

Consumer's Behaviour ✓

(Marginal Utility Analysis Cardinal Approach)

The consumer has a pivotal place in the economic activity. He consumes goods and services for the satisfaction of his wants. Satisfaction of wants is the beginning and end of all economic activities. Thus, micro-economic analysis always begins with the understanding of the consumers' behaviour, by investigating into the fundamental basis of demand.

CONCEPT OF UTILITY

Stanley Jevons, a noted classical economist, originated the concept of 'utility' as the fundamental basis of consumers' demand for a commodity. The term utility refers to the want satisfying power or capacity of a commodity or service, assumed by the consumer to constitute his demand for that commodity or service. Utility is, thus, an introspective or subjective term. It relates to the consumers' mental attitude and experience regarding a given commodity or a service. Thus, utility of a commodity may differ from person to person, as psychologically, every individual has his own experience. Again, utility is a relative term. It depends on time and place. Thus, the same consumer may experience a higher or a lesser utility for the same commodity at different times and different places. Moreover, utility has no ethical or moral consideration. A commodity which satisfies any type of want whether morally good or bad has utility, e.g. a knife has utility as a house-hold appliance to a house-wife, but, it has also a utility to a killer for stabbing somebody. Again, utility is not necessarily equated with usefulness. A commodity may have utility—a power to satisfy some want but it may not be useful to the consumer. For instance, cigarette has utility to the smoker but it is injurious to his health. Utility is the function of intensity of want. A want which is unsatisfied and greatly intense will imply a high utility for the commodity concerned to a person. But when a want is satisfied in the process of consump-

tion, it tends to become less intense than before. As such, the consumer tends to experience a lesser utility of the commodity than before. Such an experience is very common and it is described as the tendency of diminishing utility experienced with the increase in consumption of a commodity. In other words, when more of a thing we have, the less we want it.

Utility and Satisfaction

The term utility is, however, distinct from satisfaction. Utility implies potentiality of satisfaction in a commodity. It serves as a basis to induce the consumer to buy the commodity. But, the real satisfaction is the end result of the consumption of a given commodity.

Though utility and satisfaction are both psychological, there is a distinctive gap between the two experiences. Utility is anticipation of satisfaction visualised. Satisfaction is the actual realisation. Sometimes, satisfaction derived from the consumption of a commodity may be less or more than what is expected in the visualisation of utility, e.g. when a consumer buys a motor car and if it starts giving trouble within a short time, his satisfaction so realised from the use of that car will be less than what he estimated about its utility. Nonetheless, in economic theory, for the sake of simplicity and convenience in analysis, economists usually assume utility and satisfaction as synonymous terms.

Measurement of Utility

Utility being an introspective phenomenon cannot be measured directly in a precise manner. There cannot be a direct numerical expression of utility. Economists, however, adopt an indirect measurement of utility in terms of 'price' a consumer is willing to pay for a given commodity. When a consumer is willing to pay a high price for a commodity, it means there is a high utility estimated by him (the consumer) for that commodity and *vice versa*. But, this is just a rough indication. It suggests no precise and proportionate measurement of utility.

From the standpoint of theory, however, there are two basic approaches to the measurement of utility, namely : (i) The cardinal approach, and (ii) The ordinal approach.

The cardinal measurement of utility was enunciated by Prof. Marshall and his followers. According to them, utility of a commodity is quantifiable, hence measurable numerically. They assume that

for a consumer an apple may yield 10 utils* of satisfaction, while a mango may yield 30 utils of satisfaction. Thus, utility of a mango is three times more in proportion to the utility of an apple. Such a numerical measurement is imaginary. When a utility statement is tabulated as a schedule of utility, it is referred to as the cardinal measurement of utility.

On the other hand, Professor Hicks and Allen and their followers among the modern economists, have suggested an ordinal measurement utility. In their view, utility cannot be quantified, so its numerical expression is unrealistic. Realistically, utility is measurable only in the ordinal sense, i.e. as 1st, 2nd, 3rd, 4th, 5th etc. order of satisfaction. There is the ranking of the level of satisfaction, as if a consumer experiences more satisfaction from a mango than an apple, so he prefers a mango to an apple. Hence, the economist would say that the consumer has 2nd ordinal of satisfaction in mango and 1st ordinal of satisfaction in apple. But, here 2nd does not necessarily mean twice as that of the first ordinal of satisfaction.

In short, cardinal utility means quantification of the size of satisfaction involved, while ordinal utility implies merely a quality and ranking of the level of satisfaction experienced. The latter is a more realistic concept.

Total Utility and Marginal Utility

The concepts of total utility and marginal utility are the basic concepts in the cardinal measurement of utility.

Total utility means the total satisfaction experienced or attained by the consumer regarding all the units of a commodity taken together in consumption or acquired at a time. Apparently, total utility tends to be more with a larger stock and less in with a smaller stock. In mathematical terms, thus, total utility is a direct function of the number of units of a commodity in consideration. To put it symbolically:

$$TU_x = F(Q_x), \text{ where } \frac{\Delta TU_x}{\Delta Q_x} > 0$$

(Read: Total utility of X is the increasing function of its quantity.) Where, TU_x = total utility of a commodity, X, F = functional relation, Q_x = quantity of X. Δ refers to a small change.

