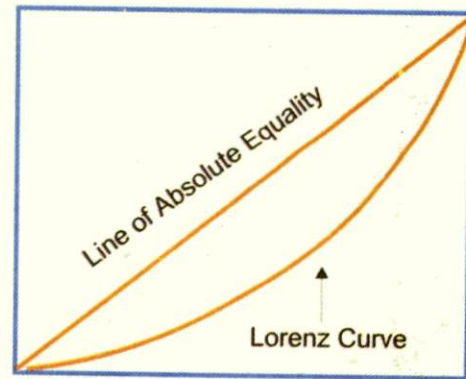
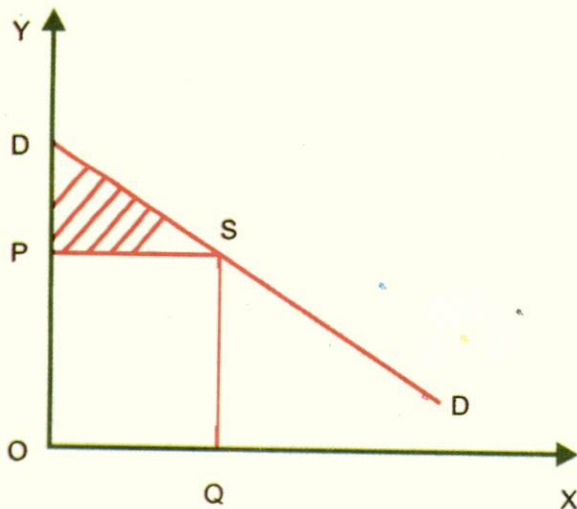
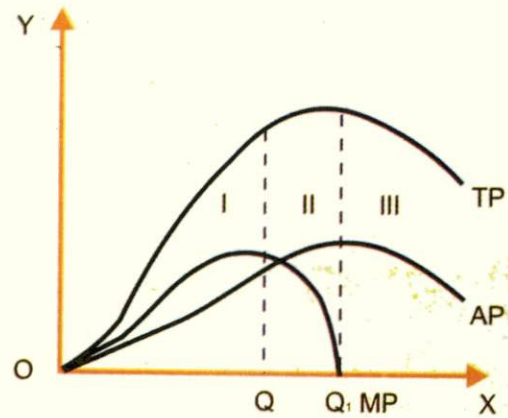
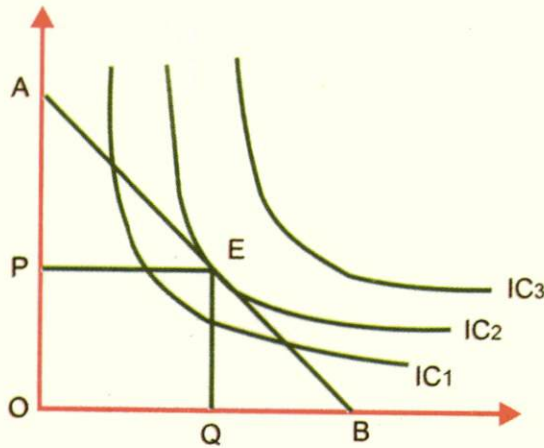




COURSE : I

M.A. (PREVIOUS)  
MICRO-ECONOMIC ANALYSIS



ಉನ್ನತ ಶಿಕ್ಷಣಕ್ಕಾಗಿ ಇರುವ ಅವಕಾಶಗಳನ್ನು ಹೆಚ್ಚಿಸುವುದಕ್ಕೆ ಮತ್ತು ಶಿಕ್ಷಣವನ್ನು ಪ್ರಜಾತಂತ್ರೀಕರಿಸುವುದಕ್ಕೆ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ವ್ಯವಸ್ಥೆಯನ್ನು ಆರಂಭಿಸಲಾಗಿದೆ.

**ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ 1986**

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ವಿದ್ಯಾಕಾಂಕ್ಷಿಗಳನ್ನು ಜ್ಞಾನ ಸಂಪಾದನೆಗಾಗಿ ಕಲಿಕಾ ಕೇಂದ್ರಕ್ಕೆ ಕೊಂಡೊಯ್ಯುವ ಬದಲು, ಜ್ಞಾನ ಸಂಪತ್ತನ್ನು ವಿದ್ಯೆ ಕಲಿಯುವವರ ಬಳಿ ಕೊಂಡೊಯ್ಯುವ ವಾಹಕವಾಗಿದೆ.

ಡಾ. ಕುಳಂದೈಸ್ವಾಮಿ

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**Block**

**5**

**Introduction**

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**Unit 22**

**Alternative Theories of the Firm** **1 to 20**

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**Unit 23**

**Bain's limit Pricing Theory and its Recent Development  
including Sylos-Labin Model** **21 to 32**

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**Unit 24**

**Behavioral Theory of the Firm** **33 to 46**

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Unit 22 to 24

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**Block – 5: Alternative Theories of the Firm.**

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**Block Introduction:**

So far years learnt that the firm's sole objective is to maximize its profits. But with little introspection and observation of the world around, you will feel that this is an unsearchable goal because perfect competition is a non-entity and the type of information required for maximizing the profits – marginal cost and marginal revenue – is not easy to obtain. So don't you feel that firms might diverge from this goal?

This block attempts to answer this question by introducing to you the alternative objectives of the firm which are also called as the alternative theories of the firm. Though these theories get nearer to the reality, you will later realize that these theories too boil down to the concept of profit maximization in the long-run. Moreover for analytical purposes the assumptions of the traditional theory are employed in most cases.

This block comprises three units. The first unit deals with Baumol's sales revenue maximization, Marris's model of managerial enterprise, Williamson's model of managerial discretion and full-cost pricing rule.

The second unit gives an insight into the Bairis limit pricing theory and some recent development in it elaborating Sylos-Labini model. The third unit systematically describes the basic concepts of the behavioral model of the firm through game theoretic models.

Unit : 22 . Baumol's sales revenue maximization, Marris's model of managerial enterprise, Williamson's model of managerial discretion and full-cost pricing rule.

## Structure

- 22.0 Objectives
- 22.1 Introduction
- 22.2 Baumots theory of sales Maximization
- 22.3 Baumots Static Models
- 22.4 Baumots Dynam Model
- 22.5 Comments
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- 22.10 The Model Presentation
- 22.11 Evidence from Field studies and comments
- 22.12 Full-cost Pricing Principle
- 22.13 Reasons for Break down of Marginalism
- 22.14 Comments

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### 22.0 Objectives:

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On successful completion of this unit, you should be able to

- ☞ Know the need for alternative theories to marginalism.
- ☞ List the various alternative theories with their strengths and weakness.
- ☞ Distinguish between sales maximization and profit maximization.
- ☞ Distinguish between managers utility and owner-shareholders utility function.
- ☞ Recognise the role of management.
- ☞ Understand what is full – cost pricing rule.
- ☞ Reasons for breakdown of marginalism.

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## 22.1 Introduction

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The separation of ownership from management permits the top management to deviate from profit maximization and Purina goals which maximize their own utility. The basic feature of all managerial theories is that the managers maximize their own utility, subject to a maximum profit constraint. Which is set at a level adequate to satisfy shareholders, ensures job security of the top managers, avoids fall in prices of shares on the stock exchange etc.

We will discuss here three models of managerialism namely Baumol's model of sales revenue maximization, Marris's model of managerial discretion. These models have same basic assumption – the maximization of the utility of the managers subject to a minimum profit constraint. They differ (a) in the factors which enter into the managerial function (b) in the key policy variables which the managers will use in attaining their goals and (c) in their prediction of the consequences of changes of various parameters of the model. We also present the full – cost pricing rule at the end of the unit. Let us discuss these models one by one.

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## 22.2 Baumol's theory of sales Revenue Maximization

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W.J. Baumol suggested sales revenue maximization as an alternative goal to profit maximization. He presented both static and dynamic versions of growth of sales revenue maximization. Before presenting the model let us have some idea of rationalization of the sales maximization hypothesis.

Baumol's several justifications of sales maximization as a goal of the firm. The separation of ownership from management is the characteristic of the modern firm. This gives direction to managers to pursue goals which maximize their own utility and deviate from owner's goal of profit maximization.

Given this discretion Baumol argues that sales maximization seems the most plausible goal of managers. Baumol found that managers are preoccupied with maximization of the sales rather than profit, mainly because

- i) The salaries and other earnings of top managers are correlated with sales than with profit.
- ii) The banks and other financial institutions keep a close eye on the sales of the firm.
- iii) Large sales, growing over time give prestige to the managers, while large profits go into the pockets of shareholders.

- iv) Managers prefer a study performance with satisfactory profit.
- v) Large and growing sales strengthen the competitiveness of the firm and
- vi) Personal problems are handed more satisfactorily when sales are growing.

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### 22.3 Baumol's Static Model:

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The basic assumptions of the static models are

- 1) The time – horizon of a firm is a single period.
- 2) During this period the firm attempts to maximize its total sales revenue subject to a profit constraint.
- 3) The minimum profit constraint is exogenously determined by the demands and expectations of the shareholders, the banks and other financial institutions.
- 4) U – Shaped cost curves and downward sloping demand curve are assumed.

