



Lecture Notes

Microeconomics

Semester I

Dr.Ranga Sai
Vaze College, Mumbai



Lecture Notes

On

Microeconomics

Part I

Dr. Ranga Sai
Vaze College, Mumbai

As per
Revised Business Economics I Syllabus for F.Y.B.Com from 2008 onwards
University of Mumbai

I Semester

Module I: Demand analysis

Utility: Cardinal and ordinal approaches

Indifference Curve Analysis

Properties of IC, Consumer Equilibrium, Price Effect, Derivation of demand curve from PCC

Consumer surplus

Elasticity of demand, Income, cross, promotional. Case studies-

Demand forecasting: meaning significance and methods-case studies

Module II Theory of production

Production function-short run and long run- Law of variable proportions- Isoquant- producers' equilibrium- returns to scale-economies of scale-economies of scope- case studies

Module III Cost of production

Concepts: social costs private costs, economic and accounting costs- fixed and variable cost curves in short and long run costs- Learning curve- producers' surplus- case studies

Please follow class room instructions before using notes

Indifference Curve Analysis

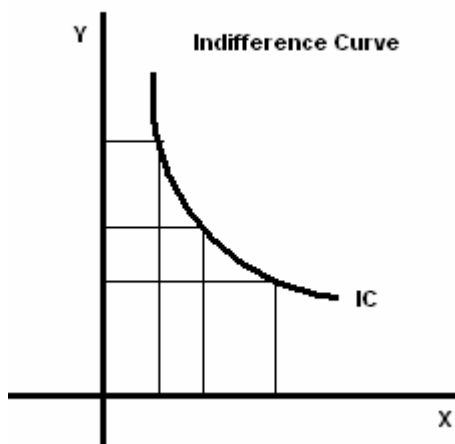
Consumption theory in economics contains two parts. Firstly, the theory studies the consumer behavior and secondly, the theory will suggest the consumer the way in which satisfaction can be maximized.

In utility analysis, the Law of Diminishing marginal utility studies consumer behavior and the law of Equi-marginal utilities suggested a method of maximizing consumer satisfaction.

Indifference curve analysis is a consumption theory given by Hicks and RGD Allen. The theory is an improvement over Utility analysis. Utility analysis had a major draw back that it measured utility in cardinal terms.

Indifference curve analysis measures utility in ordinal terms. Further, IC analysis provides wider descriptions and details as compared to utility analysis.

IC deals with various combinations of two goods which give the consumer the same amount of satisfaction.



Indifference Schedule	
X	Y
1	12
2	10
3	7
4	3

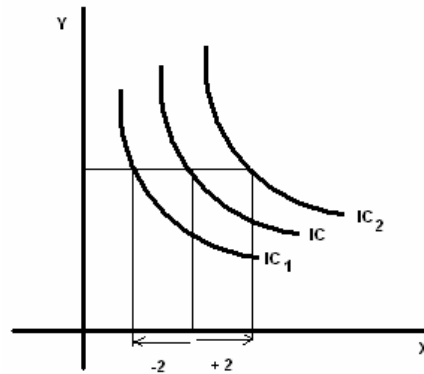
All these combinations give the consumer same amount of satisfaction. In this case the consumer will not be able to choose any combination as better than other. The consumer will be indifferent between these combinations. The curve drawn indifference schedule is called the IC.

Hicks use an IC to explain the consumer behavior.

ICs can be understood better with the help of its properties.

Properties of Indifference curves

1. Indifference curves towards the axis represent lower satisfaction and IC away from the axis represents higher satisfaction.

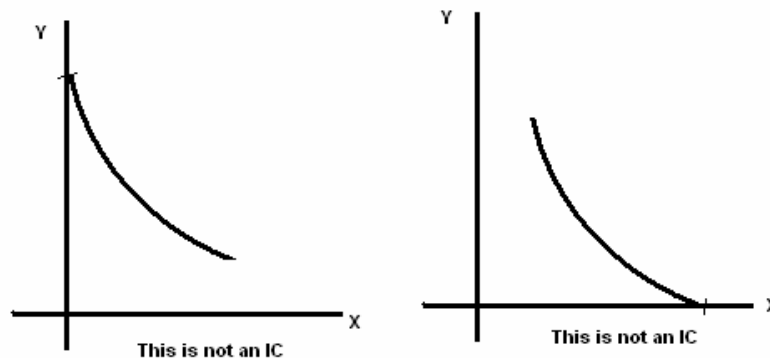


In the diagram IC 1 represents lower satisfaction and IC2 represents higher satisfaction.

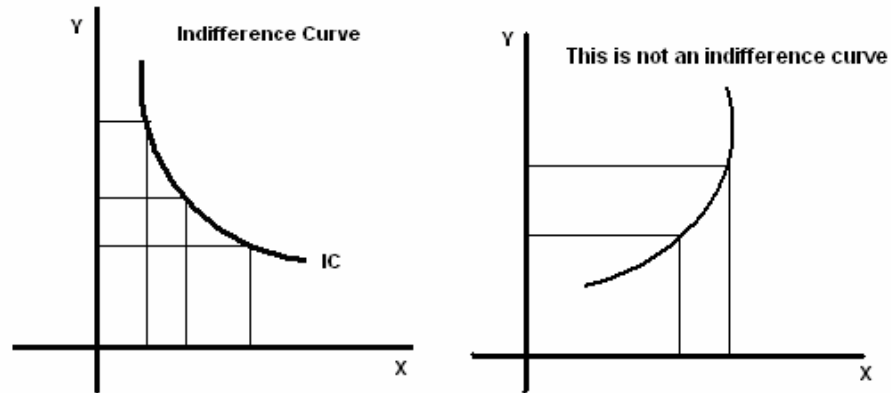
This is because on higher IC the consumption increases and on lower IC consumption decreases.

It can be seen that for the same amount of Y the consumer gets +2 on IC2 and gets -2 on IC1. Higher the consumption higher the satisfaction and lower the consumption lower the satisfaction

2. Indifference curves never touch the axis. By touching the axis the indifference curve will represent only one good. In fact an IC should necessarily represent two goods always.



3. Indifference curve is a down ward sloping curve. It slopes down from left to right. A consumer has to sacrifice one goods to gain the other. This is essential to keep the level of satisfaction constant on an IC.

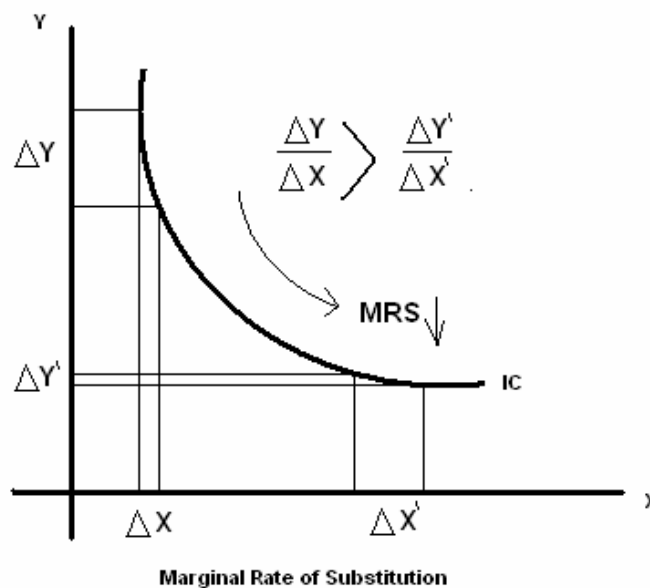


4. On an indifference curve the marginal rate of substitution decreases.

The **marginal rate of substitution**, is the rate at which a substitutes one commodity with the other.

By gaining one commodity the consumer shall sacrifice the other. This is needed to keep the level of satisfaction constant on an IC.

the slope of an indifference curve, $MRS = \Delta y/\Delta x$.



The marginal rate of substitution decreases on an IC. On the diagram it can be seen that

On the upper half, the consumer sacrifices 4 Y for 1 X, that is the rate of substitution is 4/1

On the Lower half it can be seen that the rate of substitution is 1/ 4 i.e. the consumer equates 1Y with 4 X.

This is because on the upper half the consumer has more of Y so he likes more of X and lower half he has more of X so he likes more of Y.

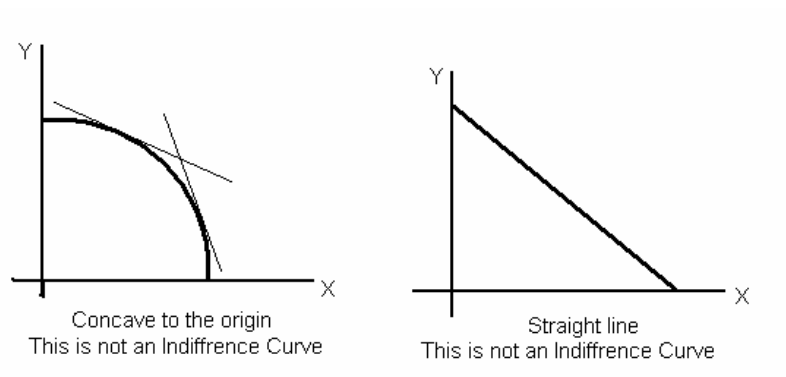
In this process the rate of substitution decreases from 4/1 to 1/ 4.

On an IC the consumer expresses his utility behavior through decreasing Marginal rate of substitution.

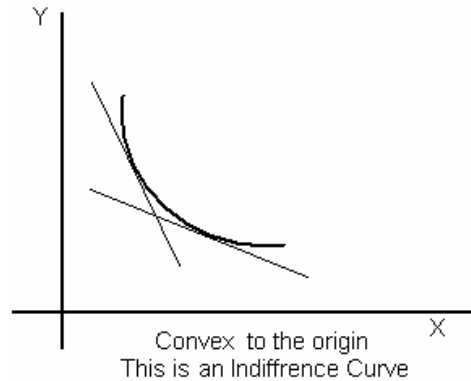
Comparing the IC analysis and the Utility analysis it can be seen that the marginal rate of substitution is equal to the ratio of the marginal utilities,

$$MRS = \Delta Y/\Delta X = - MU_x/MU_y$$

5. An indifference curve is convex to the origin. Only on a convex curve the marginal rate of substitution decreases. Slope of an IC is found by drawing a tangent. The slope of the tangent is the slope of IC at that point.



On a concave curve the slope of IC increases that is MRS increases. So it is not an IC. Similarly, a straight line has constant slope or constant MRS hence not an IC.

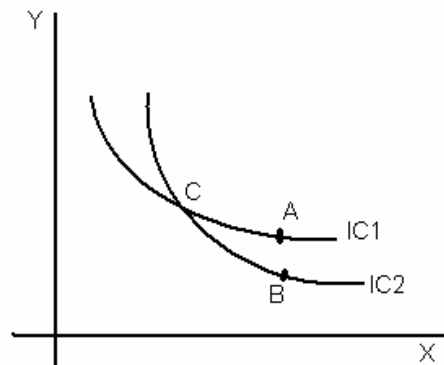


A curve convex to the origin has decreasing slope or decreasing MRS, hence, an IC.

6. Indifference curves need not be parallel. Converging indifference curves are accepted to be correct.

7. Indifference curves do not intersect. Indifference curves need not be parallel. Converging indifference curves are accepted to be correct but they shall not intersect. Intersection of Indifference curves is considered to be illogical, inconsistent and irrational.

In the diagram it can be seen that



Combination A gives larger satisfaction, because it is on a higher indifference curve IC1

And

Combination B gives smaller satisfaction, because it is on a lower indifference curve IC2

But

Combination C gives same satisfaction, yet it is on two indifference curves IC1 and IC2.

Two indifference curves can not give same satisfaction. This is illogical, inconsistent and irrational.

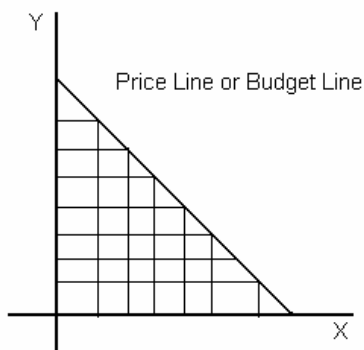
Foundations of Assumptions of Indifference curves:

Indifference curve analysis is based on the following assumptions:

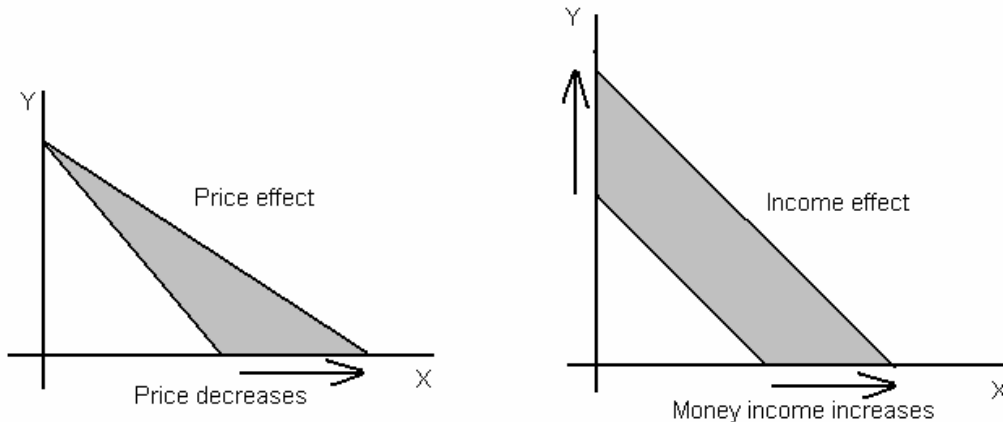
1. **Transitivity:** It is assumed that the combinations are continuous to form a curve. The combinations between two tested sets are given.
2. **Ordinality:** The indifference curve analysis considers ordinal measure of utility. That is utility is compared but not qualified.
2. **Rationality:** The consumer is rational. He always prefers higher satisfaction to the lower and he knows all the combinations giving him same satisfaction or different satisfactions.
3. **Convexity:** A convex indifference curve represents the consumer behavior. The convex IC shows the utility behavior with out actually measuring utility in cardinal terms.
4. **Scale of preference:** On a series of indifference curves the consumer has a preference increases from low to high. The consumer always prefers higher satisfaction to lower. This is called the scale of preference.

