Chapter Three

THEORY OF CONSUMER BEHAVIOUR

?

- Have you ever thought of how your mother or any other person whom you know decides to buy those consumption goods and services? What do they consider ?

Introduction

- Consumer theory is based *"Consumers choose the best that they can afford."*
- Consumer behavior can be best understood in three steps.

1. First, by examining consumer's preference, we need a practical way to describe how people prefer one good to another.
2. We must take into account that consumers face budget constraints – they have limited incomes that restrict the quantities of goods they can buy.
3. Third, we will put consumer preference and budget constraint together to determine consumer choice.

Chapter objectives

- ❑ After successful completion of this chapter, you will be able to:

- ✓ explain consumer preferences and utility
- ✓ differentiate between cardinal and ordinal utility approach
- ✓ define indifference curve and discuss its properties
- ✓ derive and explain the budget line
- ✓ describe the equilibrium condition of a consumer

3.1 Consumer preferences

- A consumer makes choices by comparing bundle of goods.
- Given any two consumption bundles, the consumer either decides that one of the consumption bundles is strictly better than the other, or decides that she is indifferent between the two bundles.

i) If she always chooses X when Y is available, then

- this consumer prefers X to Y. so that **$X \succ Y$** that the consumer strictly prefers X to Y, in the sense that she definitely wants the X-bundle rather than the Y-bundle.

ii) If the consumer is indifferent between two bundles of goods, **$X \sim Y$**.

- Indifference means that the consumer would be just as satisfied, consuming the bundle X as she would be consuming bundle Y.

- If the consumer prefers or is indifferent between the two bundles we say that she weakly prefers X to Y. **$X \succeq Y$.**

❑ Given any two consumption bundles X and Y, the consumer definitely wants the X-bundle than the Y-bundle if and only if the utility of X is better than the utility of Y.

3.2 The concept of utility

- *Utility* describes the satisfaction or pleasure derived from the consumption of a good or service.
- It is the power of the product to satisfy human wants.
- Given any two consumption bundles X and Y, the consumer definitely wants the X-bundle than the Y-bundle if and only if the utility of X is better than the utility of Y.

Note:

- *Utility' and 'Usefulness' are not synonymous*.
- *usefulness* is product centric whereas *utility* is consumer centric For example, paintings by Picasso may be useless functionally but offer great utility to art lovers.

❖ *Utility is subjective.*

- The utility of a product will vary from person to person.
- That means, the utility that two individuals derive from consuming the same level of a product may not be the same.
- For example, non-smokers do not derive any utility from cigarettes.

❖ *Utility can be different at different places and time.*

- For example, the utility that we get from drinking coffee early in the morning may be different from the utility we get during lunch time.

○ ***How do you measure or compare the level of satisfaction (utility) that you obtain from goods and services?***

3.3 Approaches of measuring utility

- There are two major approaches to measure or compare consumer‘s utility: cardinal and ordinal approaches.

- The cardinalist school postulated that utility can be measured objectively.

- According to the ordinalist school, utility is not measurable in cardinal numbers rather the consumer can rank or order the utility he derives from different goods and services.

3.3.1 The cardinal utility theory

- Utility is measurable by arbitrary unit of measurement called ***utils*** in the form of 1, 2, 3 etc.
- For example, we may say that consumption of an orange gives Bilen 10 utils and a banana gives her 8 utils, and so on.
- From this, we can assert that Bilen gets more satisfaction from orange than from banana.

Assumptions

- Rationality of consumers
- Utility is cardinally measurable
- Constant marginal utility of money
- Diminishing marginal utility (DMU)
- Total utility of a basket of goods depends on the quantities of the individual commodities. TU = f (*X1* , *X2* .....*X n*).

- **Total Utility** (TU) is the total satisfaction a consumer gets from consuming some specific quantities of a commodity at a particular time.

- As the consumer consumes more of a good per time period, his/her total utility increases.
- However, there is a saturation point for that commodity beyond which the consumer will not be capable of enjoying any greater satisfaction from it.

- **Marginal Utility** (MU) is the *extra satisfaction* a consumer realizes from an additional unit of the product.

- It is the change in total utility that results from the consumption of one more unit of a product.
- Graphically, it is the slope of total utility.