#### RQI

#### Model 1: A Single product model without adverting:

The total cost (TC) and total revenue (TR) curves under the above assumptions are shown in figure 22.1. Total sales revenue is at its maximum level at the highest point of the TR curve where the price elasticity of demand is unity and the slope of this TR curve is equal to zero.

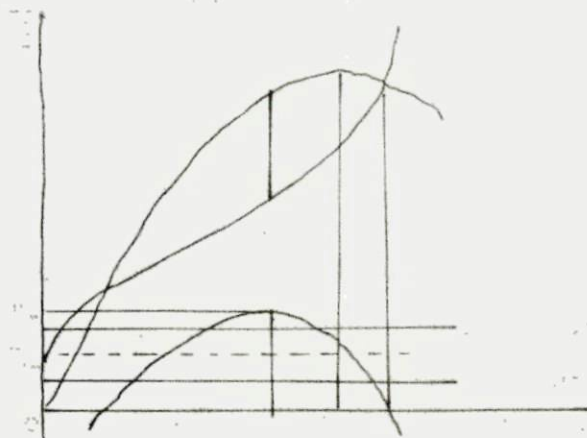


Figure 22.1



**SAQ I:**

1. How do you justify sales maximization as a goal of the firm?
2. Why sales maximization hypothesis has better predictive ability than the traditional profit maximization hypothesis?

**SAQ II:**

How advertisement affects the sales revenue of a firm?

**SAQ III:**

1. What are the components of managers utility function as specified by Williamson?
2. Explain the following:
  - a) Reported Profit
  - b) Minimum profit
  - c) Discretionary profit.

Whenever this maximum sales revenue will be realized or not depends on the level of the minimum acceptable level of profit which may act as a constraint to the activity of the firm. If the firm were a profit maximiser, it would produce the level of output  $X_{Pm}$ . However, the firm is a sales maximiser and also looks for minimum acceptable profit to shareholders. If the minimum acceptable level of profit is  $P_1$ , the firm will produce the level of output  $X_{sm}$  which maximiser its sales revenue with this level of output ( $X_{sm}$ ) the firm earns profits  $P_{sm}$ . Which are greater than the minimum acceptable profits under this situation, we say that the minimum profits constraint is not operative.

If the minimum acceptable profit is  $\Pi_2$ , the firm will not be able to attain the maximum sales revenue because the profit constraint is operative and the firm will produce  $X_s$  unit of output which are less than  $X_{sm}$  units. So we have one equilibrium point where the profit constraint provides no effective barrier to sales maximization ( $X_{sm}$  unit 2 profit  $\Pi_1$ ) and another possible equilibrium point in which the profit constraint acts as effective barrier ( $X_s$  unit  $\Pi_2$  profit). If the profit constraint is operative, Baumol predicted that the sales maximiser will produce a higher level of output is compared to a profit maximiser. The sales maximiser sells at a price lower than the profit maximiser the sales maximiser will earn lower profits than the profit maximiser. Baumol claims that firm in the real world do in fact change their output and price

whenever their overhead costs increase. This he says that the sales maximization hypothesis has a better predictive performance than the traditional profit maximization hypothesis.

**Model 2: A Single product model with adverting:**

In addition to basic assumptions stated earlier, a new element i.e advertising is introduced in this mode. It is assumed here that sales revenue increases with advertising enditure. This implies that advertising will always shift the demand curve of the firm to the right and the firm will sell a larger quantity and earn a larger revenue. The price is assumed to remain constant. The sales maximiser will normally have higher advertising expenditures than a profit maximiser. Beumols single product model with advertising is shown in figure 22.2. If we superimpose cost curves with advertisement expenditure and corresponding revenue curves and join the points of intersection of the total cost and total revenue curves, we obtain a curve which is called by Haveman and DeBartol the TC=TR curve. It is dotted curve shown in the figure.

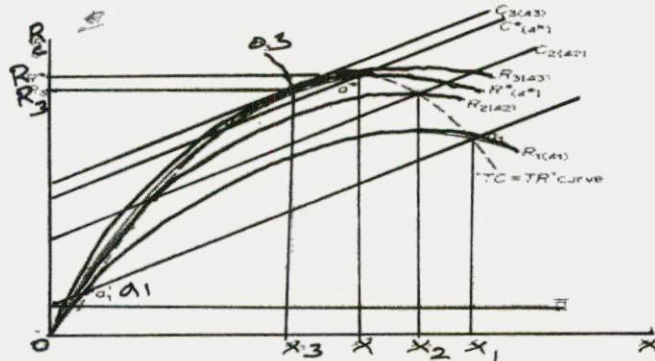


FIGURE 22.2

The firm is in equilibrium when it reaches the highest point of this curve. The equilibrium of the firm is at point  $a^x$  with total costs  $c^x$ , total revenue  $R^x$ , output  $X$  advertising  $A$  and price equal to  $OR/OX$ , the required condition i.e  $MC > MR$  holds good at this point  $a^x$ .

**Model 3: Multi-product without adverting:**

If we assume that the firm has a given amount of resources and costs and wants to allocate them among the various commodities it produces so as to maximize sales revenue, then it will reach the same equilibrium solution as the profit maximiser i.e it produce the same quantities of the various products as if it were a profit maximiser. However if the resources (and costs) are not given and the firm can allocate increased quantities of factors to the production



of any product, the profit maximiser will have a different equilibrium product mix than the sales maximiser. This may be shown graphically by using isorevenue and isoprofit curves in figure 22.3.



Figure 22.3

The isorevenue curves have convex shape and isoprofit curves are concave to the origin. The multiproduct firm will reach a different equilibrium product mix depending on whether it is a profit maximiser or a sales maximiser. The formal condition of equilibrium of sales maximizing multiproduct firm is the ration of the marginal revenues of commodity and must be equal to the ration of their marginal profitabilities that is the equilibrium of the sales maximiser is defined by a point of tangency of the isorevenue and the isoprofit curves. This is shown by a point on the curve R a b c d e in the figure.

**Model 4: Multi-product model with adverting:**

To achieve maximum generality calculus is used in developing this model. The firm aims at sales revenue maximization subject to a minimum profit constraint. i.e.

Masimise  $R = f_1(x_1, a_1)$   
 Subject to  $\Pi = R - C - A = \Pi$  where  
 $R = \text{revenue} = P_1 X_1 + P_2 X_2 + \dots + P_n X_n$   
 $C = \text{Cost functi on} = f_2(x_1, x_2, \dots, x_n)$   
 $A = \text{total advertising} = a_1 + a_2 + \dots + a_n$  expenditure  
 $X = \text{output}$        $P = \text{minimum acceptable profit}$

The solution of the constrained maximization problem can be obtained by using the lagranzian multiplier method. When the method is applied, we get the solution which is same as that of model 3.

$$\text{i.e. } \frac{\partial R / \partial X_i}{\partial R / \partial X_j} = \frac{\partial C / \partial X_i}{\partial C / \partial X_j}$$

So advertising does not alter this condition due to Baumol's assumption that advertising is not a function of output.

RQ-II

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## 22.4 Baumol's Dynamic Model

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The most serious weakness of the static model is the short time horizon of the firm and the treatment of the profit constraint as an exogenously determined magnitude. In the dynamic model the time horizon is extended and profit constraint is endogenously determined. The assumptions of the dynamic model are

1. The firm attempts to maximize the rate of growth of sales over its lifetime.
2. Profit is the main means of financing growth of sales and is endogenously determined.
3. Downward sloping demand and U-shaped costs curves are assumed.

The firm attempts to maximize the present value of the stream of sales revenue over its lifetime by choosing appropriate value for the current level of sales revenue (R) and its growth rate (g). It is obvious that the total present (discounted) value of all future revenue (S) is positively related to both R and g. The value of S will be higher for higher R and g. Thus firm should choose values of R and g as large as possible clearly there is an infinite combination of values of g and R that the firm may face. Among all possible values, the firm will choose the pair of values of g and R that maximize the present value of the future stream of sales (S).

To find the equilibrium of the firm we need an additional tool, the iso-present-value curve. This curve shows all combinations of g and R that yield the same S. The firm will choose the highest possible of the iso-present-value curves. That is the firm is in equilibrium at the point of tangency of the growth curve (O or A) to the highest S curve shown in the figure 22.4. The point tangency defines the equilibrium values  $g^x$  and  $R^x$  which maximize the  $S^x$ .



Figure 22.4

Growth is financed out of current profit and the growth curve is therefore derived from the profit curve. Given  $R^x$  we may determine the equilibrium level of output from the total revenue curve shown on figure 22.5. The sales maximiser will produce output  $X^x$  and will sell it at price equal to  $OR^x / OX^x$ . Given the equilibrium output  $X^x$  and the profit function, the profit constraint is now endogenously determined at  $P^x$ . In other words, the sales maximiser will require a profit level of  $P^x$  in order to finance the optimal growth rate  $g^x$ .



Figure 22.5

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**22.5 Comments:**

---

The sales maximization hypothesis cannot be tested against competing behavioral hypothesis unless the demand and cost function of individual firms are measured. It has been argued that in the long run the sales maximization and the profit maximization hypothesis yield identical solutions, because profit

attain their normal level in the long run and the minimum profit constraint will coincide with the maximum attainable level of profit. But to accept the empirical evidence to support is required.