Price Line

The price line represents the budget of the consumer. It is made up of the money income of the consumer and the prices of two goods. The price line deals with various combinations of two good that a consumer can buy with in his limited income. This is only the possibility of buying and does not represent the choice of the consumer. Given the price line, the consumer can buy any combination on the line or combinations below the line.



When the price of a good decreases the real income of the consumer increases. Real income is what the consumer can buy with his money income. With this, the price line will shift upwards on a single axis (shift on X axis if the price of X decreases)



Similarly, if the money income increases the price line will shift upwards parallel on both axes.

Consumer equilibrium

The consumer equilibrium suggests the method in which he consumer can maximize satisfaction with in the given limitations of money income and prices.

The indifference curve analysis is an improvement over the utility analysis. It is given by Hicks and RGD Allen. As an improvement IC analysis uses ordinal measure of utility in place of cardinal measure.

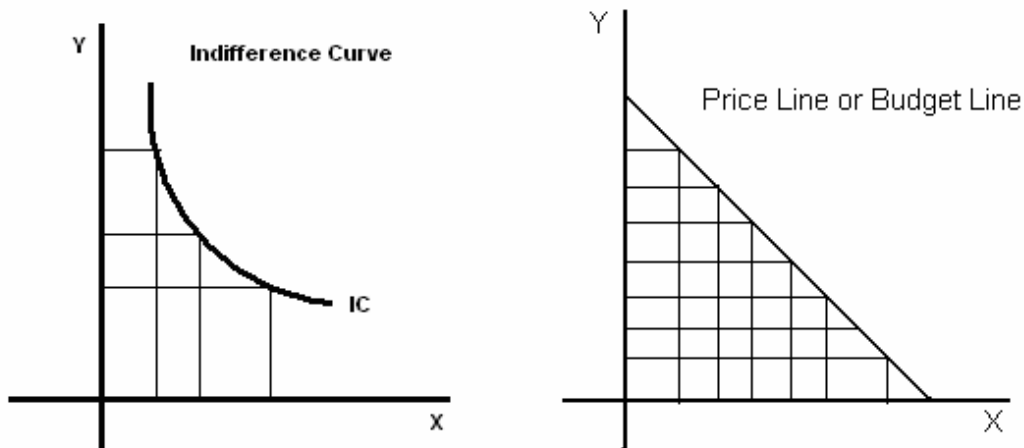
Assumptions

Consumer equilibrium is based on the following assumptions:

1. The prices of two goods are given and constant.
2. The money income of the consumer remains constant
3. The tastes and preferences of the consumer remain same
4. The consumer is rational, i.e. the consumer prefers larger satisfaction to smaller satisfactions.
5. The theory follows all the foundations of indifference curves, like convexity, transitivity, ordinality and scale of preference.

The consumer equilibrium considers the indifference map and the price line. The indifference map represents the consumer behavior, tastes and preferences of the consumer. On the other hand the price line represents income and the prices of two goods.

The indifference curve is made up of combinations the consumer wants to consume on the other hand the price line denote the combinations the consumer can buy. Consumer equilibrium determines such combinations which the consumer can buy, those which he likes and finally gets maximum satisfaction.



The consumer equilibrium is derived by combining the indifference curves and the price line.

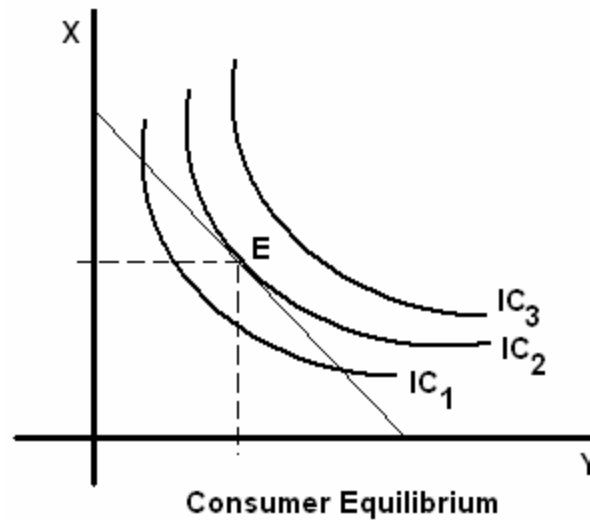
In the diagram

IC₃ is possible because the consumer can not reach this with his limited income.

IC₁ is possible because there are several combinations with in the budget; price line

IC₂ and the price line have one combination common. At the point of tangency between the IC and price line i.e. E.

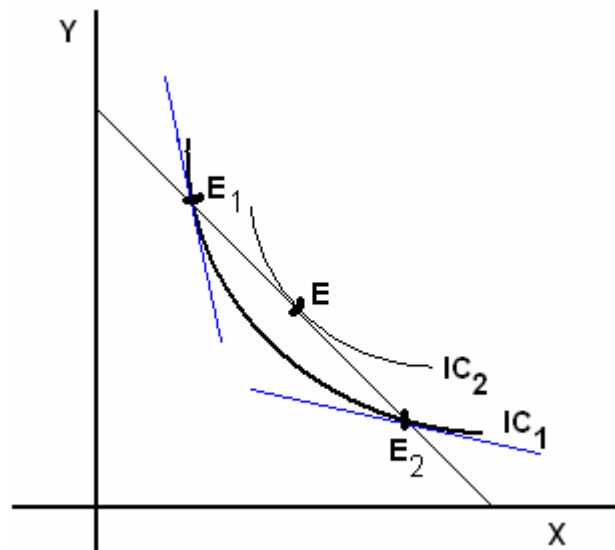
This is the consumer equilibrium. A combination which offers maximum satisfaction and is also falls with in the price line.



Conditions of Consumer Equilibrium

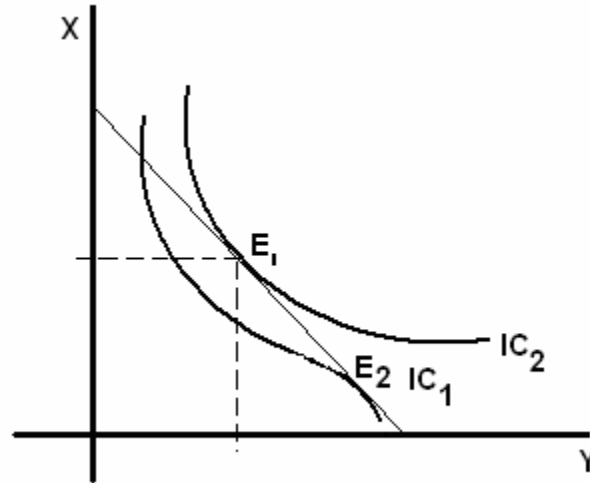
The consumer equilibrium is found at a place where Indifference Curve (IC) and Price Line (PL) are tangential.

Slope of the price line = Slope of the Indifference curve
 Or Slope of the price line = Marginal Rate of substitution
 [Equilibrium condition]



In the diagram

E₁ is not equilibrium because slope of IC > Slope of PL
 E₂ is not equilibrium because slope of IC < Slope of PL
 At E Slope of IC = Slope of PL, hence equilibrium



There are two conditions of consumer equilibrium

a. **Necessary Condition:** Tangency is a necessary condition. It is case of optimizing satisfaction. In the diagram E2 is a necessary condition. Yet it is not the equilibrium.

b. **Sufficient condition:** Tangency + convexity is sufficient condition. Tangency represents mathematical optimization and convexity denotes consumer behavior. In the diagram E2 is necessary condition. It fulfills tangency as well as convexity.

Such consumer equilibrium remains valid as long as the price and money income remain unchanged.

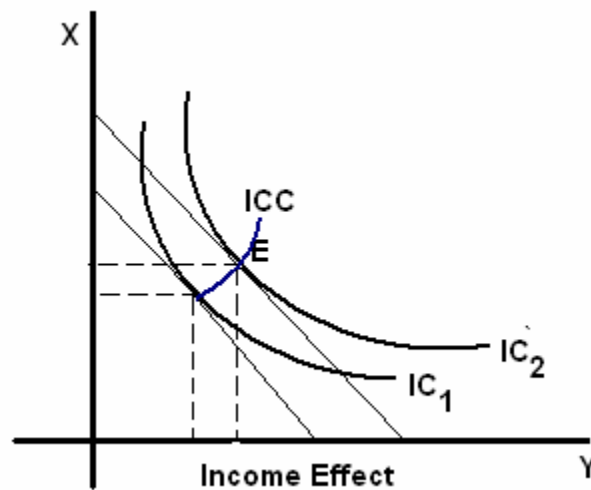
Income Effect

Income effect shows the effect of changes in the money income of a consumer on his consumption.

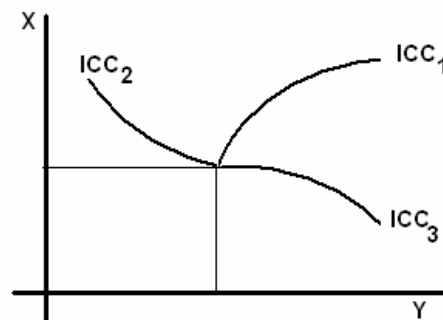
All other things remaining constant if the money income of the consumer increases, the price line will shift upwards parallel. An upward shift of price line indicates an increase in the income. With an increase in the income the consumer will consume more. The IC will shift upwards on the new price line. The increase in the consumption of a commodity is called income effect.

When the money income increases the consumer shifts on to IC_2 . The increase in consumption of X is called income effect. If we join the points of equilibrium an income consumption curve can be drawn.

Income consumption curve shows changes in the consumption of a commodity for changes in money income. The nature shape of the ICC indicates the nature of commodity, whether normal good, inferior or Giffen's good.



With increase in the money income if the consumption increases it is called positive income effect and if consumption decreases with increasing income it is called negative income effect.



The nature of income effect determines the shape of the Income Consumption Curve.

ICC_1 : If the ICC slopes upwards to the right both X and Y are normal goods with positive income effect.

ICC₂: If the ICC slopes backwards, Y is inferior with negative income effect and X is normal with positive income effect.

ICC₃: If the ICC slopes forwards to the right, X is inferior with negative income effect and Y is normal with positive income effect.

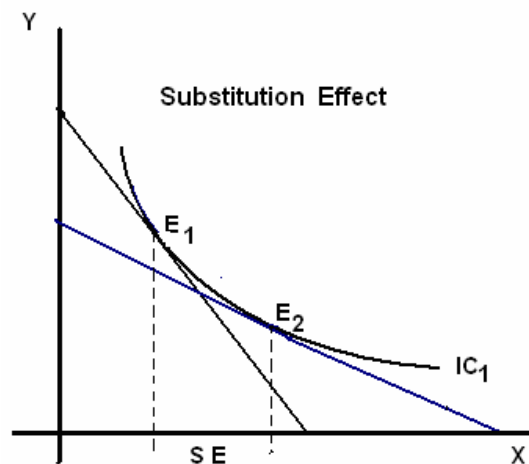
Assumptions

Income effect is based on the following assumptions:

1. The prices of two goods are given and constant.
2. The money income of the consumer is given and subject to changes.
3. The tastes and preferences of the consumer remain same
4. The consumer is rational, i.e. the consumer prefers larger satisfaction to smaller satisfactions.
5. The theory follows all the foundations of indifference curves, like convexity, transitivity, ordinality and scale of preference.

Substitution Effect

When the price of commodity decreases the consumer substitutes a costlier commodity with a cheaper commodity with out affecting the level of satisfaction. This is called Substitution effect.



In the diagram, the movement from E₁ to E₂ is called substitution effect. The consumer consumes more of X by sacrificing Y. The movement is on the same IC showing that the level of satisfaction remains same.

The substitution effect is always positive for normal as well as inferior goods. For Giffen's goods substitution effect is positive but very weak. Substitution effect together with income effect constitutes the price effect.

Price Effect

Price effect shows the effect of changes in the price of a good on consumption.

All other things remaining constant if the price of a commodity increases, the price line will shift upwards on that axis. An upward shift of price line indicates an increase in the real income. With an increase in the real income the consumer will consume more. The IC will shift upwards on the new price line. The increase in the consumption of a commodity is called price effect.

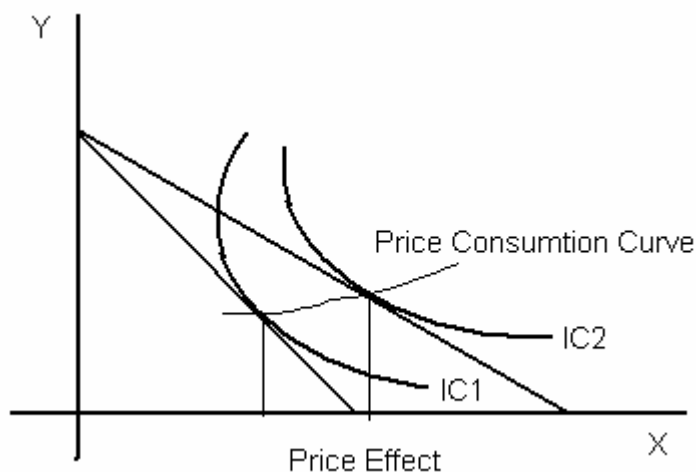
When the price decreases the consumer shifts on to IC2. The increase in consumption of X is called price effect. If we join the points of equilibrium a price consumption curve can be drawn.

Price consumption curve shows changes in the consumption of a commodity for changes in price. The nature shape of the PCC indicates the nature of commodity, whether normal good, inferior or Giffen's good.

