

## General equilibrium

### Interdependence in the Economy:

We have adopted a partial equilibrium approach, concentrating on decisions in a particular segment of the economy in isolation of what was happening in other segments, under the ceteris paribus assumption.

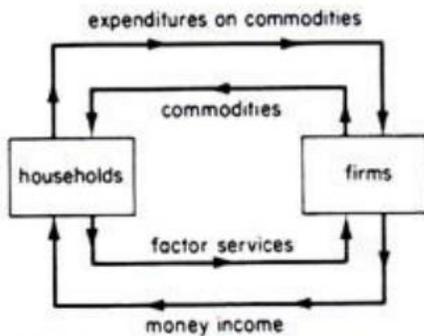
We examined the utility-maximizing behaviour of a household under the assumption that its income was given, although income depends on the amount of labor and other factors of production that the consumer owns and on their prices (wage, rental of capital, etc.).

The ceteris paribus assumption was useful in that it enabled us to study the individual's demand for different commodities in isolation from influences arising from other parts of the economy.

We studied the production decision of a firm on the assumption that factor prices, the state of technology and the prices of commodities were given. The ceteris paribus assumption allowed us to study the cost-minimization behaviour of a firm in isolation from such factors as the demands for the products, which in turn are influenced by the level of employment, income and tastes of consumers.

It is assumed that:

- (a) All production takes place in the business sector;**
- (b) All factors of production are owned by the households;**
- (c) All factors are fully employed;**
- (d) All incomes are spent.**



The real flow is the exchange of goods for the services of factors of production: firms produce and offer final goods to the household sector, and consumers offer to firms the services of factors which they own.

The monetary flow is the real flow expressed in monetary terms. The consumers receive income payments from the firms for offering their factor services. These incomes are spent by consumers for the acquisition of the finished goods produced by the business sector.

### **The Walrasian System:**

The most ambitious general equilibrium model was developed by the French economist Leon Walras (1834-1910).

In his *Elements of Pure Economics* Walras argued that all prices and quantities in all markets are determined simultaneously through their interaction with one another. Walras used a system of simultaneous equations to describe the interaction of individual sellers and buyers in all markets, and he maintained that all the relevant magnitudes (prices and quantities of all commodities and all factor services) can be determined simultaneously by the solution of this system.

In the Walrasian model the behaviour of each individual decision-maker is pre-sented by a set of equations.

For example, each consumer has a double role: he buys commodities and sells services of factors to firms.

Thus for each consumer we have a set of equations consisting of two subsets: one describing his demands of the different commodities, and the other his supplies of factor inputs.

Similarly, the behavior of each firm is presented by a set of equations with two subsets one for the quantities of commodities that it produces, and the other for the demand for factor inputs for each commodity produced. The important characteristic of these equations is their simultaneity or interdependence. The solution of this system of millions of simultaneous equations defines the 'unknowns' of the model, namely the prices and quantities of all commodities and all factor inputs.

In a general equilibrium system of the Walrasian type there are as many markets as there are commodities and factors of production.

For each market there are three types of functions: demand functions, supply functions and a 'clearing-the-market' equation, which stipulates that the quantities demanded be equal to the quantities supplied.

In a commodity market the number of demand functions is equal to the number of consumers, and the number of the supply functions is equal to the number of firms which produce the commodity.

### **A Graphical Treatment Of The Two-Factor, Two-Commodity, Two-Consumer (2 X 2 X 2) General Equilibrium Model:**

Now we use graphical analysis to show the general equilibrium of a simple economy in which there are two factors of production, two commodities (each produced by a firm) and two consumers.

This is known as the 2 x 2 x 2 general equilibrium model. We will restrict our analysis to the perfectly competitive market system, since with free competition it has been proved that a general equilibrium solution exists (given some additional assumptions about the form of the production and demand functions). Furthermore we will be concerned with the static properties of general equilibrium and not with the dynamic process of reaching the state of such an equilibrium, the latter having been sketched in the preceding section.

## **Assumptions of the 2 X 2 X 2 Model:**

1. There are two factors of production, labour (L) and capital (K), whose quantities are given exogenously. These factors are homogeneous and perfectly divisible.

2. Only two commodities are produced, X and Y.

Technology is given. The production functions of the two commodities are represented by two isoquant maps, with the usual properties. The isoquants are smooth and convex to the origin, implying diminishing marginal rate of factor (technical) substitution along any isoquant.

Each production function exhibits constant returns to scale.

Finally, it is assumed that the two production functions are independent: there are no external economies or diseconomies for the production activity of one product arising from the production of the other.

3. There are two consumers in the economy, A and B, whose preferences are represented by ordinal indifference curves, which are convex to the origin, exhibiting diminishing marginal rate of substitution between the two commodities. It is assumed that consumer choices are independent: the consumption patterns of A do not affect B's utility, and vice versa. Bandwagon, snob, Veblenesque and other 'external' effects are ruled out. Finally, it is assumed that the consumers are sovereign, in the sense that their choice is not influenced by advertising or other activities of the firms.

4. The goal of each consumer is the maximization of his own satisfaction (utility), subject to his income constraint.

5. The goal of each firm is profit maximization, subject to the technological constraint of the production function.

6. The factors of production are owned by the consumers.

7. There is full employment of the factors of production, and all incomes received by their owners (A and B) are spent.

8. There is perfect competition in the commodity and factor markets. Consumers and firms pursue their goals faced by the same set of prices ( $P_x$ ,  $P_y$ ,  $w$ ,  $r$ ).

In this model a general equilibrium is reached when the four markets (two commodity markets and two factor markets) are cleared at a set of equilibrium prices ( $P_x$ ,  $P_y$ ,  $w$ ,  $r$ ) and each participant economic agent (two firms and two consumers) is simultaneously in equilibrium.

The general equilibrium solution thus requires the determination of the values of the following variables:

The total quantities of the two commodities X and Y, which will be produced by firms and bought by the consumers.

The allocation of the given K and L to the production of each commodity ( $K_x$ ,  $K_y$ ,  $L_x$ ,  $L_y$ ). The quantities of X and Y which will be bought by the two consumers ( $X_A$ ,  $X_B$ ,  $Y_A$ ,  $Y_B$ ).

The prices of commodities ( $P_x$  and  $P_y$ ) and of the factors of production (wage  $w$ , and rental of capital  $r$ ).

The distribution of factor ownership between the two consumers ( $K_A$ ,  $K_B$ ,  $L_A$ ,  $L_B$ ). The quantities of factors multiplied by their prices define the income distribution between A and B, and hence their budget constraint.

### **Existence, Uniqueness and Stability of an Equilibrium:**

**1. Does a general equilibrium solution exist? (Existence problem.)**

**2. If an equilibrium solution exists, is it unique? (Uniqueness problem.)**

**3. If an equilibrium solution exists, is it stable? (Stability problem.)**

These problems can best be illustrated with the partial-equilibrium example of a demand-supply model.

Assume that a commodity is sold in a perfectly competitive market, so that from the utility-maximizing behavior of individual consumers there is a market demand function, and from the profit-maximizing behavior of firms there is a market supply function. An equilibrium exists when at a certain positive price the quantity demanded is equal to the quantity supplied.