* 'Utils' is term used by Marshall for expressing the measurement of imaginary units of utility.

This functional relationship of total utility to quantity of a commodity may be illustrated by constructing a utility schedule as shown in Table 3.1

Table 3.1
Schedule of Utility

Units of Commodity X (Q_x)	Total Utility of X in units (TU_x)
1	35
2	60
3	75
4	80
5	82

In this schedule, we have assumed a cardinal measurement of utility in terms of so many units expressed in numbers. It can be seen that when our consumer in the illustration buys 5 units of X, he derives 82 units of total satisfaction. Total utility, thus, measures the strength of the consumer's demand for the entire stock of the given commodity.

Marginal utility, on the other hand, refers to the successive increment in total utility made by taking separately each unit of the commodity in a successive manner as an addition to its total stock. Thus, utility of the first unit is measured as the marginal utility at the beginning. Then, the utility of the second unit of X is measured as the marginal utility of two units in the given stock. Similarly, the utility derived from the third unit would be the marginal utility of the stock with 3 units and so on.

Thus, marginal utility may be measured as the difference between the utility of the total units of stock of consumption of a given commodity *minus* that of consuming one unit less in the stock considered. In symbolic terms, thus :

$$MU_n = TU_n - TU_{n-1}$$

where, MU_n stands for the marginal utility relating to n units of stock of a commodity.

TU_n = Total utility of n units taken together.

TU_{n-1} = Total utility of $n-1$ units taken together.

The computation of marginal utility has been illustrated in Table 3.2 below :

Table 3.2: Computation of Marginal Utility of Data in Table 3.1

Units of X n	Total Utility TU	Marginal Utility $MU_n = TU_n - TU_{n-1}$
1	35	$35 - 0 = 35$
2	60	$60 - 35 = 25$
3	75	$75 - 60 = 15$
4	80	$80 - 75 = 5$
5	82	$82 - 80 = 2$

It is easy to see that marginal utility determines the rate of increase in the total utility with an increase in the units of a commodity. Thus, marginal utility may also be defined as :

$$MU_x = \frac{dU_x}{dQ_x}$$

where, MU_x is the marginal utility of a commodity X , dU_x is the small change in the total utility of X , dQ_x is the unit change in the total stock of X .

In short, marginal utility refers to the utility of the marginal unit of consumption. Marginal unit is not a fixed unit. It changes according to the change in the stock of things. It is the last unit in the sequence of consumption.

In expounding the marginal utility analysis of the consumer's demand behaviour, Professor Marshall has enunciated two fundamental laws : (i) The Law of Diminishing Marginal Utility; and (ii) The Law of Equi-marginal Utility.

THE LAW OF DIMINISHING MARGINAL UTILITY

This law expresses the mode of consumer's satisfaction of a commodity. It is drawn from the simple law of diminishing utility which indicates that "as the stock of goods for consumption increases, the utility derived from it decreases or diminishes." It is just a natural tendency in us that the more of a thing we have, the less we want it. Thus, in fact, the law of diminishing utility or diminishing marginal utility is based on the satiability characteristic of human wants, that a single want taken separately at a time can be fully satisfied.

Statement of the Law

Professor Boulding states the law of diminishing marginal utility as follows : "As a consumer increases the consumption of any one commodity, keeping constant the consumption of all other commodities, the marginal utility of the variable commodity must eventually decline." According to Marshall, "the additional benefit which a person derives from a given increase of his stock of a thing diminishes with every increase in the stock that he already has."

Briefly, thus, we may say that, "other things being equal, with the increase in the stock of a commodity consumed or acquired, its marginal utility diminishes." In other words each additional unit of consumption adds relatively less and less to the total satisfaction derived.

In mathematical terms, the law implies a decreasing functional relationship between the quantity of a commodity consumed and the marginal utility derived. Thus :

$$MU_x = F(Q_x)$$

$$\text{where, } \frac{dU_x}{dQ_x} < 0.$$

Illustration of the Law

To illustrate the tendency of the diminishing marginal utility, let us review the hypothetical utility schedule computed through the introspective method of enquiry in consumer's consumption experience, as given in Table 3.3.

Table 3.3: Utility Schedule

Units of Consumption of Commodity X	Total Utility (Units) TU_x	Marginal Utility (Units) MU_x
1	60	60
2	100	40
3	125	25
4	140	15
5	148	8
6	148	0
7	145	-3

From the schedule in Table 3.3, it appears that as the units of commodity X consumed increases, the marginal utility derived from each successive unit tends to diminish. Eventually, the marginal utility may become zero and ultimately negative. Zero marginal utility implies the point of satiety, that is, there is complete satisfaction of a given want when marginal utility is zero. The marginal utility becomes zero only when the want is not at all intense, as it is fully satisfied. It must, however, be remembered that though marginal utility varies inversely with the acquisition or consumption of the stock of a given commodity, the variation is not necessarily proportionate or uniform. And if any such thing is observed, it is incidental. Any further addition to consumption after zero marginal utility causes a negative marginal utility. Negative marginal utility indicates disutility or dissatisfaction resulting from excessive consumption of a commodity.