Assumptions

Price effect is based on the following assumptions:

1. The prices of two goods are given and the price of one good only changes.
2. The money income of the consumer is given and constant.
3. The tastes and preferences of the consumer remain same
4. The consumer is rational, i.e. the consumer prefers larger satisfaction to smaller satisfactions.
5. The theory follows all the foundations of indifference curves, like convexity, transitivity, ordinality and scale of preference.

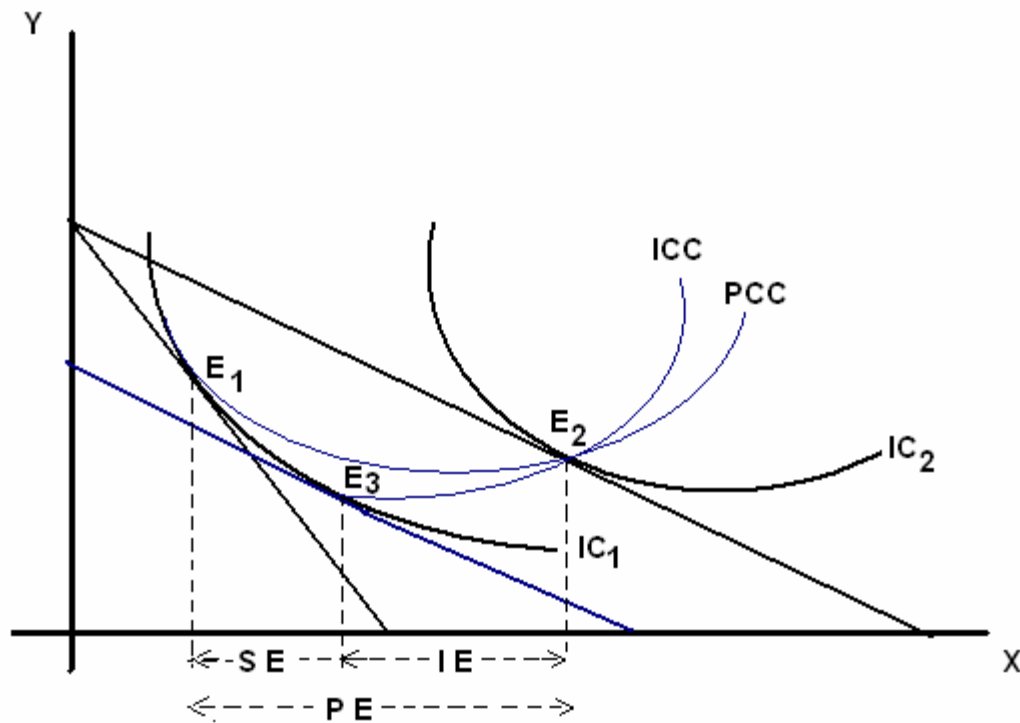


Composition of Price Effect

Price effect is made up of income effect and substitution effects. When the price of a commodity decreases:

- a. The real income increases and the consumer consume more of a commodity. This is called income effect.
- b. When a commodity becomes cheaper the consumer has a natural tendency to substitute the costlier commodity with a cheaper commodity. This is called as substitution effect.

Thus, $\text{Price Effect} = \text{Income Effect} + \text{Substitution Effect}$



In the diagram

E1 is the consumer equilibrium

With a decrease in the price of X the price line shifts upwards and the consumer will shift on to IC2 at equilibrium E2. The movement from E1 to E2 is called Price effect

To separate income effect from price effect-

Shift the price line parallel from E2 downwards, so as to reach IC1 at E3.

A parallel downward shift indicates decrease in the income.

The price line shall be shifted to such level on IC1 that the consumer comes back on to his original level of satisfaction.

With a decrease in income effect the consumption is reduced to E3, The consumption from E1 to E3 is substitution effect, found on the same IC.

According to Hicks the price line should be shifted on to lower IC such that the ‘consumer is neither better off nor worse off’

Nature of Price Effect

Positive price effect means with a decrease in the price the consumption increases. This is same as the law of demand. The exception to the law of demand is negative price effect.

The price effect is positive for normal goods and inferior goods. There are some inferior goods where the price effect is negative. These goods with negative price effect are called Giffen’s goods.

The price effect depends on the components - income and substitution effects.

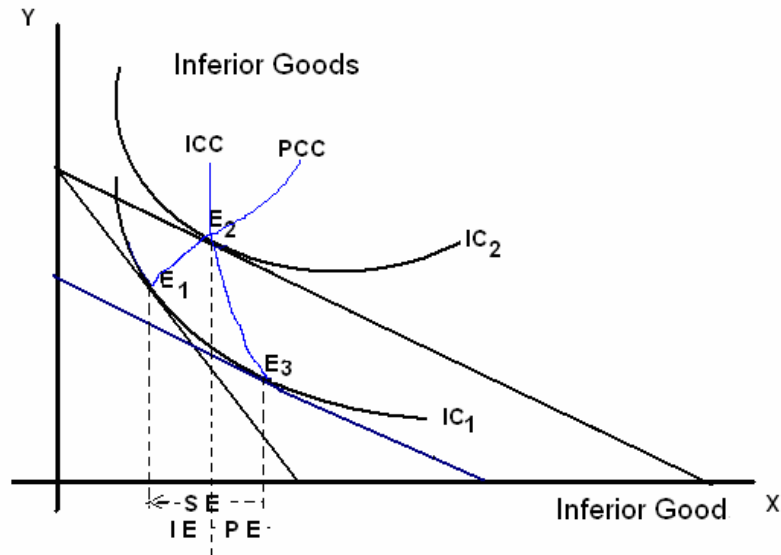
	Income Effect	Substitution Effect	Price effect
Normal Goods	+ve	+ve	+ve
Inferior goods	-ve (weak)	+ve (strong)	+ve
Giffen’s Goods	-ve (strong)	+ve (weak)	-ve

For normal goods the price effect is positive because the components income and substitution effects are positive.

Inferior Goods

In case of inferior goods in general, the price effect is positive.

The income effect is negative but very weak. The substitution effect is positive and very strong. So finally, the price effect remains positive.

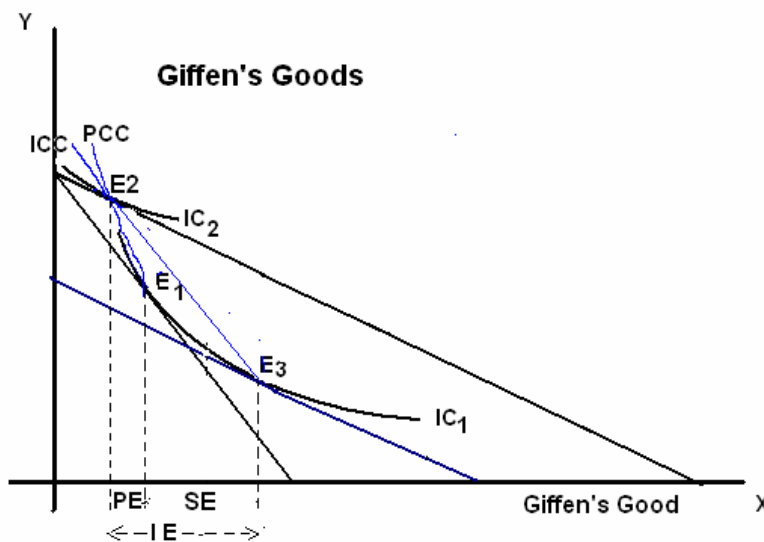


In the diagram:

The movement from E₃ to E₂ is negative income effect. This is negative
 The movement from E₁ to E₂ is positive substitution effect which positive and strong.

So, finally, the movement from E₁ to E₂ is positive price effect.
 Inferior goods in general follow the law of demand with positive price effect.

Giffen's Goods



Giffen's goods are those inferior goods where the income effect is strongly negative and substitution effect is weak.

Giffen's goods are inferior goods but all inferior goods are not Giffen's goods. Giffen's goods are those inferior goods which have a negative price effect.

In the diagram:

The movement from E3 to E2 is negative income effect. This is negative and strong

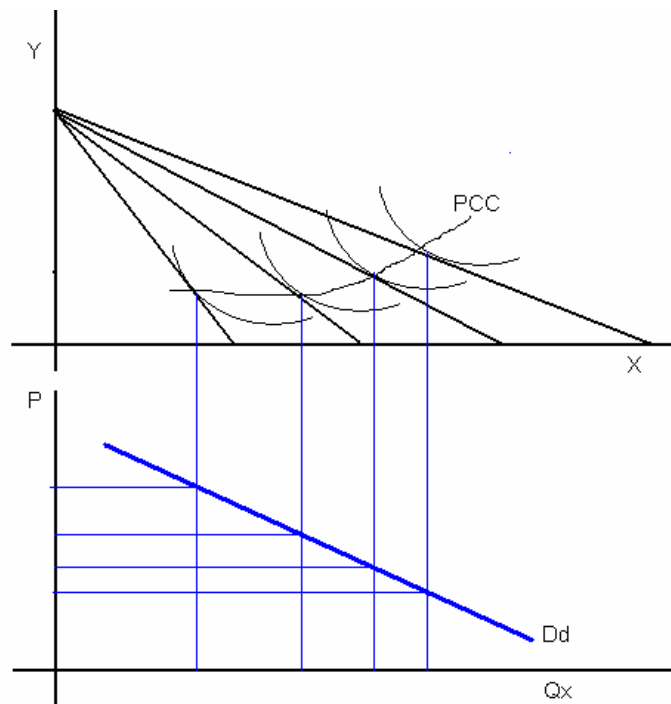
The movement from E1 to E2 is positive substitution effect which is positive but weak.

So, finally, the movement from E1 to E2 is negative price effect.

Derivation of demand curve from Price Consumption Curve

For drawing the demand curve there is a need for a set of prices and corresponding quantities. The Price Consumption curve shows different price lines. Each price line represents one price of commodity X. The corresponding quantities can be read from the X axis at different equilibriums.

The quantities from different equilibriums are drawn on the lower graph with X axis marked quantity. The price at different quantities can be plotted on the Y axis. By joining all the points the demand curve can be drawn on the lower panel.



Utility Analysis and Indifference Curve Analysis

Utility Analysis

Marshall

Cardinal measure of utility

Law of Diminishing Marginal Utility

Consumer Equilibrium

$$\frac{MU_a}{P_a} = \frac{MU_b}{P_b}$$

$$\frac{MU_a}{MU_b} = \frac{P_a}{P_b}$$

Indifference Curve Analysis

Hicks and RGD Allen

Ordinal Measure of Utility

Decreasing MRS on an IC

MRS = Slope of price line

$$MRS = \frac{P_a}{P_b}$$

$$\frac{MU_a}{MU_b} = MRS$$

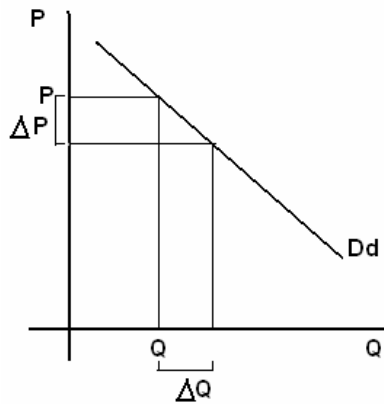
Elasticity of Demand

Elasticity of demand measures intensity of changes in the quantity of a commodity for changes in the price, income or the price of a related commodity. Accordingly, it is called price elastic, income elasticity or cross price elasticity of demand.

Price Elasticity of demand

Price elasticity of demand measures proportionate changes in the quantity of a commodity for proportionate changes in the price.

Price elasticity relates quantity demanded and the price.



Price elasticity is measured as

$$\begin{aligned}
 e_p &= \frac{\text{Proportionate change in the quantity}}{\text{Proportionate change in the price}} \\
 &= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} \\
 &= \frac{\Delta Q}{Q} \cdot \frac{P}{\Delta P} \\
 &= - \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}
 \end{aligned}$$

The price elasticity has a negative value, because the price decreases for an increase in the quantity demanded.

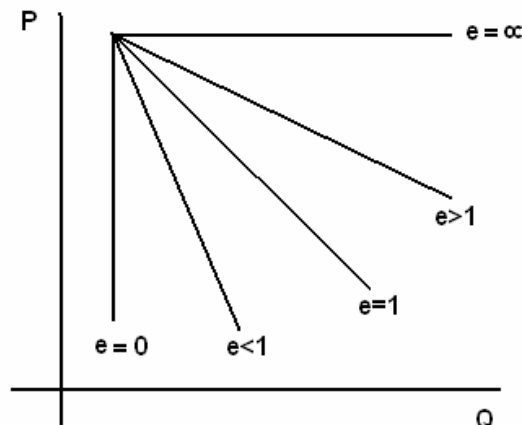
$e_p = 1$, Unitary elastic, reference elasticity

$e_p > 1$, Relatively elastic, luxury goods

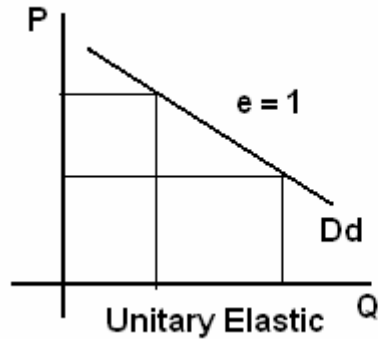
$e_p < 1$, Relatively inelastic, necessary goods

$e_p = \infty$, Perfectly elastic, hypothetical

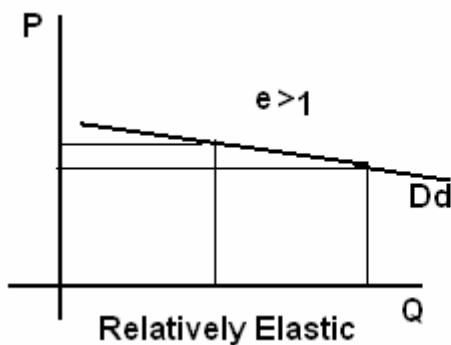
$e_p = 0$, Perfectly inelastic, hypothetical



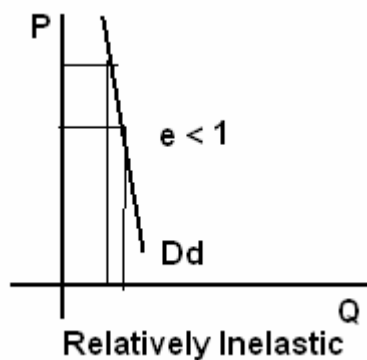
The value of elasticity changes with changing responsiveness of quantity changes for changes in the price. Larger the responsiveness greater will be the elasticity. No change in the quantity the elasticity will be zero. For highly sensitive quantity, the elasticity will be infinity.