The price at which  $Q_d = Q_s$  is the equilibrium price. At such a price there is neither excess demand nor excess supply. (The latter is often called negative excess demand.) Thus an equilibrium price can be defined as the price at which the excess demand is zero, the market is cleared and there is no excess demand.

The equilibrium is stable if the demand function cuts the supply function from above. In this case an excess demand drives price up, while an excess supply (excess negative demand) drives the price down (figure 22.2).

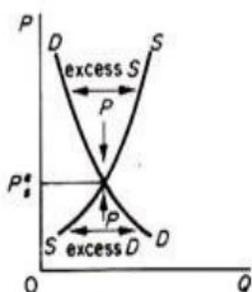


Figure 22.2 Unique, stable equilibrium

### Unique, stable equilibrium

The equilibrium is unstable if the demand function cuts the supply function from below. In this case an excess demand drives the price down, and an excess supply drives the price up .

### Unique, unstable equilibrium

In figure we depict the case of multiple equilibria. It is obvious that at  $P_{e1}$  there is a stable equilibrium, while at  $P_{e2}$  the equilibrium is unstable. Finally in figure 22.5 an equilibrium (at a positive price) does not exist.

## Multiple equilibria

It should be clear from the above discussion that

(a) the existence of equilibrium is related to the problem of whether the consumers' and producers' behaviour ensures that the demand and supply curves intersect (at a positive price)

(b) the stability of equilibrium depends on the relationship between the slopes of the demand and supply curves;

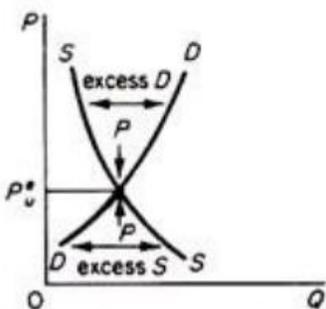
(c) the uniqueness of equilibrium is related to the slope of the excess demand function, that is, the curve which shows the difference between  $Q_D$  and  $Q_S$  at any one price. In fact the three basic questions related to the existence, stability and uniqueness of an equilibrium can be expressed in terms of the excess demand function.

$$E(P_i) = QD(P_i) - Qs(P_i)$$

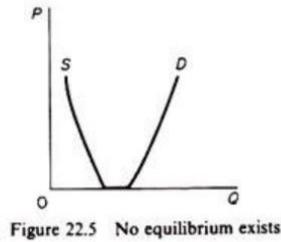
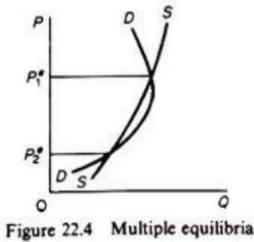
To see this we redraw below figures 22.2-22.5

in terms of the excess demand function. For each of these cases we have derived the relevant excess demand function by subtracting  $Q_S$  from  $Q_D$  at all prices.

The equilibrium is unstable if the demand function cuts the supply function from below. In this case an excess demand drives the price down, and an excess supply drives the price up



We depict the case of multiple equilibria. It is obvious that at  $P_{e1}$  there is a stable equilibrium, while at  $P_{e2}$  the equilibrium is unstable. Finally in figure 22.5 an equilibrium (at a positive price) does not exist.



## Brouwer's fixed-point theorem

Brouwer's fixed-point theorem is a fixed-point theorem in topology, named after L. E. J. (Bertus) Brouwer. It states that for any continuous function  $f$  mapping a compact convex set to itself there is a point  $x$  such that  $f(x) = x$ .

The simplest forms of Brouwer's theorem are for continuous functions from a closed interval in the real numbers to itself or from a closed disk  $D$  to itself. A more general form than the latter is for continuous functions from a convex compact subset of  $K$  Euclidean space to itself.

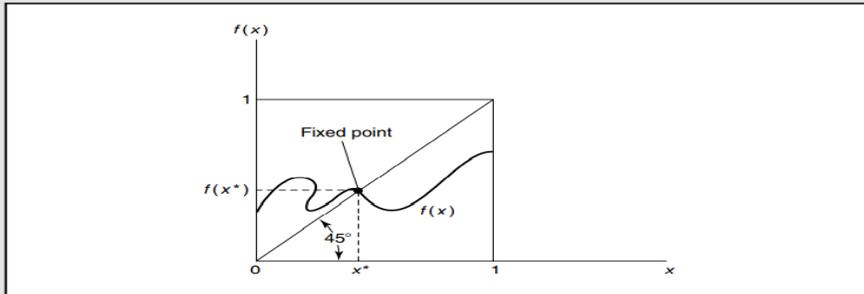
Among hundreds of fixed-point theorems

- Brouwer's is particularly well known, due in part to its use across numerous fields of mathematics. In its original field, this result is one of the key theorems characterizing the topology of Euclidean spaces, along with the Jordan curve theorem, the hairy ball theorem, the invariance of dimension and the Borsuk-Ulam theorem.
- This gives it a place among the fundamental theorems of topology
- The theorem is also used for proving deep results about differential equations and is covered in most introductory courses on differential geometry. It appears in unlikely fields such as game theory. In economics, Brouwer's fixed-point theorem and its extension, the Kakutani fixed-point theorem, play a central role in the proof of existence of general equilibrium in market

economies as developed in the

A Graphical Illustration of Brouwer's Fixed Point Theorem

Because any continuous function must cross the 45° line somewhere in the unit square, this function must have a point for which  $f(x^*) = x^*$ . This point is called a "fixed point."



- 
- 1950s by **economics Nobel prize winners Kenneth Arrow and Gérard Debreu.**

### **Welfare economics:**

- Welfare Economics is concerned with the evaluation of alternative economic situations from the point of view of well-being of the society. The task of welfare economics is to suggest ways to improve a country's welfare to the maximum attainable position. Criteria of social science includes:
  - **Bentham's Criterion**
  - **Cardinalist' Criterion**
  - **Pareto optimality Criterion**
  - **Kaldor-Hicks Compensation**
  - **Scitovsky Criterion**

## **Bentham's Criterion**

- Welfare is improved when the greatest good is secured for the greatest number.
- Total utility is the sum of utilities of the individuals of the society.
- An interpersonal comparison of the deservingness of the members of the society.
- Criterion cannot be applied to compare situations where the greatest good and number do not exist simultaneously greatest

## **Cardinalist' Criterion**

The law of diminishing marginal utility is a criterion of social welfare. Social welfare would be maximized if income is equally distributed among all members of the society.

### **Limitations**

- All individuals have identical utility functions for money
- An equal income distribution may induce some people to work less leading to a reduction in total GNP

## **Pareto Optimality Criterion**

- A market situation, where in it is not possible to make at least one person better off, without making no one worse off.
- Because of optimum allocation of resources in General equilibrium.
- Marginal conditions of Pareto Optimality is also known as first order condition .

