Annexure-03

INTERMEDIATE MICRO ECONOMICS

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UNIT 1 PRODUCTION FUNCTION

PRODUCTION FUNCTION

Production Function is the relationship between physical inputs (land, labour, capital, etc.) and physical outputs (quantity produced). It is a technical relationship (not an economic relationship) that studies material inputs on one hand and material outputs on the other hand. Material inputs include variable and fixed factors of production. In a standard equation, the Production function is represented by Q, Labour (Variable element) is represented by L, and Capital (Fixed element) is represented by K.

Q = f(L,K)

In the words of Watson, "Production Function is the relationship between a firm's production (output) and the material factors of production (input)."

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Production is a process that business uses to convert inputs into outputs. Production involves a series of activities that convert the inputs into outputs that people can use for the fulfilment of theirp needs. Production is basically the transformation of inputs into output. Input is anything that is utilised in the creation of a commodity and Output is something that gets produced at the end of the production process. The relationship between inputs and outputs is defined using the Production Function.

Assumptions of Production Function

Both inputs and outputs are divisible.
There are only two factors of production, i.e., land (Variable element) and capital (Fixed element).
Factors of production are imperfect substitutes.
Technology is constant.

Graphical Representation of Production Function

For example, When there are 4 units of labour and 5 units of capital, the equation for the production function is Q = f(4,5).

production function

In the above graph, X-axis represents inputs that are being used in the production process and Y-axis represents outputs that get produced. Q is the Production Function.

Variable Factors are the factors that can be changed during the course of the short run. Variable factors vary with the level of output. An increase in variable factors leads to more production and vice-versa. Employment of variable factors is not required when there is no production. Variable factors include labour, power, fuel, etc.

Fixed Factors are the factors that can not be changed in the short run. The number of fixed factors always remains constant even when is zero production. Fixed factors include land, capital, building, etc.

Note: Production in the short run can only be increased by increasing the variable factor.

Features of Production Function

1. Complementary: A producer will have to combine the inputs to produce outputs. Outputs can not get generated without the use of inputs.

2. Specificity: For any given output, the combination of inputs that may be used is clearly defined. What type of factors are needed for the production of a particular product is clearly mentioned before the actual production gets started.

3. Production Period: The period of the production process is clearly explained to the production unit. Each stage of production is given some specific time. Production generally gets completed over a long period of time.

Types of Production Function
Production function on the basis of the time period can be divided into two categories: Short Run Production Function and Long Run Production Function. In these production functions, the combination and behaviour of variable factors and fixed factors are different.

1. Short Run Production Function: Short Run is a period of time where output can only be changed by changing the level of variable inputs. In the short run, some factors are variable and some are fixed. Fixed factors remain constant in the short run like land, capital, plant, machinery, etc. Production can be raised by only increasing the level of variable inputs like labour. Therefore, the situation where the output is increased by only increasing the variable factors of input and keeping the fixed factors constant is termed as Short Run Production Function. This relationship is explained by the 'Law of Variable Proportions.'

2. Long Run Production Function: Long Run is a span of time where the output can be increased by increasing all the factors of production whether it is fixed (land, capital, plant, machinery, etc.) or variable (labour). Long run is enough time to alter all the factors of production. All factors are said to be variable in the long run. Therefore, the situation where the output is increased by increasing all the inputs simultaneously and in the same proportion is termed Long Run Production Function. This relationship is explained by the 'Law of Returns to Scale.'

Concept of Product
Product or output refers to the volume of the goods that the company produces using inputs during a specified period of time. The concept of product can be looked at from three different angles: Total Product, Marginal Product, and Average Product.

1. Total Product: Total Product (TP) refers to the total quantity of goods that the firm produced during a given course of time with the given number of inputs. Total Product is also known as Total Physical Product (TPP) or Total Output or Total Return. For example, if 6 labours produce 10 kg of wheat, then the total product is 60 kg. A company can increase TP in the short term by focusing primarily on the variable components. But over time, both fixed and variable elements can be increased to raise TP.

2. Average Product: Average Product refers to output per unit of a variable input. AP isp calculated by dividing TP by units of the variable factor. For example, if the total product is 60 kg of wheat produced by 6 labours (variable inputs), then the average product will be 60/6, i.e., 10 kg.

Average Product = \frac{Total~Product}{Units~of~Variable~Factor}
Units of Variable Factor
Total Product

3. Marginal Product: Marginal Product refers to the addition to the total product when one more unit of a variable factor is employed. It calculates the extra output per additional unit of input while keeping all other inputs constant. Other names of Marginal Product are Marginal Physical Product (MPP) or Marginal Return.

MPn = TPn - TPn-1

MPn = Marginal product of nth unit of the variable factor,

TPn = Total product of n units of the variable factor, and

TPn-1 = Total product of (n-1) units of the variable factor.

MARKET STRUCTURE AND PRICING PRACTICES

INTRODUCTION

Ordinarily, the term "market" refers to a particular place where goods are purchased and sold. But, in economics, market is used in a wide perspective. In economics, the term "market" does not mean a particular place but the whole area where the buyers and sellers of a product are spread.

The essential features of a market are:

(1) An Area:

In economics, a market does not mean a particular place but the whole region where sellers and buyers of a product are spread. Modem modes of communication and transport have made the market area for a product very wide.

(2) One Commodity:

In economics, a market is not related to a place but to a particular product. Hence, there are separate markets for various commodities. For example, there are separate markets for clothes, grains, jewellery, etc.

(3) Buyers and Sellers:

The presence of buyers and sellers is necessary for the sale and purchase of a product in the market. In the modern age, the presence of buyers and sellers is not necessary in the market because they can do transactions of goods through letters, telephones, business representatives, internet, etc.

(4) Free Competition:

There should be free competition among buyers and sellers in the market. This competition is in relation to the price determination of a product among buyers and sellers.

(5) One Price:

The price of a product is the same in the market because of free competition among buyers and sellers.

Market Structure

Market structure refers to the nature and degree of competition in the market for goods and services. The structures of market both for goods market and service (factor) market are determined by the nature of competition prevailing in a particular market.

Characteristics of Market Structure

1. Number and Nature of Sellers:

The market structures are influenced by the number and nature of sellers in the market. They range from large number of sellers in perfect competition to a single seller in pure monopoly, to two sellers in duopoly, to a few sellers in oligopoly, and to many sellers of differentiated products.

2. Number and Nature of Buyers:

The market structures are also influenced by the number and nature of buyers in the market. If there is a single buyer in the market, this is buyer's monopoly and is called monopoly market. Such markets exist for local labour employed by one

large employer. There may be two buyers who act jointly in the market. This is called duopsony market. They may also be a few organised buyers of a product.

This is known as oligopsony. Duopsony and oligopsony markets are usually found for cash crops such as rice, sugarcane, etc. when local factories purchase the entire crops for processing.

3. Nature of Product:

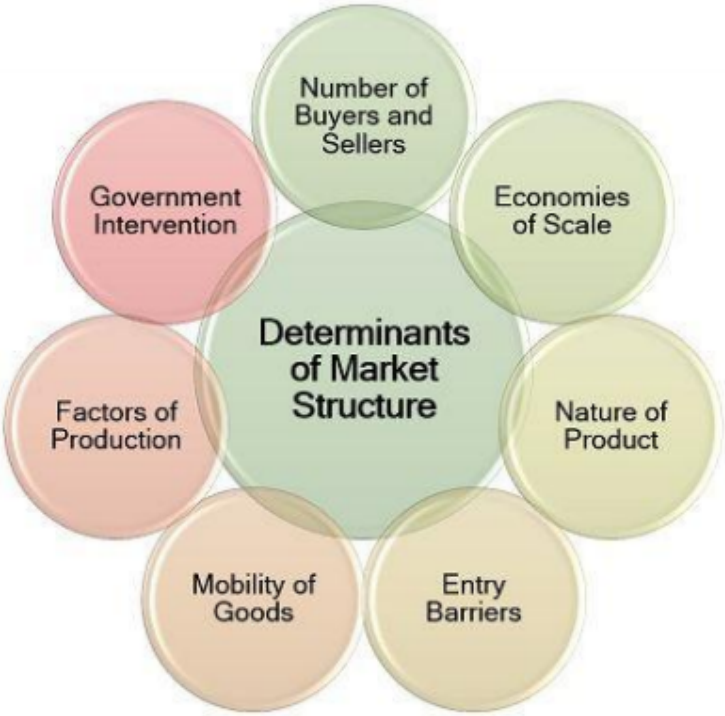
It is the nature of product that determines the market structure. If there is product differentiation, products are close substitutes and the market is characterised by monopolistic competition. On the other hand, in case of no product differentiation, the market is characterised by perfect competition. And if a product is completely different from other products, it has no close substitutes and there is pure monopoly in the market.

4. Entry and Exit Conditions:

The conditions for entry and exit of firms in a market depend upon profitability or loss in a particular market. Profits in a market will attract the entry of new firms and losses lead to the exit of weak firms from the market. In a perfect competition market, there is freedom of entry or exit of firms.

But in monopoly and oligopoly markets, there are barriers to entry of new firms. Usually, governments have a monopoly in public utility services like postal, air and road transport, water and power supply services, etc. By granting exclusive franchises, entries of new supplies are barred. In oligopoly markets, there are barriers to entry of firms because of collusion, tacit agreements, cartels, etc. On the other hand, there are no restrictions in entry and exit of firms in monopolistic competition due to product differentiation

Factors That Determine Market Structure



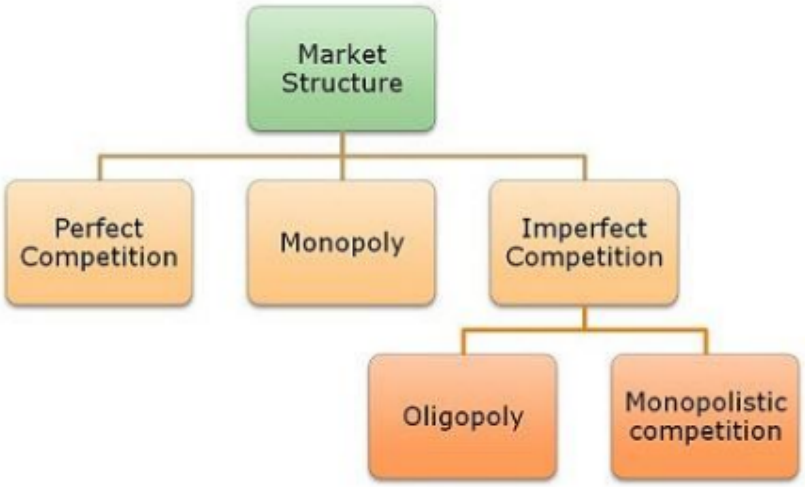
- **Number of Sellers**: The number of firms selling a particular product on the market, determines the level of competition, ultimately choosing the structure of the market for that specific product.
- **Number of Buyers**: Buyers decide the demand for a particular product. A monopsony market has multiple sellers and a single buyer who influences the price of the product.
- **Economies of Scale**: The size of the firm or the level of production contributes to a market structure. If the output is done on such a large scale that it fulfils the market demand solely, it may create a monopoly market.
- **Nature of Product**: The product features determines the type of market structure to which it belongs. If the products offered by different sellers are homogeneous, it lies in a perfect competition market. If it is unique and has no other substitute, it creates a monopoly in the market.
- **Entry Barriers**: The profitability of a product invites the sellers to enter such markets. The market runs on the rule 'survival of the fittest' where weak firms exit and strong ones survive. There are some public utility service

markets which run on monopoly by the government like post offices, railways, water supply, etc.