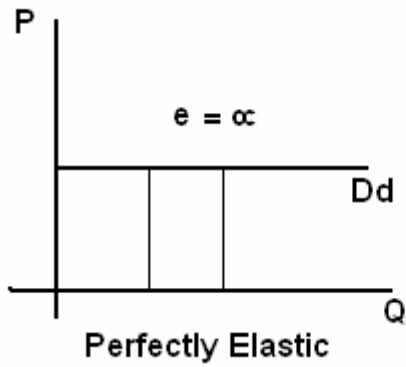
$$\frac{\Delta Q}{Q} / \frac{\Delta P}{P} = 1$$



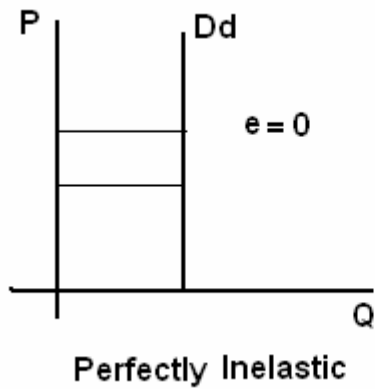
$$\frac{\Delta Q}{Q} / \frac{\Delta P}{P} > 1$$



$$\frac{\Delta Q}{Q} / \frac{\Delta P}{P} < 1$$



$$\frac{\Delta P}{P} = 0$$

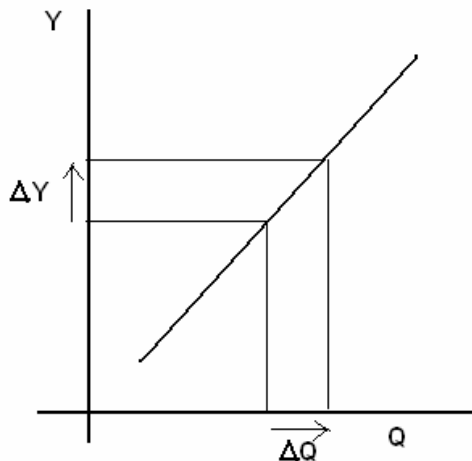


$$\frac{\Delta Q}{Q} = 0$$

Income Elasticity of demand

Price elasticity of demand measures proportionate changes in the quantity of a commodity for proportionate changes in the price.

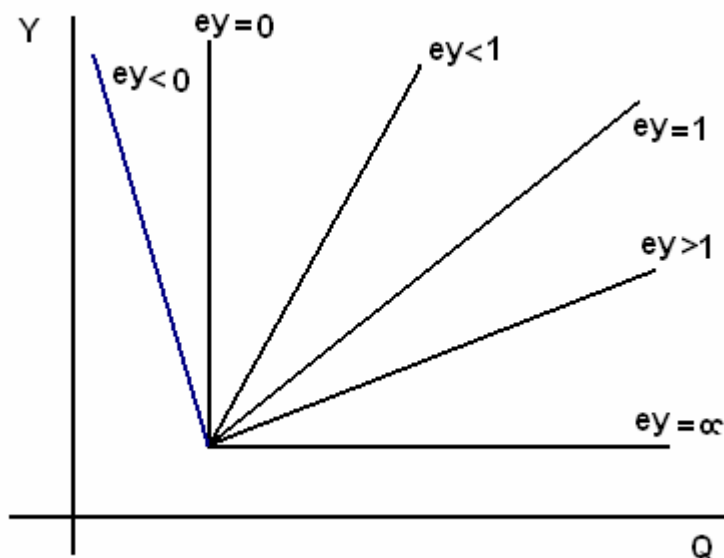
Income elasticity relates quantity demanded and the income.



With an increase in the income the consumer increases the consumption. This happens in case of normal goods. In case of inferior goods with increase in the income the consumer decreases the consumption. This is called negative income effect.

$$\begin{aligned}
 e_y &= \frac{\text{Proportionate change in the quantity}}{\text{Proportionate change in the Income}} \\
 &= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta Y}{Y}} \\
 &= \frac{\Delta Q}{Q} \cdot \frac{Y}{\Delta Y} \\
 &= \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q}
 \end{aligned}$$

For normal goods the value of income elasticity is positive for inferior goods it is negative,



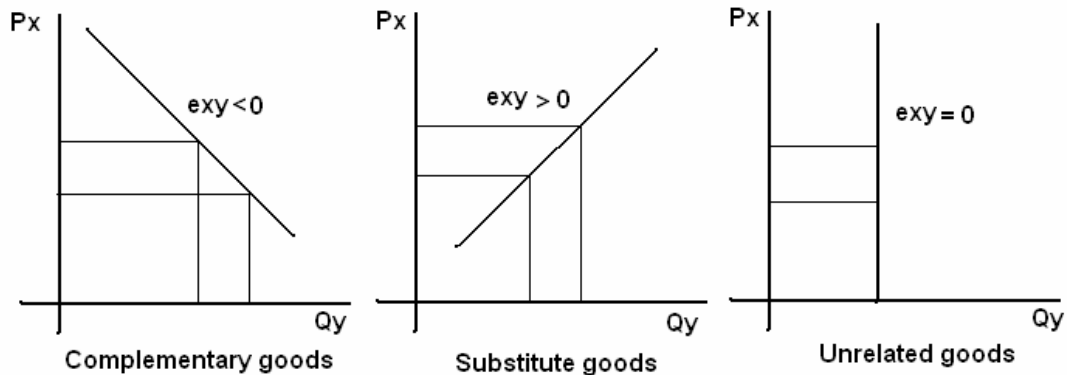
$e_y = 1$, Unitary elastic, reference elasticity
 $e_y > 1$, Relatively elastic, luxury goods
 $e_y < 1$, Relatively inelastic, necessary goods
 $e_y < 0$, Inferior goods
 $e_y = 0$, Perfectly inelastic, hypothetical
 $e_y = \infty$, Perfectly elastic, hypothetical

positive income effect
 positive income effect
 positive income effect
 negative income effect

Cross Price Elasticity of Demand

Price elasticity of demand measures proportionate changes in the quantity of one commodity for proportionate changes in the price of a related commodity.

Cross Price elasticity relates quantity demanded of one commodity and the price of a related commodity.



$$\begin{aligned}
 e_{xy} &= \frac{\text{Proportionate change in the quantity of Y}}{\text{Proportionate change in the price of X}} \\
 &= \frac{\frac{\Delta Q_y}{Q_y}}{\frac{\Delta P_x}{P_x}} \\
 &= \frac{\Delta Q_y}{Q_y} \cdot \frac{P_x}{\Delta P_x} \\
 &= \pm \frac{\Delta Q_y}{\Delta P_x} \cdot \frac{P_x}{Q_y}
 \end{aligned}$$

The value of cross price elasticity depends on the type of relationship between the goods.

$e_{xy} < 0$, Complementary goods

When the price of X increases, the demand for x decreases, the consumer decreases the demand for Y. Since, X and Y are complementary goods.

Complementary goods are those which give utility only in combinations. These are called joint goods having joint demand. e.g. shoe and shoe lace, pen and ink

$e_{xy} > 0$, Substitute goods

When the price of X increases, the demand for x decreases, the consumer increases the demand for Y. Since, X and Y are substitutes.

Substitute goods are those goods which give similar utility. Since the goods give similar utility the consumer can consume one in the place of the other.

$e_{xy} = 0$, Unrelated goods

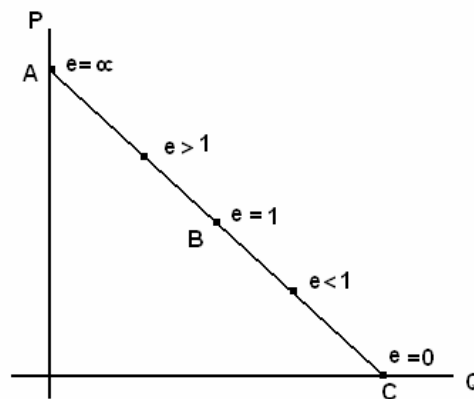
If the price of X increase the demand for Y remains unchanged this is because the goods are unrelated and independent in consumption and utility.

Point Elasticity of Demand

According to Lucas all goods tend to be elastic at higher prices and inelastic at lower prices. This principle can be shown geometrically on a demand curve using point elasticity of demand method.

It is ratio of lower segment to the upper segment.

The elasticity increase as it moves upon the demand curve to the left.



The demand curve is extended on both sides so as to make a right angle triangle.

Then the elasticity at point is measured as

$$E = \frac{\text{Lower segment}}{\text{Upper segment}}$$

$$\text{Or } \frac{BC}{AB}$$

So

$e = 1$, Unitary elastic, reference elasticity

$e = 0$, Perfectly inelastic, hypothetical

$e > 1$, Relatively elastic, luxury goods

$e < 1$, Relatively inelastic, necessary goods

$e = \infty$, Perfectly elastic, hypothetical

Promotional Elasticity of Demand

Promotional elasticity of demand measures proportionate changes in the sales of a commodity for proportionate changes in the promotional budget. Price elasticity relates sales and the promotional budget.

$$\begin{aligned}
 e_{P'} &= \frac{\text{Proportionate change in the Sales}}{\text{Proportionate change in the promotional budget}} \\
 &= \frac{\frac{\Delta S}{S}}{\frac{\Delta P'}{P'}} \\
 &= \frac{\Delta S}{S} \cdot \frac{P'}{\Delta P'} \\
 &= \frac{\Delta S}{\Delta P'} \cdot \frac{P'}{S}
 \end{aligned}$$

Promotional elasticity is a managerial tool of corporate decision making. It enables the enterprise to decide whether a sales promotion budget is desirable or not in terms of generating corporate incomes and sales.

An elastic promotional elasticity means that the sales are in larger proportions than the promotional budget and desirable. If the promotional elasticity is less than one that inelastic it means that the promotional budget has failed in promoting proportionate sales, hence undesirable. The promotional budget may have components like media, advertising, sales promotions, free samples, gifts, promotional offers etc.

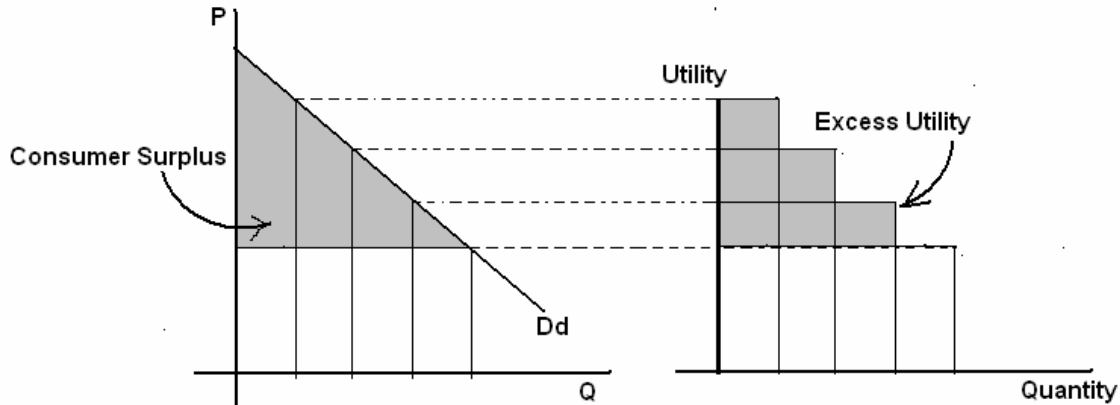
Consumer Surplus

Consumer surplus is the excess of Utility drawn over the price paid. According to the law of demand the price decreases with increasing quantity. This is because the utility decrease with increasing consumption as per the law of diminishing marginal utility.

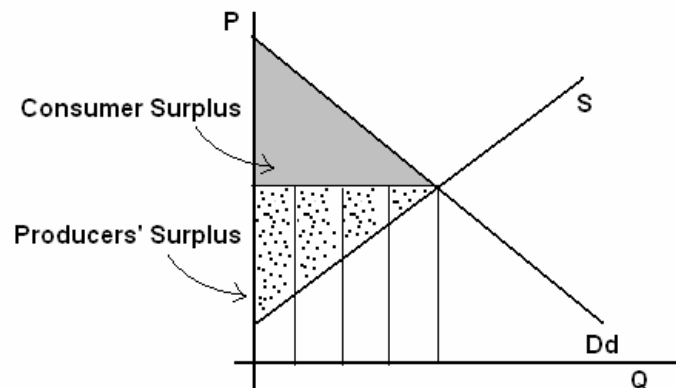
A consumer pays the price according to the utility drawn on the last commodity. This price is uniform for all the earlier units. In this process the

consumer derives surplus utility over the price paid on earlier units. This surplus utility is called the Consumer Surplus.

$$\text{Consumer surplus} = \text{Utility derived} - \text{price paid}$$



Consumer surplus is the excess of utility derived by consumer. The producer surplus is the surplus of price charged by the producer over the supply price. The supply curve shows that the price increases with increasing quantity. The price is charged as per the last unit produced, whereas the producer receives a surplus over the supply price. This is called producers' surplus. The producers' surplus can be increased by reducing consumer surplus. This is called consumer exploitation.