## **Assumptions**

## ENTRI

- Each individual has his own ordinary utility function
- Production function remain constant.
- Goods Perfectly divisible
- Least –cost combination of factors,
- Maximize satisfaction
- Purchases all goods
- Perfectly mobile

### **Marginal Conditions**

Pareto efficiency implies a condition where no one can be made better off without making someone else worse off. When we consider overall efficiency in the context of general equilibrium in production and exchange, it implies a state where all possibilities of gain from trade and all possibilities of efficient allocation of resources are fully exhausted. This means a condition where the marginal rate of substitution between two goods is equal to the marginal rate of transformation so that consumer satisfaction is maximized and goods in the economy are produced as per the consumer preferences. That is, Pareto efficiency requires satisfaction of the following three marginal conditions:

**a) Efficiency in Exchange— requiring efficient distribution of commodities among consumers.**

**b) Efficiency in Production— requiring efficient allocation of factors among firms.**

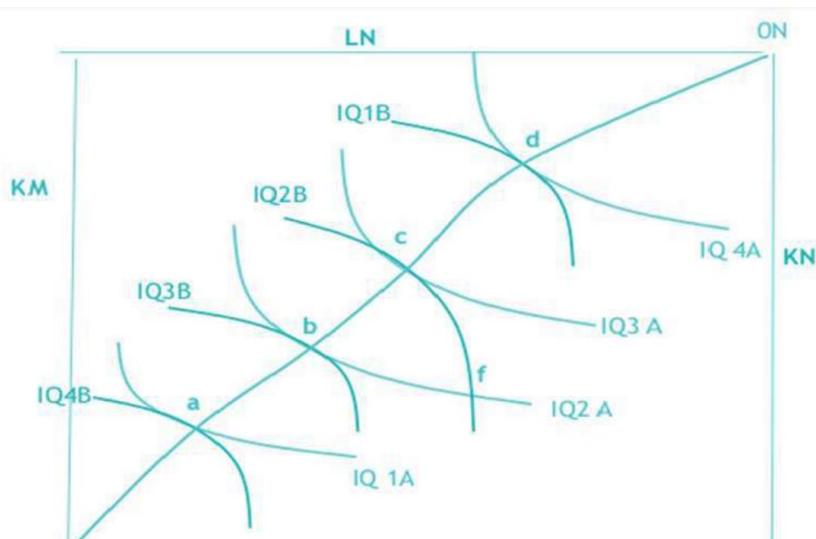
**c) Efficiency in Output mix— requiring efficient allocation of factors among commodities.**

### **Efficiency In Exchange Among Consumers**

- Increase the utility of one individual without reducing



## Efficiency in production

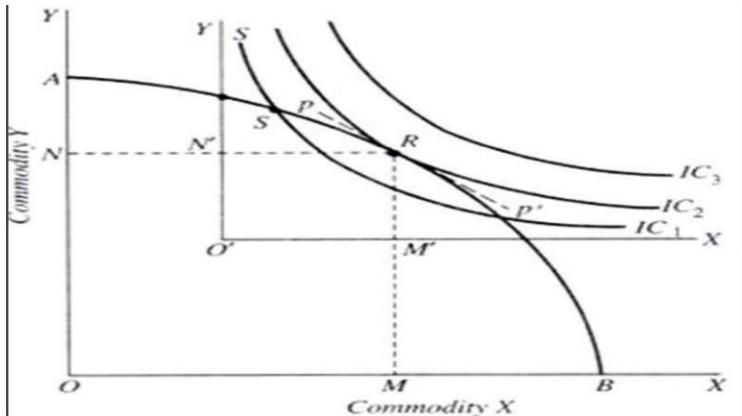


Isoquants of two firms M, N. Both use K and L. Each tries to achieve its highest IQ. If M moves to higher IQ, then N is forced to move to lower IQ. More K, L for one firm M means less for N. So lowers its output.

## Efficiency in the composition of output

- The MRPT (Marginal rate of product transformation) between any two commodities is equal to the MRS (Marginal rate of substitution) between the same two goods.
- MRPT is the slope of the Production Possibility Curve (PPC)
- MRPT is the rate at which a good can be transformed into another

## Efficiency in Product Mix



### Marginal Conditions For Pareto Optimality

Three conditions must be satisfied

$$(1) \quad MRS_{XY}^A = MRS_{XY}^B$$

$$(2) \quad MRTS_{LK}^X = MRTS_{LK}^Y$$

$$(3) \quad MRPT_{XY} = MRS_{XY}^A = MRS_{XY}^B$$

### Criticisms

- It cannot evaluate a change that make some individual better off and others worse off
- It is a necessary but not sufficient conditions for the welfare maximisation
- Many points are not comparable unless interpersonal
- comparison and value judgments are made

## New welfare economics

### The Kaldor-Hicks Compensation criterion

An important criteria for measuring social welfare.

To overcome the limitation of Pareto criterion, Kaldor and Hicks introduced a welfare criterion which is based on the compensation principle.

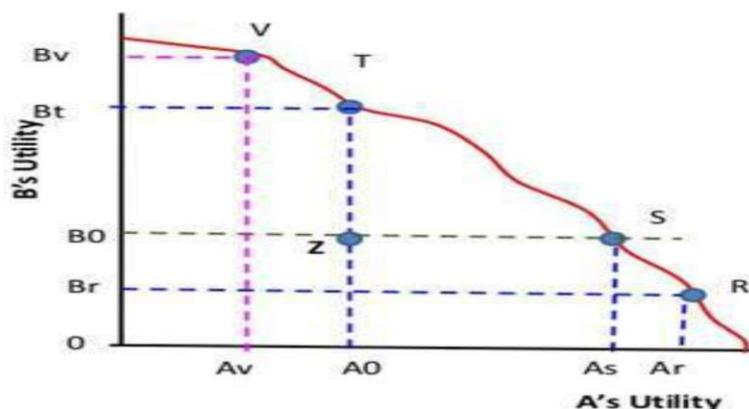
If those who gain from the change could compensate those who are hurt from the change and can still be better off, from the gainer's point of view. If there is some one who is a loser from a change can bribe the gainers to prevent the change to happen and still remain better off, that change constitutes an improvement according to Kaldor-Hicks criterion.

### Kaldor-Hicks Compensation Principle

- **The Utility Possibility Curve :** Contract curve of consumption, drawn in outer space. If both consumers are at Z, A's utility is  $oA$  and B's utility is  $Bo$ . Not an optimal point .
- If A moves to point R, his utility increases to  $Ar$ , but B's utility falls to  $Br$ . If A can compensate for B worth  $BoBr$ , so that B is back to Z with his original U:  $Bo$ , i.e. point S, then A's utility still increases to  $AS$ . At S, A is still better off, while B's utility has not decreased, he is not worse off. So movement from Z to S improves social welfare .

E.g.: At point R, if A's welfare increases by Rs.1000, and B's utility falls by Rs.200, then A can pay Rs.200 to B as compensation, and still be better off with extra Rs.800 than

at point Z. So from Z-S is improvement in Social Welfare.



## Limitations

- The criterion ignores the existing income distribution
- It assumes the marginal utility of money is equal for all the individuals in the society.
- It work only under the assumptions of equal utility of money to all individuals.