The sales maximization theory does not show how equilibrium in an industry will be attained the relationship between the firm and the industry is not established by Baumol.

Baumol rules out interdependence, his theory cannot explain the core problem of uncertainty in non-collusion oligopoly markets. The theory ignores not only actual competition but also the threat of potential competition. The assumption of positive MR of advertising is not justified by Baumol.

M.H.Peston argued that a firm may be willing to keep sales at a high level even though they are unprofitable in the short run in the hope that eventually the product will become profitable once established in the market.

In summary, we can say that although various studies have been conducted to test Baumols hypothesis, the empirical evidence is not conclusive in favour of or against the sales maximization hypothesis.

### **Review Question.**

- i) Explain how Baumols sales revenue maximization model is an improvement over the traditional model.
- ii) Analyse Baumols static single product model with advertising.
- iii) Comment on the practical relevance of Baumols sales revenue maximization hypothesis.

### **Key-words:**

Objectives of the firm ; Alternative objectives; profit – maximization, divorce of ownership and management; sales revenue maximization, static and dynamic models, advertising, single product firm, multiproduct firm.

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## **22.6 Marris's Model of the Managerial Enterprise.**

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The goal of the firm in Marris's model is the maximization of the balanced rate of growth of the firm that is the maximization of the rate of growth of demand for the products of the firm and of the growth of its capital supply. Thus the firm aims to



Maximise  $g = g_d - g_c$  where

$g$  = balanced growth rate

$g_d$  = growth of demand for the products of the firm

$g_c$  = growth of supply of capital

In pursuing this maximum balanced growth rate the firm has two constraints namely available managerial team and its skills and secondly a financial constraints. The rationalization of this goal is that by jointly maximizing the rate of growth of demand and capital the managers achieve maximization of their own utility as well as the utility of the owners shareholders.

Marris argues that since growth happens to be compatible with the interests of the shareholders. In general the goal of maximization of the growth rate seems plausible Marris considers the utility function of the owners as

$U_{owners} = f^*(g_c)$  where  $g_c$  = rate of growth of capital. Further he assumes that salaries status and power of managers are strongly correlated with the growth of demand for the products of the firm. Managers will enjoy higher salaries and will have more prestige the faster the rate of growth of demand. Therefore he takes the managerial utility function as

$U_m = f(g_d, S)$  where

$g_d$  = rate of growth of demand for the product of the firm

$S$  = a measure of job security

As a first approximation Marris treats 'S' as an exogenously determined constraint by assuming that there is a saturation level for job security with this assumption the managerial utility function becomes  $U_m = f(g_d)S$  where  $S$  is the security constraint determined exogenously.

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## **22.7 Equilibrium of the Firm**

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The managers aim at the maximization of their own utility which is a function of the growth of demand for the products of the firm given the security constraint i.e.,  $U_m = f(g_d)$

The owner-shareholders aim at the maximization of their own utility which Marris assumes to be a function of the rate of growth of the capital supply i.e.,  $U_0 = f(g_c)$ .

The firm is in equilibrium when the maximum balanced growth rate is attained that is the condition for equilibrium is  $g_d = g_c = g_x$  maximum

Thus the solution lies in identifying the factors that determine  $g_d$  and  $g_c$ . Marris establishes that the factors that determine  $g_d$  and  $g_c$  can be expressed in terms of two variables namely

- i) the diversification rate  $d$  and
- ii) the average profit margin.

Thus Marris shows that  $g_d = f_1(d, m)$  and

$g_c = a f_2(m, d)$  where  $a$  = the financial security coefficient determined exogenously and is assumed constant. At equilibrium we have

$$f_1(m, d) = a f_2(m, d)$$

Clearly the model cannot be solved unless one of the variables  $m$  or  $d$  is subjectively determined by the managers. Once the managers define one and one of the other two policy variables, the equilibrium rate of growth can be determined the equilibrium of the firm is shown graphically in figure 22.6.

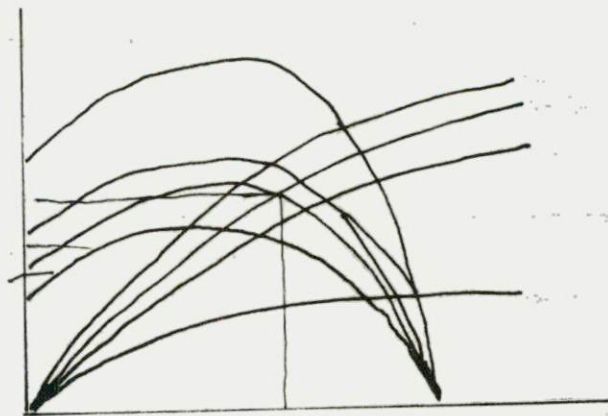


Figure 22.6

If we join all points of intersection of  $g_d$  and  $g_c$  curves corresponding to the same level of  $m$ , we form the curve called the balanced-growth curve (BGC) given the financial constraint  $a$  the firm is in equilibrium when it reaches the highest point on the balanced-growth curve. The balanced-growth rate



$g^x$  is defined by the highest point B of this BGC. This  $g^x$  rate is compatible with a unique pair of values of the policy variables  $m^x$  and  $d^x$ , then  $m^x$  is simultaneously determined and vice-versa.

However, if the financial co-efficient  $a$  is allowed to vary, then profit and growth become competing goals. Marris argues that in the real world, the financial co-efficient  $a$  is not constant but varies. It is clear that  $a$  cannot be increased beyond a certain value determined by the minimum profit requirements of the shareholders. Otherwise the job security of managers decreases dangerously. If the solution of the model does not yield profit adequate to satisfy the shareholders,  $a$  will be reduced until the maximum obtainable balanced growth rate is constant with minimum acceptable level of profit. This implies that managers seek to maximize the growth rate subject to a minimum profit constraint.

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## 22.8 Comments :

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Marris's main contribution is the incorporation of the financial policies of the firm into the decision making process of the firm. This is done by introducing the financial security coefficient  $a = a^x$  the model as an additional policy variable. However not much is said regarding the actual value of this coefficient. The determination of  $a$  is exogenous to the model. This model is ingenious in that it seeks a solution which maximizes the utility of both the managers and the owners this may be so in periods of steady growth but need not be true for recessions or tight markets. Marris does not justify the preference of owners for capital growth over maximization of profit. Oligopolies interdependence is not satisfactorily dealt with in the model. This model relies heavily on the assumption that firms have their own research and development department which is not so in the real world. Determination of price in the market is not explained clearly in the model. The welfare implications of this model are not obvious.

SAQs.

1. Define balanced rate of growth of the firm.
2. Distinguish between the goals of the owners and the managers of the firm.

---

## 22.9 Williamson's Model of Managerial Discretion.

---

We first present the concepts and basic relations used in the model.

### i) The managerial utility function:

Williamson's argues that managers have discretion in pursuing policies which maximize their utility rather than attempting maximizing of profit which maximizes the utility of owners. Profits acts as a constraint to this managerial behaviour. The managerial utility function includes such variables as salary as salary, security, power, status, prestige professional excellence. Staff expenditures emoluments and discretionary investment expenses are measurable in money terms and will be used as proxy variables to replace the non-operational concepts like power, status, prestige, professional excellence appearing in the managerial utility function. Thus the utility function of managers (according to Williamson) may be written as  $U = f_1(S, M, I_D)$  where

S = Staff expenditure including managerial salaries.

M = Managerial emoluments (discretionary expenditures which are tax deductible)

$I_D$  = Discretionary investment.

### ii) The demand of the firm :

It is assumed that the firm has a known downward sloping demand curve defined by the function  $X = f^x(P, S, E)$

or  $P = f_2(X, S, E)$  where

X = output

P = price

S = Staff expenditure

E = The condition of the environment

It is assumed that the demand is negatively related to price but positively related to staff expenditure and to the shift factor E.

### iii) Production cost:

The total production cost (c) is assumed to be an increasing function of output. i.e.,  $C = f_3(x)$ .

**iv) Actual profit  $\Pi$ :**

The actual profit is revenue from sales (R) less the production cost (c) and less the staff expenditure (s).

$$\Pi = R - C - S$$

**v) Reported profit  $P_R$  :**

This is the profit reported to the tax authorities. It is the actual profit less the managerial emoluments (M) which are tax deductible.

$$\Pi_R = \Pi - M = R - C - S - M$$

**vi) Minimum profit  $P_o$  :**

This is the amount of profit (after tax) which is required for an acceptable dividend policy by the shareholders. For this the reported profits must be atleast as high as the minimum profit requirement plus the tax that must be paid to the government.

$$\Pi_R = \Pi_o + T \quad \text{Where } T = \text{tax}$$

The tax function is of the form

$$T = T + t P_R \quad \text{Where } t = \text{marginal tax rate}$$

$T = \text{a lump sum tax}$

**vii) Discretionary Investment  $I_D$  :**

Discretionary investment is the amount left from the reported profit after subtracting the minimum profit ( $\Pi_o$ ) and the tax (T).

$$I_D = \Pi_R - \Pi_o - T$$

**viii) Discretionary profit  $P_D$**

This is the amount of profit left after subtracting from the actual profits ( $\Pi$ ) the minimum profit requirement ( $\Pi_o$ ) and the tax (T).

$$\Pi_D = \Pi - \Pi_o - T$$

---

**22.10 The Model Presentation :**

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**a) A simplified model of managerial discretion.**

We will present the model in two stages to simplify the exposition. In the first stage we assume that there are no managerial emoluments (Manasagangotri, Mysore = 0) so that the actual profit is the reported profit for tax purposes.