Again, viewing the schedule in its ascending order, it would be seen that with a decrease in the stock of consumption, the marginal

utility increases. Hence, when one wants to increase the marginal utility of a commodity, he would consume or purchase less of it.

When the marginal utility schedule (given in Table 3.3) is represented on a graph, we have a diagrammatic representation of the law through the curve we get, which is called "the marginal utility curve" (see Fig 3.1).

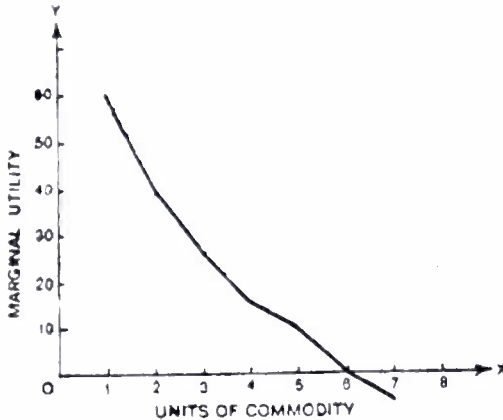


Fig. 3.1

In Fig. 3.1, the x-axis represents the units of commodity X , and the marginal utility is measured on the y-axis. The MU curve represents the marginal utility curve. The marginal utility curve slopes downward from left to right, indicating an inverse relationship between marginal utility and the stock of the commodity, *i.e.*, as the stock increases, the marginal utility diminishes.

The MU curve intersects at a certain point on the x-axis. This intersection point is the point of satiety, where the marginal utility is zero. After this, the curve slopes down further, denoting negative values. It should be noted that the area under the marginal utility curve represents the total utility of the commodity.

Relationship between Total and Marginal Utility

Incidentally, the following points of relationship between total and marginal utility may be observed from the schedule of utility in Table 3.3.

1. With an increase in the units of X , its total utility increases but marginal utility diminishes. However, the increment in total utility is at a diminishing rate. In fact, the rate of increment in total utility is determined by the marginal utility.

2. When marginal utility is zero, the total utility is maximum (the highest). This shows that want is completely satisfied and its intensity is nil.

3. When marginal utility becomes negative, the total utility starts decreasing due to dissatisfaction.

This typical relationship between total utility and marginal utility can also be visualised diagrammatically by drawing marginal and total utility curves as shown in Fig. 3.2.

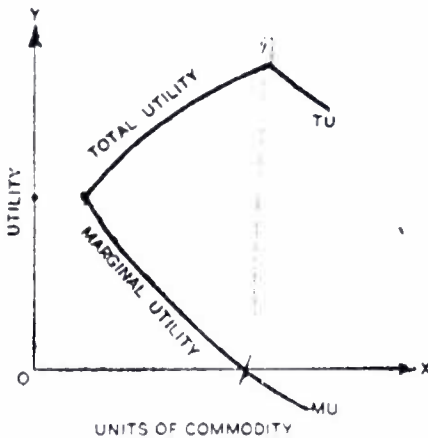


Fig. 3.2

curve starts moving downward, indicating that total utility decreases when the marginal utility is negative.

Assumptions of the Law

The law of diminishing marginal utility is conditional. Its validity is attributed to the following assumptions or conditions :

1. *Homogeneity* : The law holds true only if all the successive units taken in the process of consumption are homogeneous in character, like quality, size, taste, flavour, colour, etc. If there is a change in the characteristics of the units of the given commodity, it is quite likely that marginal utility may tend to increase rather than diminish with the successive additional units of consumption.

2. *Continuity* : The consumption or acquisition process is continuous at a given time, that is, units are taken one after another successively without any interval of time. Indeed, the first cup of tea in the morning and the second one in the evening will not result in the diminishing of marginal utility.

In Fig. 3.2 the curve *MU* represents marginal utility and the curve *TU* total utility. It is easy to see that as the *MU* curve slopes downwards, *TU* curve moves upward, indicating that total utility increases at the rate of marginal utility. When the *MU* curve intersect the x-axis to that extent, the *TU* curve is as its peak, meaning when marginal utility is zero, total utility is maximum. When the *MU* curve enters the negative quadrants, the *TU*

3. *Reasonability* : The units of consumption are in reasonable size, i.e., of normal standard unit. For instance, we should think of a glass of milk, a cup of tea, etc., and not a spoon of milk or tea.

4. *Constancy* : The law presumes that there is no change in income, taste, habit or preference of the consumer. Similarly, the price of the commodity is also assumed to be given.

5. *Rationality* : The consumer is assumed to be a rational economic man whose behaviour is normal and aiming at maximisation of satisfaction.

Above all, the Marshallian exposition of the law of diminishing marginal utility is based on the cardinal measurement of utility. It is assumed that utility can be numerically expressed by the consumer, i.e., he is capable of mentioning the quantum of utility derived from each additional unit consumed or acquired by him.