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

- ***Table 3.1: Total and marginal utility***

Quantity	Total utility (TU)	Marginal utility (MU)
0	0	-
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2

- TU first increases, reaches the maximum (when the consumer consumes 6 units) and then declines as the quantity consumed increases.
- MU continuously declines (even becomes zero or negative) as quantity consumed increases.

Graphically, the above data can be depicted as follows.

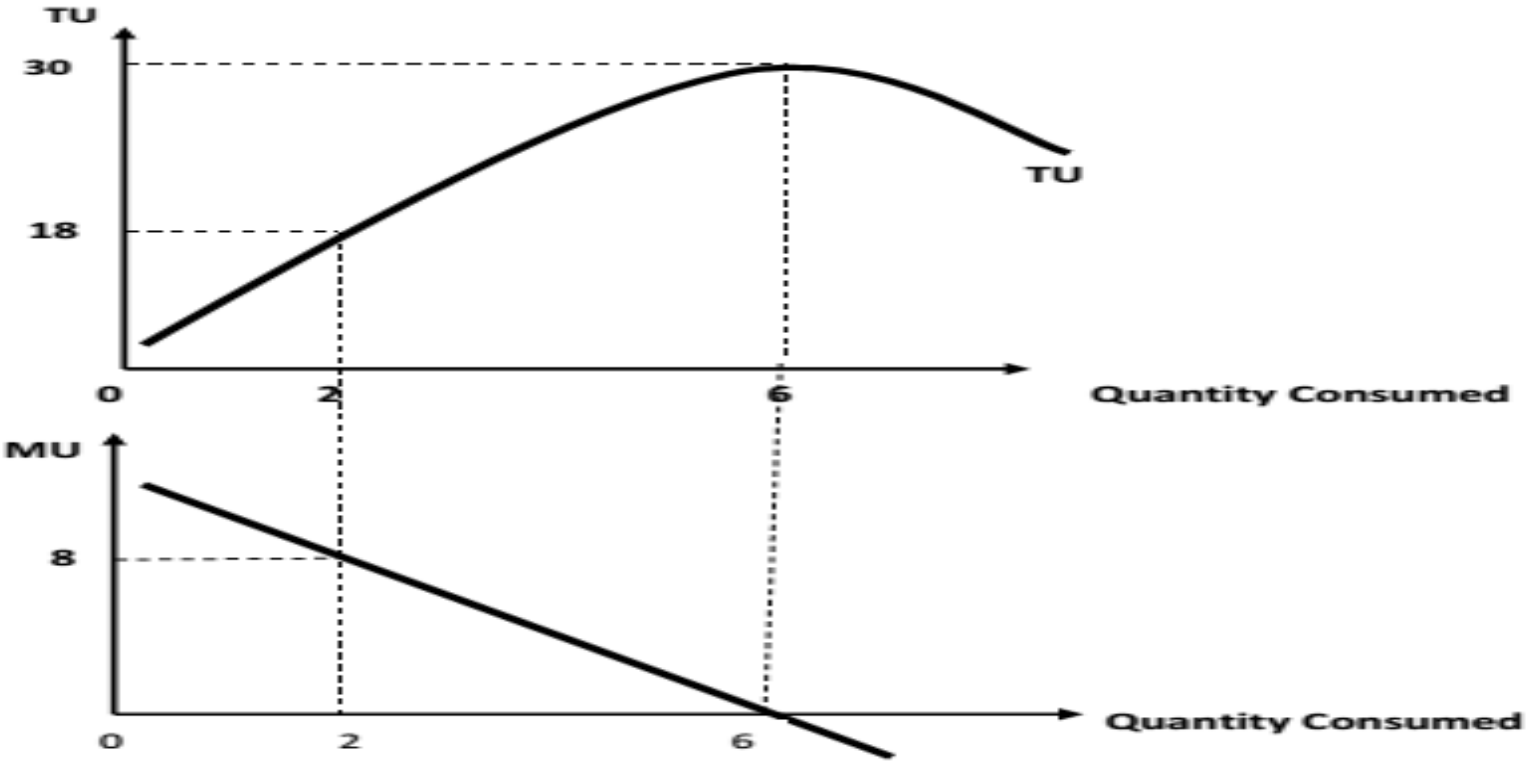


Figure 3.1: Total and marginal utility curves

- As it can be observed from the above figure,
  When TU is increasing, MU is positive.
  When TU is maximized, MU is zero.
  When TU is decreasing, MU is negative.