- **The mobility of Goods**: Easy transportation of goods from production place to the market ensures uniform prices by different sellers.
- **Government Intervention**: Some markets are indirectly controlled by the government. The government either imposes heavy taxes or makes the business license mandatory to restrict the entry of firms

Types of Market Structure

On the basis of competition, a market can be classified in the following ways:



1. PERFECT COMPETITION:

A perfectly competitive market is one in which the number of buyers and sellers is very large, all engaged in buying and selling a homogeneous product without any artificial restrictions and possessing perfect knowledge of market at a time. In the words of A. Koutsoyiannis, "Perfect competition is a market structure characterised by a complete absence of rivalry among the individual firms." According to R.G. Lipsey, "Perfect competition is a market structure in which all

firms in an industry are price- takers and in which there is freedom of entry into, and exit from, industry."

For Example; the farmers' market can be seen as the most common examples of a perfect competition market. Here, all the sellers are engaged in selling identical products at a single price.

Characteristics of Perfect Competition:

The following are the conditions for the existence of perfect competition:

(1) Large Number of Buyers and Sellers:

The first condition is that the number of buyers and sellers must be so large that none of them individually is in a position to influence the price and output of the industry as a whole. The demand of individual buyer relative to the total demand is so small that he cannot influence the price of the product by his individual action.

Similarly, the supply of an individual seller is so small a fraction of the total output that he cannot influence the price of the product by his action alone. In other words, the individual seller is unable to influence the price of the product by increasing or decreasing its supply. Rather, he adjusts his supply to the price of the product. He is "output adjuster". Thus no buyer or seller can alter the price by his individual action. He has to accept the price for the product as fixed for the whole industry. He is a "price taker".

(2) Freedom of Entry or Exit of Firms:

The next condition is that the firms should be free to enter or leave the industry. It implies that whenever the industry is earning excess profits, attracted by these

profits some new firms enter the industry. In case of loss being sustained by the industry, some firms leave it.

(3) Homogeneous Product:

Each firm produces and sells a homogeneous product so that no buyer has any preference for the product of any individual seller over others. This is only possible if units of the same product produced by different sellers are perfect substitutes. In other words, the cross elasticity of the products of sellers is infinite.

No seller has an independent price policy. Commodities like salt, wheat, cotton and coal are homogeneous in nature. He cannot raise the price of his product. If he does so, his customers would leave him and buy the product from other sellers at the ruling lower price. The above two conditions between themselves make the average revenue curve of the individual seller or firm perfectly elastic, horizontal to the X-axis. It means that a firm can sell more or less at the ruling market price but cannot influence the price as the product is homogeneous and the number of sellers very large.

(4) Absence of Artificial Restrictions:

The next condition is that there is complete openness in buying and selling of goods. Sellers are free to sell their goods to any buyers and the buyers are free to buy from any sellers. In other words, there is no discrimination on the part of buyers or sellers.

Moreover, prices are liable to change freely in response to demand-supply conditions. There are no efforts on the part of the producers, the government and

other agencies to control the supply, demand or price of the products. The movement of prices is unfettered.

(5) Profit Maximization Goal:

Every firm has only one goal of maximizing its profits.

(6) Perfect Mobility of Goods and Factors:

Another requirement of perfect competition is the perfect mobility of goods and factors between industries. Goods are free to move to those places where they can fetch the highest price. Factors can also move from a low-paid to a high-paid industry.

(7) Perfect Knowledge of Market Conditions:

This condition implies a close contact between buyers and sellers. Buyers and sellers possess complete knowledge about the prices at which goods are being bought and sold, and of the prices at which others are prepared to buy and sell. They have also perfect knowledge of the place where the transactions are being carried on. Such perfect knowledge of market conditions forces the sellers to sell their product at the prevailing market price and the buyers to buy at that price.

(8) Absence of Transport Costs:

Another condition is that there are no transport costs in carrying of product from one place to another. This condition is essential for the existence of perfect competition which requires that a commodity must have the same price everywhere at any time. If transport costs are added to the price of the product, even a homogeneous commodity will have different prices depending upon transport costs from the place of supply.

(9) Absence of Selling Costs:

Under perfect competition, the costs of advertising, sales-promotion, etc. do not arise because all firms produce a homogeneous product.

Price Output Determination in Perfectly Competitive Market

Perfect competition refers to a market situation where there are a large number of buyers and sellers dealing in homogenous products. Moreover, under perfect competition, there are no legal, social, or technological barriers on the entry or exit of organizations.

In perfect competition, sellers and buyers are fully aware about the current market price of a product. Therefore, none of them sell or buy at a higher rate. As a result, the same price prevails in the market under perfect competition. Under perfect competition, the buyers and sellers cannot influence the market price by increasing or decreasing their purchases or output, respectively. The market price of products in perfect competition is determined by the industry. This implies that in perfect competition, the market price of products is determined by taking into account two market forces, namely market demand and market supply. In the words of Marshall, "Both the elements of demand and supply are required for the determination of price of a commodity in the same manner as both the blades of scissors are required to cut a cloth." As discussed in the previous chapters, market demand is defined as a sum of the quantity demanded by each individual organization in the industry.

On the other hand, market supply refers to the sum of the quantity supplied by individual organizations in the industry. In perfect competition, the price of a product is determined at a point at which the demand and supply curve intersect each other. This point is known as equilibrium point as well as the price is known as equilibrium price. In addition, at this point, the quantity demanded and supplied is called equilibrium quantity. Let us discuss price determination under perfect competition in the next sections

Demand under Perfect Competition:

Demand refers to the quantity of a product that consumers are willing to purchase at a particular price, while other factors remain constant. A consumer demands more quantity at lower price and less quantity at higher price. Therefore, the demand varies at different prices.

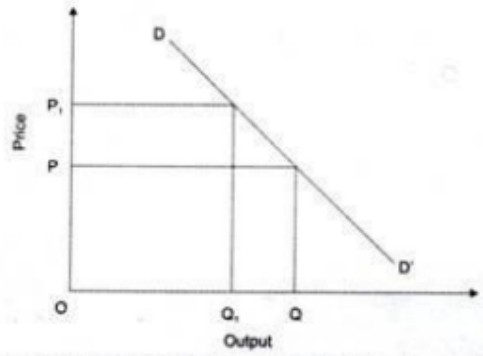


Figure-1: Demand Curve under Perfect Competition

As shown in Figure-1, when price is OP, the quantity demanded is OQ. On the other hand, when price increases to OP1, the quantity demanded reduces to OQ1. Therefore, under perfect competition, the demand curves (DD') slopes downward.

Supply under Perfect Competition:

Supply refers to quantity of a product that producers are willing to supply at a particular price. Generally, the supply of a product increases at high price and decreases at low price.

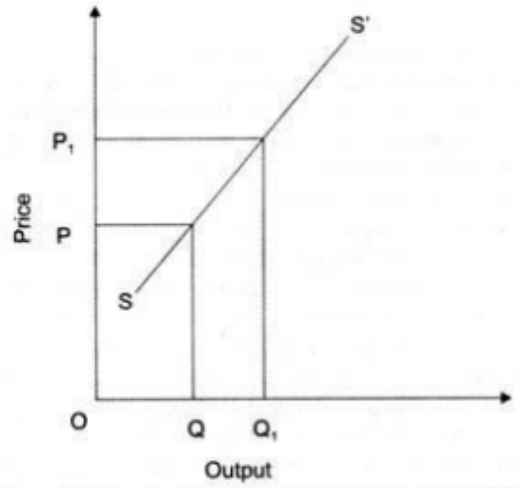


Figure-2: Supply Curve under Perfect Competition

In Figure-2, the quantity supplied is OQ at price OP. When price increases to OP1, the quantity supplied increases to OQ1. This is because the producers are able to earn large profits by supplying products at higher price. Therefore, under perfect competition, the supply curves (SS') slopes upward.

Equilibrium under Perfect Competition:

As discussed earlier, in perfect competition, the price of a product is determined at a point at which the demand and supply curve intersect each other. This point is known as equilibrium point. At this point, the quantity demanded and supplied is called equilibrium quantity.

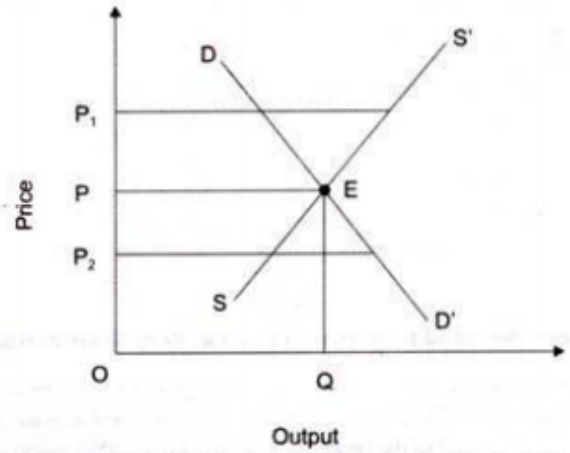


Figure-3: Price and Output Determination under Perfect Competition

In Figure-3, it can be seen that at price OP1, supply is more than the demand. Therefore, prices will fall down to OP. Similarly, at price OP2, demand is more than the supply. Similarly, in such a case, the prices will rise to OP. Thus, E is the equilibrium at which equilibrium price is OP and equilibrium quantity is OQ.

2. IMPERFECT COMPETITION

a) MONOPOLISTIC COMPETITION

Monopolistic competition refers to a market situation where there are many firms selling a differentiated product. "There is competition which is keen, though not perfect, among many firms making very similar products." No firm can have any perceptible influence on the price-output policies of the other sellers nor can it be influenced much by their actions. Thus monopolistic competition refers to competition among a large number of sellers producing close but not perfect substitutes for each other.

It's Features:

The following are the main features of monopolistic competition:

(1) Large Number of Sellers:

In monopolistic competition the number of sellers is large. They are "many and small enough" but none controls a major portion of the total output. No seller by changing its price-output policy can have any perceptible effect on the sales of others and in turn be influenced by them. Thus there is no recognised interdependence of the price-output policies of the sellers and each seller pursues an independent course of action.

(2) Product Differentiation:

One of the most important features of the monopolistic competition is differentiation. Product differentiation implies that products are different in some ways from each other. They are heterogeneous rather than homogeneous so that each firm has an absolute monopoly in the production and sale of a differentiated product. There is, however, slight difference between one product and other in the same category.