Exceptions to the Law

Under the above-stated conditions of homogeneity, continuity, reasonability, constancy and rationality, the law is deemed to be universal. In certain cases, however, it has been observed that a consumer tends to attain increasing marginal utility with an increase in the stock of a commodity consumed or acquired. Such cases are treated as exceptions to the law of diminishing marginal utility. Really speaking, these so-called exceptions are not very genuine cases and are found to be erroneous when we strictly apply the criteria of the law with all the *ceteris paribus* assumptions. Let us briefly review such cases.

1. *Hobbies* : It is often argued that in certain hobbies like stamp collection, collection of antique goods, collection of old coins etc., every additional unit gives more pleasure, i.e. the marginal utility tends to increase. No doubt, this is true. But it is not a genuine exception to the law of diminishing utility, because in such cases, homogeneity condition of the law is violated. Indeed, each time a new variety of stamp or coin or antique is collected by a person and not of the same variety.

2. *Drunkards* : The law seems to be inapplicable a drunkard, as intoxication increases with every successive dose of liquor. This is true, but the rationality condition of the law is violated. The introspective behaviour of a drunkard at the time is irrational or abnormal.

3. *Misers* : In the case of a miser, it is pointed out that greed increases with every additional acquisition of money. Hence, the

marginal utility of money does not diminish for him with more and more money. But, here we may say that when the miser spends his money, his utility of the commodity will be diminishing, perhaps more rapidly than in the case of others. Hence, a miser's behaviour cannot be a significant exception to the law of diminishing marginal utility.

4. *Music and Poetry* : In the case of music and poetry, it is commonly experienced that a repeat hearing gives a better satisfaction than the first one. Hence, it is thought that the law of diminishing marginal utility may not be applicable here. But, we may say that there is a limit to it, as the repeated hearing of the same music or poetry proves to be monotonous and yields disutility. So it is not a genuine exception to the law.

5. *Reading* : Since more reading gives more knowledge, a scholar would get more and more satisfaction with every additional book. But, here also we may point out that it is not a real exception to the law as the homogeneity condition is violated here. Knowledge and satisfaction increase by reading different books and not the same one over and over again.

Marginal Utility and Price

A rational consumer always seeks to maximise his total satisfaction. For this purpose, he is usually found to be relating marginal utility with the price of the given commodity.

From the consumer's point of view, thus, it is the marginal utility of a commodity which determines its price. That is to say, the marginal gain derived by consuming the last unit, or marginal unit, of a commodity is equal to the sacrifice in terms of money that the consumer has to undergo for purchasing that unit of commodity. Evidently, no consumer will be ready to pay a price higher than his estimate of the marginal utility of a given commodity.

Thus, the consumer will go on purchasing units of a commodity until the marginal utility of it is equal to the disutility of the last unit of money spent (*i.e.* the price paid for the marginal unit purchased).

We may, thus, lay down the condition of consumer's equilibrium with respect to a single commodity, namely, a rational consumer seeking maximisation of total satisfaction from purchasing a particular commodity will try to equalise marginal utility with price. To elucidate the point, observe Table 3.4.

Table 3.4.

Units of Commodity X	Price (or Disutility of Money)	Marginal Utility (MU_x)
1	10	15
2	10	13
3	10 ←	10 ←
4	10	8
5	10	4

From the above table of price and marginal utility, it appears that with a given market price, initially when only 1 unit of X is purchased, disutility of money is 10 but the gain of utility is 5 as the marginal utility is 15. Hence, the consumer is induced to purchase more. In the case of two units purchased also, there is a gain of utility. But when the third unit of X is purchased, disutility and marginal utility are the same, *i.e.*, price = MU . After that if more is purchased, marginal utility derived is less than the price paid, so that the consumer is a loser when sacrifice of money utility and satisfaction from the commodity are compared. Thus, the consumer in this case is at equilibrium when he purchases 3 units of X . This means, satisfaction can be increased when marginal utility is greater than price. And it is maximum when the price is equal to marginal utility.

Criticisms of the Law

Though the law expresses a universal tendency of consumer's introspective behaviour, its traditional exposition has been criticised on various counts :

1. The traditional or Marshallian explanation of the law presumes the cardinal measurement of utility. The utility schedule used for this assumes that utility can be numerically measured, added or subtracted. This is rather not convincing because utility being a subjective or introspective (psychological) phenomenon, cannot be measured numerically. It is a feeling experienced by the consumer. How can a feeling be quantified?

It is, however, pointed out that though utility cannot be measured cardinally or numerically, it can be measured ordinarily, *i.e.* the orders of utility as to higher or lower utility can be determined. Hence, that additional units of a commodity give a lower and lower (level) of satisfaction is perfectly true. Thus, the law is, of course, perfect, but its cardinal utility measurement is certainly questionable.

2. The law is based on unrealistic assumptions or conditions. The homogeneity, continuity, constancy and rationality conditions all together at a time are very difficult to find in practice.

3. The application of this law to the assumption of an indivisible bulky commodity seems to be absurd, because no one would normally buy at a time more than one unit of goods like T. V. set, refrigerator, scooter, house, etc. It would then be absurd to talk of increase in the stock of such goods and marginal utility thus derived.