The Law of diminishing marginal utility (LDMU)

- states that as the quantity consumed of a commodity increases per unit of time, the utility derived from each successive unit decreases, consumption of all other commodities remaining constant.
- the extra satisfaction that a consumer derives declines as he/she consumes more and more of the product in a given period of time.

- The law is based on the following assumptions.
  - ✓The consumer is rational
  - ✓The consumer consumes identical or homogenous product.
  - ✓There is no time gap in consumption of the good
  - ✓The consumer taste/preferences remain unchanged

Equilibrium of a consumer

- The objective of a rational consumer is to maximize total utility.

- As long as the additional unit consumed brings a positive marginal utility, the consumer wants to consumer more of the product because total utility increases.

- However, given his limited income and the price level of goods and services, what combination of goods and services should he consume so as to get the maximum total utility?

a) the case of one commodity

- The equilibrium condition of a consumer that consumes a single good X occurs when the MU of X is equal to its market price.

$$MUX = PX$$

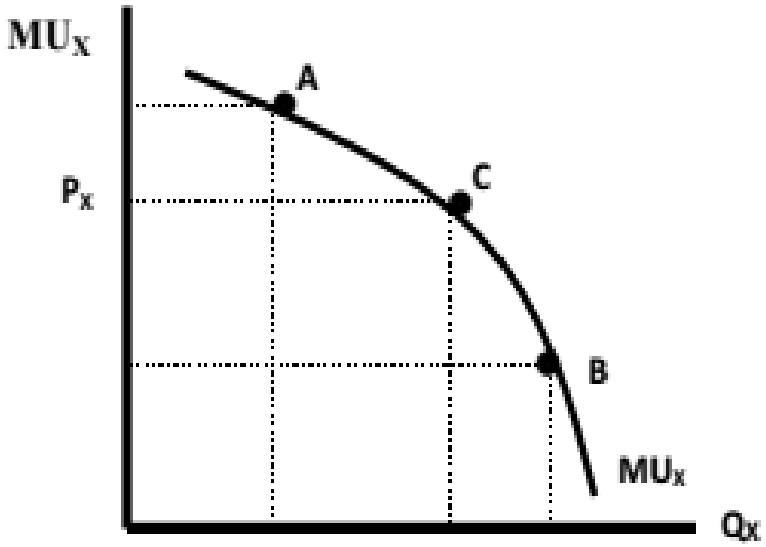


Figure 3.2: Equilibrium condition of consumer with only one commodity

At any point above point C (like point A) where $MU_X > P_X$, it pays the consumer to consume more. When $MU_X < P_X$ (like point B), the consumer should consume less of X. At point C where $MU_X = P_X$ the consumer is at equilibrium.

b) the case of two or more commodities

- the consumer's equilibrium is achieved when the marginal utility per money spent is equal for each good purchased and his money income available for the purchase of the goods is exhausted.
- That is,

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} = \cdots = \frac{MU_N}{P_N} \quad \text{and} \quad P_X Q_X + P_Y Q_Y + \cdots + P_N Q_N = M$$

where, M is the income of the consumer.

Example: Suppose Saron has 7 Birr to be spent on two goods: banana and bread. The unit price of banana is 1 Birr and the unit price of a loaf of bread is 4 Birr. The total utility she obtains from consumption of each good is given below.

Table 3.2: Utility schedule for two commodities

Income = 7 Birr, Price of banana = 1 Birr, Price of bread = 4 Birr							
Banana				*Bread*			
Quantity	*TU*	*MU*	*MU/P*	*Quantity*	*TU*	*MU*	*MU/P*
0	0	-	-	0	0	-	-
1	6	6	6	1	12	12	3
2	11	5	5	2	20	8	2
3	14	3	3	3	26	6	1.5
4	16	2	2	4	29	3	0.75
5	16	0	0	5	31	2	0.5
6	14	-2	-2	6	32	1	0.25

- Recall that utility is maximized when

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2}$$

- ❑ Saron will be at equilibrium when she consumes 3 units of banana and 1 loaf of bread

Limitation of the cardinal approach

- ❖ The assumption of cardinal utility is doubtful because utility may not be quantified.
  - Utility cannot be measured absolutely (objectively).