The simplified model may be stated as follows.

$$\begin{array}{ll} \text{Maximise} & U = f(S, I_D) \\ \text{Subject to} & \Pi = \Pi_0 + T \end{array}$$

Since there are no emoluments, discretionary investment absorbs all the discretionary profit thus we may write the managerial utility function as

$$U = f(S, \Pi - \Pi_0 - T)$$

For simplicity, we may assume that there is no lump sum tax so that  $T = tP$ . Thus utility function become,  $U = f[S, (1-t)\Pi - \Pi_0]$  where  $(1-t)\Pi - \Pi_0 = \Pi_D$  is the discretionary profit.

The graphical presentation of the equilibrium of the firm according to Williamson's model requires the construction of the indifference curves of managers and the curve showing the relationship between the two variables  $S$  and  $P_D$ . This is shown in figure 22.7.

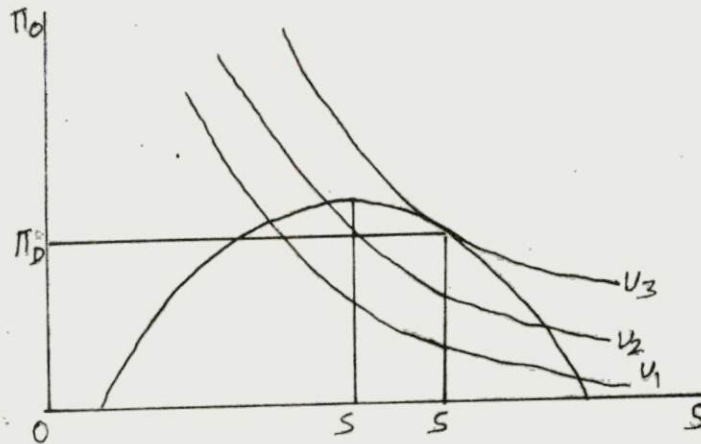


Figure 22.7



The equilibrium of the firm is determined by the point of tangency of the profit staff curve with the highest possible indifference curve as shown at point e in the figure. Given that the indifference curves have a negative slope it follows that the equilibrium solution will be always on the following section of the profit staff curve this shows the preference of managers for staff expenditure. Further this model implies higher output, lower price and lower level of profit than the profit maximization model.

**b) The general model of managerial discretion:**

In this case the managerial emoluments are not zero i.e.,  $M = 0$ . Formal model may be stated as

$$\begin{array}{ll} \text{Maximize} & U = f(S, M, \Pi_R - \Pi_0 - T) \\ \text{Subject to} & \Pi_R = \Pi_0 + T \end{array}$$

The firm will always choose positive values for these components ( $S, M, I_D$ ) with this assumption the constraint becomes redundant and we may treat the problem as one of straight forward maximization. After substitution it can be shown that the managerial utility function depends on three variables namely output  $X$ , staff expenditures  $S$ , and the proportion  $r$  where  $r = P_R / P$ . These are the policy variables of the firm. The managers will choose such values for  $X, S$  and  $r$ . So as to maximize their utility function. The findings show that some amount of the profit will be absorbed as emoluments and this amount depends on tax rate at equilibrium the firm will employ administrative staff beyond the optimal level. Thus there is a tendency for the managerial firm to overspend on staff to employ more staff than a profit – maximizing firm.

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**22.11 Evidence from field studies and comments:**

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Williamson conducted several case studies from which he infers that his model is better for the explanation of some real world phenomena such as

- i) Increase in  $S$  and Manasagangotri, Mysore in booms and drastic cut of these expenditures in recessions.
- ii) Reaction of firms to taxation changes.
- iii) Changes if the level of  $X, S$  and  $M$  in response to changes in the fixed costs of the firm.

- iv) Drastic cuts in staff expenditure by newly appointed top management without affecting the productivity of the firm.
- v) Reducing inefficient plants and activities.

Williamson argues that such phenomena is incompatible with a profit maximizing behaviour and can be explained by his model of rational managerial behaviour.

However the available evidence is not enough for the verification of the theory. Dynamic situations are not clearly explained. The model fails to deal with the core problem of oligopolistic interdependence and of strong oligopolistic rivalry. When rivalry is strong, a profit maximizing model may be more appropriate unless some form of collusive agreement is achieved.

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### **22.12 Full – cost Pricing Principle.**

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It was argued that firms cannot attain the goal of profit maximization because they do not have the necessary knowledge information or ability firms do not know with certainty their demand and costs curves hence they cannot apply the marginalist principle  $MC = MR$  Let us examine such attacks as presented by Hall and Hitch in their full cost pricing principle.

#### **Full cost Pricing Principle.**

In 1939 hall and Hitch published some results of research undertaken at oxford relating , to the decision process of businessmen their study covered 38 firms, out of which 33 were manufacturing, 3 were retail trading firms and 2 were building firms.

The most striking results of the studies reported by Hall and Hitch were that firms did not attempt to maximize their profit they did not use the marginalist rule  $MC = MR$  and that oligopoly was the main market structure of the business world. Up to then the theory of monopolistic or imperfect competition of chamberlin and John Robinson had been generally accepted as ideal or relevant the firms were assumed to be able to act freely , ignoring their rivals reactions and pursuing their short run (long-run) profit maximization by equating  $MC = MR$  in each time period. The finding of Hall and Hitch may be summarized as follows.



- i) The firms do not act automatically. Firms are continuously conscious of the reactions of their competitors. This behaviour is in contradiction to the postulates of monopolistic competition. Oligopolistic interdependence could not be dealt with within the framework of traditional theory.
- ii) They found that firms do not attempt to maximize short-run profit by applying marginalisation rules ( $MC = MR$ ) but aim at long run profit maximization.
- iii) Firms set their price on the average cost principle which is often called as full cost principle (by Hall & Hitch). That is, firms do not set their price and output at the levels determined by the intersection of the MC and MR curves. But they set a price to cover the average variable cost, the average fixed cost and a normal profit margin (usually 10%). Thus  $P = AVC + AFC + \text{Profit margin}$ .

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### **22.13 Reasons for Breakdown of Marginalism :**

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The reasons given by Hall and Hitch for the breakdown of marginalism are

- a) Firms do not know their demand curve nor their marginal cost. Hence application of  $MC=MR$  is impossible due to lack of information.
- b) Firms believed that the full-cost price is the right price since it allowed a fair profit and covered the costs of production.

They found that the firms main preoccupation is price and not output as the traditional theory implied. Thus the firms would set their price on the basis of the above full-cost principle and they would sell at that price whatever the market would take. Lastly it was found that prices of manufactures were fairly stickly despite changes in demand and costs. But 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. To explain the stickiness of prices Hall and Hitch introduced the chamberlain apparatus of the linked demand curve which helped to explain stickiness of the price but not their levels. Thus they suggest that the firms set their price independently of one another on the basis of the full cost principle. Once these prices are set, tend to be sticky because of the expectations of firms about competitors reactions to change in the firms price. Thus the points need stressing are

- i) The application of the marginalistic rule to maximize short-run profit require that businessmen make continuous adjustment to price as demand and costs change continuously the observed

stickiness of prices in the face of changing conditions of the environment suggest that marginalism is not applied atleast in the shortrun.

- ii) It is not certain that the pricing practices reported by businessmen in the context of various studies are inconsistent with marginalism or that the full cost pricing rule based on this evidence, provide an alternative to the model of marginalism.

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### **22.14 Comments:**

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It can be said that full cost rules of pricing one useful for avoiding uncertainty and co-ordinate the market. But the evidence of constant AVC strips the full cost rule of its essence as a new theory of long run profit maximization different from marginal analysis. Full cost pricing practices are compatible with almost all hypotheses pertaining to explain the behaviour of the firm. For example full cost pricing rules are compatible with Baumol's sales maximization hypothesis. Thus full cost pricing practices should be interpreted as routine rules of thumb which are adopted in the real world because they are useful as a market co-ordinating device and they cannot explain the goals and the decision making of firms.

### **Self Assessment Questions:**

- i) What are the reasons for breaking of marginalism?
- ii) Explain the meaning of full cost pricing principle.

### **Review Questions:**

- i) Explain the equilibrium of the firm under marris model.
- ii) Examine how williamson's model implies higher output, lower price and lower profit than the profit maximization model.
- iii) Discuss the findings and limitations of the Hall and Hitch survey regarding the pricing by firms.

### **Key words:**

Balanced growth rate, managerial utility function, financial co-efficient, Discretionary investment, Full cost pricing, marginalism.