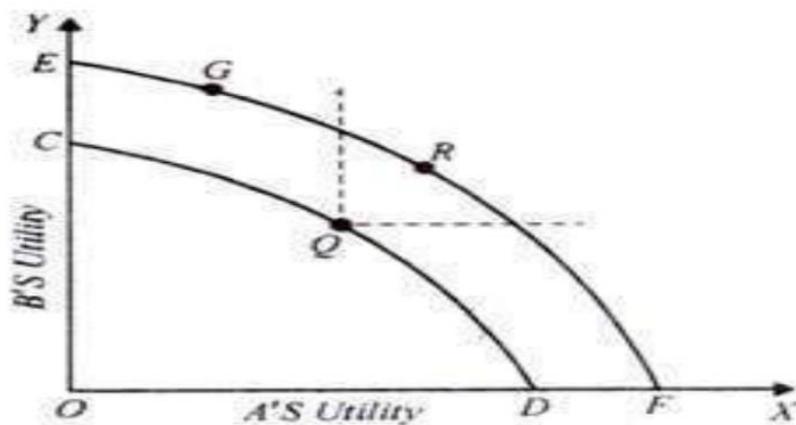
## Scitovsky's Double Criterion of Social Welfare

Scitovsky pointed out an important limitation of Kaldor-Hicks

- Criterion This could lead to contradictory results
- It is possible that if R is an improvement for A, then another point, V could be an improvement for B.
- For getting consistent results if V is preferred to R on the basis of a welfare criterion, then position R must not be preferred to position V on the same criterion

## Scitovsky Double Criterion

- When the two utility possibility curves are non intersecting and change involves movement from a position on a lower utility possibility curve to a position on a higher utility possibility curve, the change raises social welfare on the basis of Scitovsky criterion.
- The change brings about an increase in aggregate output or real income.



**Fig. 41.4. Scitovsky's Double Criterion**

## Social Welfare Function of Economics

In welfare economics, a social welfare function is a function that ranks social states (alternative complete descriptions of the society) as less desirable, more desirable, or indifferent for every possible pair of social states.

Inputs of the function include any variables considered to affect the economic welfare of a society.

In using welfare measures of persons in the society as inputs, the social welfare function is individualistic in form. One use of a social welfare function is to represent prospective patterns of collective choice as to

alternative social states. The social welfare function provides the government with a simple guideline for achieving the optimal distribution of income.

The social welfare function is analogous to the consumer theory of indifference-curve-budget constraint tangency for an individual, except that the social welfare function is a mapping of individual preferences or judgments of everyone in the society as to collective choices, which apply to all, whatever individual preferences are for (variable) constraints on factors of Production.

One point of a social welfare function is to determine how close the analogy is to an ordinal utility function for an individual with at least minimal restrictions suggested by welfare economics, including constraints on the number of factors of production.

There are two major distinct but related types of social welfare functions:

- **A Bergson–Samuelson social welfare function** considers welfare for a given set of individual preferences or welfare rankings.
- **An Arrow social welfare function** considers welfare across different possible sets of individual preferences or welfare rankings and seemingly reasonable axioms that constrain the function.

### **Bergson and Samuelson social welfare function**

It is an ordinal index of society's welfare  $W$  and is a function of the utilities level of all individuals constituting the society. Bergson-Samuelson

social welfare function can be written as;

$$W = W (U_1, U_2, U_3, \dots, U_n)$$

**Where, W= social welfare**

**$U_1, U_2, U_3, \dots, U_n$  = ordinal utility indices of different individuals of the society**

**Bergson and Samuelson social welfare function based on the three propositions:**

1. Social welfare function depends solely on the utility of welfare of individual members of the community and no one else.
2. Welfare or individual utilities denoted by  $U_1, U_2, U_3, \dots, U_n$  etc depends on individuals on evaluation of their own welfare rather than anyone else (individualistic).
3. The notion that unless there are specific reasons to the contrary individuals should be free to act in the light of their own personal assessments of their own welfare is a fundamental one in market oriented economies and therefore needs to be taken into account in appraising the potential efficiency of such economies.

**Assumptions:**

1. Social welfare depends upon each individual's wealth and income and on the distribution of welfare among the members of the society.
2. It assumes the presence of external diseconomies and economies with their consequent effect.
3. It is based on ordinal ranking of the combination of those variables which influence individual welfare.
4. Interpersonal comparison of utility involving value judgements are fully permissible.

## Arrow's Impossibility Theorem

Arrow's Impossibility Theorem shows that there is no perfect way to "aggregate" individual preferences to make one social preference. It is pointed out by Arrow that a social decision mechanism (way of aggregating preferences), should have the following features:

Given any set of complete, reflexive, and transitive individual preferences, the social decision mechanism should result in social preferences that satisfy the same properties.

If everybody prefers alternative  $x$  to alternative  $y$ , then the social preferences should rank  $x$  ahead of  $y$ . The preferences between  $x$  and  $y$  should depend only on how people rank  $x$  versus  $y$ , and not on how they rank other alternatives.

Arrow's theorem says that the three very plausible and desirable features of a social decision mechanism are inconsistent with democracy:

There is no "perfect" way to make social decisions. In order to find a way to aggregate individual preferences to form social preferences, we will have to give up one of the properties of a social decision mechanism described in Arrow's theorem.

The most probable feature of social welfare function, described above, that can be dropped is the property

. Actually, if the property that social preference between two alternatives only depends on the ranking of those two alternatives, then certain kinds of rank-order voting become possible.

## Pigovian Welfare Economics

Pigovian lays down two conditions for maximisation of welfare:

**(i) Given the taste and income distribution, an**

**increase in national income represents an increase in welfare,**

**(ii) For welfare maximisation, the distribution of national income is equally important.** If national income remains constant, transfer of income from rich

to the poor would improve welfare. With income subject to diminishing marginal utility, transfers of income from the rich to the poor will increase social welfare by satisfying the more intense wants of the poor. Thus it is economic equality that maximises welfare.

- Prof. Pigou had a dual criterion for detecting the increase in social welfare. First, he measured the economic welfare of the society in money value and thus, given the supply of resources, an increase in national dividend meant an increase in social welfare.
- Second, Pigou favoured an income equalisation policy and therefore, reorganisation of the economy which increases the share of the poor without offsetting adversely “productive effort enterprise and development of capital equipment was to be taken as a gain in social welfare.”

Pigou has made a distinction between private and social costs. The Private marginal cost of a commodity is the cost of producing an additional unit. The social marginal cost is the expense or damage to society as a consequence of producing that commodity. Private marginal benefit can be measured by the selling price of the commodity. Social marginal benefit refers to the total benefit that society gets from the production of an additional unit. By making a distinction between social and private

valuations of economic activity, he paved the way for the analysis of external effects or externalities in social welfare economics.

## **Theory of the second best**

In welfare economics, the theory of the second best (also known as the general theory of second best or the second best theorem) concerns the situation when one or more optimality conditions cannot be satisfied.

The economists **Richard Lipsey and Kelvin Lancaster** showed in 1956, that if one optimality condition in an economic model cannot be satisfied, it is possible that the next-best solution involves changing other variables away from the values that would otherwise be optimal.

Politically, the theory implies that if it is infeasible to remove a particular market distortion, introducing one or more additional market distortions in an interdependent market may partially counteract the first, and lead to a more efficient outcome.

In an economy with some uncorrectable market failure in one sector, actions to correct market failures in another related sector with the intent of increasing economic efficiency may actually decrease overall economic efficiency. In theory, at least, it may be better to let two market imperfections cancel each other out rather than making an effort to fix either one.

Thus, it may be optimal for the government to intervene in a way that is contrary to usual policy.

This suggests that economists need to study the details of the situation before jumping to the theory-based conclusion that an improvement in market perfection in one area implies a global improvement in efficiency.