- ❖ The assumption of constant MU of money is unrealistic because as income increases, the marginal utility of money changes.

3.3.2 The ordinal utility theory

- It is not possible for consumers to express the utility of various commodities they consume in absolute terms, like 1 util, 2 utils, or 3 utils but
- it is possible to express the utility in relative terms.
- The consumers can rank commodities in the order of their preferences as 1st, 2nd, 3rd and so on.

Assumptions

- Consumers are rational
- Utility is ordinal
- Diminishing marginal rate of substitution
- Total utility (TU) = f (*X1* , *X2* .....*X n*).
- Consumer's preferences are consistent and *transitivity*

- The ordinal utility approach is explained with the help of indifference curves. Therefore, the ordinal utility theory is also known as the *indifference curve approach.*

❑ ***Indifference schedule/*curve** shows different combination of goods for which the consumer is indifferent.

- It shows the various combinations of two goods from which the consumer derives the same level of utility (satisfaction).

○ A set of indifference curves is called **indifference map.**

Table 3.3: Indifference schedule

Bundle (Combination)	A	B	C	D
Orange	1	2	4	7
Banana	10	6	3	1

- Each combination of good X and Y gives the consumer equal level of total utility. Thus, the individual is indifferent whether he consumes combination A, B, C or D.

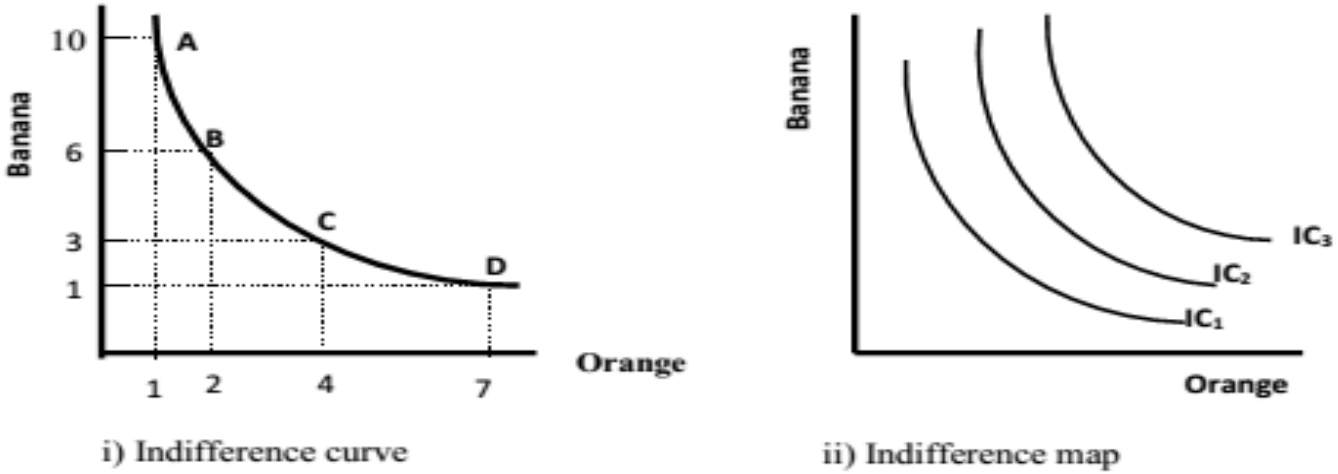


Figure 3.3: Indifference curve and indifference map

❑ Properties of indifference curves

i) have negative slope (downward sloping to the right)

ii) are convex to the origin- the diminishing marginal rate of substitution since the commodities are not perfect substitutes.

iii) A higher IC is always preferred to a lower one

iv) never cross each other (cannot intersect).-The assumptions of consistency and transitivity

- Figure 3.4 shows the violations of the assumptions of preferences due to the intersection of indifference curves.