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**UNIT 23 : BAIN'S LIMIT PRICING THEORY AND ITS  
RECENT DEVELOPMENT INCLUDING SYLOS-  
LABINI MODEL**

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**Structure**

- 23.1 Introduction
- 23.2 Bain's Limit Price Models
- 23.3 Barriers to New competition
- 23.4 Barriers to entry
- 23.5 Assumptions of Bain's models
- 23.6 Bains Models
- 23.7 Comments on Bain's model
- 23.8 Recent Developments in limit pricing theory
- 23.9 Sylos – Labini Model
- 23.10 Working of the model
- 23.11 Price determination
- 23.12 Comments

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**23.0 OBJECTIVES:**

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On successful completion of this unit, you should be able to

- ☞ Understand that traditional theory was unable to explain. Why firms did not charge the price which would maximize their revenue.
- ☞ Know what is limit pricing.
- ☞ Know why actual price set by oligopolist is below the monopoly price.
- ☞ Recognize the threat of potential entry.
- ☞ Explain Barriers to entry.
- ☞ Distinguish between Bain's model and sylos labini model.
- ☞ Know the recent development in limit price theory.



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**Unit 23 : Bain's Limit Pricing Theory and its Recent Development**

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**23.1 Introduction**

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Bain formulated his limit price theory in an article published in 1949, much before his major work 'Barriers to new competitions', which was published in 1956. His aim in his early article was to explain why firms over a long period of time were keeping their price at a level of demand where elasticity was below unity that is, they did not charge the price which would maximize their revenue. His conclusion was that the traditional theory was unable to explain this empirical fact due to the omission of an important factor namely the threat of potential entry in the pricing decision.

Recent developments in this field include sylos – Labini's model, the model of Franco Moeliglians the model of Bhagavati and the model of Pashigian.

Let us discuss in detail the Bain's model and sylos – Labini's model one by one.

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**23.2 Bain's Limit Pricing Models.**

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Traditional theory was concerned only with actual entry which resulted in the long run equilibrium of the firm and the industry (where  $P = LAC$ ). However Bain argued that the price did not fall to the level of LAC in the long run because of existence of barriers to entry also, at the same time price not set at the level compatible with profit maximization because of the threat of potential entry. Actually he found that price was set at a level above LAC (= pure competition price) and below the monopoly price (where  $MC = MR$ ) and short run profits are maximized. He says that this behaviour can be explained by assuming that there are barriers to entry and that the existing firms do not set the monopoly price but the 'limit price', that is the highest price which the established firms believe and can charge without inducing entry.

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**23.3 Barriers to New competition:**

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Bain tried to explain why the actual price set by oligopolists is below the monopoly price. His answer was that the retention of price below the

monopoly level is due to the threat of potential entry. The firms charged the limit price, lower than the monopoly price because the entry prevention policy secured maximum long run profits. In his book, Bain explains why price is set above the competitive price (= long run AC). His conclusion is that the limit price is above competitive price due to barriers to entry. So it is better to have Bains ideas about competition, entry and barriers to entry.

Competition: Bain distinguishes between two types of competition, actual competition between established firms and potential competition arising from the potential entry of firms outside the industry. This implies that entry comes from completely new firms starting from search which was ignored in the theory of pure competition and monopolistic competition.

Entry : Bain considers entry as the establishment of a new firms which builds or introduces new productive capacity that was not used for production in the industry prior to the establishment of the new firms. Thus for Bain entry involves the setting up of a new firm and the addition of new capacity in the industry Bain explicitly excludes the cases of i) the take over ii) the expansion of capacity iii) cross entry.

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#### **23.4 Barriers to entry :**

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Bain introduced the concept of the condition of entry which he defined as the margin by which established firms can raise their price above the competitive price level without attracting entry. This can be expressed as

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

Where E = Condition of entry.

$P_L$  = limit price

$P_C$  = competitive price (= LAC)

Solving for  $P_L$  we find  $P_L = P_C ( 1 + E )$

Thus the condition of entry E, is in fact the premium accruing to the established firms in an industry from charging a price  $P_L$  higher than the pure competition price  $P_C$  without attracting entry. The lag of entry that is, the time

required for a new firm to be established depends on various factors which constitute the barriers to entry. Bain distinguishes four main barriers to entry. They are

- i) Product differentiation barrier or preference barrier.
- ii) Absolute cost advantage of established firms.
- iii) Economies of scale.
- iv) Large initial capital requirements.

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### 23.5 Assumptions of Bain's models

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1. For each industry there exists a minimum optimal scale of plant i.e., a minimum plant size ( $x$ ) at which the economies of scale are fully realized.
2. The LAC curve is L-shaped costs remain constant beyond the minimum optimal scale.
3. The LAC is the same for all firms, the established ones and potential entrant since technology is the same for all.
4. The flat part of the LAC curve determines the long run competitive price  $P_c = LAC$
5. The market demand curve  $DD$  is known to all firms, existing and potential entrants. That is all firms know the price elasticity of the market demand curve.
6. All firms produce very similar product
7. All firms are assumed to have equal market shares.
8. the share of each firm is a constant proportion of the market demand at all price levels.

Under the above set of assumptions we may use the individual LAC and  $DD$  curves to derive the equilibrium of the firm and the industry shown in figure 23.1

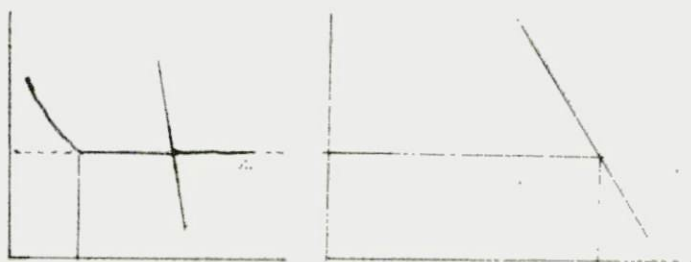


FIGURE 23.1



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## 23.6 Let us now examine the Bain's models.

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### Model A: Constant P at the entry level.

Hence the entrant expects that the established firms will keep their price constant at the pre-entry level and allow the entrant to secure any share he can at this price. This implies that, given the market DD curve, the established firms will accommodate the entrant and their market shares will be reduced by the amount that the entrant will sell. The established firms will set the price at a level which will make entry unattractive to outside firms.

$$P_L = P_C (1 + E)$$

The premium E by which the limit price will exceed the competitive price depends on four factors, namely

1. The initial share 'd' of the entrant relative to the minimum optimal scale X
2. The number of firms in the industry N.
3. The steepness of the LAC curve.
4. The elasticity of demand E.

It can be said that if the entrant expects the price to remain constant and his actual share is equal to or greater than X, then there is no barrier to entry. However, if the share is smaller than X, then there exists a scale barrier the limit price will be above  $P_C = LAC$ .

### Model B: Constant Quantity Q at the pre-entry level.

There the entrant expects that the established firms will retain their output constant. This allows industry price to fall as a consequence of such additions to industry output by the entrant. The established firms keep their output at the pre-entry level and allow the added output of the entrant to lower price accordingly the existing firms expect that entry will not occur if the price falls below the minimum range of the LAC curve. It is also assumed that the entrant will enter at the minimum optimal plant size X. Under these assumptions, there will be a scale-barrier to entry the existing firms will charge an entry preventing prize which is above the competitive price.

$$P_L = P_C (1 + E)$$

The determinants of the premium by which the limit price will exceed the  $P_C = LAC$  are

1. The minimum optimal scale  $X$ .
2. The size of the market at the competitive price.
3. The elasticity of market demand.
4. The number of established firms in the industry.

As shown in the figure 23.2, the established firms will produce a quantity  $X_L$  such that if the entrant adds his minimum optimal output  $X$ , the market price will fall below the  $LAC = P_C$  clearly  $X_2 = X_c - X$

Once  $X_L$  is determined the limit price  $P_c$  is defined simultaneously from the given market demand curve  $DD$ . The limit price will be higher the larger  $X$ , the larger  $N$ , the smaller  $X_c$  and the smaller the price elasticity  $C$ .

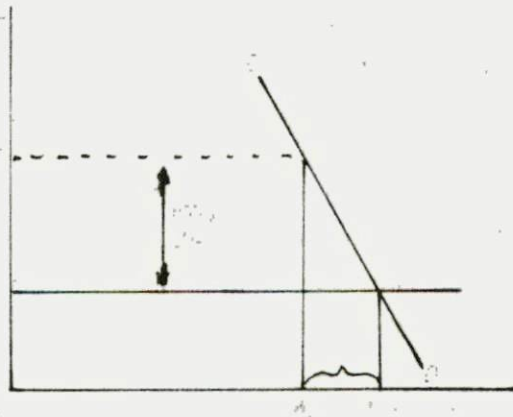


FIGURE 23.2

**Model C: Price and output change post – entry.**

The entrant expects the established firms partly to decrease their quantity and partly to allow the price to fall. In other words the established firms accommodate the entrant only partially. This is the intermediate case between the above two limiting cases. Bain says that this is the more realistic and probable expectation. Existing firms will reduce their output somewhat, but not enough to maintain prices in the face of entry. In this case the entry barriers resulting from economics of scale alone will lie somewhere between the barriers of the limit pricing models A and B.

