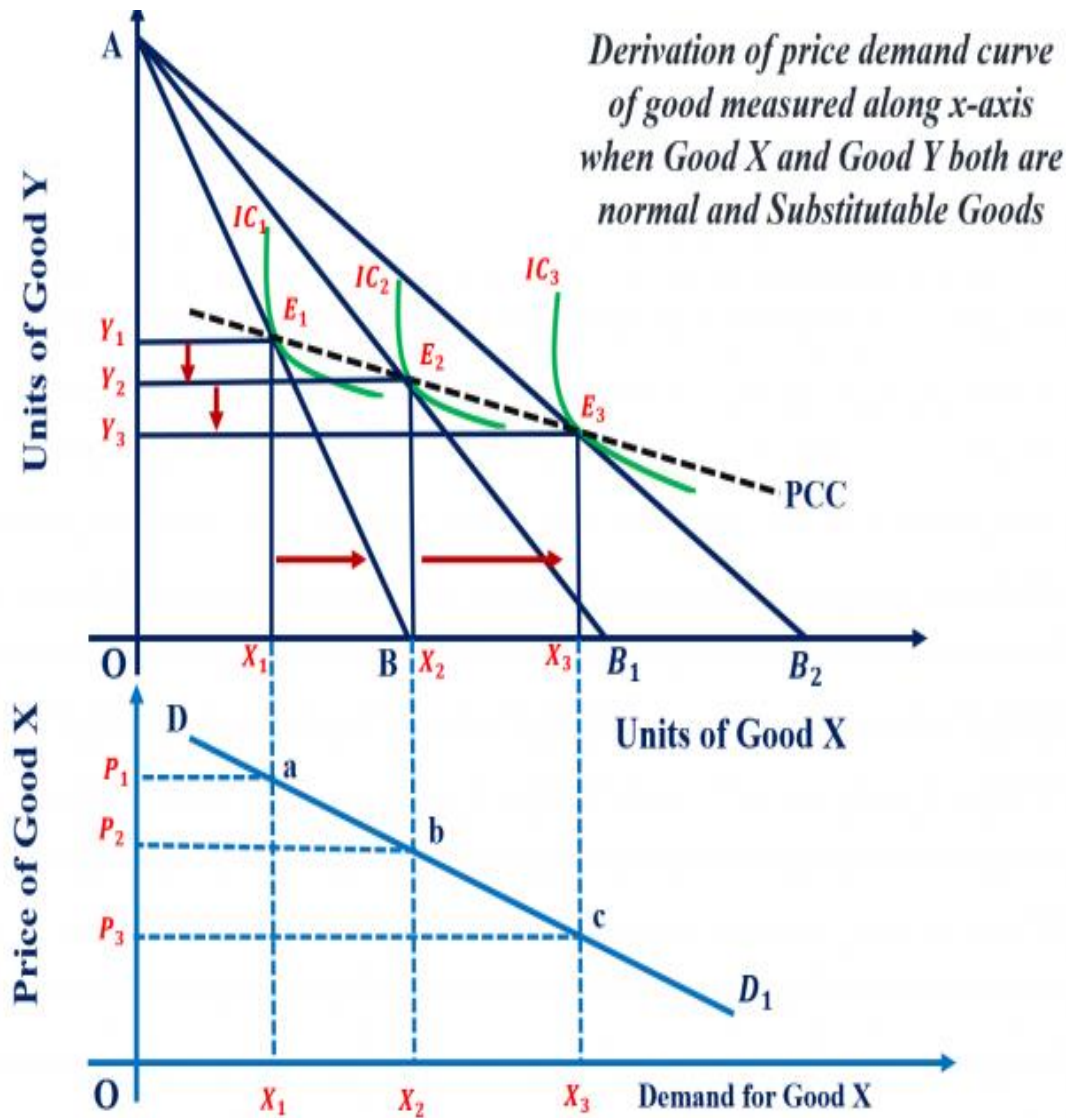
**DEMAND CURVES UNDER ORDINAL APPROACH**

The demand curve under the ordinal approach is derived from the Price consumption curve

The demand curve for a good show the quantity demanded of that good at various prices of the good, with income, tastes and preferences and prices of other goods being held constant. The price consumption curve gives us the change in quantity demanded when price of a good changes but it does not directly relate the

goods' price with quantity demanded. The demand curve of an individual shows that the relationship between price and quantity demanded can be easily derived from the price consumption curve as shown in the lower panel of Figure 3. The horizontal axis in the lower panel measures quantity of good X, as in the top panel, but the vertical axis measures the price of commodity X.