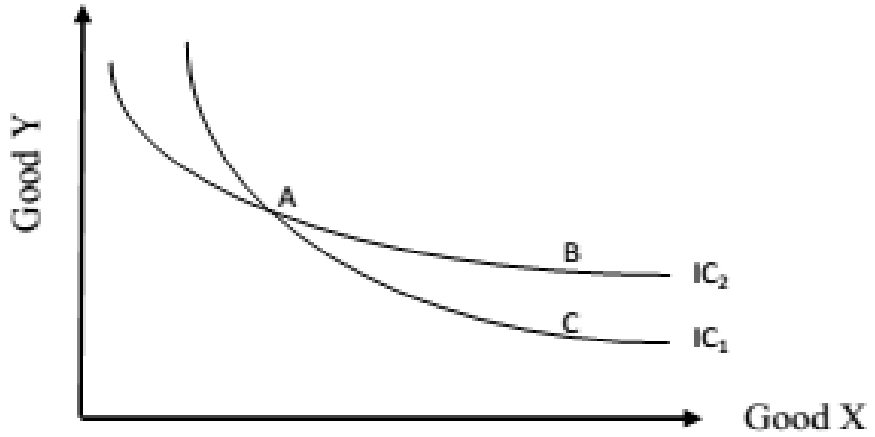


Figure 3.4: Intersection of indifference curves

- The consumer prefers bundle B to bundle C. On the other hand, following IC1, the consumer is indifferent between bundle A and C, and along IC2 the consumer is indifferent between bundle A and B. According to the principle of transitivity, this implies that the consumer is indifferent between bundle B and C which is contradictory or inconsistent with the initial statement where the consumer prefers bundle B to C.
- Therefore, indifference curves never cross each other.

Marginal rate of substitution (MRS)

- is a rate at which consumers are willing to substitute one commodity for another in such a way that the consumer remains on the same indifference curve.
- It shows a consumer‘s willingness to substitute one good for another while he/she is indifferent between the bundles.
- MRS of X for Y is $$MRS_{X,Y} = \frac{Number\ of\ units\ of\ Y\ given\ up}{Number\ of\ units\ of\ X\ gained} = -\frac{\Delta Y}{\Delta X}$$
- Since one of the goods is scarified to obtain more of the other good, the MRS is negative.
- Hence, usually we take the absolute value of the slope.

To understand the concept, consider the following indifference curve.

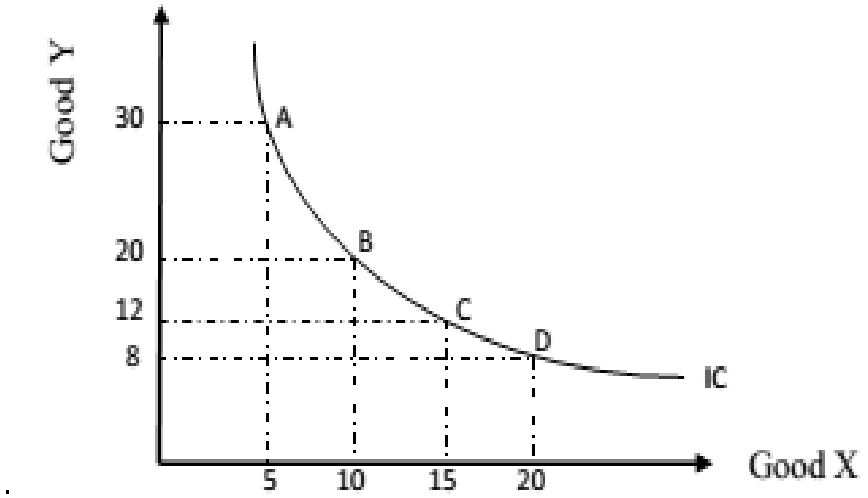


Figure 3.5: Indifference curve for two products X and Y

- MRSX,Y associated with the movement from point A to B, point B to C and point C to D is 2.0,1.6, and 0.8 respectively.

- That is, for the same increase in the consumption of good X, the amount of good Y the consumer is willing to scarify diminishes.
- This principle is reflected by the convex shape of the indifference curve and is called diminishing marginal rate of substitution.