Products are close substitutes with a high cross-elasticity and not perfect substitutes. Product "differentiation may be based upon certain characteristics of the products itself, such as exclusive patented features; trade-marks; trade names; peculiarities of package or container, if any; or singularity in quality, design, colour, or style. It may also exist with respect to the conditions surrounding its sales."

(3) Freedom of Entry and Exit of Firms:

Another feature of monopolistic competition is the freedom of entry and exit of firms. As firms are of small size and are capable of producing close substitutes, they can leave or enter the industry or group in the long run.

(4) Nature of Demand Curve:

Under monopolistic competition no single firm controls more than a small portion of the total output of a product. No doubt there is an element of differentiation nevertheless the products are close substitutes. As a result, a reduction in its price will increase the sales of the firm but it will have little effect on the price-output conditions of other firms, each will lose only a few of its customers.

Likewise, an increase in its price will reduce its demand substantially but each of its rivals will attract only a few of its customers. Therefore, the demand curve (average revenue curve) of a firm under monopolistic competition slopes downward to the right. It is elastic but not perfectly elastic within a relevant range of prices of which he can sell any amount.

(5) Independent Behaviour:

In monopolistic competition, every firm has independent policy. Since the number of sellers is large, none controls a major portion of the total output. No seller by changing its price-output policy can have any perceptible effect on the sales of others and in turn be influenced by them.

(6) Product Groups:

There is no any 'industry' under monopolistic competition but a 'group' of firms producing similar products. Each firm produces a distinct product and is itself an industry. Chamberlin lumps together firms producing very closely related products and calls them product groups, such as cars, cigarettes, etc.

(7) Selling Costs:

Under monopolistic competition where the product is differentiated, selling costs are essential to push up the sales. Besides, advertisement, it includes expenses on salesman, allowances to sellers for window displays, free service, free sampling, premium coupons and gifts, etc.

(8) Non-price Competition:

Under monopolistic competition, a firm increases sales and profits of his product without a cut in the price. The monopolistic competitor can change his product

either by varying its quality, packing, etc. or by changing promotional programmes.

Price Output Determination in Monopolistic Competition

Under monopolistic competition, organizations need to make optimum adjustments in the prices and output sold to attain equilibrium.

Apart from this, under monopolistic competition, organizations also need to pay attention toward the design of the product and the way the product is promoted in the market. Moreover, an organization under monopolistic competition is not only required to study its individual equilibrium, but group equilibrium of all organizations existing in the market. Let us first understand individual equilibrium of an organization under monopolistic competition.

As we know every seller, irrespective of the market structure, is willing to maximize his/her profits. In monopolistic competition, profits are maximized at a point where marginal revenue is equal to marginal cost. The price determined at this point is known as equilibrium price and the output produced at this point is called equilibrium output.

If the marginal revenue of a seller is greater than marginal cost, he/she may plan to expand his/her output. On the other hand, if marginal revenue is lesser than marginal cost, it would be profitable for the seller to reduce his/her output to the level where marginal revenue is equal to marginal cost.

Equilibrium in Short Run:

The short-run equilibrium of a monopolistic competitive organization is the same as that of an organization under monopoly. In the short run, an organization under monopolistic competition attains its equilibrium where marginal revenue equals marginal cost and sets its price according to its demand curve. This implies that in the short run, profits are maximized when MR=MC.

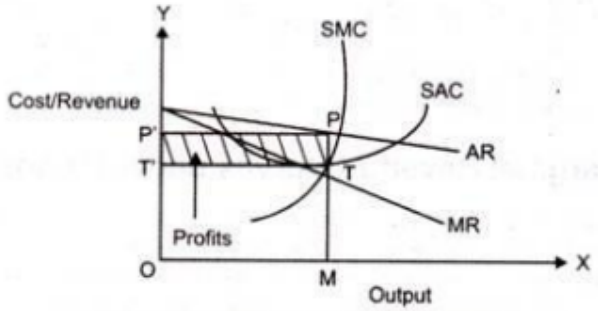


Figure-2: Equilibrium in the Short Run

In Figure-2, AR is the average revenue curve, MR represents the marginal revenue curve, SAC curve denotes the short run average cost curve, while SMC signifies the short run marginal cost. In Figure-2, it can be seen that MR intersects SMC at output OM where price is OP' (which is equal to MP). This is because P is the, point on AR curve, which is price.

From Figure-2, it can be interpreted from that the organization is earning supernormal profit. Supernormal profit per unit of output is the difference between the average revenue and average cost. In Figure-2, average revenue at equilibrium point is MP and average cost is MT.

Therefore, PT is the supernormal profit per unit of output. In the present case, supernormal profit would be measured by the area of rectangle P'PTT' (which is output multiplied by supernormal profit per unit of output).

On the other hand, when marginal cost is greater than marginal revenue, organizations would incur losses, as shown in Figure-3:

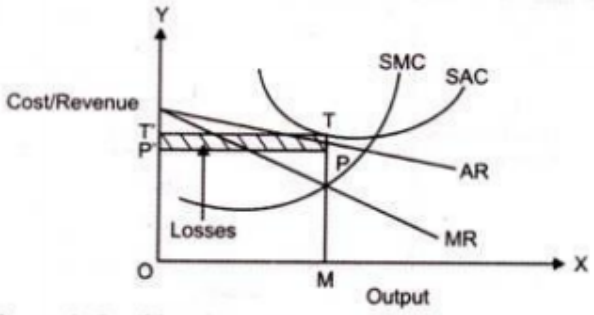


Figure-3: Equilibrium in the Short Run in Case of Losses

Figure-3 shows the condition of losses in the short run under monopolistic competition. Here, OP' is smaller than MT, which implies that average revenue is smaller than average cost. TP is representing the loss that has incurred per unit of output. Therefore total loss is depicted from rectangle T'TPP'.

Equilibrium in Long Run:

In the preceding sections, we have discussed that in the short run, organizations can earn supernormal profits. However, in the long run, there is a gradual decrease in the profits of organizations. This is because in the long run, several new organizations enter the market due to freedom of entry and exit under monopolistic competition.

When these new organizations start production the supply would increase and the prices would fall. This would automatically increase the level of competition in the market. Consequently, AR curve shifts from right to left and supernormal profits are replaced with normal profits.

In the long run, the AR curve is more elastic than that of in the short run. This is because of an increase in the number of substitute products in the long- run. The long-run equilibrium of monopolistically competitive organizations is achieved when average revenue is equal to average cost. In such a case, organizations receive normal profits.

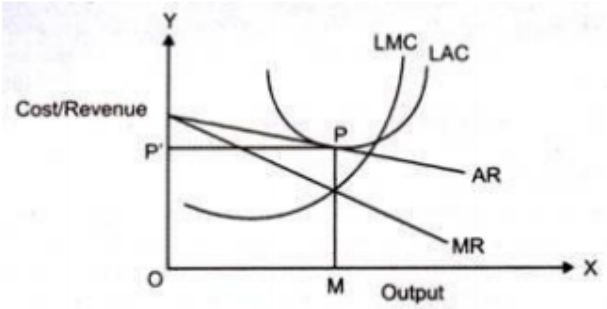


Figure-4: Equilibrium in the Long Run

In Figure-4, P is the point at which AR curve touches the average cost curve (LAC) as a tangent. P is regarded as the equilibrium point at which the price level is MP (which is also equal to OF) and output is OM.

In the present case average cost is equal to average revenue that is MP. Therefore, in long run, the profit is normal. In the short run, equilibrium is attained when marginal revenue is equal to marginal cost. However, in the long run, both the conditions (MR=MC and AR=AC) must hold to attain equilibrium.

b) Oligopoly Market

Oligopoly is a market situation in which there are a few firms selling homogeneous or differentiated products. It is difficult to pinpoint the number of firms in 'competition among the few.' With only a few firms in the market, the action of one firm is likely to affect the others. An oligopoly industry produces either a homogeneous product or heterogeneous products.

The former is called pure or perfect oligopoly and the latter is called imperfect or differentiated oligopoly. Pure oligopoly is found primarily among producers of such industrial products as aluminium, cement, copper, steel, zinc, etc. Imperfect oligopoly is found among producers of such consumer goods as automobiles, cigarettes, soaps and detergents, TVs, rubber tyres, refrigerators, typewriters, etc.

Characteristics of Oligopoly:

In addition to fewness of sellers, most oligopolistic industries have several common characteristics which are explained below:

(1) Interdependence:

There is recognised interdependence among the sellers in the oligopolistic market. Each oligopolist firm knows that changes in its price, advertising, product characteristics, etc. may lead to counter-moves by rivals. When the sellers are a few, each produces a considerable fraction of the total output of the industry and can have a noticeable effect on market conditions.

He can reduce or increase the price for the whole oligopolist market by selling more quantity or less and affect the profits of the other sellers. It implies that each seller is aware of the price-moves of the other sellers and their impact on his profit and of the influence of his price-move on the actions of rivals.

Thus there is complete interdependence among the sellers with regard to their price-output policies. Each seller has direct and ascertainable influences upon every other seller in the industry. Thus, every move by one seller leads to counter-moves by the others.

(2) Advertisement:

The main reason for this mutual interdependence in decision making is that one producer's fortunes are dependent on the policies and fortunes of the other producers in the industry. It is for this reason that oligopolist firms spend much on advertisement and customer services.

As pointed out by Prof. Baumol, "Under oligopoly advertising can become a life-and-death matter." For example, if all oligopolists continue to spend a lot on advertising their products and one seller does not match up with them he will find his customers gradually going in for his rival's product. If, on the other hand, one oligopolist advertises his product, others have to follow him to keep up their sales.

(3) Competition:

This leads to another feature of the oligopolistic market, the presence of competition. Since under oligopoly, there are a few sellers, a move by one seller immediately affects the rivals. So each seller is always on the alert and keeps a close watch over the moves of its rivals in order to have a counter-move. This is true competition.

(4) Barriers to Entry of Firms:

As there is keen competition in an oligopolistic industry, there are no barriers to entry into or exit from it. However, in the long run, there are some types of barriers to entry which tend to restraint new firms from entering the industry.

They may be:
(a) Economies of scale enjoyed by a few large firms; (b) control over essential and specialised inputs; (c) high capital requirements due to plant costs, advertising costs, etc. (d) exclusive patents and licenses; and (e) the existence of unused capacity which makes the industry unattractive. When entry is restricted or blocked by such natural and artificial barriers, the oligopolistic industry can earn long-run super normal profits.

(5) Lack of Uniformity:

Another feature of oligopoly market is the lack of uniformity in the size of firms. Finns differ considerably in size. Some may be small, others very large. Such a situation is asymmetrical. This is very common in the American economy. A symmetrical situation with firms of a uniform size is rare.

(6) Demand Curve:

It is not easy to trace the demand curve for the product of an oligopolist. Since under oligopoly the exact behaviour pattern of a producer cannot be ascertained with certainty, his demand curve cannot be drawn accurately, and with definiteness. How does an individual seller s demand curve look like in oligopoly is most uncertain because a seller's price or output moves lead to unpredictable reactions on price-output policies of his rivals, which may have further repercussions on his price and output.