Consider the equilibrium point  $E_1$  on the budget line  $AB$  where the quantity demanded of  $X$  is  $OX_1$ . The price of  $X$  for the budget line  $AB$  is given by the slope of the budget line. The point 'a' in the lower panel directly relates the quantity demanded of  $X$  at  $E$  to the price level of  $X$  corresponding to the budget line  $AB$ . Similarly, points  $b$  and  $c$ , show the quantity of  $X$  demanded at the equilibrium points  $E_2$  and  $E_3$  in the top panel and the price levels of  $X$ , corresponding to the budget lines  $AB_1$  and  $AB_2$  respectively. The demand curve for good  $X$  is obtained by joining the points like  $E_1$ ,  $E_2$ , and  $E_3$ . Thus, an individual's demand curve for a good, showing how much of the good a consumer would demand at different prices, is derived from the price consumption curve, with income, tastes and preferences and prices of other goods remaining constant

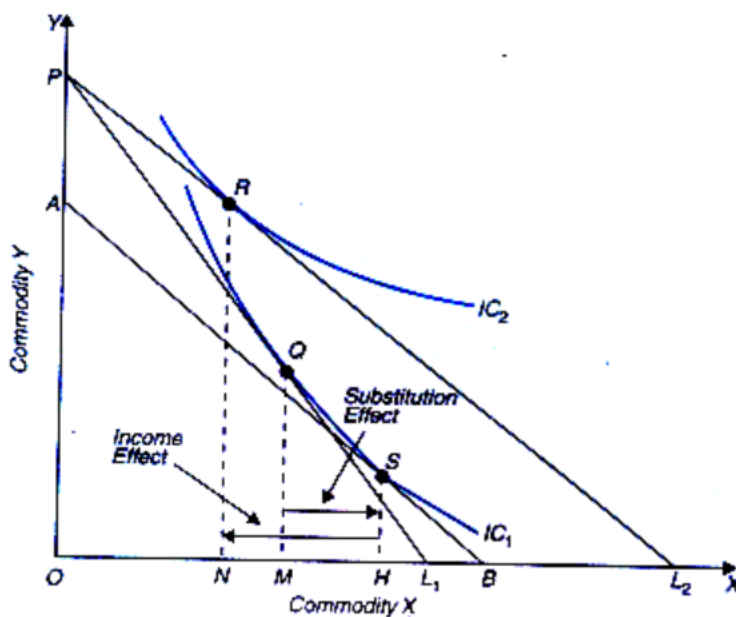
**Substitution Effect and Income Effect for Normal Goods**

We have just seen in the previous sections that a fall in the price of a good normally results in an increase in quantity purchased. This total effect of a price change can be separated into two components called the substitution effect and the income effect. These arise owing to the fact that a change in the price of a good, *ceteris paribus* has two effects – it changes the *relative* price of goods and it also changes the *real* income

of the consumer. The substitution effect measures the change in consumption of a good as a result of change in relative prices alone, holding real income constant. On the other hand, the income effect measures the change in quantity demanded of a good as a result of change in his real income only.

Let us consider a decrease in the price of good X. When the price of a good declines, the real income of the consumer increases. To find out the substitution effect of this price change and separate it from the income effect, the consumer's money income must be reduced so as to exactly offset the gain in real income due to the fall in price. In case of the Hicksian substitution effect, the price change is accompanied by a change in money income such that the consumer is neither better off nor worse off than before (in terms of utility). Thus, the consumer will remain on the same indifference curve even after the change in price. The amount by which the money income is changed to bring the consumer back to the original indifference curve is called *Compensating Variation*. In other words, the compensating variation is used to compensate the consumer for a change in price so that the consumer's satisfaction remains same.

**Illustration:**



With the given money income and prices, the consumer's equilibrium is shown at point O where the indifference curve IC1 is tangent to the budget line PL1. With a fall in the price of commodity X, *ceteris paribus*, the budget line rotates to PL2 and the new equilibrium is achieved at point R. This decrease in price of X results in an increase in the real income or purchasing power of the consumer. To isolate the substitution effect, the individual's money income should be reduced sufficiently, so as to keep him on the initial indifference curve IC1. To show this, an imaginary budget line AB is drawn, that is parallel to the budget line PL2 and lies below it (as it represents a reduction in income), such that it touches the original indifference curve IC1. PA represents the compensating variation in income due to a fall in price of X – it is the amount by which income is reduced to offset the gain due to the increase in real income (owing to the fall in price), so that the consumer remains on the same indifference curve as before.

In this case, the consumer's satisfaction is maximized at point S where the indifference curve IC1 is tangent to our imaginary budget line AB. The imaginary budget line AB reflects the new relative prices of commodities X and Y since it is parallel to the new budget line PL2 which was obtained after the fall in price of commodity X. At the point S the consumer increases the consumption of good X and decreases the consumption of good Y due to the change in relative price of commodities X and Y (the fall in price of X makes it relatively cheaper compared to Y whose price is unchanged). Thus, point S shows the new consumer's equilibrium when only the relative price of the commodities has changed. So, the movement from point O to point S along the indifference curve IC1 measures the substitution effect. The convexity of the indifference ensures that the decline in relative price of a good always leads to an increase in its quantity demanded due to substitution effect. MH represents the substitution effect while NH represents the Income effect.