#### **Model D: Increase of the pre entry output.**

Hence the entrant expects the established firms to increase their output. This reduces price below the LAC until the entrant is closed down. They can subsequently elevate the price to the entry preventing level and no entry will occur since any potential entrant will have learned the retaliation lesson. Bain does not deal this case assuming that its occurrence is very unlikely.

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### **23.7 Some Comments:**

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Bain's contribution to the theory of the firm is important his work contains seminal ideas on the importance of potential entry in the pricing decisions. However Bain's empirical findings have serious limitations. Bain concentrates on entry by new firms. He omits cross entry, take overs, vertical integration and addition to capacity by existing firms. Bain's theory of pricing is basically collusive. The price is set by the firm with least cost and the less efficient firms are price followers. The leader does not set price to maximize his own short run profit but rather aims at a price which would prevent entry. The rationale of this policy is that by preventing entry, long run profits are maximized.

#### **Self Assessment Questions:**

- i) Distinguish between actual and potential entry.
- ii) What are the barriers to entry according to Bain?
- iii) Define limit – pricing.

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### **23.8 Recent Developments in Limit Pricing theory – Sylos – Labini Model**

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Introduction : Recent developments in the theory of limit pricing include in the theory of limit pricing include models developed by sylos – Labini. Fraco modigliani, Jagadeesh Bhagwati, and Pashigian. For all these models, sylos – labini model is the basic frame work Modigliani relaxed the restrictive assumptions made under sylos – Labini model Bhagwati extended modigliani's model by adding the number of firms in the industry and a measure of strength of established firms to the entrants and by introducing dynamic approach. Thus sylos – Labini modigliani and Bhagwati models postulate that the limit price will be higher than the LAC due to the scale barriers to



entry. Thus the firms will be earning abnormal profits without attracting entry. Bhagwati concludes that firms under certain conditions may adopt a mixed strategy namely change the monopoly price ( $P_m > P_L$ ) over a certain period of time and subsequently reduce their price to the level that will prevent entry ( $P_L$ ). Pashigiem in his model, explored more systematically the implications of the above mixed strategy by defining the period at which the firms will switch from the monopoly price to the entry-preventing price ( $P_L$ ) or to the competitive equilibrium price ( $P_c$ ) depending on the profitability of each alternative since Sylos-Labini model provides the basis frame work, let us discuss this the model in detail.

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### 23.9 Sylos – Labini Model

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Sylos – Labini developed a model of limit pricing based on scale –barriers to entry though the model is clumsy due to its stringent assumptions, his analysis of the economics of scale barrier is more thorough than that of Bain the model makes the following assumption.

1. The market demand is given and has unitary elasticity. The product is homogeneous and will be sold at a unique equilibrium price.
2. The technology consists of three types of plant i.e. plant size of 100 units, 1000 units and 8000 units of output. Each firm can expand by multiples of its initial plant size only. Thus use have three cost lines corresponding to the three plant sizes.
3. The price is set by the price leader who is the largest firm, with the lowest cost at a level low enough to prevent entry. The smaller firms are price-takers thus the largest firms does not full power in setting the price i.e., it must set a price that is acceptable to all the firms in the industry.
4. There is a normal rate of profit in each industry ( around 5% profit)
5. The leader is assumed to know the cost structure of all plant size and market demand.
6. The entrant is assumed to come into the industry with the smallest plant size.
7. The established firms and the entrant behave according to the Sylos's Postulate. So as entry takes place the market price falls and increase in the market demand.



### 23.10 Working of the Model:

Sylos-Labini presents his model with a numerical example. He starts with the market structure shown in the following table 23.1. Which is assumed to be created at random and proceeds to examine how equilibrium is attained in the market.

Table 23.1 Initial market structure and minimum acceptable prices.

Plant size	Capacity (units of X)	No. of firms	Total output X	Initial price (arbitrary units)	Market demand (value)	ATC	Profit rate	Minimum acceptable price at 5% profit
Small	$X_s = 100$	20	2000	20	40,000	18.5	8.1	19.4
Medium	$X_m = 1000$	2	2000	20	40,000	18.0	11.1	18.9
Large	$X_l = 8000$	1	8000	20	160,000	17.0	17.6	17.85
Total		23	2000		240,000			

The equilibrium at price 20 is not stable because the market output is too small and the price is too high, so entry will take place. This is due to the fact that given the cost structure of the three plants (ATC) the price 20. From the table it is clear that profits are 8.1% for small forms, 11.1% for medium firms and 17.6% for large forms these rates are higher than minimum profit (normal profit) rate of 5%. The excess profits will attract entry. But under the above rigid assumptions, the following results will emerge.

No new large and medium firm will enter into the industry. If they enter sales would rise and the price would fall to a level lower than minimum acceptable price any firm in the industry. At 5% normal profit, the minimum acceptable prices are 19.4 for small firms, 18.9 for medium firms and 17.85 for large firms.

However, three small firms can enter the market but the entry of the fourth small firm would depress the price to 19.3, a level below the minimum acceptable price of 19.4 for small firms.

Thus the entry forestalling price is just above the minimum acceptable level of the smallest least efficient firms.

### 23.11 Price determination:

It is said that the price is set by the largest, most efficient firms. The equilibrium price must be acceptable by all firms in the industry and it should be at a level which would prevent entry. Given that firms have different costs there are as many minimum acceptable prices as plant size for each plant. minimum acceptable price is defined on the average cost principle. i.e.,

$$P_i = TAC_i (1 + r) \text{ where}$$

$P_i$  = the minimum acceptable price for the  $i$

$TAC_i$  = Total Average Cost for the  $i$ st plant size.

$r$  = normal profit of the industry (say 5%)

The price leader i.e., the most efficient firm, will set the price at a level acceptable to all existing firms and low enough to forestall entry clearly the medium and large firms, having lower costs, will be earning abnormal profits. But small firms will also be earning some abnormal profits without attracting entry. In figure 23.3 the market demand at the minimum acceptable price  $P_s$  of the smallest, least efficient, firm is  $X$ . The leader will set the limit price  $P_l > P_s$ .

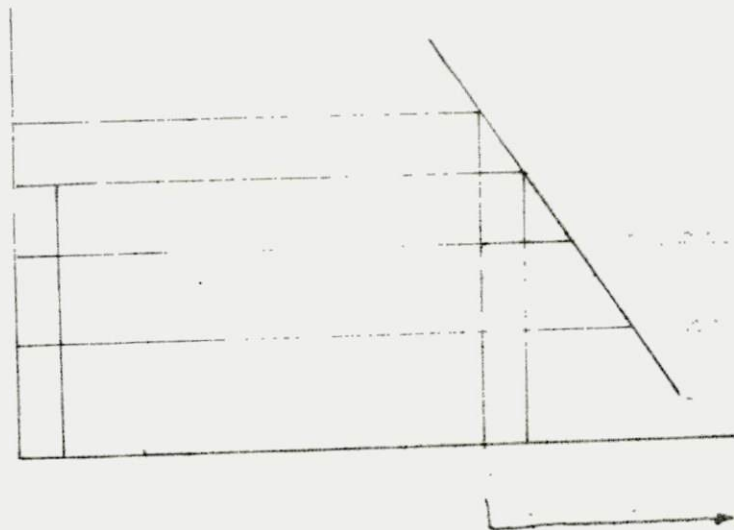


FIGURE 23.3

The price  $P_L$  corresponds to the level of output  $X_L = X - X_s$  and is the equilibrium price because it satisfies the two necessary conditions i.e. it is acceptable by all firms and it stops entry. If the entry occurs, the total output  $X_L$  will be increased to  $X = S_L + X_s$  and the price will fall just below the minimum acceptable price i.e. just below  $P_L$ . The price  $P_L$  is indirectly determined by the total output that the established firms will sell in the market given  $X_L$ . the limit price  $P_L$  is determined from the market demand curve  $DD$  the entrant will be stopped from entering the market because he knows that if he enters he will cause the price to fall below his  $AC$ . Any output larger than  $X_L$  is entry-preventing while any output small than  $X_L$  will not prevent entry.

Thus in Sylos's model, all firms earn abnormal profits which are increasing with plant size and there is an upper and lower limit of the entry-preventing price. The equilibrium price cannot be higher than  $P_L$  and nor lower than  $P_s$ . In this model, the factors that determine the entry – preventing price are;

1. the absolute size of the market ( $x$ )
2. the elasticity of market demand
3. the technology of the industry
4. the prices of factors of production.

Sylos also extended his analysis to the case of differentiated oligopoly. He argues that when the products are differentiated, the entry-barriers will be stronger than in the case of scale in marketing product differentiation therefore, will reinforce the scale barrier.

**Comments:** Sylos model has been severely attacked on several grounds. Firstly the model is criticized on the grounds of unrealistic assumptions and also even if assumptions are relaxed, it does not affect the validity of the model. Secondly the model is criticized on methodological approach, assumption of rigid technology unitary etc. The model also assumes considerable knowledge of the conditions of supply and demand, cost structure of all plant sizes etc and the required information on these things is very unlikely to be available in practice. However Sylos's contribution lies in the systematic discussion of the most important determinants of the limit price in the case of substantial economics of scale.