Price and Output Determination in Oligopoly

A diversity of specific market situations works against the development of a single, generalized explanation of how an oligopoly determines price and output. Pure monopoly, monopolistic competition and perfect competition, all refer to rather clear cut market arrangements; oligopoly does not.

It consists of the 'tight' oligopoly situation in which two or three firms dominate the entire market and the 'loose' oligopoly situation where six or seven firms occupy the maximum share of the market.

Other firms share the balance. It includes both differentiation and standardization. It encompasses the cases in which firms are acting in collusion and in which they are acting independently. Therefore, the existence of various forms of oligopoly prevents the development of a general theory of price and output. The element of mutual interdependence in oligopolistic market further complicates the determination of price and output.

Theories on Price and Output Determination

No single theory can explain how the price is determined under Oligopoly. Several theories suggest various ways on how the price determination under oligopoly is done. Here we will discuss the important theories of price and output determination.

Cournot's Model

According to Cournot, Each firm in a duopolist market thinks that instead of its action and effect on the market, The other firm will keep on producing the products. The Cournot model suggests that the most profitable pricing is when a firm's output is two-third of its competitor's output, and the price is also two-third.

Bertrand Model

Bertrand model can be explained when there exists a symmetry in the industry, i.e. there are firms which are equal in size and operations. The Bertrand model suggests that the firms set a low price until the price matches the cost of production. This is done to dominate the market.

Edgeworth Model

The Edgeworth Model suggests that each firm in a duopoly market thinks that his competitor will charge the same price, so it changes its price to make a greater profit. This thinking of the firm keeps the price war continued.

PRICE DETERMINATION MODELS OF OLIGOPOLY

1. Kinked Demand Curve: The kinky demand curve model tries to explain that in non-collusive oligopolistic industries there are not frequent changes in the market prices of the products. The demand curve is drawn on the assumption that the kink in the curve is always at the ruling price. The reason is that a firm in the market supplies a significant share of the product and has a powerful influence in the prevailing price of the commodity. Under oligopoly, a firm has two choices:

(a) The first choice is that the firm **increases the price** of the product. Each firm in the industry is fully aware of the fact that if it increases the price of the product, it will lose most of its customers to its rival. In such a case, the upper part of demand curve is more elastic than the part of the curve lying below the kink.

(b) The second option for the firm is to **decrease the price.** In case the firm lowers the price, its total sales will increase, but it cannot push up its sales very much because the rival firms also follow suit with a price cut. If the rival firms make larger price cut than the one which initiated it, the firm which first started the price cut will suffer a lot and may finish up with decreased sales. The oligopolists, therefore avoid cutting price, and try to sell their products at the prevailing market price. These firms, however,

compete with one another on the basis of quality, product design, after-sales services, advertising, discounts, gifts, warrantees, special offers, etc.

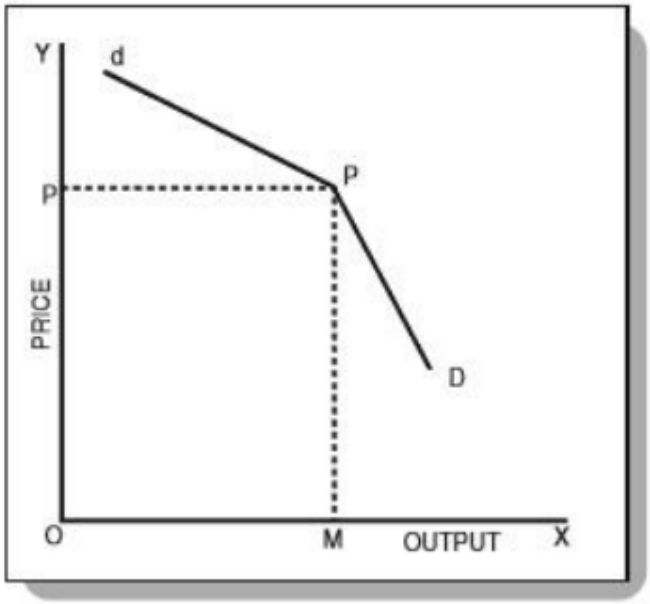


Fig. 1 : Kinked Demand Curve under oligopoly

2. Price Leadership Model: Under price leadership, one firm assumes the role of a price leader and fixes the price of the product for the entire industry. The other firms in the industry simply follow the price leader and accept the price fixed by him and adjust their output to this price. The price leader is generally a very large or dominant firm or a firm with the lowest cost of production. It often happens that price leadership is established as a result of price war in which one firm emerges as the winner.

In oligopolistic market situation, it is very rare that prices are set independently and there is usually some understanding among the oligopolists operating in the industry. This agreement may be either tacit or explicit.

Types of Price Leadership: There are several types of price leadership. The following are the principal types:

(a) Price leadership of a dominant firm, i.e., the firm which produces the bulk of the product of the industry. It sets the price and rest of the firms simply accepts this price.

(b) Barometric price leadership, i.e., the price leadership of an old, experienced and the largest firm assumes the role of a leader, but undertakes also to protect the interest of all firms instead of promoting its own interests as in the case of price leadership of a dominant firm.

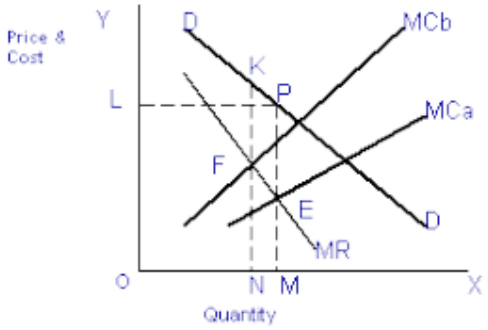
(c) Exploitative or Aggressive price leadership, i.e., one big firm built its supremacy in the market by following aggressive price leadership. It compels other firms to follow it and accept the price fixed by it. In case the other firms show any independence, this firm threatens them and coerces them to follow its leadership.

Price Determination under Price Leadership: There are various models concerning price-output determination under price leadership on the basis of certain assumptions regarding the behaviour of the price leader and his followers. In the following case, there are few assumptions for determining price-output level under price leadership:

(a) There are only two firms A and B and firm A has a lower cost of production than the firm B.

(b) The product is homogenous or identical so that the customers are indifferent as between the firms.

(c) Both A and B have equal share in the market, i.e., they are facing the same demand curve which will be the half of the total demand curve.



In the above diagram, MCa is the marginal cost curve of firm A and MCb is the marginal cost curve of firm B. Since we have assumed that the firm A has a lower cost of production than the firm B, therefore, the MCa is drawn below MCb.

Now let us take the firm A first, firm A will be maximising its profit by selling OM level of output at price MP, because at output OM the firm A will be in equilibrium as its marginal cost is equal to marginal revenue at point E. Whereas the firm B will be in equilibrium at point F, selling ON level of output at price NK, which is higher than the price MP. Two firms have to charge the same price in order to survive in the industry. Therefore, the firm B has to accept and follow the price set by firm A. This shows that firm A is the price leader and firm B is the follower.

Since the demand curve faced by both firms is the same, therefore, the firm B will produce OM level of output instead of ON. Since the marginal cost of firm B is greater than the marginal cost of firm A, therefore, the profit earned by firm B will be lesser than the profit earned by firm A

3. MONOPLY

Monopoly is a market situation in which there is only one seller of a product with barriers to entry of others. The product has no close substitutes. The cross elasticity of demand with every other product is very low. This means that no other firms produce a similar product. According to D. Salvatore, "Monopoly is the form of market organisation in which there is a single firm selling a commodity for which there are no close substitutes." Thus the monopoly firm is itself an industry and the monopolist faces the industry demand curve.

The demand curve for his product is, therefore, relatively stable and slopes downward to the right, given the tastes, and incomes of his customers. It means

that more of the product can be sold at a lower price than at a higher price. He is a price-maker who can set the price to his maximum advantage.

However, it does not mean that he can set both price and output. He can do either of the two things. His price is determined by his demand curve, once he selects his output level. Or, once he sets the price for his product, his output is determined by what consumers will take at that price. In any situation, the ultimate aim of the monopolist is to have maximum profits.

Characteristics of Monopoly:

The main features of monopoly are as follows:

1. Under monopoly, there is one producer or seller of a particular product and there is no difference between a firm and an industry. Under monopoly a firm itself is an industry.

2. A monopoly may be individual proprietorship or partnership or joint stock company or a cooperative society or a government company.

3. A monopolist has full control on the supply of a product. Hence, the elasticity of demand for a monopolist's product is zero.

4. There is no close substitute of a monopolist's product in the market. Hence, under monopoly, the cross elasticity of demand for a monopoly product with some other good is very low.

5. There are restrictions on the entry of other firms in the area of monopoly product.

6. A monopolist can influence the price of a product. He is a price-maker, not a price-taker.

7. Pure monopoly is not found in the real world.

8. Monopolist cannot determine both the price and quantity of a product simultaneously.

9. Monopolist's demand curve slopes downwards to the right. That is why, a monopolist can increase his sales only by decreasing the price of his product and thereby maximise his profit. The marginal revenue curve of a monopolist is below the average revenue curve and it falls faster than the average revenue curve. This is because a monopolist has to cut down the price of his product to sell an additional unit.

Price and Output Determination In Monopoly Market

Short Run:

Pricing under monopoly, like that under perfect competition, is determined by demand and supply conditions in the market. Since the number of consumers is large even under monopoly, the monopoly is similar to the pure competitive market so far as the demand side as a whole i.e. industry demand is concerned. The difference lies in the demand curve facing a firm. Under monopoly, there is no difference between the industry and the firm, and thus the demand curve facing the monopolist firm is the one faced by the purely competitive industry, which is downward sloping.

Further, the downward sloping demand curve implies that more could be sold only at a lower price and vice versa, thus the firm is a price maker. Given the consumer's demand, the monopolist could either set the price or the output, and the remaining of the two variables will be determined by the demand function. Since the monopolist takes part in pricing his product and the demand for its

product varies with the product price. Accordingly under monopoly, the relevant curves are revenue curves.

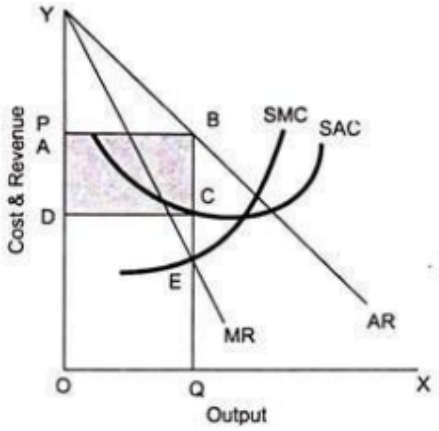


Fig. 4.10. Short- run Price and Output Determination.

The monopolist hires his factors of production from the factors market just as a purely competitive firm does. Thus, there is no significant difference with regard to cost curves between the two market structures. Accordingly, the cost curves of the monopolist would be of usual shapes.