It is also possible to derive MRS using the concept of marginal utility. $MRS_{X,Y}$ is related to MU_X and MU_Y as follows.

$$MRS_{X,Y} = \frac{MU_X}{MU_Y}$$

Proof: Suppose the utility function for two commodities X and Y is defined as:

$$U = f(X, Y)$$

Since utility is constant along an indifference curve, the total differential of the utility function will be zero.

$$dU = \frac{\partial U}{\partial X} dX + \frac{\partial U}{\partial Y} dY = 0$$

$$MU_X dX + MU_Y dY = 0$$

$$\frac{MU_X}{MU_Y} = -\frac{dY}{dX} = MRS_{X,Y} \qquad \text{Similarly, } \frac{MU_Y}{MU_X} = -\frac{dX}{dY} = MRS_{Y,X}$$

Example: Suppose a consumer's utility function is given by $U(X,Y) = X^4Y^2$. Find $MRS_{X,Y}$

Solution: $MRS_{X,Y} = \frac{MU_X}{MU_Y}$

$MU_X = \frac{\partial U}{\partial X} = 4X^3Y^2$ *and* $MU_Y = \frac{\partial U}{\partial Y} = 2X^4Y$ Hence, $MRS_{X,Y} = \frac{MU_X}{MU_Y} = \frac{4X^3Y^2}{2X^4Y} = \frac{2Y}{X}$

The budget line or the price line

- Indifference curves only tell us about consumer preferences for any two goods but they cannot show which combinations of the two goods will be bought.
- In reality, the consumer is constrained by his/her income and prices of the two commodities.
- This constraint is often presented with the help of the budget line.

❑ The *budget line* is a set of the commodity bundles that can be purchased if the entire income is spent.

- It is a graph which shows the various combinations of two goods that a consumer can purchase given his/her limited income and the prices of the two goods.

❑ We can express the budget constraint as:

$$M = P_X X + P_Y Y$$

- By rearranging the above equation, we can derive the following general equation of a budget line.

$$Y = \frac{M}{P_Y} - \frac{P_X}{P_Y} X$$

- Graphically

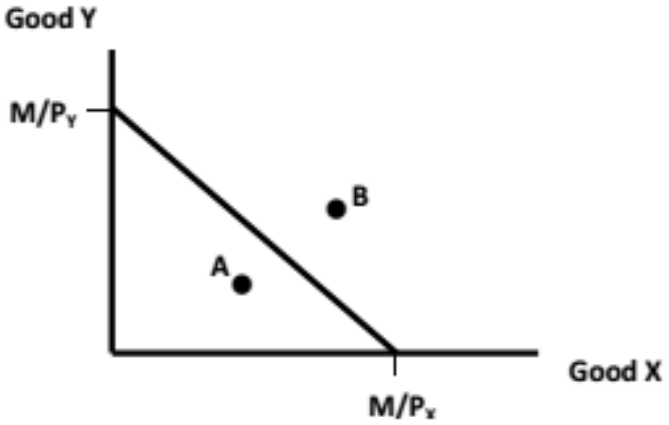


Figure 3.6: The budget line

- The slope of the budget line is given is by the ratio of the prices of the two goods (–Px/Py)

- **Example:** A consumer has $100 to spend on two goods X and Y with prices $3 and $5 respectively. Derive the equation of the budget line and sketch the graph.

Solution: The equation of the budget line can be derived as follows.