### **Self-Assessment Questions.**

- i) Explain scale barriers to entry as postulated by Sylos-Labini.
- ii) What factors prevent entry of a new firm according to Sylos-Labini?
- iii) Briefly explain the recent developments in the theory of limit pricing?

### **Key words :**

Entry, Potential entry, limit price, Barriers to entry, scale - barriers, price leader.

### **References:**

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**UNIT 24: Behavioral Theory of the Firm**

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**Structure**

- 24.1 Objectives
- 24.2 Introduction
- 24.3 Behavioral Theories
  - 24.3.1 Simon's Theory of satisficing behaviour
  - 24.3.2 Comments
- 24.4 Cyert – March Model of Behaviourism
- 24.5 Critique of Behaviorisms
- 24.6 Critique of Behaviourism
- 24.7 Game Theoretic models of the Firm
  - 24.7.1 Introduction
  - 24.7.2 Game Theory
  - 24.7.3 Two – person Zero sum Game
- 24.8 Summary

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**UNIT 24: Behavioral Theory of the Firm**

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**24.1 Objectives.**

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On learning this unit you should be able to:

- a) Understand behaviouristic approach to decision – making.
- b) Assumptions of the behavioural model;
- c) Contributions and limitations of behavioural theory.
- d) The use of game theory to understand the strategy formulation by the firm.

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**24.2 Introduction**

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The theory of the firm based on the marginalist principles was criticized on many counts. The goal of the firm is , many times not profits nor its maximization alone. The behavioural theory between that firm has multiple goals and depending upon the internal and external environment of the firm the process of goal formation is an important activity. Since there are many stakeholders on the performance of the firm, the goals of these stakeholders also called as aspiration will be often conflicting. The firm in the behavioural model, always tries to reconcile these conflicting interests and hence it is a satisficer and not a maximiser. In this unit we shall learn the contributions of Simon Cyert March and Colen Cyert models of behaviourism. You will also learn application of the theory of games to study the behaviour of the firm.

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**24.3 Simon's Theory of Satisficing Behaviour.**

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Simon believes that organisation behaviour and individual behaviour are similar. Each organisation and achievement levels. Like individual firm also review their goals in the light of aspirations and achievements.

If the actual achievement is less than the aspiration, the firm may need to collect more and qualitative information. It is also possible that the aspiration level itself is pitched too high. Therefore in the light of fresh and more qualitative information the firm may reset its aspiration.

Secondly, if the achievement is equal to the aspirations, the targets have not neither been fixed at low nor high level. The firm is satisfied because it has rightly estimated its performance level. There will be no drastic resetting of the aspirations.

Thirdly, if the actual achievement is greater than the aspirations targeted, the firm is satisfied. But the firm needs to review its policies so as to improve its efficiency.

Thus except for the first situation the firm remains satisfied for the first situation, the firm will have to start 'search activity' as well as 'choice' to improve information flow. In this way, the firm tries to equate its aspirations and achievements thereby satisfying itself and stakeholder of the firm. This is referred to as a satisfying behaviour.

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### **24.3.2 Comments:**

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Simon tries to provide empirical justification to reasonable profits as a goal of the firm. His model successfully shows how the stakeholders have conflicting interests. For instance, shareholders expect higher dividends, workers expect fair wages, consumers prefer lower price, investors demand high returns, managers expect better package, government desires more tax revenue. Thus the various interests in firm's performance will be in conflict with each other. The firm has to chase a level of performance which will be acceptable and can satisfy all of the above.

However, Simon does not clarify as to how to determine the satisfactory level of performance which may not be single but multiple.

### **Self-Assessment Question.**

1. List the stakeholders of a firm.
2. Examine the decision making process in Simon's model.

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### **24.4 Cyert – March model of Behaviour.**

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The book on 'A Behavioural theory of the Firm' by Cyert and March published in 1963 provides a lucid account of the decision-making process in large multi-product firms. Imperfect markets, uncertainty conditions and divorce between ownership and management are the conditions under which the firm operates.

According to cyert and march, the firm has the following features:

1. Given a number of states of the system and at any point some of these states are preferable to others.
2. The system is disturbed by external shocks which are beyond its control.
3. Similarly the system has many internal decision variables, which are under its control.
4. A combination of external shock and internal decision variable results in a particular state of the system.
5. If any decision rule leads to the preferred state it is more likely to be used.

Hence, the focus of cyert and march is on the decision-making process rather than profit maximizing or satisfactory level of the firms. Cyert and march opine that the firm attempts to create new states by using its internal decision variables in response to external shocks until it reaches the preferred state. This adjustment and adaptation by the firms is the crux of the behavioural theory.

Cyert and march describe the firm as a coalition of conflicting interest. In the last section you saw that workers consumers shareholders investors, managers, financiers, Government and the society at large are some of the groups whose aspiration need to be taken care of by the firm. The firm by satisfying these varied interests tries to maintain their coalition. This is essential for survival as well as growth of the firms.

Further, cyert and march argue that firms have multiple goals based on its coalition partners and this might be called as the organizational goal. The coalition members together decide the goal and the nature of activity to obtain it.

In order to keep the coalition intact the firm has to make some payments to the various coalition members. If the resources available are equal to the payments required then the coalition is a feasible one. But often disparity between the two exists mainly because of the conflicting nature of the groups. This difference between the payments required to be made and the resource available is called as organizational slack. Slack is therefore, payments to members of the coalition in excess of what is required to maintain the organization: Under imperfect market conditions many forms of slack



exist and these slacks enable the firms to adjust themselves to shifts in external environment. In fact slack play stabilizing and adaptive role and therefore represent a cushion to absorb the shocks.

Given this background of the properties of the firm let us now look briefly at the decision making process in the firms.

The organizational goals set by top-management are to be implemented by decisions. These decisions are taken at the top management level as well as at the lower levels of administration.

Usually given the goals and resources the resource allocation is decided by the top management and implemented through the budget. Each department is allotted a certain portion of the budget depending on the bargaining power and skill of the department heads which is determined in turn on the past performance of the departments. However in the final allocation of the budget depends upon the flow of adequate and appropriate information about the performance and requirements plans of a department.

At lower levels of administration each manager enjoys discretion in spending the funds allocated to his department in a way it increases the performance and meets the aspiration level that are pre-determined.

### **Self-Assessment Questions.**

1. What is the importance of slack in behavioral models?
2. Explain how the organizational goals are formed?

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### **24.5 Cohen and cyert model of Behaviourism.**

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Cohen and cyert based on the framework outlined by cyert and march presented the decision-making process within a large corporation under duopoly. Homogeneous product and single price are assumed.

The process is described to operate through the following steps:

- i) Forecast of rival's reaction.
- ii) Forecast of firm's demand.
- iii) Estimation of costs including the historical costs as well as slack payments.

- iv) Specification of goals.
- v) Evaluation of achievements vis-à-vis goals especially the profit goal.
- vi) If profit goal is not achieved the firm re-examines the cost estimate.
- vii) If the new solution with downward adjustment of costs leads to target profits. It is adopted
- viii) If cost adjustments do not yield target profit, the firm re-examines its demand estimates.
- ix) Evaluation of new solution.
- x) Downward adjustment of aspiration. If through refixation of costs and demand the profit goal is not attained then the targeted profit level itself has to be revised downwards.

The firm operates with multiple goals and profit is one among them. There may be other goals like production goal, sales goal, market share goal etc along with profit goal. In this framework, a firm will be a satisficer rather than a maximiser; Depending upon the changes in external environment and consequent adjustments in internal decision variables, the goals will continuously change. When failure occurs the firm searches for improvement in firm's performance by doing so the firm seeks to overcome market uncertainty. The uncertainty rivals reaction is overcome by creating a negotiated environment.

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#### **24.6 Critique of Behaviourism.**

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The main positive contribution of the behavioural theory are:

- i. Systematic presentation of the process of goal formation
- ii. Providing a systematic view of the decision making process.
- iii. The introduction of the concepts of 'slacks' and 'shocks' that have tremendous operational use.

But the theory does not deal with industry equilibrium, discusses only the short term situation empirical use for support of the theory is very limited and at times one feels that the theory is more tautological.

Despite this the behavioural theory has evidenced the theory of the firm and provides many new insights into the actual operation of the firm.

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## **24.7 Game Theoretic models of the firm.**

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### **24.7.1 Introduction.**

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The interdependence of firms and uncertainty about rival's reactions are not considered by the traditional theory of the firm. The alternative theories of the firm discussed so far do not provide a general theory of oligopoly and also cannot fully explain the decision making by the oligopolists. This problem was solved by von Neumann and Morgenstern who propounded a game theoretic approach to the behaviour of the firms. In fact Shubik (1971) argues that the only hope for the development of a general theory of oligopoly is the game theory. However, game theory has a lot of limitations when it comes to its application to the real business situations.

In this section you will learn about the mechanics of game theory in explaining the behaviour of an oligopoly firm.

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### **24.7.2 Game Theory**

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An oligopolistically or monopolistically competitive firm considers how its actions affect its rival and how rivals' actions will affect it. Each firm form a strategy which is a course of action with clearly defined values for the policy variables. A strategy may consist of setting a price, spending a particular sum on advertisement and similar other activities to increase sales or market share and also profits. To each of these strategies a competitor may react by adopting different strategies. It may adopt the same or a different course of action than the one adopted by the firm. Thus each firm has various strategies open to it, and in any particular case it will adopt the one that will seem most advantageous under the given circumstances.