Given the revenue and cost curves and firm's objective of profit-maximization price-output determination can easily be explained.

The monopolist maximizes his short-run profits at the point where marginal cost is equal to the marginal revenue and the slope of the marginal cost is greater than the slope of the marginal revenue at the point of intersection. In Figure 4.10 the monopolist attains his equilibrium at point E where the MC intersects the MR curve from below. Price is OA and the quantity is OQ.

The monopolist enjoys supernormal profit equal to the shaded area PBCD. A change in either the demand curves or in cost curves or in both would cause a change in the equilibrium price and output. It is easy to see that while an increase in demand, which would cause an upward shift in AR and MR curves, ceteris paribus, would lead to an increase both in price and quantity, and an increase in supply, causing cost to shift downward, ceteris paribus, would lead to an increase in quantity but a decline in price.

Long Run Equilibrium:

In the long run the monopolist has the time to expand his plant, or to use his existing plant at any level that will maximize his profit. Since the monopolist does not face the threat of entry of new firms, it is not necessary for him to reach an optimal scale.

A monopolist will not stay in business if he makes losses in the long run. He will most probably continue to make supernormal profits even in the long run, given that entry is barred. However, the size of his plant and the degree of utilization of any given plant size depend entirely on the market demand. He may reach the optimal scale or remain at sub-optimal scale or surpass the optimal scale depends on the market conditions. Figure 4.11 portrays the situation in which the market size is such that does not allow the monopolist to reach the optimal scale.

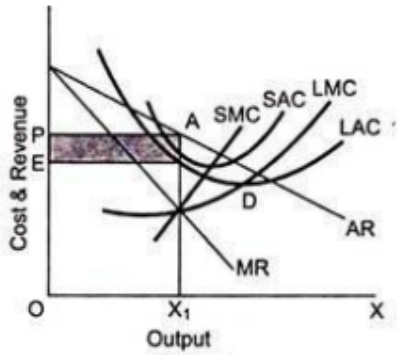


Figure 4.11. Long run Price and Output Determination.

In case of monopoly, one can know about price determination or equilibrium position with the help of marginal revenue and marginal cost analysis.

According to this analysis, a monopolist will be in equilibrium when two conditions are fulfilled:

(i) MC =MR and

(ii) MC curve cuts MR curve from below.

Price Discrimination under Monopoly

In monopoly, there is a single seller of a product called monopolist. The monopolist has control over pricing, demand, and supply decisions, thus, sets prices in a way, so that maximum profit can be earned.

The monopolist often charges different prices from different consumers for the same product. This practice of charging different prices for identical product is called price discrimination.

Types of Price Discrimination:

Price discrimination is a common pricing strategy' used by a monopolist having discretionary pricing power. This strategy is practiced by the monopolist to gain market advantage or to capture market position.

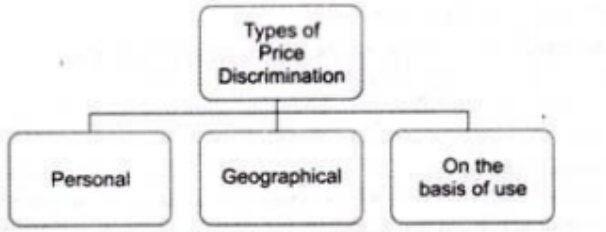


Figure-13: Price Discrimination

i. Personal:

Refers to price discrimination when different prices are charged from different individuals. The different prices are charged according to the level of income of consumers as well as their willingness to purchase a product. For example, a doctor charges different fees from poor and rich patients.

ii. Geographical:

Refers to price discrimination when the monopolist charges different prices at different places for the same product. This type of discrimination is also called dumping.

iii. On the basis of use:

Occurs when different prices are charged according to the use of a product. For instance, an electricity supply board charges lower rates for domestic consumption of electricity and higher rates for commercial consumption.

Degrees of Price Discrimination:

Price discrimination has become widespread in almost every market. In economic jargon, price discrimination is also called monopoly price discrimination or yield management. The degree of price discrimination vanes in different markets.

i. First-degree Price Discrimination:

Refers to a price discrimination in which a monopolist charges the maximum price that each buyer is willing to pay. This is also known as perfect price discrimination as it involves maximum exploitation of consumers. In this, consumers fail to enjoy any consumer surplus. First degree is practiced by lawyers and doctors.

ii. Second-degree Price Discrimination:

Refers to a price discrimination in which buyers are divided into different groups and different prices are charged from these groups depending upon what they are willing to pay. Railways and airlines practice this type of price discrimination.

iii. Third-degree Price Discrimination:

Refers to a price discrimination in which the monopolist divides the entire market into submarkets and different prices are charged in each submarket. Therefore, third-degree price discrimination is also termed as market segmentation.

Advantages and Disadvantages of Price Discrimination:

A monopolist practices price discrimination to gain profits. However, it acts as a loss for the consumers.

Following are some of the advantages of price discrimination:

i. Helps organizations to earn revenue and stabilize the business

ii. Facilitates the expansion plans of organizations as more revenue is generated

iii. Benefits customers, such as senior citizens and students, by providing them discounts

In spite of advantages, there are certain disadvantages of price discrimination.

Some of the disadvantages of price discrimination as follows:

i. Leads to losses as some consumers end up paying higher prices

ii. Involves administration costs for separating markets.

(no subject)

1 message

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Sat, May 24, 2025 at 11:28

UNIT 3
GAME THEORY
NASH EQUILIBRIUM

Nash equilibrium, in game theory, an outcome in a noncooperative game for two or more players in which no player's expected outcome can be improved by changing one's own strategy. The Nash equilibrium is a key concept in game theory, in which it defines the solution of N-player noncooperative games. It is named for American mathematician John Nash, who was awarded the 1994 Nobel Prize for Economics for his contributions to game theory.

Game theory uses mathematics to model and analyze situations in which decisions are interdependent. While it can be used to model recreational games such as Monopoly or poker, it is often used to analyze topics of real-world interest, including economics and military strategy. In game theory, a game may be any situation in which there are interdependent decisions, and the players are all the decision-making entities.

A game is noncooperative as long as no mechanism exists for the players to make binding agreements with one another. For example, in the famous prisoner's dilemma, two prisoners have been accused of a crime and are asked to confess. If one confesses and the other does not, the one who confesses will be released, and the one who does not will receive a harsh sentence. If both confess, both will receive a serious, but not harsh, sentence. If neither confesses, both will receive a very light sentence. Because there is no outside authority enforcing any agreement between the prisoners, the game is noncooperative; neither prisoner suffers a penalty for betraying the other.

PAY OFF MATRIX AND SADDLE POINT

Payoff matrix

A payoff matrix is often used to help YOU determine the optimal strategy for the players in the game. In the payoff matrix, each row represents one possible strategy for one player, and each column represents one possible strategy for the other. In the example above, the matrix would look like the figure below.

PRISONER DILLEMA

Prisoner's dilemmaThe prisoner's dilemma is a well-known problem in game theory. It demonstrates how communication between the participants can drastically alter their best strategy.
Each player (prisoner A or prisoner B) will attempt to adopt the strategy (confess or remain silent) that results in the least amount of jail time (0, 1, 5, or 20 years). The best outcome for the prisoners is for both to remain silent, as this results in a total sentence of only 2 years (as opposed to 20, if only one chooses to remain silent, or 10, if both choose to confess). This collection of strategies results in the best payoff for the players collectively. However, it is not the Nash equilibrium, because either prisoner's payoff can be improved by choosing a different strategy.

If prisoner A remains silent, then prisoner B can either remain silent and receive a 1-year sentence or confess and go free. Prisoner B's own payoff therefore can be improved by confessing. However, one prisoner confessing and the other remaining silent is also not a Nash equilibrium, because the payoff of the prisoner who remains silent can be improved by changing strategies. If prisoner A confesses, then prisoner B can either remain silent and face a 20-year sentence or confess and face a 5-year sentence. Thus, prisoner B's payoff can be improved by switching from remaining silent to confessing.

The only collection of strategies in which no player's payoff can be improved by switching strategies is if both prisoners confess. In this scenario, either prisoner choosing to switch strategies will result in a lower payoff. Despite this being worse for both players (resulting in a total 10-year sentence) than if both were to remain silent, it is the Nash equilibrium.

It is possible for there to be multiple Nash equilibria to a given problem. For example, suppose two friends wish to see a movie together but disagree on which movie. If both would rather see either movie together than see a movie alone, then both friends seeing either movie constitutes a Nash equilibrium, as neither can opt to see the other film without suffering a worse outcome.

It is also possible that a Nash equilibrium is a “mixed” equilibrium, meaning that at least one player should employ a specific mix of strategies rather than employing the same strategy consistently (a “pure” Nash equilibrium). For example, in the game rock-paper-scissors, the Nash equilibrium is that each player should choose each option exactly one-third of the time, because if a player chooses one option more than the others, the other player can exploit that tendency to win a greater percentage of the matches.

Nash equilibria may be found for situations involving many players (such as individual use of common resources) or for asymmetrical situations (such as contract negotiations between an individual and a business). Nash proved that if mixed strategies are allowed, then there is at least one Nash equilibrium for every noncooperative game with a finite number of players choosing from a finite number of strategies.

(no subject)

1 message

Ravinder Sharma <ravinder.law@tmu.ac.in> Sat, May 24, 2025 at 11:31
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The Prisoner's Dilemma is a classic game theory scenario illustrating that self-interest can lead to a suboptimal outcome for all involved, even when cooperation would be mutually beneficial. In this thought experiment, two suspects are arrested for a crime and questioned separately. Each has a choice to either cooperate by remaining silent or betray the other by confessing.
Key aspects of the Prisoner's Dilemma:
Self-Interest:
Each player (prisoner) acts in their own best interest, aiming to minimize their jail time.
Incomplete Information:
Players don't know what the other player will do, making it difficult to trust in cooperation.
Dominant Strategy:

Confessing is the dominant strategy for each player, regardless of the other's choice, because it offers the best individual outcome.
Suboptimal Outcome:

If both prisoners confess, they each receive a longer sentence than if they both remained silent and cooperated.
How the dilemma works:
1. Cooperation (Both Stay Silent):
If both prisoners remain silent, they each receive a short sentence (e.g., 1 year).
2. Defection (One Confesses, One Stays Silent):
If one confesses and the other stays silent, the one who confessed goes free, while the other receives a long sentence (e.g., 5 years).
3. Mutual Defection (Both Confess):
If both prisoners confess, they each receive a medium sentence (e.g., 3 years).

The paradox:

The paradox of the Prisoner's Dilemma is that while each individual's rational choice (confessing) leads to a worse outcome for both, cooperation (staying silent) would lead to a better outcome for both. This illustrates the difficulty of maintaining cooperation in situations where there is an incentive for individuals to act in their own self-interest, even when it's not in the best collective interest.
Real-world applications:
The Prisoner's Dilemma has broad applications in various fields, including:
Economics: Understanding price wars, arms races, and environmental issues.
Business: Analyzing competitive strategies, advertising campaigns, and marketing decisions.
Social Sciences: Studying cooperation, conflict, and public goods provision.
Politics: Examining international relations, arms control agreements, and global cooperation.