Assumptions

1. The concept believes in the law of diminishing marginal utility
2. The law of demand is considered for determining the price.
3. The price remains uniform.
4. The supply of goods is uniform.
5. The tastes of the consumer remain constant
6. There is perfect competition.

Limitations

The concept of consumer surplus has several limitations due to its rigid assumptions.

1. The utility can not be measured
2. Consumer surplus can not be easily quantified.
3. Market imperfections deny consumer surplus to the consumer.
4. Marketing techniques increase consumer surplus by showing greater utility and then in crease price.
5. Consumer surplus encourages the government to levy tax.

Applications:

Consumer surplus is a very useful concept applied in marketing, product design and pricing.

1. It helps in determining the price. Larger the consumer surplus, greater the possibility of increasing the price.
2. The Government can determine tax based on consumer surplus.
3. Under monopoly, the producer charges different prices for the same commodity depending on the consumer surplus. It helps on price discrimination.
4. Necessities have larger consumer surplus than luxury goods.
5. Consumer surplus helps in demand forecasting.

Demand forecasting

Demand forecasting refers to future market situation. Demand forecasting is an important technique of corporate decision making. It enables a firm decide upon a commodity for production among several or helps in understanding the future market of a given product.

Nature and significance of demand forecasting

1. Demand forecasting starts with defining the product or the product mix. This will depend on the nature of firm and its corporate image.
2. Once the product is decided the forecast will now describe the buying objectives of the product. The buying objectives will determine the target population for whom the product is being produced.
3. The buying objectives will influence the product design, the cost and ultimately, the price.
4. Depending on the product design, the inputs are drawn. The factors need to be imported or domestically procured. The demand forecast will provide the sources and the costs.
5. To define the market prospects the product is identified with the product cycle. The product may belong to any of the states of product cycle: interdiction, growth, competition, stagnation or decay. The stage to which the product belongs will determine the selection of the product and forecast.
6. Specialized inputs and labour may require efforts in procuring and training.
7. The production and delivery schedule is drawn depending on the market. Seasonal good may have different delivery schedule as compared with a regular good of consumption.
8. The price is decided and the cash flows are estimated. The sales, revenue profits, costs and the rates of return are estimated for period of three to five years.
9. The market is described with respect to risk of competition, Government policy, future prospects. In case of any risk the possible methods of overcoming risk will be indicated.

Such demand forecast will be useful for a firm in taking decisions.

Process of demand forecasting

The process of demand forecasting depends on the nature of product and nature of firm. The process differs from firm to firm and product to product.

1. The demand forecast has to first consider the corporate policy. The product to be produced depends on the firm and the nature of market image it carries.
2. There after the approach to demand forecast changes between an existing firm and a new firm. An existing firm will have historical data which can be used for future analysis, where as a new firm has to generate relevant data from the market.
3. Depending on the product, firm and market the method of demand forecasting will be selected. Thus a model is built with all required parameters.
4. The tolerance limits are defined. These are the accuracy levels of the forecast. The accuracy level will determine whether to accept or reject the model.
5. The Model goes for sample testing in a limited region to see all the needed information is got. The trial run will help in making modifications to the model, if need be.
6. When the model is successful, the larger study is conducted and the results are analyzed.
7. Finally, the forecast will provide projected cash flows for five years to come. Notes, definitions are given together with risk and methods to risk management. A detailed description on the market trends and the prospects of the product to be marketed is appended.

Methods of Demand forecasting

There are different types of demand forecast each meant for a specific objective and has a specific data requirement and ha specific information to offer.

The methods of demand forecasting can be classified into two groups:

- A. Statistical or Quantitative methods of demand forecasting
- B. Survey methods of demand forecasting

A. Quantitative OR Statistical methods of Demand forecasting

Quantitative methods of demand forecasting need a large data base for analysis. It is more suited for older firms with historical data. Quantitative methods provide accurate results but skills in analysis and interpretation will it more effective.

Some of the quantitative methods are static and consider only limited variables. The active forecasts use highly developed mathematical tools of analysis and provide accurate and dependable results.

1. Linear equation

Linear equation is the simplest of quantitative methods of demand forecasting applied on time series data. It assumes a constant rate of change of sales and based on the change coefficient, the sales for any future year is estimated.

Illustration

Given, initial sales (a) of 1500 tons and an annual increase (b) of 500 tons, the out put can be estimated for any future year, with the equation:

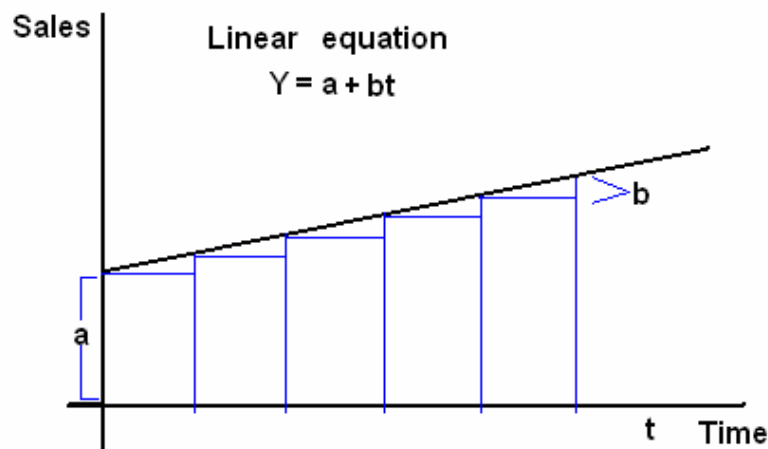
$$\text{Sales, } Y = a + bt,$$

Where **a** is the initial sales, **b** is the annual expected change and **t** is the time period.

The projected sales after 5 years will be

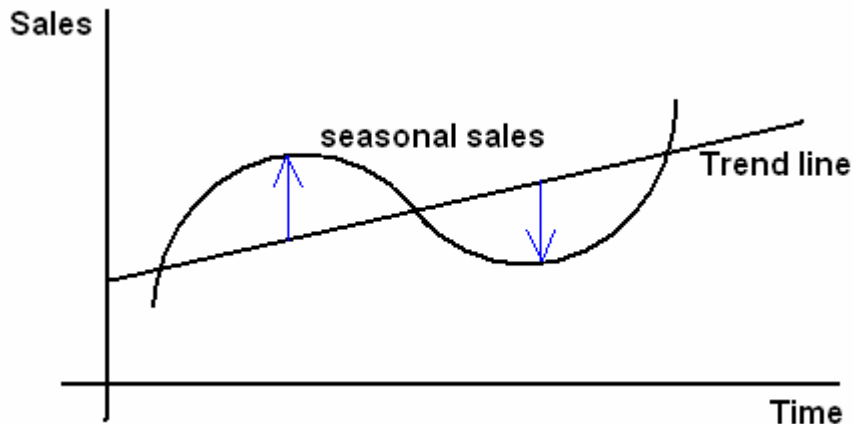
$$\begin{aligned} \text{Sales, } Y &= 1500 + (500 \times 5) \\ &= 1500 + 2500 \\ &= 3,500 \end{aligned}$$

The linear equation is a static method of quantitative demand forecasting. It assumes a constant rate of change. Though it is not the most accurate method, it is commonly used as preliminary estimate.



2. Trend line

Seasonality is a characteristic of time series data. It prevents the usage of any liner method of demand fore casting. For this reason, the data needs to be corrected for the seasonality before any method is applied.



The seasonality is time series data can be corrected in different ways. One method is applying the statistical method of trend fitting or least squares method.

A trend line is fitted in such a manner that the positive variations are same as the negative variations. In other words the trend should be an average of the seasonal changes. In other words the trend line should be so fitted that the square of the deviations is least.

3. Moving averages

The seasonality is time series data can be corrected by applying the statistical method of moving averages. The date is studied to first find out the period of seasonality. Then a moving average is calculated by taking average of that period, sequentially, each year. Each year one earlier observation is dropped and a later observation is included. This way, the set of averages of the reference period is computed.

Normally, after applying the moving averages the trend becomes clear. If the trend can not be found the moving averages is repeated with different time period or on the same period again.

Year	Sales		3 year moving average
2000	200	—	—
2001	300	900	300.00
2002	400	1020	340.00
2003	320	1170	390.00
2004	450	1370	456.67
2005	600	1500	500.00
2006	550	1850	616.67
2007	700	—	—

In the illustration a moving average of three years is applied and the trend is brought out.

4. Regression equation

Regression equation deals with the relation between the quantity demanded and the factors determining it. The process begins with the demand function

$$\text{Quantity demanded, } Q_d = f(P, P_c, T, A)$$

Once the demand function is identified the nature of effect is described and the intensity of relation is qualified in terms of figures. Then the regression equation is cast as an input output relation

$$\text{Quantity demanded, } Q_d = a - 0.8 P + 0.3 P_c + 0.2 T + 0.9 A + E$$

Where, P - is the price P_c - the price of the competitors, T - tax, A - advertising, and E - stochastic variable, explaining the change not explained by the existing variables

With this equation all the factors are brought out. The demand forecast can be managed with the help of these parameters.

B. Survey methods of demand forecasting

The survey methods of demand forecasting provide descriptive analysis. The method is suitable for consumer goods, for firms which are new. Hence there is no need for historical data, the methods uses cross sectional data.

There are several survey methods which collect information from those whose decisions determine the market demand.

1. Consumer survey

The consumer survey collects information from the consumer directly on the nature of product price payable, qualities and attributes, the position of a given product with respect to other competing goods, customer satisfaction and the utility.

The consumer opinions can be collected in questionnaire designed specific to the purpose and the opinions can be solicited in three different ways.

- a) By mail: Collecting information from consumers through post is most economical and the methods can provide large information. This method gives enough time for the respondent. But the method may consume more time and information can be, at times, spurious.
- b) By telephone: Telephonic interviews help in getting candid opinions. This method gives quick results and it is very economical. However the method may be confined to those consumers having telephone facility.
- c) By personal interviews: Interviews are by far the best method of collecting consumer opinion. The method can provide more information than the study expect. However, the method can be very expensive and time consuming

2. Expert opinion study

This is also called the Delphi methods. The method depends on the opinion of experts in determining the nature of demand forecast. In case of certain good, the consumer opinions may not be important. The consumer may depend on the experts for advice. Medicines, sport equipment, text books, health drinks belong to this category.

3. End use study

The method collects opinions of the user sector in estimating the demand for a given product. The method is suitable for industrial products/ intermediate

goods; those goods which become input for some other firm to become consumer goods.

For such goods the demand for the end product will determine the demand for the intermediate goods.

E.g. steel, cotton, cement etc.

4. Simulated market / Consumer clinics

Simulated market is a model market which represents the actual market. In a simulated (artificial) market the consumers are let in predetermined amounts of money. The consumers buy goods with this money. The choice of the consumers provides valuable and most dependable information for the study. This method is most dependable, accurate and quick in giving information

5. Export potential study

Export potential studies generally apply linear models with large descriptive notes on the cultural pattern of consumption and Government/local practices. These are statistical models as well as opinion studies.

Active and Passive forecasts

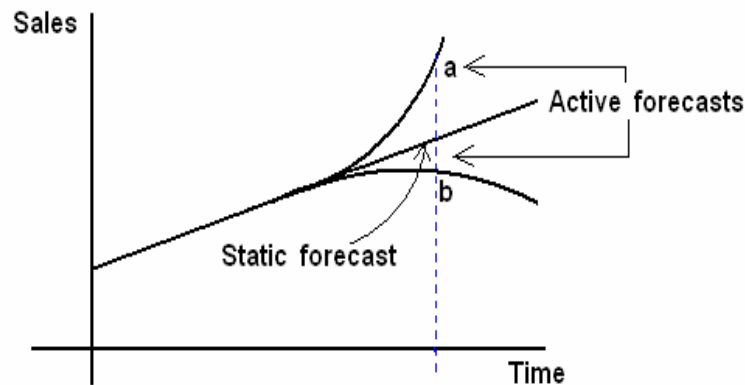
Quantitative methods provide accurate results but skills in analysis and interpretation will it more effective.

Some of the quantitative methods are static and consider only limited variables. The active forecasts use highly developed mathematical tools of analysis and provide accurate and dependable results.

Static forecasts are simple mathematical models which are mostly used for the ease. They provide quick estimates for preliminary studies.

Active forecasts are non linear models which are advanced models using more variables. They provide dependable estimates.

In the diagram it can be seen that **a** and **b** are active forecasts for similar static forecast. As non linear forecasts they can show larger variation in rate of change. A static model is a linear relation which can give only an average growth.



Features of an ideal demand forecast

An ideal demand forecast should fulfill the following characteristics:

1. Accuracy: A demand forecast shall be accurate. The accuracy is given by the tolerance limit. The percentage of tolerance will determine the accuracy.
2. Comprehensive: A comprehensive demand forecast will provide details on the product, product mix and a detailed study of the market. The risks and the prospects for growth shall be also made clear.
3. Economical: The cost of conducting survey shall be low so that the demand forecast will be in the reach of even the smaller firms.
4. Time: The demand forecast shall take as little time as possible so that the data and analysis remain relevant to the market and the policies of the Government.
5. Flexibility: The demand forecast shall be flexible enough to accommodate small changes and also adjust itself to the need of future demand forecasts.
6. Durability: A demand forecast shall be durable. A good model of demand forecast should be useful for a long time to come. Any changes should be adapted as per the need in future.

Theory of production

Production function

A production function provides the relationship between out put and various factors of production. A production function is a functional relation between the inputs and out put.

The production function can be classified as per time period. There can be short run production function and the long run production function. Between time periods the nature of factors can change.