## Rawlsian SWF

An extreme view about the SWF is put forward by Jon Rawls (1971). His view is that welfare of the society depends on the welfare of the worst-off individual in the society. Thus, if the poorest person in the society is taken to be the worst-off individual, then social welfare will entirely depend on whether economic policies increase the welfare of that individual, irrespective of gain or loss of the better off individuals in the society.

In other words, even if the better off individuals gain more utility on account of some policies, and the worst-off individual is left untouched, then welfare of the society will not increase. In terms of the social indifference curve, the SICs are L-shaped since fixing the utility of worst off person at  $u_0^a$  will lead to no increase in social welfare no matter how much utility is increased for the other better off individuals.

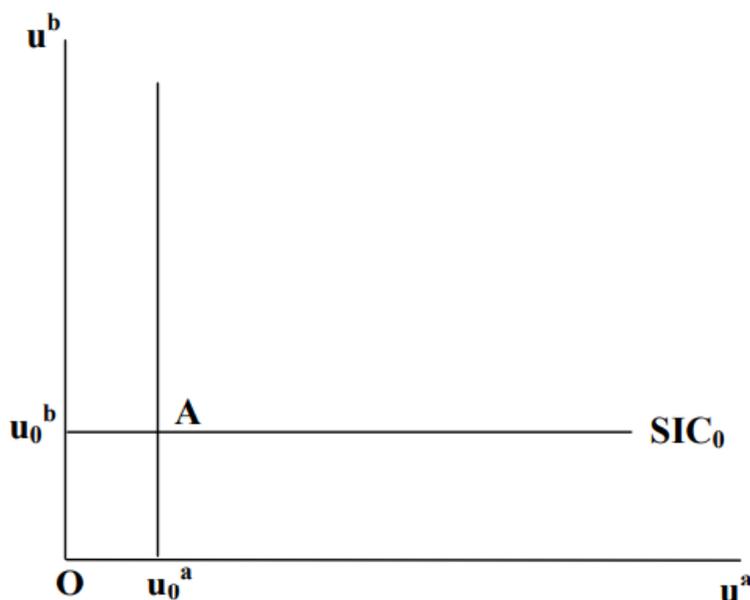


Fig. 1.3: Rawlsian SWF and the Social Indifference Curve

## **Coase Theorem**

The Coase Theorem is a legal and economic theory developed by economist Ronald Coase regarding property rights, which states that where there are complete competitive markets with no transaction costs and an efficient set of inputs and outputs, an optimal decision will be selected.<sup>1</sup>

It basically asserts that bargaining between individuals or groups related to property rights will lead to an optimal and efficient outcome, no matter what that outcome is.

The Coase Theorem is applied when there are conflicting property rights. The Coase Theorem states that under ideal economic conditions, where there is a conflict of property rights, the involved parties can bargain or negotiate terms that will accurately reflect the full costs and underlying values of the property rights at issue, resulting in the most efficient outcome.

One of the tenets of the Coase Theorem is that bargaining must be costless; if there are costs associated with bargaining, such as those relating to meetings or enforcement, it affects the outcome.

The Coase Theorem shows that where property rights are concerned, involved parties do not necessarily consider how the property rights are divided up if these conditions apply and that they care only about current and future income and rent without regard to issues such as personal sentiment, social equity, or other non-economic factors.

The Coase Theorem has been widely viewed as an argument against the legislative or regulatory intervention of conflicts over property rights and privately negotiated settlements thereof.

It was originally developed by Ronald Coase when considering the regulation of radio frequencies. He posited that regulating frequencies was not required because stations with the most to gain by broadcasting on a particular frequency had an incentive to pay other broadcasters not to interfere.

### **Example of the Coase Theorem**

The Coase Theorem is applied to situations where the economic activities of one party impose a cost on or damage to the property of another party. Based on the bargaining that occurs during the process, funds may either be offered to compensate one party for the other's activities or to pay the party whose activity inflicts the damages in order to stop activity.

For example, if a business that produces machines in a factory is subject to a noise complaint initiated by neighbouring households who can hear the loud noises of machines being made, the Coase Theorem would lead to two possible settlements.

## **Marginalist Controversy and Managerial and Behavioural Theories of the Firm**

The neo-classical theory of the firm is based on two rules:  $MC = MR$  and the MC curve cuts the MR curve from below. The objective of the firm is to

maximise its profits and the marginal analysis is an appropriate tool for attaining this objective. This was an accepted theory of the firm till the 1930s. In 1939, Hall and Hitch mounted “a root-and -branch attack” on the notion of profit maximisation.

This led to a controversy for and against the neo-classical theory of the firm. There were economists like Hall and Hitch, Andrews, Lester, Gordon, etc. who criticised the traditional theory for its unrealistic as-sumptions and its marginalistic behavioural rules. On the other side were economists like Austin Robinson, Kahn, Machlup, etc. who defended this theory. We discuss their arguments as under.

### **Arguments against the Marginalist Theory:**

The arguments advanced against the neo-classical theory of the firm are based on its unrealistic assumptions:

1. It is assumed that the firm is owned and operated by a single entrepreneur. He is the sole decision-maker as to what to produce, how to produce, how much to produce, for whom to produce, whom to employ and how much to pay. He is a rational person who makes correct decisions that will maximise his profits. In fact, the owner-entrepreneur of the firm is omniscient who manages the firm single-handedly.
2. Another unrealistic assumption of the neoclassical theory is that the firm's sole objective is to maximise its profits. To achieve this, the firm follows the twin rule:  $MC = MR$  and the MC curve cuts the MR from below. The critics point out that the modern firms do not bother about the calculation of MC and MR. Most of them are not even aware of these two terms. Others do not know the demand and cost curves faced by them.
3. The neo-classical theory of the firm assumes that the firm is certain about the level of its maximum profits. It has complete knowledge about its costs

and revenues and what they will be. Thus it makes its decisions under conditions of certainty. But this assumption is also unrealistic because the firm does not possess sufficient and accurate knowledge about the conditions under which it operates. At best, it knows about its own costs.

4. The critics of the neo-classical theory of the firm point towards its static nature. The theory is explained both in the context of the short-run and the long-run. But it does not explain the duration of the short-run and the long-run.

5. One of the defenders of this theory, Prof Machlup himself admits that the exact numerical calculation of marginal magnitudes—cost and revenue of the firm in the neo-classical theory is not designed to explain and predict the behaviour of real firms. Instead, it is designed to explain and predict changes in observed prices (quoted, paid and received) as effects of particular changes in such conditions as wage rates, interest rates, import duties, excise taxes, etc.

### **Arguments for the Marginalist Theory:**

1. The first argument in favour of the neoclassical theory of the firm is essentially methodological. On the basis of these criteria, the realism of assumptions of a theory is an entirely irrelevant matter. Thus a theory should be judged not on the basis of the realism of its assumptions but on the basis of the predictions it can make. Friedman argues that the neoclassical theory of the firm meets this criterion and is, therefore, perfectly acceptable.

2. Empirical evidence in favour of retaining the traditional theory of the firm reveals that the modern firms apply marginalistic rules in their accounting methods. Barley's study of the 110 'excellently managed companies' in the

U.S revealed that the firms followed marginal accounting and costing principles in their decision-making.