(no subject)

1 message

Ravinder Sharma <ravinder.law@tmu.ac.in> Sat, May 24, 2025 at 11:33
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UNIT 3 GAME THEORY

ZERO SUM GAME

In game theory, a zero-sum game is a situation where one player's gain directly corresponds to another player's loss, with no net gain or loss overall. Essentially, if one player wins, another player must lose, and the total value of the game remains constant.
Key Characteristics:
Inverse Relationship: One player's gain is another player's loss.
No Net Change: The total value of the game (gains and losses) sums to zero.
Competitive: Players have opposing interests and seek to maximize their own gain while minimizing the gain of others.
Examples:
Competitive Games:
Chess, poker, and other two-player games where one player's win is the other's loss are classic examples.
Financial Markets:
Some transactions, like trading options or futures, can be considered zero-sum as one party's profit is directly linked to another's loss.
Negotiation:
Bargaining over a price, where one party's gain in a lower price is directly linked to the other party's loss in revenue, is a zero-sum game.
Limited Resources:
Dividing a limited resource (like land or money) among multiple parties is a zero-sum situation, as one party's share will increase at the expense of others.
Contrast with Non-Zero-Sum Games:
In contrast, non-zero-sum games involve situations where players can benefit or lose without necessarily causing an equivalent loss or gain to others. For example, cooperation or creating a new resource can be a non-zero-sum outcome.
In essence, zero-sum games in game theory represent situations where the pie is fixed, and any gain for one player must come at the expense of another, highlighting competition and a lack of potential for mutually beneficial outcomes.
Zero-sum game -
Zero-sum game is a mathematical representation in game theory and economic theory of a situation that involves two competing entity.

methods of zero sum game in game theory.

In zero-sum games, where one player's gain is exactly another player's loss, the primary methods for analysis and solution involve finding optimal strategies. These methods include identifying saddle points, dominance analysis, and solving for mixed strategies using various techniques like the odds method or graphical methods.
Here's a more detailed look at these methods:
1. Identifying Saddle Points:
Concept:
A saddle point represents a point in the payoff matrix where the strategy is optimal for both players.
Method:
Find the minimum value in each row of the payoff matrix.
Find the maximum value in each column of the payoff matrix.
If a cell has both the minimum of its row and the maximum of its column, it's a saddle point.
Significance:
If a saddle point exists, the players can employ a pure strategy (choosing a specific action) and guarantee a certain outcome, as a mixed strategy is not necessary, according to University of Babylon.

2. Dominance Analysis:
Concept:
Identifying and eliminating strategies that are always worse than other available strategies, regardless of the opponent's choice.
Method:
Row dominance: If one row in the payoff matrix always yields better outcomes than another row (for all column choices), the dominated row can be eliminated.

Column dominance: Similarly, if one column always results in better outcomes than another (for all row choices), the dominated column can be eliminated.
Significance:

Dominance analysis can simplify the payoff matrix and make it easier to find optimal strategies.
3. Solving for Mixed Strategies:
Concept:
When no saddle points exist, players may need to use mixed strategies, which involve choosing a strategy with a certain probability.
Methods:
Odds Method: A method for solving 2x2 games without saddle points.
Graphical Method: A method for solving games where one player has a strategy with 3 or more actions.
Other numerical methods: In more complex cases, numerical methods or software tools like Gambit can be used to compute mixed strategy solutions.
4. Software and Analytical Frameworks:
Concept: Advanced tools can be used to analyze complex zero-sum games.
Tools:
Gambit is an open-source toolkit for game theory analysis, including zero-sum games.
MATLAB/Simulink can be used for simulations.
Python libraries like NumPy and SciPy can be used for calculations and simulation.

(no subject)

1 message

Ravinder Sharma <ravinder.law@tmu.ac.in> Sat, May 24, 2025 at 11:36
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UNIT 3 GAME THEORY

DEFINITION OF GAME THEORY

At its core, game theory is a mathematical framework that analyses interactions between rational decision-makers. It explores how these actors anticipate and respond to the actions of others, aiming to identify optimal strategies in various scenarios.

Originating from the works of scholars like John von Neumann and John Nash, game theory has transcended its roots in mathematics and found profound applications across disciplines, including economics.

Game theory application in economics
In economics, individuals, firms, and governments strategise their choices based not only on their own objectives but also on their expectations of how others will act.

Game theory provides a structured approach to understanding these strategic interactions, offering insights into competitive behaviours, pricing strategies, negotiations, and more.

By modelling economic interactions as games, economists can analyse various scenarios and predict outcomes with greater precision.

Types of game theory

Game theory encompasses a spectrum of classifications, each shedding light on different aspects of strategic interactions:

Symmetric and Asymmetric Games:

Symmetric games involve players with identical strategies and payoffs, while asymmetric games feature players with distinct roles or capabilities.
Simultaneous and Sequential Games: In simultaneous games, players make decisions simultaneously, without knowledge of each other's choices. In contrast, sequential games involve players making decisions in a specific order, often with the knowledge of prior actions.

Zero-Sum and Non-Zero-Sum Games: Zero-sum games entail situations where one player's gain is exactly balanced by another player's loss. Non-zero-sum games, on the other hand, allow for outcomes where both players can gain or lose collectively.
Cooperative and Non-Cooperative Games: Cooperative games involve players collaborating to achieve common goals, often through binding agreements. Non-cooperative games, however, entail independent decision-making without formal agreements.
An example of game theory:

The prisoner’s dilemma
The prisoner's dilemma serves as a quintessential example of game theory in action. Imagine two suspects apprehended for a crime, held in separate cells with no means of communication.

Each prisoner faces a choice: cooperate with their accomplice by remaining silent or betray them by confessing to the crime.

If both prisoners remain silent (cooperate), they receive a lighter sentence collectively. However, if one confesses while the other remains silent, the betrayer walks free while the other faces a severe penalty. If both confess (defect), they both receive moderate sentences.

This dilemma illustrates the tension between individual rationality and collective welfare, showcasing how self-interest can lead to suboptimal outcomes.

Benefits and limitations of game theory
Game theory offers numerous benefits, including its ability to model complex interactions, predict strategic behaviours, and inform decision-making in various domains.

However, it also has limitations, such as the assumption of rationality among players, the challenge of predicting human behavior accurately, and the complexity of analyzing real-world scenarios with numerous variables.

In conclusion, game theory serves as a powerful lens through which economists analyse strategic interactions in diverse contexts. By understanding the dynamics of decision-making, economists can devise more effective policies, strategies, and interventions to navigate the complexities of the economic landscape.

In game theory, a payoff matrix is a table that represents the outcomes of different strategic choices for two or more players. It displays the payoffs (gains or losses) each player receives for various combinations of strategies. This tool is crucial for understanding strategic decision-making and identifying potential equilibrium points in games.
Key Components and Purpose:
Players: The individuals or entities involved in the game.

Strategies: The choices or actions available to each player.

Payoffs: The results or outcomes for each player, typically represented by numerical values, reflecting gains or losses.

Purpose: To analyze the potential outcomes of different strategic interactions and identify stable equilibrium points where no player has an incentive to deviate.

Example:
Consider a simple game of chicken. Two players, A and B, can either "swerve" (change course) or "continue" (stay on the original course). The payoff matrix might look like this (with numbers representing the payoffs, e.g., gains for swerving, losses for continuing):
B Swerves
B Continues
A Swerves
1, 1
-2, 5
A Continues
5, -2
-10, -10
In this matrix:
Rows represent Player A's strategies, Columns represent Player B's strategies, and Each cell shows the payoffs for both players.
Interpreting the Matrix:
If both players swerve, they both receive a payoff of 1 (e.g., a moderate outcome).
If A swerves and B continues, A loses 2 and B gains 5 (e.g., A loses, B wins).
If A continues and B swerves, A gains 5 and B loses 2 (e.g., A wins, B loses).
If both continue, they both lose a significant amount (-10 each) (e.g., a terrible outcome).
Using the Payoff Matrix:
Dominant Strategies:
A strategy that is always the best choice for a player, regardless of what the other player chooses.
Nash Equilibrium:
A state where no player can improve their payoff by unilaterally changing their strategy, given the strategies of the other players. In the example, the Nash equilibrium is A and B both swerving, as neither can get a better payoff by unilaterally changing their strategy.
In Summary:
The payoff matrix is a powerful tool in game theory that helps analyze strategic interactions by visualizing the possible outcomes and payoffs for different player choices. It aids in identifying potential dominant strategies and Nash equilibria, providing insights into the likely outcome of a strategic decision-making process. 7

(no subject)

1 message

Ravinder Sharma <ravinder.law@tmu.ac.in> Sat, May 24, 2025 at 23:18
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UNIT 4

What Is Behavioral Economics?

Behavioral economics is the study of psychology as it relates to the economic decision-making processes of individuals and institutions. Behavioral economics is often related with normative economics. It draws on psychology and economics to explore why people sometimes make irrational decisions, and why and how behavior diverges from the predictions of economic models.

Key Takeaways
Behavioral economics is the study of psychology that analyzes the economic decisions people make.
Factors that affect behavior include bounded rationality, choice architecture, cognitive biases, discrimination, and herd mentality.
Behavior economics is crafted around many principles including framing, heuristics, loss aversion, and the sunk-cost fallacy.
Companies use information from behavioral economics to price their goods, craft their commercials, and package their products.
Behavioral Economics

Understanding Behavioral Economics
In an ideal world, people would always make optimal decisions that provide them with the greatest benefit and satisfaction. In economics, rational choice theory states that when humans are presented with various options under the conditions of scarcity, they would choose the option that maximizes their individual satisfaction.

This theory assumes that people, given their preferences and constraints, are capable of making rational decisions by effectively weighing the costs and benefits of each option available to them. The final decision made will be the best choice for the individual. The rational person has self-control and is unmoved by emotions and external factors and, hence, knows what is best for himself. Alas, behavioral economics explains that humans are not rational and are incapable of making good decisions.

Because humans are emotional and easily distracted beings, they make decisions that are not in their self-interest. For example, according to the rational choice theory, if Charles wants to lose weight and is equipped with information about the number of calories available in each edible product, he will opt only for food products with minimal calories.

Behavioral economics states that even if Charles wants to lose weight and sets his mind on eating healthy food going forward, his end behavior will be subject to cognitive bias, emotions, and social influences. If a commercial on TV advertises a brand of ice cream at an attractive price and quotes that all human beings need 2,000 calories a day to function effectively after all, the mouth-watering ice cream image, price, and seemingly valid statistics may lead Charles to fall into the sweet temptation and fall off of the weight loss bandwagon, showing his lack of self-control.

Behavioral economics and behavioral finance are often driven by many of the same factors, though behavior finance is often more related to financial markets.

Factors That Influence Behavior

There are often five factors that are cited when analyzing how individual behavior is influenced.