4. The law unrealistically assumes constant marginal utility of money.

Importance of the Law

The law of diminishing marginal utility has great economic significance—theoretical as well as practical.

From the theoretical point of view, it may be laid down that :

(i) The law explains the behaviour and equilibrium condition of a rational consumer with respect to a single want and commodity.

(ii) Though utility cannot be measured cardinally, it can be compared and measured ordinarily, so the law cannot be discarded outright.

(iii) Diminishing utility is a universal truth for every consumption, otherwise, a single want also would remain insatiable.

(iv) The law explains the divergence between value-in-use and value-in-exchange of a commodity. Thereby it explains the paradox of values. In fact, the paradox of value-in-exchange and value-in-use in respect of commodities like water and diamonds can be explained in terms of the difference between marginal and total utility. For example, though the total utility of water is quite high, as also its value-in-use, its value-in-exchange is very low and insignificant, because its marginal utility is very low and diminishes very rapidly. On the other hand, even though the total utility of diamonds may not be as high as that of water, its price or value-in-exchange may be very high, just because its marginal utility is very high and it diminishes very slowly. Thus, marginal utility influences the value in exchange to a great extent, apart from the scarcity factor of a commodity. Marginal utility indicates the degree of intensity of a want. Total utility denotes only the extent of its satiation. The maximum total utility implies maximum satisfaction. But a higher marginal utility of a commodity implies that people want it very intensely, therefore, are ready to pay a higher price.

The law has the following practical significance as well :

1. To the producers, the law serves as a guide to promote sales by reducing price. Because when the price falls, to attain equilibrium, the consumer has to decrease the marginal utility to that extent. To do this, he has to purchase more goods, as the marginal utility diminishes only when the stock is increased.

2. The law is useful to the Finance Minister also in formulating an appropriate taxation policy. He can justify progressive taxation on higher incomes on the ground that rich people will feel a relatively lesser impact of the tax burden as their marginal utility of money is lower with the increase in income.

3. Similarly, socialists can agitate for a redistribution of wealth to promote welfare on the ground that the transfer will cause more gain to the poor and less loss to the rich.

✓ THE LAW OF EQUI-MARGINAL UTILITY

This law is an extension of the law of diminishing marginal utility. This law is also called the law of substitution or the law of maximum satisfaction. It is obvious that the law of diminishing marginal utility is applicable only to a single want with a commodity in one use. But, in reality, there may be a number of wants (more than one) to be satisfied at a time and these various wants are to be satisfied with several goods. To analyse such a situation, we have to extend the law of diminishing marginal utility and such extended form is called the law of equi-marginal utility.

The law of equi-marginal utility is based on the three characteristics of wants, viz. that wants are *comparative, substitutable and complementary*. The law takes the following axioms as its starting point :

- > 1. The consumer has limited income or limited stock of a given commodity.
- > 2. The consumer has more than one want to satisfy. This he can do either by purchasing the required number of commodities out of a given income or putting a given commodity to various uses to satisfy his different wants.
3. The consumer is rational and seeks maximum satisfaction.
4. He has no control over the price of the commodity, but the prices are given.

Under these conditions, we shall expose the law which shows how to acquire maximum satisfaction by spending a given income for purchasing various goods to satisfy a number of wants (i.e. optimum allocation of income expenditure).

Statement of Law

The law of equi-marginal utility states that, other things being equal, a consumer gets maximum total utility from spending his given income, when he allocates his expenditure to the purchase of different goods in such a way that the marginal utilities derived from the last units of money spent on each item of expenditure tend to be equal. That is to say, the consumer maximises his satisfaction when he obtains equi-marginal utilities from all the goods purchased at a time.

In a more analytical way, to consider the condition of consumer's equilibrium with respect to maximum total satisfaction, a proportionality rule in terms of equi-marginal utility has been formulated by Marshall. The proportionality rule states that when the ratios of marginal utility to prices of different goods are equalised with the given marginal utility of money income of the consumer, total utility so derived would be the maximum and the consumer will be at equilibrium under this condition. So long as the ratios of marginal utility of money are not equalised, the consumer will go on redistributing his expenditure from one commodity to the other, buying less of one and more of the other, i.e. substituting one for the other, till these ratios become equal. In symbolic terms, thus, the proportionality rule may be stated as under :

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c} = m$$

where,

MU = marginal utility,

P = price,

m = marginal utility of the given money income,
and a, b, c = refer to different goods.

Illustration of the Law

The law may be elucidated with the help of an imaginary example as follows :

Let us assume that :

- (1) A consumer has a given income of Rs. 24/-.
- (2) He wishes to spend this entire income on three different goods, a, b and c .
- (3) The prices of these goods are : Rs. 2/- per unit of a , Rs. 3/- per unit of b , and Rs. 5/- per unit of c .

- (4) The consumer has a definite scale of preference as revealed by the marginal utility schedule given below :

Units	1	2	3	4	5	6
Marginal Utility of <i>a</i>	30	20	16	8	6	4
Marginal Utility of <i>b</i>	24	15	9	6	3	1
Marginal Utility of <i>c</i>	15	10	8	5	1	0

- (5) The consumer is rational and seeks maximum satisfaction.