**3.** Hall and Hitch criticised the traditional theory of the firm for its assumption of profit maximisation.

**4.** Prof Machlup who defended the attack on the traditional theory of the firm in 1946, pointed out in his Presidential address at the 79th Annual Meeting of the American Economic Association in December 1966 that despite the developments of the behavioural and managerial theories of the firm and “the war of 1946” against the traditional theory of the firm, economists have not been able “to force the abandonment or subversion of marginalism”.

**5.** It is not correct to say that modern firms have dispensed with marginalism and profit maximisation goals. Rather, profit maximisation has been incorporated as one of the goals in the behavioural and managerial theories of the firm. As pointed out by Scitovsky, “Empirical studies of businessmen’s behaviour suggest the need for modifying or qualifying the assumption of profit maximisation here and there, rather than scrapping it altogether.

## **The Hall and Hitch Report and the ‘Full-Cost’ Pricing Principle of the Firm**

In 1939 Hall and Hitch published some results of research undertaken at Oxford. Their study covered 38 firms. The most startling results of the studies were that firms did not attempt to maximize their profits, that they did not use the marginalist rule  $MC=MR$  and that Oligopoly was the main market structure. Hall and Hitch’s findings may be summarized as follows

**1.** Firms do not act automatically. Firms are conscious of the reactions of their competitors. This behaviour suggested that oligopoly was much more widespread than had been thought up to that time.

**2.** Firms do not attempt to maximise short-run profits by applying marginalistic rules  $MC = MR$ , but they aim at long-run profit maximisation.

**3.** Firms set their price on the average-cost principle or the full-cost principle. That is they set a price to cover the average variable cost, the average fixed cost and a 'normal' profit margin (usually 10%)

### **$P = AVC + AFC + \text{Profit Margin}$**

The reasons given by Hall and Hitch for the breakdown of marginalism may be summarised as follows:

1. Firms do not know their demand curves or their marginal costs. Due to the lack of this information, they cannot apply the marginalist rule.
2. Firms believed that 'full-cost price' is the 'right price' since it allowed a 'fair price' and covered the costs of production.
4. Hall and Hitch reported that firms' main preoccupation is price, and not output as the traditional theory implied.
5. Although the firms in general would adhere to the average-cost principle, they would be prepared to depart from it if they wanted to secure a big order.
6. It was found that prices were fairly sticky, despite changes in demand and costs. Traditional theory predicted a change in price and output in response to changes in demand and costs. This prediction was not observed in the real world.

Hall and Hitch did not use their findings to make a comprehensive theory of oligopoly. However, their conclusions constituted a serious attack on marginalism. The results of their study suggest the following:

- Short-run profit maximisation was rarely stated by businessmen to be their goal.
- The demand curve and its price elasticity are unknown in practice.

## ENTRI

- Marginal costs are also unknown in multiproduct firms.
- Even if MC and MR were known, and firms aimed at the maximisation of their short-term profits, the adherence to this equality would require continuous changes in the price in view of changes in costs and demand. Such frequent changes in prices are not desirable

### **Gordon's attack on Managerialism**

In 1948 Gordon joined the marginalist controversy by attacking the assumptions and postulates of the traditional theory of the firm. His line of attack may be summarised as follows.

1. The real world is extremely complex. The determinants of demand and costs vary continuously and marginal adjustments are beyond the ability of the firms. Complexity also means that firms cannot learn from their past experience because the environment changes continuously, invalidating any extrapolation of the past.
2. Uncertainty is an additional reason for making marginalist behaviour inapplicable. The businessmen resort to additional goals apart from profit maximisation in an attempt to avoid uncertainty.
3. The average cost principle is the best alternative to marginalism, especially for multiproduct firms, where changes in costs are practically impossible to estimate for all the products.
4. Firms pursue a multitude of goals, like retaining the labour force, acquiring goodwill, and so on.
5. Managers tend to concentrate on 'local' problems arising in particular sections of firms and find solutions for such problems without applying marginalistic rules.
6. The demand cannot be known or estimated with an adequate degree of accuracy. Under this condition, the average cost rule makes sense.

## ENTRI

7. For marginalist behaviour the demand and cost curve must be objectively known. If they are subjectively conceived by businessmen, then marginal reduces to a tautology.
8. Any attempt to build additional goals into cost and revenue functions leads to tautological predictions. Any attempt to account for expectations also leads to similar tautological predictions.

Gordon argues that the tautology could be avoided only if one uses dynamic multi-period analysis. But, this approach is of little use in practice, because it assumes given expectations of entrepreneurs. The entrepreneur must be assumed to have the information and ability to form definite expectations about future changes. But expectations are not explained in marginalism.

### **Bain's Limit Pricing**

J. S. Bain in his pioneering work 'A note on pricing in oligopoly and Monopoly (1949)' followed by his book 'Barriers to New Competition' developed the theory of limit pricing. The theory explains why firms do not set the price following the marginal principle rule.

According to Bain, the price is not set at the minimum point of the long run average cost curve. He explained that the firms deliberately set a price above the minimum of long run average cost in order to restrict the potential entry of new firms.

Thus, 'limit price' was the highest price, which the established firms believed they could charge without inducing further entry. This price may be lower than the price set by the profit maximising firm.

This theory basically relates to the case of collusive oligopoly firms.

According to Bain, The limit price is determined by the

## **E ▶ ENTRI**

- The cost of the potential entrants,
- Market size where firms are operating
- The number of established firms in the industry
- Price elasticity of demand for the industry product and
- The shape of the long run average cost Curve.

### **Assumptions:**

The Bain's model of limit pricing is based on some assumptions:-

- i. There are some established firms in the industry.
- ii. The market demand curve for the product is not affected by price adjustment by the existing firms or by the entry of new firms in the industry.
- iii. There is effective collusion among the firm which is based upon the dominant leader firm.
- iv. There are long run price and output adjustments.
- v. The leader firm fixes the limit price below which entry will not take place.
- vi. The other firms in the group follow a unified price policy.
- vii. The established firms seek the maximisation of their own long run growth.

Under Bain's Model, he defined the limit price model as the condition for entry. The condition for entry is defined as a percentage by which established firms can increase the price above the competitive price without attracting the entry of new firms into the industry. The conditions for entry can be expressed mathematically as

$$C = \frac{P_L - P_C}{P_C}$$

Or  $P_L = P_C(1 + C)$

Where  $P_L$  is the limit price  
 $P_C$  is the perfectly competitive price

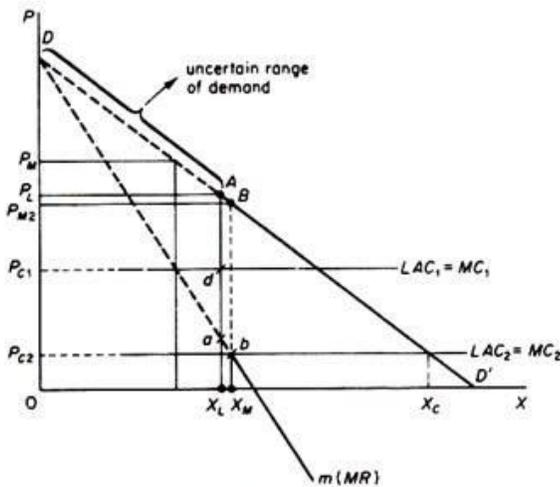


Figure 13.1

## Sylos-Labini's Theory of Limit Pricing

Sylos-Labini laid special emphasis on the economies of scale barriers to entry of potential firms.