In the long run all factors change; when all factors change there can be large changes in the out put can be brought, the technology can change, the cost structure may be totally renewed. So, the expression of long run production function will be

Quantity of out put,

$$Q = f (\text{Labour, raw material, power, land, buildings, machinery} / T)$$

Where T, is technology; an embedded (associated) factor of production. It is the qualitative description of capital,

In the short run certain factors are fixed certain other variable. Fixed factors remain fixed even with changing out put. On the other hand variable factors change with changes in the out put. So the expression of production function will have fixed and variable factors.

Quantity of out put,

$$Q, = f (\text{labour, raw material, power} / F , T)$$

Where F represents the fixed factors which remain unchanged in the short run and T is the level of technology given and constant.

The short run production function will always carry the expression fixed and variable, separately.

Law of variable proportions

The law of variable proportions studies the relationship between one variable factor and the out put. It studies the behavior of out put for changing variable factor. It deals with a short run production function with one variable factors with all other factors are given and kept constant.

$$Q, = f (\text{labour} / F , T)$$

Where F represents the fixed factors which remain unchanged in the short run and T is the level of technology given and constant.

According to the law of variable proportions, *'all other factors remaining constant, if the usage of one variable factor increases, the out put will increase rapidly, then slowly and finally decreases'*.

Labour Units	Total Product TP	Average Product AP	Marginal Product MP	Production Elasticity	Stages of production
1	5	5	0	Ep>1	Increasing returns I Stage
2	8	4	3		
3	15	5	7		
4	24	6	9		
5	30	6	6		
6	30	5	0	Ep<1	Diminishing returns II Stage
7	28	4	-2	Ep<0	Negative returns III Stage

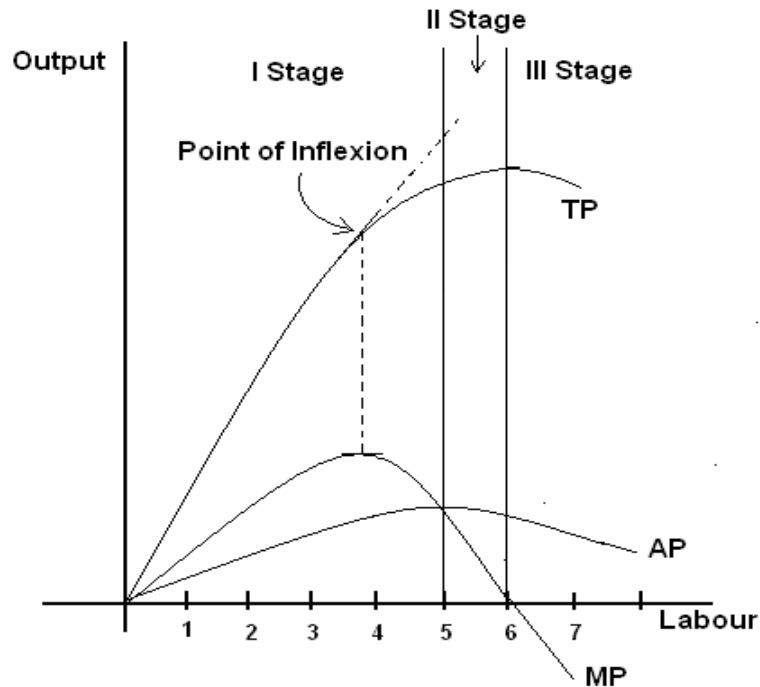
I Stage: Stage of increasing returns

During the first stage the out put increase rapidly because

- The variable factors become more and more productive, initially.
- The fixed factors become more productive.
- The elasticity of production is more than 1 (Ep>1)

During the first stage AP, MP and TP are increasing. MP reaches a maximum called as the point of inflexion. From this point onwards there will be a change in the level of factor productivity.

At the end of the stage, AP=MP and TP continues to increase.



II Stage: Stage of diminishing returns

During the second stage the output increase slowly because

- The factor substitution becomes limited
- Other factors become less and less productive
- The elasticity of production is more less 1 ($E_p < 1$)

During the second stage AP decreases but it is slower than MP. Further, $MP < AP$, MP decreases and TP is increasing, but slowly. At the end of the stage $MP = 0$

II Stage: Stage of negative returns

During the third stage the output decreases because

- There will overcrowding of one variable factor
- Fixed factors also become less productive.
- The elasticity of production is less than 0 ($E_p < 0$)

During the third stage, AP, MP and TP are all decreasing.

Assumptions:

- All factors are given and remain constant and only labour changes
- The level of technology remains same.
- There is perfect competition in product and factor markets.
- Variable factors are of similar productivity.

Isoquants

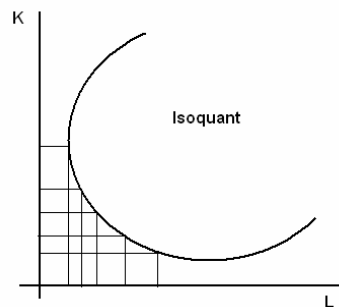
An isoquant is made up of various combinations of two factors which give rise to a fixed amount of out put.

Isoquant deals with a production function with two variable factors.

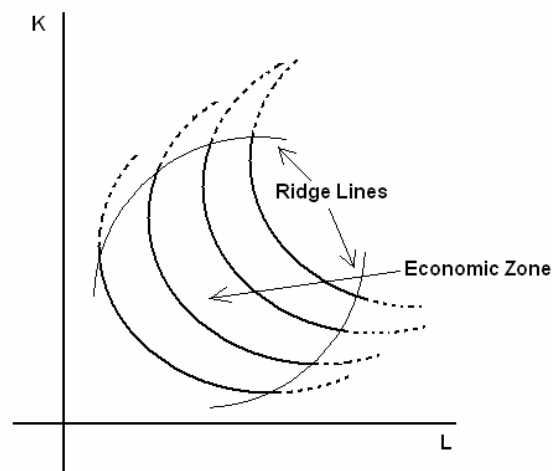
$$\text{Output} = f(K, L / F, T)$$

where K - Capital, L – labour, F – fixed factors, kept constant in the short run and T – the technology given.

Each Isoquant deal with a specific level of out put. Isoquants away from the origin represent higher out put and isoquants towards the axis represent lower out put.



The Isoquant depends on the level of factor substitutability. Factors of production are not perfect substitutes. The ridge lines give the limits of factor substitutability. The area between the ridge lines is called the economic zone. This is the area where there is factor substitutability. The analysis is confined to this area alone. The area out side the ridgelines can not be used for any study, because the factor substitutability ends.



The slope of the Isoquant represents the Marginal rate of technical substitution (MRTS). It is the ratio of change in K for changes in L.

The Marginal rate of technical substitution is the manner one factor is substituted by the other factor so as to give a fixed output through out the isoquant. Such slope of isoquant depends on the nature of factors and intensity of production.

$$MRTS_{KL} = \frac{\Delta K}{\Delta L} = \text{Slope of Isoquant}$$

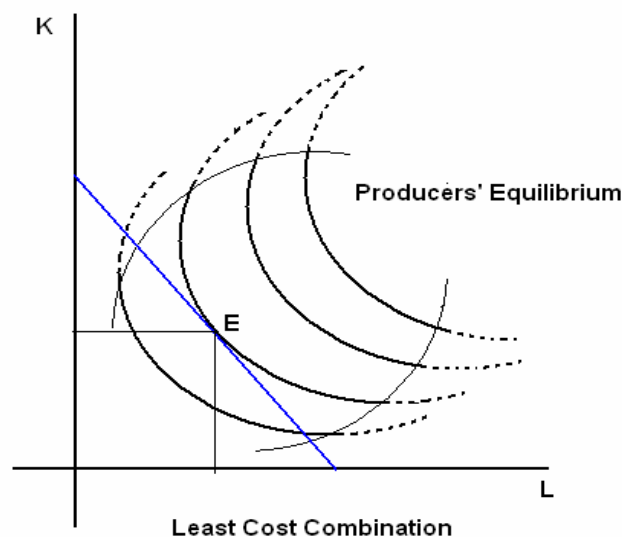
Producers' equilibrium (Least cost combination)

Producers' equilibrium deals with a least cost combination of producing a specific level of out put the producer would like to produce.

A producer will be a t a state of equilibrium when he produces a desired level of out put at a cost which is least. This can be done by using isoquants. By choosing isoquant we consider a production function with two variable factors all other factors and technology remaining constant.

$$\text{Output} = f(K, L / F, T)$$

Where K - Capital, L – labour, F – fixed factors, kept constant in the short run and T – the technology given.



Firstly the producer will determine the level of out put to be produced; the isoquant is selected. The producers' equilibrium is found at a place where the slope of the isoquant is same as the factor price ratio line. Mathematically,

the slope of the isoquant is equal to the slope of the price ratio line. Or the slope of the price ratio line is same as the Marginal rate of Technical Substitution.

Slope of Isoquant = Factor price ratio

$$MRTS_{KL} = \frac{P_K}{P_L}$$

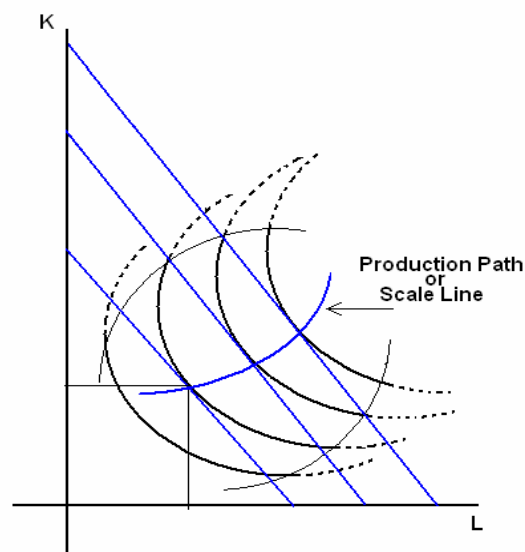
The producers' equilibrium finds the least cost combination. Least cost combination is the combination of two factors which will produce a given level of out put at least cost.

There are different least cost combinations for different levels of out put.

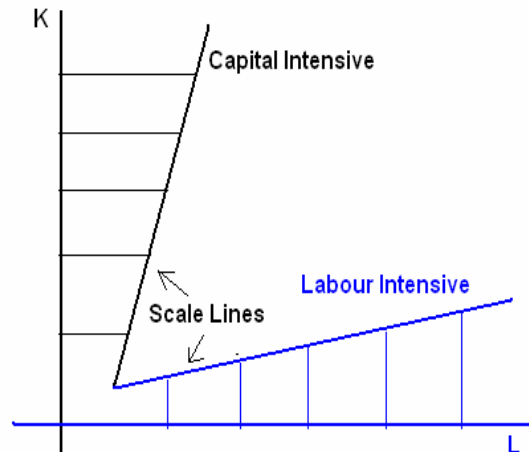
Assumptions

1. Producers' equilibrium considers a production function with two variable factors.
 2. The level of technology remains same
 3. All other factors are given and constant
 4. There is perfect competition in factor and product markets.
- The prices of two factors are given and remain unchanged.

Least cost combinations are found at different levels of out put by following the condition of producers' equilibrium. When all the points of equilibriums or the least cost combinations at different levels of out put are joined, the production path or the scale line can be derived.



The shape and position of the scale line will indicate the type of technology or the intensity of factor usage. If the production path is towards the capital axis it is capital intensive, if it is toward the labour axis the technology is labour intensive.



Laws of Returns to Scale

The laws of returns to scale deals with the long run production function.

In the long run all factors change; when all factors change there can be large changes in the out put can be brought, the technology can change, the cost structure may be totally renewed. So, the expression of long run production function will be

Quantity of out put,

$$Q = f (\text{Labour, raw material, power, land, buildings, machinery} / T)$$

Where T, is technology; an embedded (associated) factor of production. It is the qualitative description of capital,

According to the laws of returns to scale -

In the long run when the scale of production increase,

a. The out put may increase in larger proportions than the inputs used called *Increasing returns to scale*

OR

b. The out put may increase in the same proportions as the inputs used called *Constant returns to scale*

OR

c. The out put may increase in lesser proportions than the in puts used called *Diminishing returns to scale*.

The laws of returns to scale can be explained with the help of isoquants. By choosing isoquant we consider a production function with two variable factors all other factors and technology remaining constant.

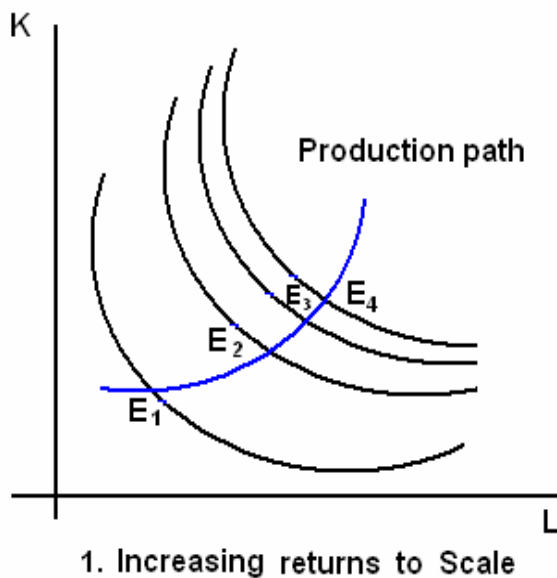
$$\text{Output} = f(K, L / F, T)$$

Where K - Capital, L – labour, F – fixed factors, kept constant in the short run and T – the technology given.