Now, the question is how would this consumer spend his Rs. 24, so that he derives maximum satisfaction.

As per the proportionality rule of the law of equi-marginal utility, we may solve the problem as under :

Table 3.5: Computation of the Ratios of Marginal Utility to Prices
($P_a = 2$, $P_b = 3$, $P_c = 5$)

Units	$\frac{MU_a}{P_a}$	$\frac{MU_b}{P_b}$	$\frac{MU_c}{P_c}$
1	$\frac{30}{2} = 15$	$\frac{24}{3} = 8$	$\frac{15}{5} = 3$
2	$\frac{20}{2} = 10$	$\frac{15}{3} = 5$	$\frac{10}{5} = 2$
3	$\frac{16}{2} = 8$	$\frac{9}{3} = 3$	$\frac{8}{5} = 1.6$
4	$\frac{8}{2} = 4$	$\frac{6}{3} = 2$	$\frac{5}{5} = 1$
5	$\frac{6}{2} = 3$	$\frac{3}{3} = 1$	$\frac{1}{5} = 0.2$
6	$\frac{4}{2} = 2$	$\frac{1}{3} = 0.33$	$\frac{0}{5} = 0$

As per the law, the consumer would get maximum total satisfaction, when :

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b} = \frac{MU_c}{P_c} = m \therefore \frac{6}{2} = \frac{9}{3} = \frac{15}{5} = 3.$$

Evidently, the consumer's optimum allocation of expenditure is :

Rs. 10 on commodity *a*, thus purchasing its 5 units ;

Rs. 9 on commodity *b*, thus purchasing its 3 units ; and

Rs. 5 on commodity *c*, thus purchasing its 1 unit.

It follows that total utility so derived tends to be :

$$TU_a = 30 + 20 + 16 + 8 + 6 = 80 \quad TU_b = 24 + 15 + 9 = 48;$$

$$TU_c = 15 \quad \therefore \Sigma TU = 80 + 48 + 15 = 143.$$

It is the maximum aggregate satisfaction.

5 units x Rs. 2 = Rs. 10/-
3 units x Rs. 3 = Rs. 9/-
1 unit x Rs. 5 = Rs. 5/-
Rs. 24/-

Diagrammatic Representation of Law

The operation of the law of equi-marginal utility explained above, can also be expressed graphically as in Fig. (3.3).

In Fig. 3.3 money expenditure of a given income is denoted on the x-axis. The y-axis represents utility. Curves MU_a , MU_b , MU_c are the marginal utility curves for the three assumed goods a , b and c respectively. It can be seen that these curves are drawn in such a way that they show the relative order of preferences of the given goods a , b and c (i.e. the first unit of commodity a gives more utility than that of b and so on). In graphical terms, now the consumer will allocate his given income in such a way that he will purchase

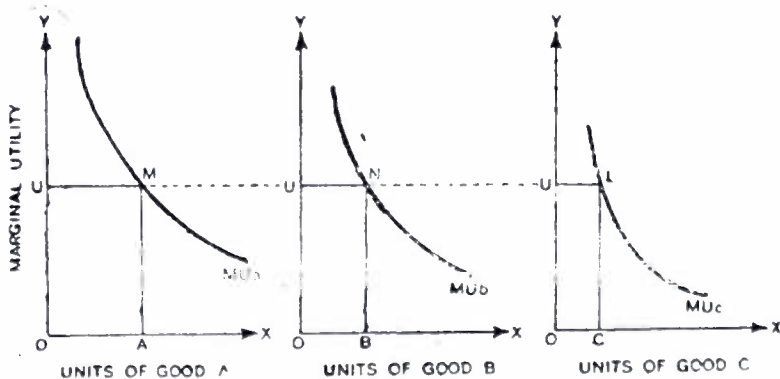


Fig. 3.3

OA units of good a , OB units of good b , OC units of good c . It is easy to see that by spending his income in this way, the consumer equalises the marginal utilities of each commodity purchased. Thus, marginal utility $MA=NE=LC$ or OU for each commodity. Obviously, his total satisfaction in this is maximum.

Relation between the Law of Diminishing Marginal Utility and the Law of Equi-marginal Utility

1. The law of equi-marginal utility is an extension of the law of diminishing marginal utility to consider the satisfaction derived from a number of commodities at a time. The law of diminishing marginal utility is applicable only to a single commodity whereas the law of equi-marginal utility is applicable to several commodities at a time. Therefore, it has greater practical value.

2. The law of equi-marginal utility also accepts the basic principle of diminishing marginal utility, i.e. as the stock of consumption of a commodity increases, its marginal utility decreases.