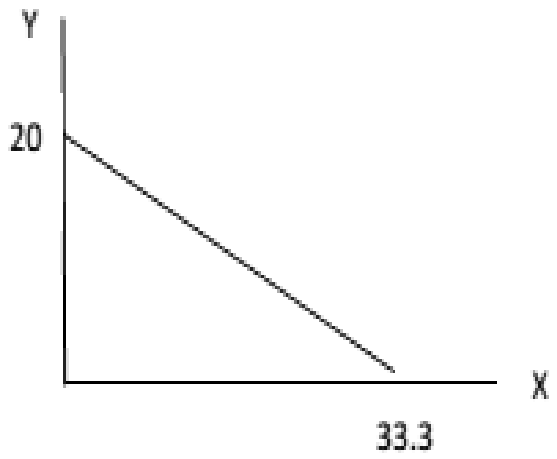
$$P_X X + P_Y Y = M$$

$$3X + 5Y = 100$$

$$5Y = 100 - 3X$$

$$Y = \frac{100}{5} - \frac{3}{5}X$$

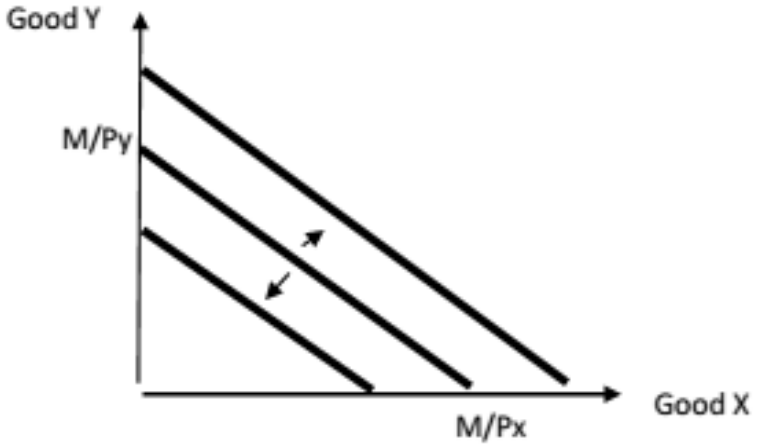
$$Y = 20 - \frac{3}{5}X$$



- Recall that a budget is drawn for given prices and fixed consumer‘s income.
- Hence, the changes in prices or income will affect the budget line.

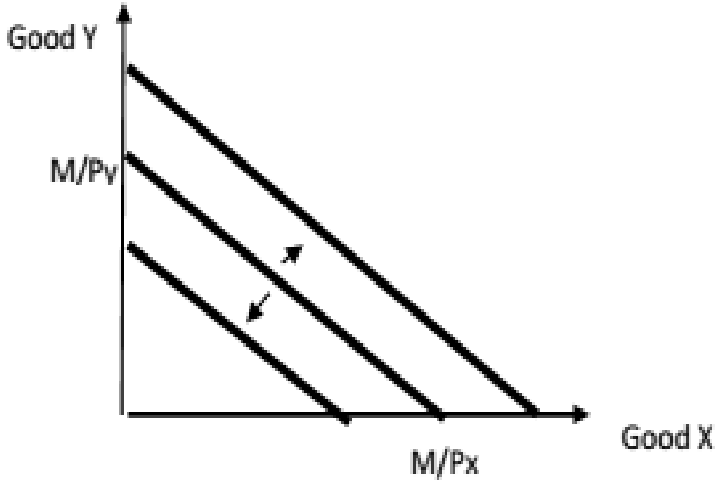
❑ Change in income:

- If the income of the consumer changes (keeping the prices of the commodities unchanged), the budget line also shifts (changes).
- Increase in income causes an upward/outward shift in the budget line that allows the consumer to buy more goods and services and decreases in income causes a downward/inward shift in the budget line that leads the consumer to buy less quantity of the two goods.
- The slope of the budget line (the ratio of the two prices) does not change when income rises or falls.



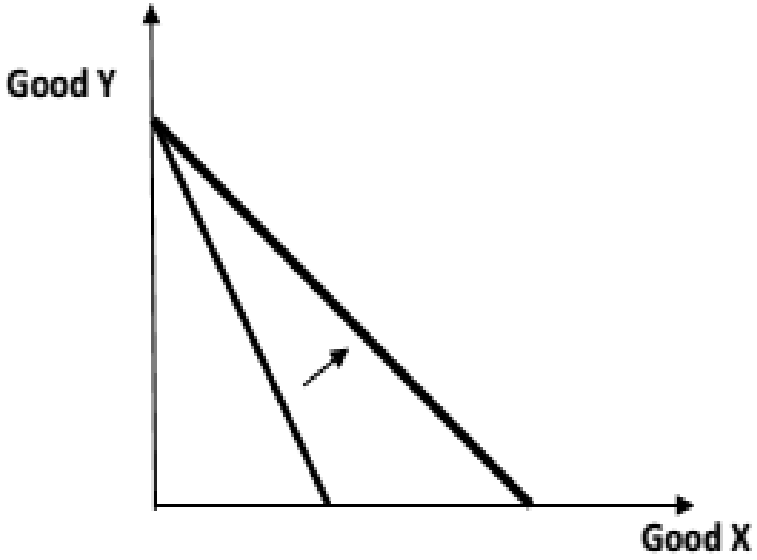
❑ Change in prices:

- An equal increase in the prices of the two goods shifts the budget line inward.
- Since the two goods become expensive, the consumer can purchase the lesser amount of the two goods.
- An equal decrease in the prices of the two goods, one the other hand, shifts the budget line out ward.
- Since the two goods become cheaper, the consumer can purchase the more amounts of the two goods.