He assumed a given market demand curve with unitary price elasticity of demand. The products produced by the firms are homogeneous and are being sold by few firms with a price leader firm.

He also assumed that three different plant sizes are available with which various firms are producing products. The different types of plant size that are available are Small, medium and large size.

The small plant is available with a capacity of 100 units of output; a medium-size plant with a capacity of 1000 units of output; a large-size plant with a capacity of 8000 units of output.

Each firm can expand by multiples of its initial plant size only. The small firm can expand by installing another small size plant; a medium firm may expand by setting up a second medium-size plant, and so on.

The economies of scale accrue as the size of the plant increases. It is assumed that the nature of technology is rigid, the continuous long run average cost curve cannot be drawn.

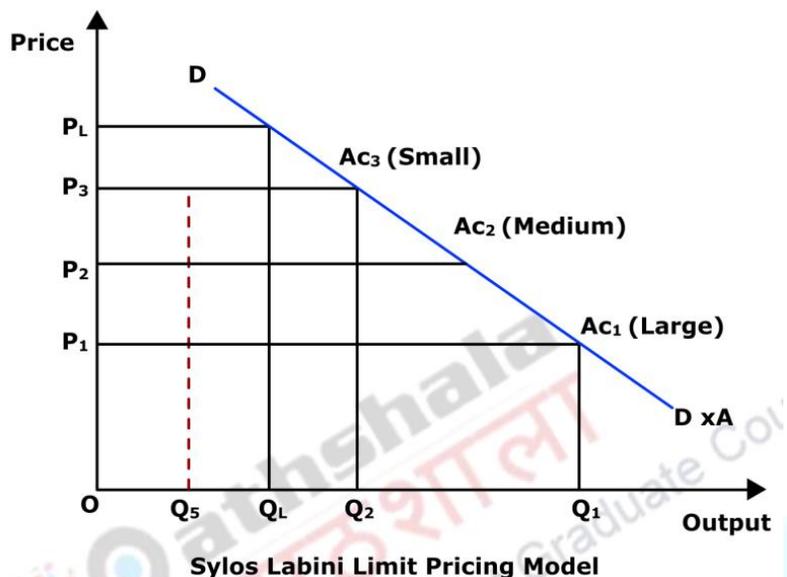
The long run average cost curve would be straight line curves. We have three cost lines corresponding to the three plant sizes and larger the plant size, the lower the long run average cost.

The most important feature of the Sylos Labini model is the existence of price leader firm. The price leader firm is the most efficient firm with the lowest average cost of production.

Sylos Labini also assumed that the entrant is assumed to come into the industry with the smallest plant size. The established firms and the potential firms behave according to what Modigliani called the '**Sylos Postulate**'.

He made an important behavioural assumption concerning the expectations of the established firms and the potential entrants.

- Firstly, the existing firms expect that the potential entrant will not come into the market if he thinks that the post entry price will fall below his average cost of production.
- Secondly, the new entrant expects that the established firms will continue in the post-entry period to produce the same level of output as in the period before entry so that as entry takes place the market price falls and the whole of the resulting increase in the quantity demanded accrues to the new entrant.



## Baumol's theory

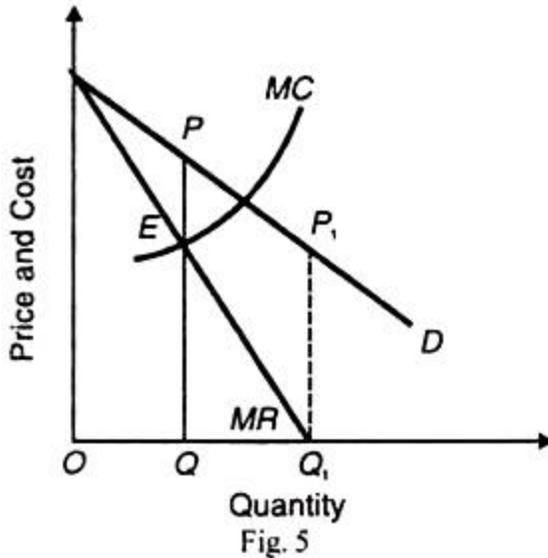
Prof. Baumol in his book *Business Behaviour, Value and Growth* (1967) has presented a managerial theory of the firm based on sales maximisation. He discusses two models of sales maximisation: a static model and a dynamic model. We shall analyse only his static model of sales maximisation with its variants of single product model without advertisement.

### Assumptions:

The model is based on the following assumptions:

1. There is a single period time horizon of the firm.
2. The firm aims at maximising its total sales revenue in the long run subject to a profit constraint.
3. The firm's minimum profit constraint is set competitively in terms of the current market value of its shares.
4. The firm is oligopolistic whose cost curves are U-shaped and the demand curve is downward sloping. Its total cost and revenue curves are also of the conventional type.

## E ▶ ENTRI



Thus minimum profits serve as a constraint on the maximisation of a firm's revenue. "Maximum revenue will be obtained only" according to Baumol, "at an output at which the elasticity of demand is unity, i.e. at which marginal revenue is zero."

This is the condition which replaces the "marginal cost equals marginal revenue profit maximisation rule." This is shown in Figure where the profit maximisation firm produces  $OQ$  output where  $MC = MR$  at point  $E$ . But the sales maximisation firm will produce  $OQ_1$  output where  $MR$  is zero.

### **Criticism:**

1. Rosenberg has criticised the use of the profit constraint for sales maximisation by Baumol. Rosenberg has shown that it is difficult to specify exactly the relevant profit constraint for a firm. This is explained in Figure. Sales revenue of the firm is measured along the vertical axis and profit on the horizontal axis.  $R$  refers to the profit constraint. For any two combinations with profits below the constraint, the one with the larger profit will be preferred.
2. According to Shepherd, under oligopoly a firm faces a kinked demand curve and if the kink is large enough, total revenue and profits would be the maximum at the same

level of output. So both the sales maximiser and the profit maximiser would not be producing different levels of output.

3. Hawkins has shown that if the firm is engaged in any form of nonprice competition such as good packaging, free service, advertising, etc., Shepherd's conclusions become invalid. When the sales maximiser spends more on advertising, his output will be more than that of the profit maximiser. This is because the kink of the former's demand curve will occur to the right of the kink of the profit maximiser.

4. Hawkins has also shown that Baumol's conclusion that a sales maximiser will in general produce and advertise more than a profit maximiser, is invalid. According to Hawkins, a sales maximiser may choose a higher, lower or identical output, and a higher, lower or identical advertising budget. It depends on the responsiveness of demand for advertising rather than price cuts."

5. In the case of multiproduct, Baumol has argued that revenue and profit maximisation yield the same results. But Williamson has shown that sale maximisation yields different results from profit maximisation.

6. Another weakness of this model is that it ignores the interdependence of the prices of oligopolistic firms.

7. The model fails to explain "observed market situations in which price are kept for considerable time periods in the range of inelastic demand."

8. The model ignores not only actual competition, but also the threat of potential competition from rival oligopolistic firms.

9. The model does not show how equilibrium in an industry, in which all firms are sales maximisers, will be attained. Baumol does not establish the relationship between the firm and industry.

10. Prof Hall in his analysis of 500 firms came to the conclusion that firms do not operate in accordance with the object of sales maximisation.