Bounded Rationality

Bounded rationality is the idea that individuals make decisions based on the knowledge they have. Unfortunately, this information is often limited, whether by the individual's lack of expertise of lack of available information. In regards to finance and investing, the same public information is available to everyone, though investors may not know true circumstances of what is happening with a company internally.

Choice Architecture

People can be easily manipulated, and this is often on display in the way promoters craft incentives or deals to make consumers buy certain products. Consider how a cracker display may be presented right next to the cheese aisle within a supermarket. This type of

design is meant to steer a consumer into making a decision based on a choreographed demonstration often between complementary goods.

Cognitive Bias

Whether people realize it or not, everybody makes decisions that are influenced by cognitive bias. Consider the choice of choosing between two companies to invest in. Behavioral economics holds the theory that the color of the logo, the name of the CEO, or the city in which each company is headquartered in may stir up an unknown bias that yields us to choose the other company.

Discrimination

In a similar light, behavioral economics is often associated with discrimination. People perceive things, events, or other people through their own lenses, potentially discriminating towards others because they simply favor a different alternative. This does not necessarily mean the alternative is a better option, though.

Herd Mentality

Many consumer decisions are influenced by what other people are doing. Whether it is the fear of missing out or whether others want to be part of a larger collective, herd mentality is the belief that individual decisions are swayed based on what other people do, not necessarily on what is the best outcome. After all, it is much easier rooting for your favorite team even if they haven't won a championship in a while as long as other fans share your pain.

Principals of Behavioral Economics
The field of economics is vast. Although behavioral economics is just a subset of the field, it itself has a number of guiding principles that dictate the themes within behavioral economics. Some of the primary principles and themes are listed below.

Framing
Framing is the principle of how something is presented to an individual. This behavioral economics concept presents a cognitive bias in that an outcome may be determined based on the structure of how something has been presented. Consider how someone may feel about the two following statements about Babe Ruth, both of which are describing the same thing:

Babe Ruth failed to get a hit in nearly two-thirds of his at-bats.
Babe Ruth, one of the greatest baseball players of all time, hit .342 in his lifetime.
3
Heuristics
Heuristics is a complicated field, but it simply means that humans tend to make decisions using mental shortcuts as opposed to using long, rational, optimal reasoning. Most often, people latch onto something as true, even if it may no longer be the case. In this situation, it's easier for the consumer to continue what they've been doing as opposed to realizing a more beneficial situation exists.

Loss Aversion

Behavioral economics is rooted in the notion that people do not like losses. In fact, people are loss averse to the point that an economic outcome of one financial value that is negative outweighs the emotional toll of the same financial value but positive. For example, some people feel there is much stronger negative emotions associated with losing a Rs 20 bill compared to finding a Rs 20 bill on the ground.

Market Inefficiencies

For lack of a better phrase, the market can take advantage of behavior economics. For this reason, market inefficiencies play a crucial part in behavior economics. Consider how overpriced stocks may still lure in investors due to drops in P/E ratios. Though the trading multiple may still be abnormally high, investors may think something in the market is more reasonable simply because it is lower. For example, a stock worth $20 may be trading at $50. Should the price to $40, investors may feel this is a great opportunity.

Mental Accounting
Consumers and investors may change their spending and trading tendencies based on circumstances. Though this is fair, often times it is illogical and shapes many aspects of behavioral economics. For example, after receiving one's annual bonus, an investor may choose to invest in riskier stocks. This mental accounting exercise led an investor to make a decision based on their circumstances, not their long-term strategy.

Applications of Behavioral Economics
Financial Markets
One field in which behavioral economics can be applied to is behavioral finance, which seeks to explain why investors make rash decisions when trading in the capital markets. Much like how poker professionals not only study the mathematics and odds of poker, they also attempt to capitalize on the irrational nature of other players. The same can be said of financial markets.

Game Theory

When a decision made leads to error, heuristics can lead to cognitive bias. Behavioral game theory, an emergent class of game theory, can also be applied to behavioral economics as game theory runs experiments and analyzes people's decisions to make irrational choices. This concept attempts to override illogical behavior to predict consumption outcomes.

Pricing Strategies

for consumers with sensitive skin. The latter target would not have purchased the product if the package did not specify that the soap was for sensitive skin. They opt for the soap with the sensitive skin label even though it's the exact same product in the general package.

What Do Behavioral Economists Do?

Behavioral economists work to understand what consumers do and why they make the choices they make. Such economists also assist markets in helping consumers make those decisions. Behavioral economists may work for the government to shape public policy to protect consumers. Other times, they may work for private companies and assist in fostering sales growth.

What Is the Goal of Behavioral Economics?

The goal of behavioral economics is to understand why humans make the decisions they do. There are usually outcomes that are the best for people and many times, people do not choose that outcome. Behavioral economics is an incredibly complex and sometimes inexplainable science of why people do things and why they choose to not be rational.

What Is the Difference Between Behavioral Economics and Psycology?

Both behavioral economics and psychology refer to the dispositions, emotions, and decision-making of individuals. Behavior economics is a much more niche field that studies the financial decision-making of an individual, while psychology may cover any aspect of human rationality.

What Is the Downside to Behavioral Economics?

One downside to behavioral economics is that it can be used to deceive or manipulate people and their decision-making. Though people are often not rational, this irrationality may be predictable. Companies can choose to exploit this by packaging their products in a certain way, pricing their goods at specific levels, or customizing their marketing to attract certain markets.

The Bottom Line

Behavioral economics is a field of study aimed at understanding why people make economically irrational decisions.

Rational choice theory holds that consumers make choices that maximize their utility. In reality, people can be swayed or distracted from doing so. Behavioral economics attempts to understand how and why this happens.

Welfare Economics

PARETO OPTAMILITY

UNIT 4

Welfare Economics Vs Positive Economics

Positive Economics	Welfare Economics
Positive Economics is largely devoted to explaining why things are the way they are: e.g., why the price of wheat has so high, why wealth in the community is unequally distributed etc., It has generalisations, principles, or laws which trace out a casual relationship between cause & effects.	Welfare economics is the normative branch of economics. It also deals with a casual relationship between cause & effect but in addition to deriving conclusions from this relationship, it seeks to evaluate various results. It is concerned primarily with policy, i.e., with judgments & prescription.

We can better understand with an example, positive economics would explain why the price of wheat has so high & welfare economics would suggest price control measures.

In *Theory & Operations Analysis, 1978,* Professor Baumol writes, "Welfare economics has concerned itself mostly with policy issues which arise out of the allocation of resources, with the distribution of inputs among the various commodities, & the distribution of commodities among various consumers. & it may be emphasized again that allocation of resources is efficient optimum when social welfare is maximized.

Individual welfare Vs Social welfare

Individual welfare

Individuals welfare at any given time or during a period of time is measured by the amount of satisfaction that he enjoys. he always tries is best to maximize his satisfaction.

Social welfare

Social welfare sum total of the satisfaction of all individual in a society.

Three Concepts of Social Welfare

Prof. Graff has distinguished three concepts of social welfare as

1. Paternalist authority- According to this concept, the preferences of the individual members of the society may be ignored & the state or a paternalist authority or a dictator uses its own ideas about social welfare.

2. Used by V. Pareto & his followers "welfare of the society is simply the sum total of the welfare of different individuals comprising it. If some persons are made better off & none worse off, social welfare increases & vice-verse. But if some are made better off & some worse off, then, we cannot know what has happened to the welfare of the society."

3. Propounded by Bergson & Samuelson, in well-known theory of social welfare function.
It involves interpersonal comparison of utility which is to be made by introducing explicit value judgments.

PARETO OPTIMALITY

The Italian economist V. Pareto rejected the notion of Cardinal utility & it's additive nature & detached welfare economics from the interpersonal comparison of utilities, his concept of maximum social welfare is based upon ordinal utility & also free from value judgments. He has specified a condition of optimal or efficient allocation referred to as Pareto condition. By this criterion, a policy change is socially desirable if everyone is made better off (the weak Pareto criterion) or at least some are made better off while no one is made worse off (the strong Pareto criterion).

Obviously, when the possibilities of making such policy changes are exhausted, we are left with an allocation of commodities that cannot be altered without someone being made worse off. Such an allocation is called Pareto optimal or efficient.

Pareto optimality: The three aspects

First, Efficiency of distribution of goods among consumers
(Efficiency of Exchange)

Second, Efficiency in the allocation of factors among firms
(Efficiency of Products)

Third, Efficiency in the allocation of factor among goods
(Efficiency in the product mix or composition of output)

First, Efficiency of distribution of goods among consumers (Efficiency of exchange)

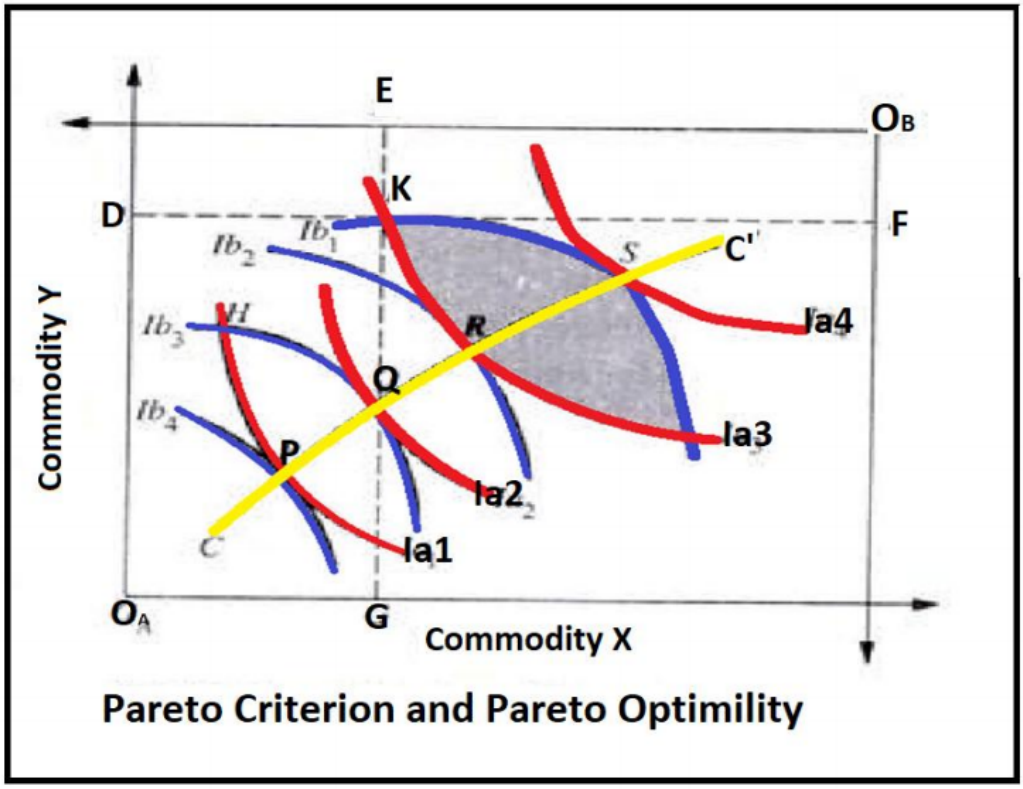
Condition

- The marginal rate of substitution between any two products must be the same for every individual consumes both. It means that the marginal rate of substitution between two consumer goods to the ratio of their prices, under perfect competition every consumer aims at maximizing this utility,

- Consumer A & B who buys the goods X & Y, A will choose X & Y such that his $MRS^{A}_{XY} = P_X/P_Y$ & similarly B choose X & Y such that his $MRS^{B}_{XY} = P_X/P_Y$

Therefore, the condition for efficiency is

- $MRS^{A}_{XY} = MRS^{B}_{XY} = P_X/P_Y$



Pareto Criterion and Pareto Optimility

Any movement from K to S through redistribution of two goods between two individuals increases the level of satisfaction of A without any changes in the satisfaction of B because as a result of this A move to his higher indifference curve Ia4 & B remains on his same difference curve Ib. In other words as a result of a movement from K to S individual A has become better off whereas individual B is no worse off.