1. Increasing returns to Scale

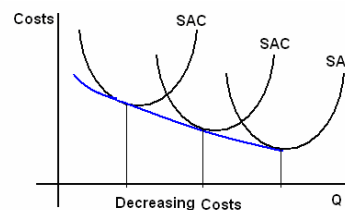
According to Increasing returns to scale

In the long run when the scale of production increase, the out put may increase in larger proportions than the inputs used called *increasing returns to scale*



Increasing returns to Scale

- The gap between E₁, E₂, E₃, and E₄ decreases
- Economies of scale
- Decreasing costs



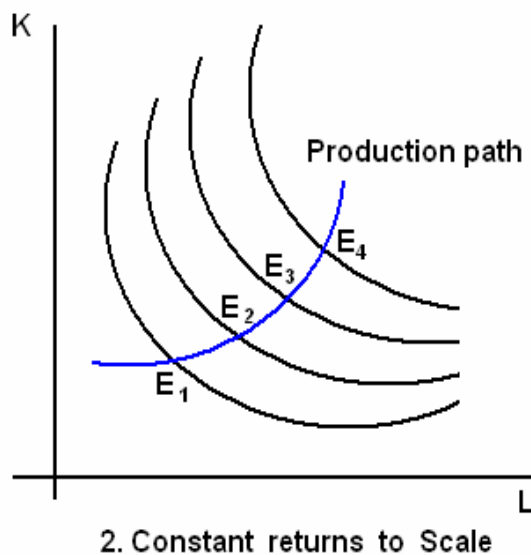
The out put responds positively because; it operates on economies of scale. In the long run the firm derives certain advantages called economies of scale. These economies of scale can come from within called internal economies or come from out side the firm called external economies.

Due to economies of scale the costs keep on decreasing. This is called decreasing costs.

In the diagram it can be seen that the gap between the isoquants keep on decreasing thus showing that lesser and lesser factors are needed for producing additional output.

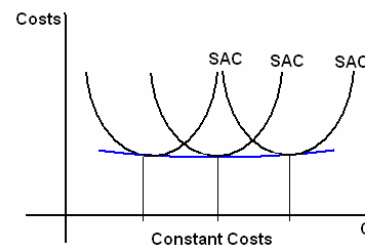
2. Constant returns to scale

In the long run when the scale of production increase, the out put may increase in the same proportions as the inputs used called *Constant returns to scale*



Constant returns to Scale

- The gap between E₁, E₂, E₃, and E₄ remains constant
- Neutral Economies of scale
- Constant costs

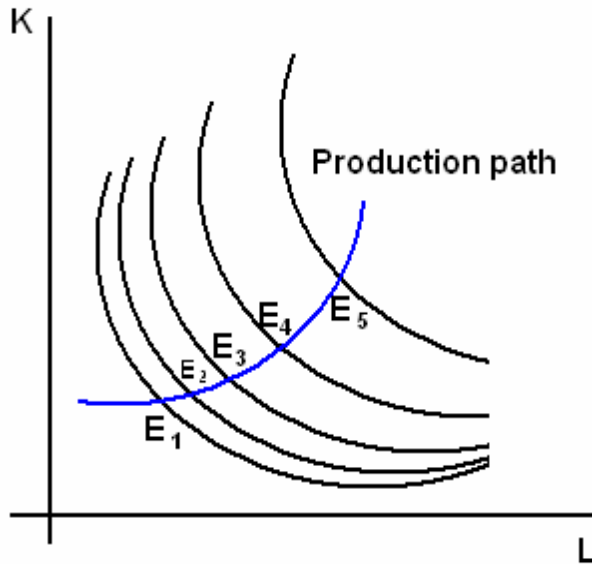


In case of constant returns to scale the out put increases in the same proportions as the inputs. The firm is said to be operating on neutral economies. The firms neither get nor lose any advantages due to large scale production.

In the diagram it can be seen that the gap between the isoquants remain constant thus showing that same ratio of factors are needed for producing additional output. The per unit costs remain constant. This is case of constant costs

3. Diminishing returns to scale.

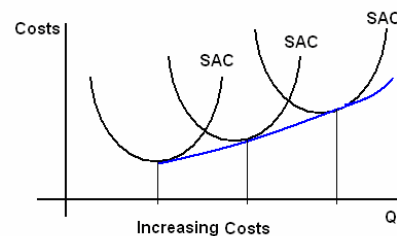
In the long run when the scale of production increase, the out put may increase in lesser proportions than the in puts used called *Diminishing returns to scale*.



3. Diminishing returns to Scale

Diminishing returns to Scale

- The gap between E₁, E₂, E₃, and E₄ increases
- Diseconomies of scale
- Increasing costs



The out put responds discouragingly, because; it operates on diseconomies of scale. In the long run the firm may face certain disadvantages called diseconomies of scale. These diseconomies of scale can come from within called internal diseconomies or come from out side the firm called external diseconomies.

Due to diseconomies of scale the costs keep on increasing. This is called increasing costs.

In the diagram it can be seen that the gap between the isoquants keep on increasing thus showing that more and more factors are needed for producing additional output.

Assumptions:

1. It is case of long run production function
2. The scale of production increases
3. Technology remains same
4. There is a perfect completion in factor and product markets.
5. Each isoquant represents a fixed increment of output.

Economics of Scale

In the long run all factors becomes viable and the firm can increases its scale of production. When the firm increases the scale of production it gets certain advantages. These advantages are called economies of scale.

A. Internal economies of scale

These are the advantages the firm gets from the factors within the firm.

These factors are endogenous to the production function.

1. **Managerial economies:** In the long run the firm will have better managerial talent in organizing factors for better productivity.
2. **Technical economies:** The firms will have improved technology in the long run and the firm will progressively reduce costs.
3. **Economies of by product:** The firm will be able to develop waste into marketable by product in the long run. This will add to the revenues of the firm.
4. **Economies of supervision:** Better supervision will improve the factor productivity in the long run.
5. **Economies of cost:** With improved supply chain and labour productivity the costs will reduce in the long run.
6. **Economies of integration:** In case of forward integration the firm will undertake an additional process of production and add value o the out put. The revenue will increase
Similarly, backward integration will enable a firm produce such factors which were earlier bought form the factor markets. This again reduces the cost and adds to the profit margins.
7. **Risk bearing economies:** Firms will greatly increase capacity to take risk with new products and technologies in the long run. This is due to established market and strong finances.
8. **Economies of specialization:** The firm may develop certain specialization in the long run depending on the production function and acceptance in the market. This may create niche and better price.

B. External economies of scale

These are the advantages the firm gets from the factors out side the firm.

These factors are exogenous to the production function.

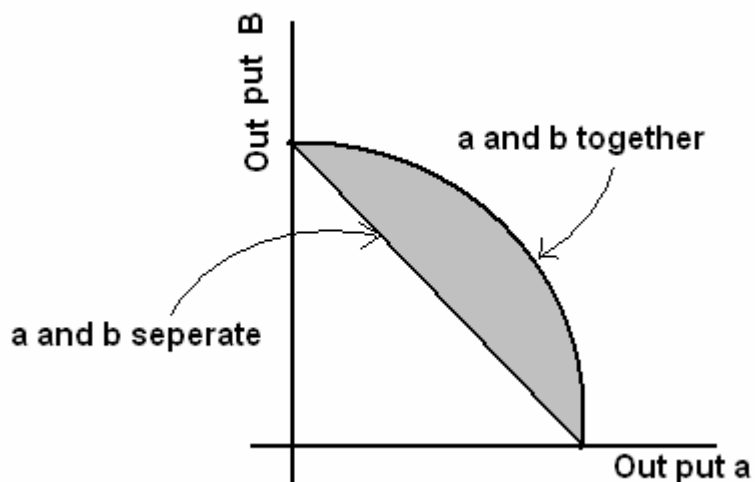
1. **Economies of marketing:** The firms will be able to market with ease due to establishment of brand and dealership network

2. Economies of finance: The firms will have better financial position in the long run due to accumulated profits. The firm will also have better institutional axis for raising more finance easily.
3. Economies of environment: In the long run the firm becomes more environmentally friendly with larger investment on pollution control and resource conservation

Economies of Scope

Economies of scope deals with the advantage a firm receives by producing a product mix of two goods instead of two firms producing them separately. When a single firm produces two products it gets advantages arising out of production function, managerial and technological reasons.

In the diagram, the linear curve denotes the combinations of two products the firms can produce separately. If the firm produces together the production possibility is found on the concave curve. The advantage of producing together is marked as extra.



The rate of advantage can be measured as

$$\frac{C(a) + C(b) - C(a+b)}{C(a+b)}$$

Where, $C(a)$ – cost of product a , $C(b)$ – cost of product b, $C(a+b)$ – cost of products a and b.

This is different from the economies of scale a firm enjoys in the long run. This advantage of scope can be derived by a firm even in the short run. This is the advantage of having multiple product mix instead of a single product.

Cost of production

There are several concepts of cost developed, each suitable for a different purpose. There are financial cost and social costs, accounting cost and economic costs, short run and long run costs and the opportunity cost.

- 1. Accounting cost and economic costs:* Accounting costs consider documentation of expenditure for purpose of future analysis. It is the analysis in retrospection. The analysis deals with spent money. As against this, the economic cost study the nature of costs, their behavior and methods of optimizing costs for minimizing cost of production and maximizing profits.
- 2. Financial cost and social costs:* Financial costs are private costs, the costs paid by a firm to procure factors for creating out put. The major consideration is optimizing usage of factors for cost reduction and maximizing profits. On the other hand the social cost deal with the burden of production on the society, environment, and resource conservation. Most of the social costs can not be quantified. But these costs are very important in terms of social objectives and justice.
- 3. Financial costs and physical costs:* Financial costs are economic costs mentioned in uniform value terms. Since all the factors are mentioned in uniform terms, it is easy to apply any quantitative or statistical method for regulating their usage and optimizing for profits. Physical costs on the other hand are factors mentioned in dissimilar units. Since they are dissimilar in expression and quantitative, it is not easy to apply techniques of quantitative analysis. Yet physical costs are important for production planning and procurement of factors.
- 4. Opportunity Cost:* Opportunity cost is the cost of a factor in its alternative use. This is the minimum which needs to be paid to bring a factor in use. Any payment less than this will make the factor leave the production function and join an alternative use. The concept of opportunity cost is useful in determining the factor price. The factor price needs to be equal to or greater than the opportunity cost. Larger the opportunity cost higher will be the factor price.

Short run Cost curves

In the short run certain factors are fixed certain other variable. Accordingly, certain costs are fixed and certain costs variable.

In the shot run there are three costs - total fixed cost, total variable cost and total cost. In addition there are four per unit costs- average fixed cost, average variable cost, average cost and the marginal cost.

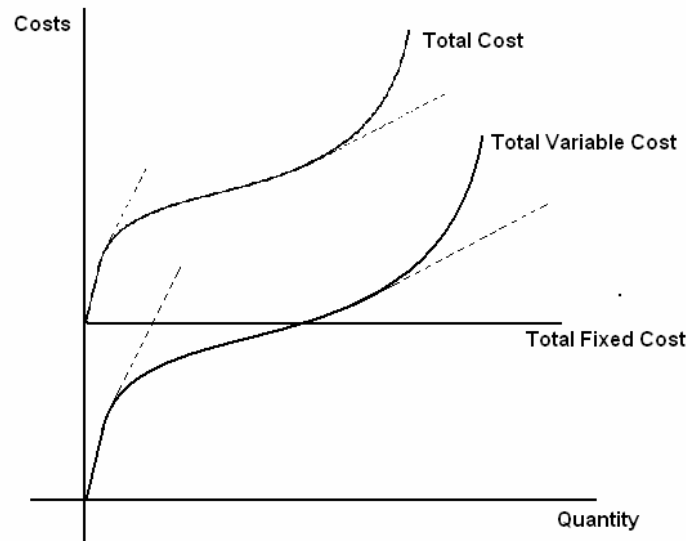


Illustration: for a given TFC of 100 and TVC over 8 units, the costs will be

Out put	TFC	TVC	TC	AFC	AVC	AC	MC
1	1000	100	1100	1000	100	1100	-
2	“	180	1180	500	90	590	80
3	“	240	1240	333	80	413	60
4	:	340	1340	250	85	335	100
5	“	480	1480	200	96	296	140
6	“	680	1680	166	113	179	200
7	“	980	1980	142	140	282	300
8	“	1480	2480	125	185	310	500

1. Total Fixed cost

The fixed cost remains constant in the short run at level of out put. The fixed cost curve is a horizontal curve parallel to x axis. At zero level of out put the total cost is equal to total fixed cost.

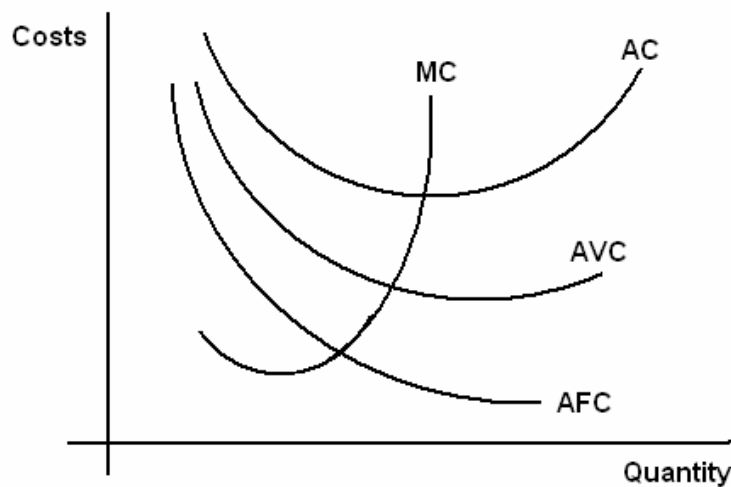
2. Total variable cost

The total variable cost increases with increasing cost. The shape of the variable cost curve is drawn from the law of variable proportions. This it has three segments. At zero level of out put the variable cost is zero.

3. Total cost

$$\text{Total cost} = \text{Total fixed cost} + \text{Total variable cost}$$

The total cost is the sum of total fixed cost and total variable cost. At zero level of out put the total cost is equal to total fixed cost. The shape and size of total cost is similar to total variable; cost but it starts from total fixed cost.



4. Average Fixed cost

$$\text{Average Fixed Cost} = \frac{\text{Total fixed cost}}{\text{Out put}}$$

Average fixed cost curve is a downward sloping curve. It keeps on decreasing, but never touches the axis. It is asymptotic to x axis. Geometrically, on this curve the product of coordinates always a constant.