## **Robin Marris Theory of Managerial Enterprise**

The Marris model of managerial enterprise was developed by Robin Marris in 1964. Like Williamson, Marris approach is also based on the fact that whenever the difference

between ownership and control exist, then the self-interest of agent makes profits lower than in a situation where principals act as their own agents. In other words, the Marris model is also based on the fact that the ownership and control of the firm are in the hands of two different people.

He, like Williamson, also assumed that the managerial utility function includes variables such as salary, status, prestige, job security and other monetary compensation. Out of these salaries are the only quantitative variable which is measurable. On the other hand, all other variables except salary are non-quantifiable i.e. not measurable. The utility function of managers is a function of salary, monetary expenditure on the staff and the discretionary investment.

$$UM = f(S, M, ID)$$

**Where  $UM$  is the Utility of the Managers**

**$S$  is Monetary expenditure on the staff**

**$M$  is the Management slack**

**$ID$  is Discretionary investment**

$$UO = f(P, MS, K, Y)$$

**Where  $UO$  is the Utility of the Owners.**

**$P$  is Profit**

**$MS$  is Market share**

**$K$  is Capital**

**$Y$  is output**

Here the goal of the manager is the maximisation of their own utility

In contrast to Williamson, Marris argues that the difference between the goal of the managers and the goals of the shareholders is not so wide as other managerial theories claim. This is so because most of the variables appearing in both functions are strongly correlated with a single variable: the size of the firm.

According to Marris, the size and the rate of growth are not necessarily equivalent from the point of view of managerial utility. If they are used interchangeably then there would be high mobility among managers of the firm:

## **Cyert and March's behavioural model**

The theory has subsequently been elaborated by Cyert and March, with whose names it has been connected to this day. The writers founded their theory on four case studies and two 'laboratory'- experimental studies.

- 1. The firm is a coalition of groups with conflicting interests.**
- 2. Process of formation of demand-goals of the different groups within the firm.**
- 3. Definition of the goals of the firm by the top management. Satisfying behaviour of the firm.**
- 4. Means for the resolution of the conflicting demands and interests of the various groups of the firm-coalition.**
- 5. The process of decision-making for the implementation of the goals set by the management.**
- 6. The environment of the firm and the treatment of uncertainty in the behavioural theory.**
- 7. A simple model of behaviourism.**
- 8. Comparison of the behavioural theory with the traditional theory of the firm.**

## **The Firm as a Coalition of Groups:**

### **With Conflicting Goals:**

The behavioural theory of the firm, as developed by Cyert and March, focuses on the decision-making process of the 'large multiproduct firm under uncertainty in an

imperfect market. Cyert and March deal with the large corporate managerial business in which ownership is divorced from management.

### **The Concept of the 'Aspiration Level':**

The behavioural theory recognizes explicitly that there exists a basic dichotomy in the firm. On the one side there are the individual members of the coalition-firm, and on the other side there is the organisation-coalition called 'the firm'. The consequence of this dichotomy is a conflict of goals individuals may have (and usually have) different goals to those of the organisation-firm.

Cyert and March argue that the goals of the firm depend on (are determined by) the demands of the members of the coalition, while the demands of these members are determined by various factors, such as the aspirations of the members, their success in the past in pursuing their demands (past achievement), their expectations, the achievements of other groups in the same or other firms, the information available to them and so on.

### **Goals of the Firm: Satisficing Behaviour:**

**The goals of the firm are set ultimately by the top management.**

There are five main goals of the firm:

- a) Production goal.**
- (b) Inventory goal.**
- (c) Sales goal.**
- (d) Share-of-the-market goal.**
- (e) Profit goal.**

#### **1) Production Goal**

Mainly it is the production department which takes care of the production goal. Smooth The production process also implies that production is evenly distributed over time and seasonal as well as cyclical variations in demand are taken care of. If demand is too

high, it may require overworking by workers and other factors of production. Similarly, if demand dips, it may lead to overproduction and lay-off of workers.

## 2) Inventory Goal

This goal either may come from the production department or from the sales department. In some instances the firm may have a separate inventory department too. Production department will always seek sufficient stock of raw materials while the sales department will seek sufficient stock of finished product.

## 3) Sales Goal

The strategy for sales will be a part of the sales goal.

## 4) Market Share Goal

It may further involve market research, analysing the competitors and deciding the advertisement strategy.

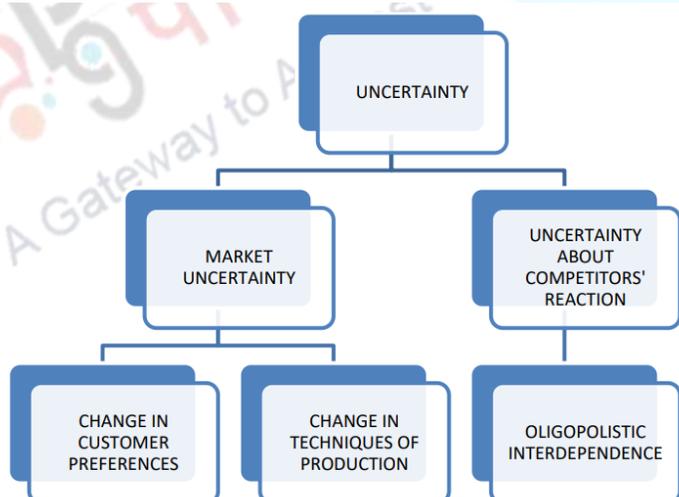
## 5) Profit Goal

Top management sets the profit goal to satisfy the shareholders. Furthermore, as the firm may have relied on banks and other financial institutions for its financing, profit goal also acts as a benchmark to satisfy them.

## UNCERTAINTIES FACED BY FIRM

Cyert and March explain two types of uncertainties faced by a firm,

- (1) The market uncertainty and
- (2) the uncertainty about competitors' reaction.



The market uncertainty can be partly avoided by collecting information. Because of market uncertainty, firm mainly depends on short term decisions and avoids long term decisions. Interestingly, in terms of uncertainty arising because of oligopolistic interdependence, the behavioural theory chooses to be quiet by assuming 'tacit collusion' among existing firms

## CRITICISM OF BEHAVIOURAL THEORY

<b>Traditional Theory</b>	<b>Behavioural theory</b>
Assumes a firm to be managed by owners only. This means that owner and entrepreneur is same. There is no gap between ownership and management.	Firm is considered to be a coalition of groups with conflicting interests.
The firm has only one objective and that is maximisation of profits.	The objectives of firm are many and are decided by top management.
Complete information is assumed. The entrepreneur will have perfect knowledge of all possible alternatives and the outcomes. Therefore global rationality prevails.	Behavioural theory accepts asymmetric information. Rather concludes that The decisions by top management are based on bounded rationality. Complete information may not be sought (as information is not free). Collecting information about all the alternatives can be uneconomical time-wise too. As no detailed cost-benefit analysis is undertaken, one can conclude that top management acts in 'limited' rational way. Information is generally searched only if some problem is there
It is assumed that there is no conflict of goals between individual and organisation	The interests of stockholders, managers, workers, consumers and suppliers may clash.
Traditional theory assumes firm's rationality since very beginning	Firm is an adaptive organisation. Firm learns from its successes and mistakes.
Short run and Long run theory	Mainly a theory for the short run.

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