According to Pareto criterion social welfare has increased following the movement from K to S & therefore K is not the position of economic optimum. Similarly, the movement from K to R is also desirable from the point of view of social welfare. therefore, both the position S & R are better than K. The tendency points of the earliest indifference curves of two individuals of the society are the Pareto optimum points & the locus of these points is called contract curve.

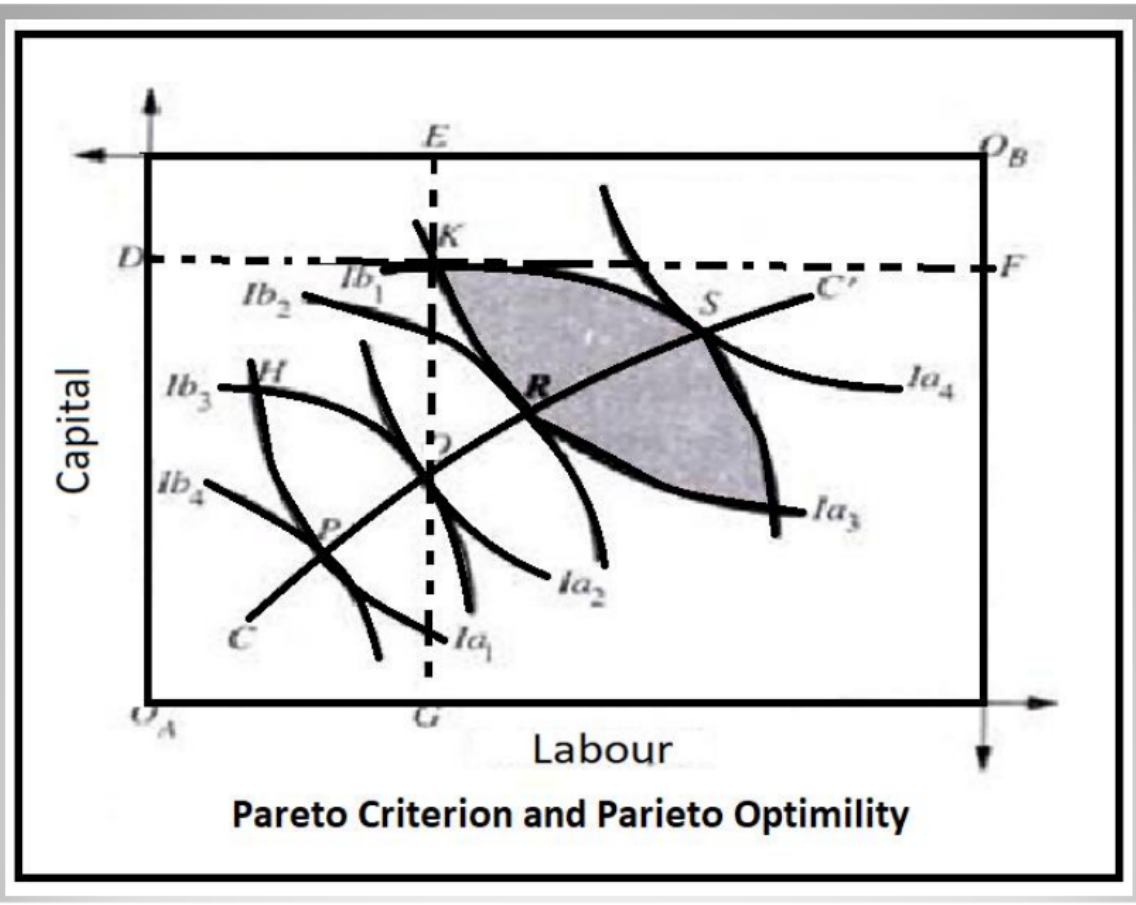
Second, Efficiency in the allocation of factors among firms (Efficiency of Products)

The 2nd condition for Pareto optimality relates to efficiency in production. A profit maximizing firm under perfect competition will be in equilibrium when the iso-revenue line is tangent to its transformation curve. It means that for equilibrium the marginal rate of transformation between two products X & Y must equal their price ratio, i.e.,

$$MRT_{XY} = \mathbf{P_X/P_Y}$$

Thus the optimum condition in the firm A & firm B will be

$$MRT^{A}_{XY} = MRT^{B}_{XY} = \mathbf{P_X/P_Y}$$



Pareto Criterion and Parieto Optimility

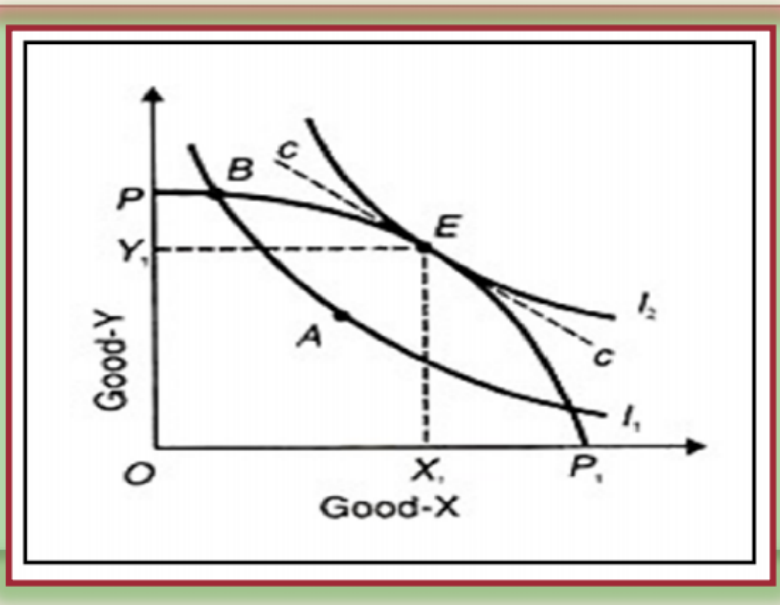
Any movement from K to S or to Q raises the output of one firm without any decrease in the output of the other. The total output of the two firms increases when through redistribution of factors between the two firms, a movement is made from the point K to the point Q or S on the contract curve.

Third, Efficiency in the allocation of factor among goods (Efficiency in the product mix or composition of output)

Pareto optimality under perfect competition also requires that the marginal rate of substitution (MRS) between two products must equal the marginal rate of transformation (MRT) between them. It means simultaneous efficiency in consumption & production.

Since the price ratios of the two products to consumers & firms are the same under perfect competition, the MRS of all individuals will be identical with MRT of all firms consequently, the two products will be produced & exchanged efficiently. Symbolically, $MRS_{XY} = P_X/P_Y$, & $MRT_{xy} = P_x/P_y$. Therefore, $MRS_{XY} = MRT_{xy}$.

Point E represents the optimum composition of production in which commodities X & Y are being produced & consumed in X_1 & Y_1 quantities. This is because of all the points on the communities transformation curve point E lies at the highest possible indifference curve I_2 of the consumer.



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(no subject)

1 message

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UNIT 5 ECONOMIC ANALYSIS OF CONTRACT.

Economic analysis of contract law examines how legal rules governing contracts affect economic outcomes, focusing on efficiency and social welfare. It analyzes how contracts are formed, enforced, and breached, considering factors like information asymmetry, transaction costs, and the incentives they create for parties. This analysis helps understand the economic consequences of different contract terms and legal rules, ultimately informing policy decisions related to contract law.

Key Concepts in Economic Analysis of Contracts:

Efficiency:
A core concept, aiming to maximize the overall benefits derived from contracts, considering both parties' perspectives.

Incentives:
How contract terms motivate parties to act in certain ways, both before and after a contract is signed.

Information Asymmetry:
When one party to a contract has more information than the other, leading to potential risks and inefficiencies.

Transaction Costs:
The costs associated with negotiating, drafting, enforcing, and potentially breaching a contract.

Remedies for Breach:
The legal consequences for failing to uphold a contract, such as damages, specific performance, or other remedies.

Default Rules:
Pre-set contract terms that apply unless the parties explicitly agree otherwise, influencing their behavior and expectations.

Social Welfare:
A broader measure of societal well-being, considering the overall impact of contract law on individuals and society.

Examples of Economic Analysis in Action:

Contract Formation:
Analyzing the optimal level of detail to include in a contract, balancing the need for clarity with the costs of negotiation.

Risk Allocation:
Determining how to best allocate risks between parties in a contract, considering factors like their risk preferences and ability to bear losses.

Enforcement Mechanisms:
Examining the effectiveness of different remedies for breach of contract, such as specific performance versus monetary damages.

Default Rules:
Designing default rules that encourage efficient contract formation and minimize the need for costly litigation.

In essence, economic analysis of contract law provides a framework for understanding how contracts function as tools for economic exchange and how legal rules can be designed to promote efficiency, fairness, and social welfare.

Economic analysis of law has traditionally assumed that legal rules are or ought to be designed to maximize social welfare taking as given that legal subjects are like Holmes's "bad man"—rational, self-interested agents who care about complying with the law only insofar as noncompliance exposes them to the risk of sanctions. But while it is plausible to suppose that some legal subjects are, like Holmes's bad man, "externalizers" of legal rules, it is likely that others regard the law from the "internal point of view"—that is, they are "internalizers" of legal rules who are motivated to conform to legal rules regardless of the consequences of defiance. In this Article, I ask what specific doctrinal implications for contract law follow when we assume that there are both internalizers and externalizers in the subject population while keeping the standard economic framework otherwise intact. I analyze several contract law phenomena: the expectation principle, according to which a victim of a breach of contract is entitled to her expectation, and no more than her expectation; the penalty doctrine and stipulated damages clauses; the doctrine of willful breach; and the doctrine of contract modification. The resulting analysis shows that internalizers respond to these doctrines differently from externalizers such that the prescriptive implications of economic analysis for the design of contract law doctrines may change once we recognize that there are both internalizers and externalizers in the subject population. For example, the presence of internalizers in the subject population provides a justification for punishing some "willful breaches" more harshly than ordinary breaches. It also helps to justify the modern doctrine of contract modification.