3. Both the laws advocate the same principle that marginal utility must be proportional to the price to maximise total utility. The law of diminishing marginal utility, however, deals with a single commodity only and states that no consumer shall pay a price for the commodity greater than its marginal utility. Thus, with a single commodity, his equilibrium condition is $MU = \text{Price}$. The same logic is extended further by law of equi-marginal utility and states that in the case of several commodities, the equilibrium condition is the marginal utilities of commodities should be proportional to their prices.

$$\text{Thus : } \frac{MU_a}{P_a} = \frac{MU_b}{P_b}, \text{ etc.}$$

$$MU_a \propto \text{Price}_a \quad (P_a)$$

$$\text{or } \frac{MU_a}{P_a} = \frac{MU_b}{P_b}, \text{ etc.}$$

Assumptions of the Law

The law of equi-marginal utility is based on the following assumptions:

1. The consumer is a rational economic man who seeks maximum total satisfaction.
2. Utility is measurable in cardinal terms.
3. The consumer has a given scale of preference for the goods in consideration. He has a perfect knowledge of utilities derived.
4. Prices of goods are unchanged.
5. Income of the consumer is fixed.
6. The marginal utility of money is constant.
7. The wants and goods are substitutable.

Limitations of the Law

The law has been subject to certain criticisms and limitations as follows:

1. The law is based on unrealistic assumptions. It being an extension of the law of diminishing marginal utility, involves all the unrealistic *ceteris paribus* assumptions and conditions such as homogeneity, continuity, constancy, etc.

2. The proportionality rule presumes cardinal measurement of utility, but it is not a realistic phenomenon.

3. The law cannot be applied to indivisible goods. On practical grounds, it looks ridiculous to equate utility of a T.V. set to coffee per rupee.

4. The consumer does not behave rationally all the time. Quite often, his behaviour is influenced by habit, social customs, fashions, advertising, propaganda, etc.

5. It has also been pointed out by many critics that it is wrong to assume that marginal utility of money will remain constant. Actually, when money is spent, the remaining units of money will tend to have a greater marginal utility. Thus, here there is a backward operation of the law of diminishing marginal utility.

Prof. Friedman, however, defends Marshall on this point stating that Marshall was perfectly right in his assumption, as only a part of income at a time is spent by the consumer on purchasing a few commodities. This income kept for allocation in the family budget can very well be assumed to be as given and its marginal utility of money will be constant as the marginal utility of money changes very gradually with large changes in the stock of money.

6. Ignorance on the part of consumer about market prices and utilities of different goods and the uncertain scale of preference due to his wavering mind also pose a limitation to the operation of this law.

Conclusion

Despite all these criticisms, it can, however, be concluded that every rational consumer tends to behave according to the law to derive maximum satisfaction, though he may not necessarily be forced to do so. On theoretical grounds, it is an analytical proposition of the law that the consumer can maximise his satisfaction only when the marginal utilities are equalised. Analysing the behavioural aspect of a consumer, the law is, thus, merely a statement of tendency that has been a common experience.

Significance of the Law

The law has theoretical as well as practical utility. Theoretically, it is a useful device for analysing the behaviour of a rational consumer. Though unscientific, logically it is a convincing tool to elucidate the conditions of consumer's equilibrium. It opens up analytical vistas; it serves as a background for the traditional theory of value.

The law has the following practical usefulness also :

1. *It applies to consumption* : It indicates how to get maximum satisfaction. With the help of the principle of substitution, the consumer is able to make the best choice of his wants to gain maximum total satisfaction. It serves as a guide to the consumer to effectuate the optimum

allocation of his income-expenditure. It, thus, determines the relative demand for different goods.

2. *It applies to production* : To the producer, the law is useful because the very principle of substitution lies in the optimum allocation of resources. The producer can have the most economical or optimal combination of factors of production (resources), when the last unit of investment expenditures brings equal productivity of all the factors of production employment.

3. *It applies to exchange* : This principle has an important bearing on the determination of value. The scarcity of a commodity is effected through rising prices in an exchange phenomenon—the market. It, thus, helps in readjustment of resources and adjustment of demand and supply by substitution, etc. and by equilibrating the price and market conditions.

4. *It applies to distribution* : The general theory of distribution involves the principle of substitution. In distributing the rewards of the various agents of production, their shares are determined by the principle of marginal productivity. An optimum distribution is one based on the marginal productivity of factors, and the factors tend to change their uses till their marginal production is equalised. This is how the law of substitution is applicable here.

5. *It applies to welfare and public finance* : Modern States are welfare States and consider the maximisation of social benefits in their revenue and expenditure activities. The principle of "maximum social advantage" involves the law of substitution when it proposes that the revenue must be distributed in such a way that the last unit of expenditure brings equal welfare and satisfaction to all classes of people.

CONSUMER'S SURPLUS

Dupuit originated the concept of consumer's surplus. But, it was Marshall who popularised it by presenting it in a most refined way. Marshall viewed that when a consumer buys a commodity, his satisfaction derived from it may be in excess of the dissatisfaction he has experienced in parting with money for paying its price. This excess of satisfaction is called consumer's surplus.

A consumer is willing to pay the price for a commodity upto its marginal utility compared with the marginal utility of money which he has to pay. If the marginal utility of a commodity is high while its actual market price is low, the consumer derives extra satisfaction, i.e., consumer's surplus. Consumer's surplus, therefore, can be measured as the

difference between the maximum price the consumer is willing to pay for a commodity and the actual market price charged for it. As Marshall put it, "the excess of the price which a consumer would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of this surplus of satisfaction. It may be called "consumer's surplus".