5. Average Variable Cost

$$\text{Average Variable Cost} = \frac{\text{Total Variable Cost}}{\text{output}}$$

Average variable cost is a broad U shaped curve; the shape of the curve is drawn from the behavior of variable facto and the law of variable proportions.

6. Average Cost

$$\text{Average Cost} = \frac{\text{Total cost}}{\text{Out put}}$$

Or Average Cost = Average Fixed cost + Average Variable Cost

Average cost curve is a U shaped curve; the shape is derived by the combination AC and AVC. AC curve lies above AVC. Average cost is minimum when AC = MC

7. Marginal cost

$$\text{Marginal cost} = TC_{(n-1)} - TC_n$$

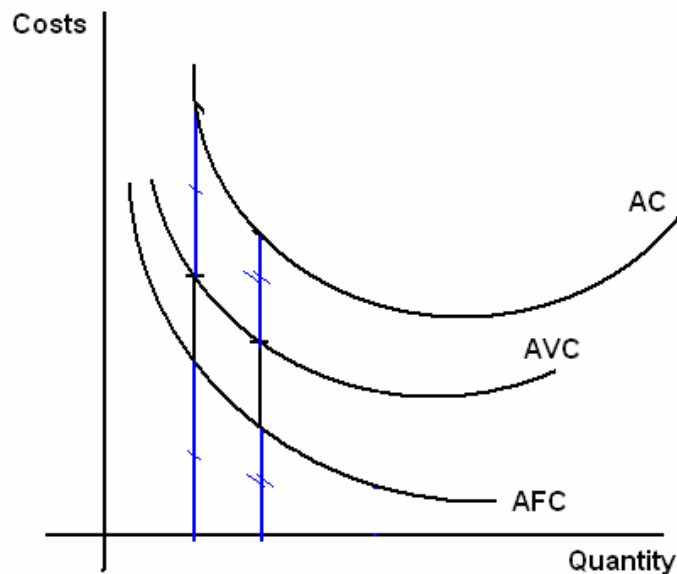
Marginal cost curve is a J shaped curve. It passes through the minimum point of AC. When AC=MC, Marginal cost is minimum. The shape is derived from the behavior of marginal product in the law of variable proportions.

The short run Average Cost Curve is a U shaped Curve

The U shape of the average cost curve is made up of three segments; downward part, change in the trend and upward trend:

- a. Initially, AVC and AFC are both decreasing so the resultant AC also decreases
- b. There after, AFC continues to decrease but AVC increases. There is a change in the trend. The decreasing curve now changes trend towards increase.
- c. Finally, the increasing AVC is stronger than decreasing AFC and AC now continues to increase.

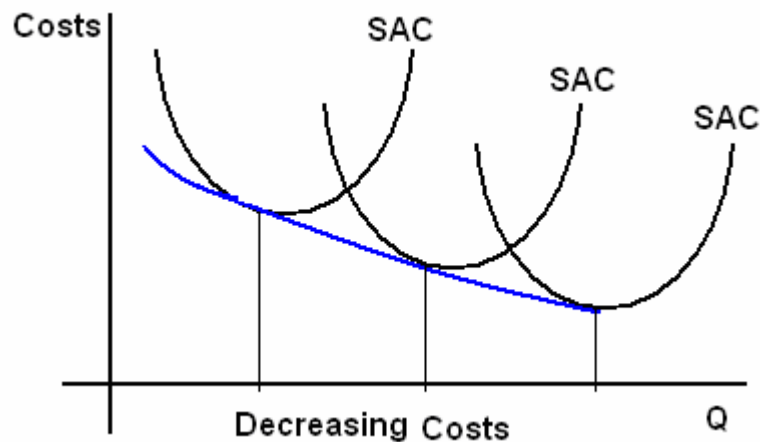
The Ac curve takes a U shape.



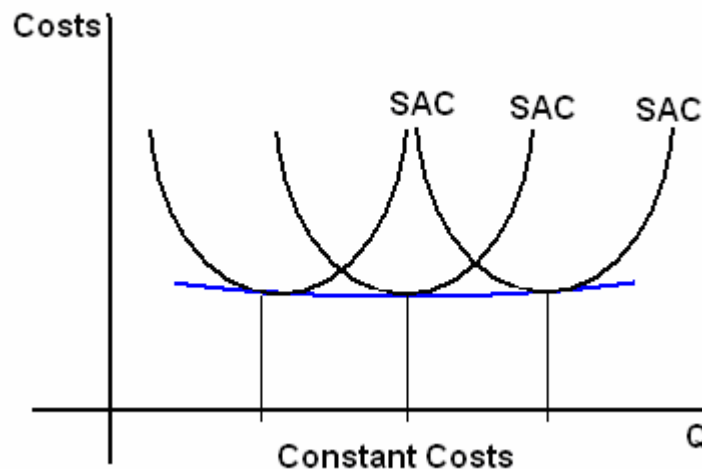
Further, Average Cost = Average Fixed cost + Average Variable Cost
 So, the gap between AVC and AC is equal to AFC.

Long run costs

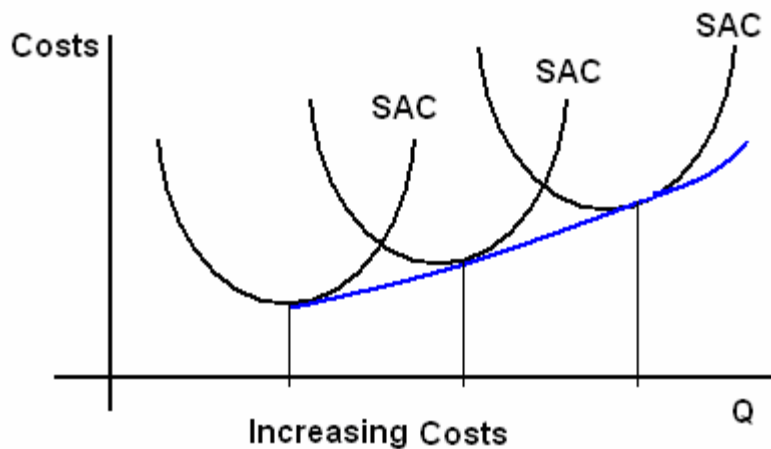
The long run cost curves are derived from the short run cost curves. The long run AC is derived from the short run AC. In the long run when the scale of production increases, the AC curves shift down wards showing decreasing costs. This is due to economies of scale. This is case of decreasing costs



In the long run, when the scale of production increases, the AC curves may shift horizontally to the right. This is due to neutral economies of scale. This is case of constant costs.

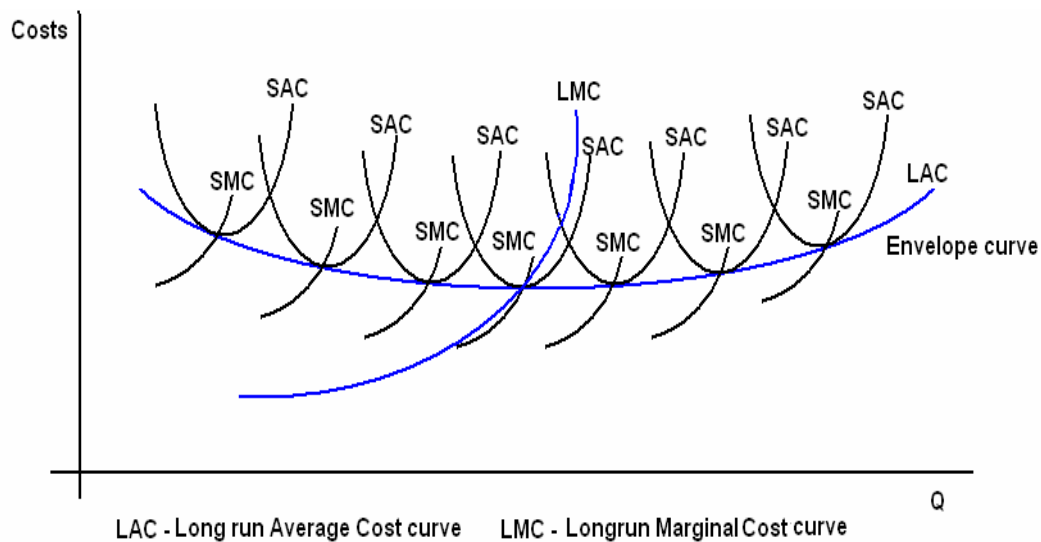


In the long run when the scale of production increases, the AC curves shift upwards showing increasing costs. This is due to diseconomies of scale. This is case of decreasing costs



The long run AC is made up of these three segments. Thus the LAC is flatter than the SACs. The LAC is also called the envelope curve. For this reason
“The long run average cost curve is flatter than the short run average cost curve.”

Long run Marginal cost curve passes through the minimum point of LAC.



Following are the long run factors responsible for flatter long run average cost curve:

1. Population

Though population changes even in the short run. The effect of population can be seen only in the long run, by way of changes in the pattern of demand and labor force.

2. Technology

Technology helps in the long run in reducing costs and making production function efficient.

3. Alternative sources of raw material and energy

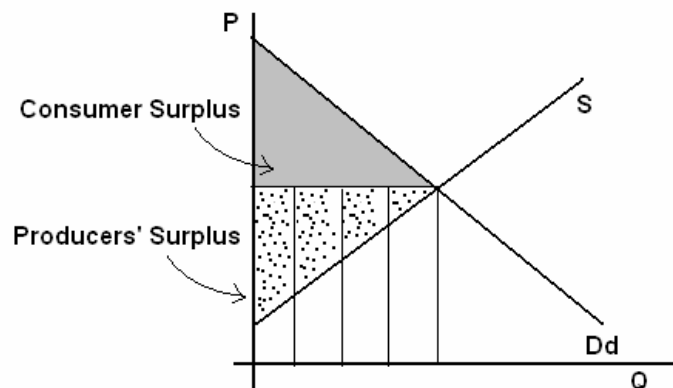
Alternative and cheaper sources of raw material and energy change the production function and help in expanding output and making it economical.

4. Expanding markets

Expanding markets provide purpose for the industry to produce and distribute. In the long run, mass consumption in the economy increases.

Producers' surplus

The producer surplus is the surplus of price charged by the producer over the supply price. The supply curve shows that the price increases with increasing quantity. The price is charged as per the last unit produced, whereas the producer receives a surplus over the supply price. This is called producers' surplus.



Producers' surplus is the area above the producers supply curve and below the market price.

The producers' surplus depends on the elasticity of factor availability, factor prices, the demand for the goods and the Government regulation on the price.

Large producers' surplus will shift the burden of tax on to the seller. Large consumer surplus will put the burden of tax on the consumer.

The producers' surplus can be increased by reducing consumer surplus. This is called consumer exploitation.

Assumptions

1. The quantity of supply increases with price
2. There is perfect competition in factor and product markets
3. There is perfect knowledge on price quantity demanded and supply

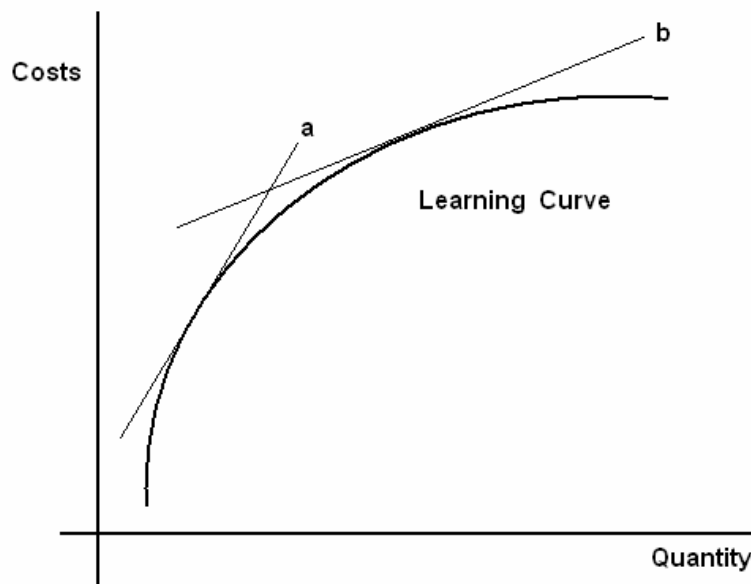
Learning curve

Learning curve refers to progressive decrease in the cost of production over a period of time, as experienced by firms.

Learning curve shows the relationship between the cost of production and time.

The costs tend to decrease with passing time because:

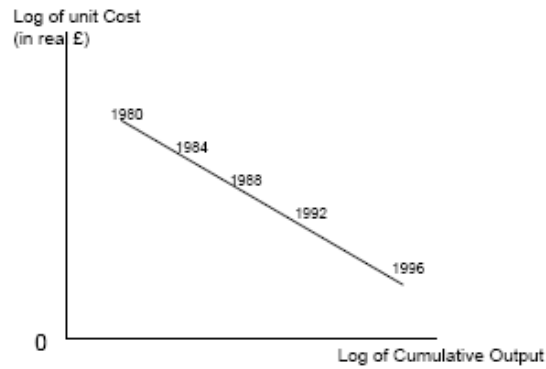
1. Repetitive production of a commodity leads to specialization
2. The usage of raw material becomes more efficient
3. Wastages in production can be reduced due to specialization.
4. Supply chain improves and inputs will help better productivity.



Learning curve is different from economies of scale. Economies of scale are found in the long run whereas learning curve can be experienced even in the short run due to specialization.

In the diagram there is a change in the incremental costs between **a** and **b**. At **b** the incremental costs have become lesser than at **a**. This is the learning curve.

Case study



Boston Consulting Group showed the importance of learning curves in various industries in the 1970s. However, they did not divorce learning from scale effects.

These learning effects are an important source of intra-industry competitive advantage as the diagram below shows. (Note that shallower learning curves may reflect mature products.)