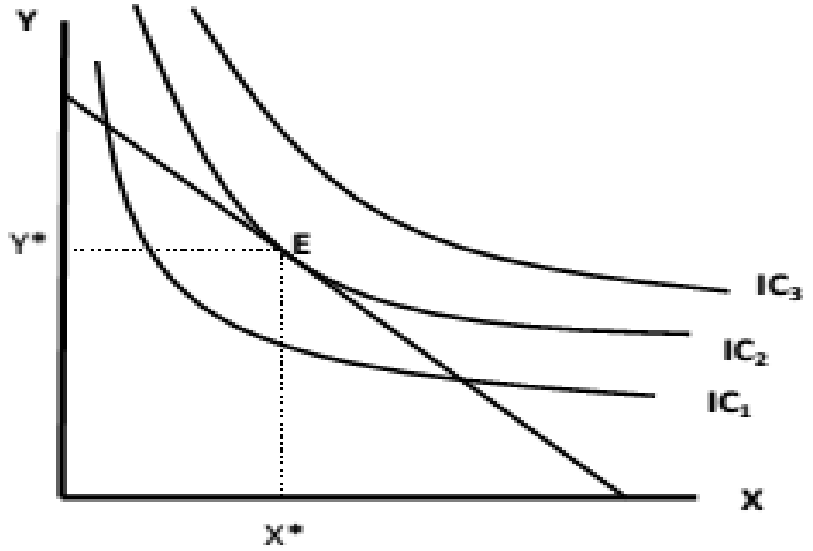
- An increase or decrease in the price of one of the two goods, keeping the price of the other good and income constant, changes the slope of the budget line by affecting only the intercept of the commodity that records the change in the price.

- For instance, if the price of good X decreases while both the price of good Y and consumer‘s income remain unchanged, the horizontal intercept moves outward and makes the budget line flatter.



Equilibrium of the consumer

- The preferences of a consumer (what he/she wishes to purchase) are indicated by the indifference curve.
- The budget line specifies different combinations of two goods (say X and Y) the consumer can purchase with the limited income.
- Therefore, a rational consumer tries to attain the highest possible indifference curve, given the budget line.
- Where the indifference curve is tangent to the budget line so that the slope of the indifference curve (*MRSxy*) is equal to the slope of the budget line (Px/Py).
- The equilibrium of the consumer is at point where the budget line is tangent to the highest attainable indifference curve .



- Mathematically, consumer optimum (equilibrium) is attained at the point where:

Slope of indifference curve = Slope of the budget line

$$MRS_{XY} = \frac{P_X}{P_Y}$$

$$\Rightarrow \frac{MU_X}{MU_Y} = \frac{P_X}{P_Y}$$

Example: A consumer consuming two commodities X and Y has the utility function $U(X,Y)=XY+2X$. The prices of the two commodities are 4 birr and 2 birr respectively. The consumer has a total income of 60 birr to be spent on the two goods.

a) Find the utility maximizing quantities of good X and Y.

b) Find the $MRS_{X,Y}$ at equilibrium.

Solution

a) The budget constraint of the consumer is given by:

$P_X.X + P_Y.Y = M$

$4X+2Y= 60$ ..... (i)

Moreover, at equilibrium

$$\frac{MU_X}{MU_Y}=\frac{P_X}{P_Y}$$

$$\frac{Y+2}{X}=\frac{4}{2}$$

$$\frac{Y+2}{X}=2$$

$$Y=2X-2 \quad \text{..... (ii)}$$

Substituting equation (ii) into (i), we obtain $Y=14$ *and* $X=8$.

b) $MRS_{X,Y}=\frac{MU_X}{MU_Y}=\frac{Y+2}{X}=\frac{14+2}{8}=2$

(At the equilibrium, MRS can also be calculated as the ratio of the prices of the two goods)

END OF CHAPTER THREE