This concept is based on the law of diminishing marginal utility.

Prof. Marshall applies the phrase 'consumer's surplus' to the difference between the sum which measures total utility and that which measures total exchange value (*i.e.*, price paid). For, while the price that he has to pay for each unit is equal to the utility of the marginal unit, *i.e.* the last unit of the total, the utility of each of the earlier units is more than that of the last. Except on the last unit, therefore, he gains more utility than he loses by making the payments. His gain is more than the loss. This is the source of his surplus satisfaction.

Thus :

$$\text{Consumer's Surplus} = \text{Total Utility} - (\text{Price} \times \text{Quantity})$$

In symbolic terms :

$$\text{Consumer's Surplus (CS)} = TU - (P \times Q)$$

where, TU = total utility

Q = quantity of the commodity

P = price.

OR

Consumer's Surplus = Price prepared to pay — Actual price paid.

Table 3.6 illustrates the measurement of consumer's surplus.

Table 3.6 : The Measurement of Consumer's Surplus

Units of Commodity X	Marginal Utility $M.U.$	Market Price Paise	Consumer's Surplus = Price prepared to pay (= MU) — Actual Market Price
1	35	10	$35 - 10 = 25$
2	30	10	$30 - 10 = 20$
3	22	10	$22 - 10 = 12$
4	10	10	$12 - 10 = 0$
Total 4 units	$TU = 97$	40	$= 57$

Thus:

$$\begin{aligned} CS &= TU - (P \times Q) \\ &= 97 - (10 \times 4) \\ &= 97 - 40 \\ &= 57 \end{aligned}$$

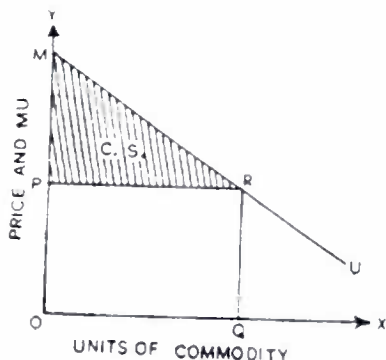


Fig. 3.4

If OP is price, OQ is the unit purchased

MU of $OQ = \text{Price } OP$

Total money paid $= OP \times OQ$

\therefore (Price paid) $= \cancel{OP} \times \cancel{OQ}$

Total utility $= OMRQ$ (Price prepared to pay)

$\therefore OMRQ - OPRQ = MRP$ (consumer's surplus).

This concept is based on the following assumptions :

- ✓ (1) Measurability of utility.
- ✓ (2) Constant MU of money.
- ✓ (3) Commodity in question does not have substitutes.

Criticisms

1. Assumptions are unrealistic.
 - (a) Utility cannot be measured cardinally, therefore, consumer's surplus cannot be measured and expressed numerically.
 - (b) Marginal utility of money does not remain constant.
 - (c) If commodities have substitutes, with the rising prices, he will purchase other goods rather than pay a higher price for the same. The concept has no theoretical validity.
2. It is meaningless to apply the doctrine of consumer's surplus to necessities, as the utility derived from necessities is infinite.
3. The concept is imaginary and illusory. It does not exist in reality. We create a surplus out of our imagination.
4. It is of no practical significance. Prof. Little says, "the doctrine of consumer's surplus is a useless theoretical toy."

It follows that a fall in price will cause an increase in consumer's surplus and a rise in price, a fall therein.

Importance of the Concept

1. The concept of consumer's surplus does emphasise the amenities that we enjoy in a modern society. Much of the consumer's surplus we enjoy depends on our surroundings and the opportunities of consumption available to us, e.g., amenities of life in America as compared to Central Africa. It thus clarifies conjunctural importance. The concept enables us to compare the advantages of environment, and opportunities or conjunctural benefits. The larger the consumer's surplus, the better off are the people. The concept, thus, serves as an index of economic betterment.

2. It is useful in price policy of a monopoly firm. The monopolist can put a higher price on the goods if consumer's surplus is high, without causing any reduction in sales.

3. It is of significance to the exchequer in determining indirect taxation. The finance minister can easily levy more taxes where consumer's surplus is high.

4. By estimating the difference in consumer's surplus resulting from a change in price, we can know and compare the effects of a given change in the price of any commodity on the different classes of people. It is, therefore, widely adopted in welfare economics.

5. Gains from international trade can be measured in terms of consumer's surplus obtained in the imported goods.

DEMAND

In common parlance, "demand" is conceived as a desire to possess a particular thing. But, in economics, demand is not the same thing as desire or want. To an economist, however, demand is an effective desire (or want for a thing). Desire becomes effective demand when it is backed by ability and willingness to pay for the goods.

Further, demand is not an absolute term. It is a relative concept. Demand for a commodity should have always a reference to price and time.

Thus, demand may be defined as the amount of commodity purchased or desired (effectively) by a person at a given point of time, and at a given price. Beuham defines demand thus: "The demand for anything looked always at a given price, is the amount of it which will be bought per unit of time at that price."

As Lipsey points out, economists are "concerned not with a single isolated purchase, but with a continuous flow of purchases." Thus, in