To each of the strategies and counter strategies adopted the firm may earn a net gain which is called as the pay off. This gain is measured in terms of the goal of the firm, i.e., in terms of profit, sales, market share etc.

A pay-off matrix of a firm is a table showing the pay-off accruing to this firm as a result of each possible combination of strategies adopted by it and by its rivals.

That is to say every move and countermove by the firms in terms of policy have different outcomes. To each strategy of one firm, the other



may choose several counter strategies. The counter strategies of the rival are probable but not certain. Yet after making due allowance for the effects of rivals probable reactions it is possible to choose a strategy that will maximize the firms 'expected' gain.

In what follows you will learn how the firms choose their best strategy. First we will study two person zero sum game and then non zero sum game.

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### **24.7.3 Two-person zero-sum game**

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The simplest model is a duopoly market in which each duopolists attempts to maximize his market share. Given this goal gain of one firm is the loss of another firm and the net gain sums up to zero. Hence the name 'zero sum game'.

The model is based on the following assumption.

1. The firms have well defined goal of market share maximizing.
2. Each firm knows the strategies open to it and to its rival and concentrates on the most important of these strategies.
3. Each firm knows with certainty the pay off of all combinations of the strategies being considered. This implies that the firm knows its total revenue total costs and total profit from each combination of strategies.
4. The action chosen by the duopolists do not affect the total size of the market.
5. Each firm chooses its strategy 'expecting the worst from its rival'. This behaviour of the firm is assumed to be rational as the rival will choose the best possible counter strategies open to it.
6. There is no incentive for collusion

Based on the above assumption the equilibrium solution can be found through the pay off matrix. In table 24.1 the pay off to the first firm is represented as the market shares due to different strategies.



	B1	B2	B3	B4	B5	Row Minima	Firm II's Payoff
A1	0.10	0.20	0.15	0.30	0.25	0.10	0.90
A2	0.40	0.30	0.50	0.55	0.45	0.30	0.70
A3	0.35	0.25	0.20	0.40	0.50	0.20	0.80
A4	0.25	0.15	0.35	0.60	0.20	0.15	0.85
Col. Maxima	0.40	0.30	0.50	0.60	0.50	0.30	0.70

Note: Since payoff is the market share, if firm I's is known, firm II's can be calculated as 1 minus firm I's payoff.

Since the payoff to the firms are market shares the corresponding shares of the two firms the payoff to firm II adding to unity can be calculated as 1 minus the share of firm I in each code. Given the above information let us study how the strategies are chosen by each of the firms.

Firm I examines the strategies open to it and the corresponding payoff and try to identify the most favorable outcome for each strategy. Expecting the worst from the rival, you notice that if the firm adopts strategies A1, the worst outcome is a share of 0.10. Similarly for A2 the worst outcome is 0.20 and for A4 the worst outcome is 0.15. Here it is also assumed that firm II adopts a counter strategies that will yield the best outcome to itself given the strategy adopted by firm I.

Since, these are worst expected outcomes, naturally their value will be minima. The firm I here choose the best of the worst or maximum among the minima and this is called as the maximum strategy which occurs at A2 i.e., choosing the strategy A2 by the firm I. Thus firm I market share for each of its own strategies is given by maximim of  $(0.10, 0.30, 0.20, 0.15) = 0.30$

Firm II operating in a similar way examines the strategies and corresponding outcomes open to it and identifies the worst outcome assuming that the rival will choose the best for himself. Among these worst outcomes Firm II chosen the best.

Based on this, firm II will calculate that for strategy B1, the maximum expected payoff to firm I is 0.40, for B2 it is 0.30, for B3 it is 0.50, for B4 it is 0.60 and for B5 it is 0.50. These are the maximum market shares which firm I can get for each of firm II's strategies. Among these maxima, it will choose that strategy which minimize the expected payoff to firm I. In which maximizes firm II's own payoff. This is called the minimax strategy. Which materials by adopting B2 strategy by firm II. Thus firm I market share for each of firm II's strategy is given by minimax of (0.40, 0.30, 0.50, 0.60, 0.50) which is 0.30.

Note that in this special case, minimax occurs at the same point as maximin with payoff at 0.30 for firm I. Hence the value of optimum combination of strategies is achieved where firm I adopts A2 strategy and firm II adopts B2 strategy resulting in respective market shares of 0.30 and 0.70. only at this optimal combination their decisions are consistent and an equilibrium will be established. This is a strictly determined game because minimax and maximin coincide.

The strategies simultaneously preferred by the two firms are called as the dominant strategies and the equilibrium resulting there under is called as the saddle point.

However it does not mean that this is the case always employing mathematical techniques mixed strategies can also be analyzed.

So far, you have learnt decision making by firms when every thing is known with certainty. But the real world is full of uncertainties. In such unrealistic condition a firm can expect a range of results for each counter strategy of the rival each result with an associated probability. The payoff matrix thus constructed will have the expected values of the outcomes.

The expected value is the sum of the products of the possible outcomes of a pair of strategies each multiplied by its probability. That is

$$E(G_{ij}) = G_{1i} P_1 + G_{2i} P_2 + \dots + G_{ni} P_n$$

$$= \sum G_{si} P_s$$

Where  $G_{si}$  = the  $s^{\text{th}}$  of the  $n$  possible outcomes of strategy I of firm I (given firm II choose strategy)

$P_s$  = the probability of 5<sup>th</sup> outcome of strategy

$E(G_{ij})$  = expected value.

### Self Assessment Questions:

- i) Identify few strategies that the firm usually adopt.
- ii) Define strategy pay off and payoff matrix.
- iii) What is a dominant strategy and saddle point?

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### 24.7.4 Non-Zero Sum Game:

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The above model is also called as the constant sum game as the total payoff for the two firms remains constant whatever the strategy. But this need not be so always. Especially when goals other than market share are considered. This is likely to be the case.

Assuming the same duopoly situation each firm selling competitive product wants to undertake advertisement. As usual, each firm will be affected by its competitors decision. The possible outcomes of the game are given in payoff matrix below (Table 24.2).

Table 4.2 : Payoff matrix for Advertisement.

		Firm B	
		Advertise	Don't Advertise
Firm A	Advertise	10, 5	15, 0
	Don't Advertise	6, 8	10, 2

The first number in each cell is the payoff to A and the second is the payoff to B. Thus if firm A decides to advertise and B does not firm A will earn to 15 and B will earn zero. If both of them advertise their profits will be 10 to A and 5 to B.

What strategy should each firm choose? Like in the previous section, assuming that the rival reaction would leave the worst for firm A and therefore it chooses the best among the worst outcomes, which is clearly going in for



advertising. Firm A does best by advertising – if firm B advertises, firm A earns a profit of 10 if it advertises, but only 6 if it doesn't similarly if B does not advertise, A earns a profit of 15 if it advertises and 10 if it doesn't. Thus advertising is a dominant strategy for firm A. So it is for B because, no matter what firm A does B does best by advertising therefore assuming that both firms are rational both will advertise and earn profit of 10 and 5, respectively. Thus both firms have dominant strategies.

But sometimes, every game may not have a dominant strategy and in this case each player will consider what the other one is upto and based on that makes his chose. So as to maximize his own gain.

The above two types of games are also referred to as non-collusive or competitive games where in the firms, under oligopoly consider their own profits irrespective of what his rival earns. However if they enter into some firm of collusion, the collective gains are likely to be higher. Even if the oligopolists know about this they do not collude either because they are unsure of his partner's further actions or the law of the land restrains collusion. Thus although there are collusive game too, the type of non-collusive games discussed above are the most common ones. This tendency of the firm is explained with the help of the classic example popularly know as the prisoner's dilemma (see box 24.1).

### **Box 24.1 Prisoner's Dilemma**

Two prisoners Ram and Sham have been accused of joint crime. They are in separate jail cells and cannot communicate with each other. Each has been asked to confers and if both of them confess, they will receive a jail term of five years. If neither confesses the prisoners can expect a term of two year imprisonment. On the other hand if Ram confesses and Sham doesn't. Ram will get a one year imprisonment only and sham will suffer imprisonment for 10 year. What should Ram and Sham do confess or not confess.

To answer this question let us look at their payoff matrix given in box table 24.1.1

Box Table 24.1.1: Pay off matrix of prisoners.



		sham	
		Confess	Don't confess
Ram	Confess	-5, -5	-1, -10
	Don't Confess	-10, -1	-2, -2

As the table shows Ram and Sham face a dilemma. If they could agree not to confess then each could go to jail for only two years. But they cannot communicate to each other and even if they could can they trust each other. If Ram does not confess he always fears that Sham would do it. So would Sham, therefore no matter what Sham does, Ram would be happy to confess similarly, sham would also be happy to do the same. In this way both prisoners will probably confess and go to jail for five year.

The oligopolist firms are exactly in this dilemma whenever they are deciding on a policy variable. But in the end no mater what the rival does the given firm would choose the course of action that gives him the most favorable outcome. Once again the possibility of earning more by colluding is still there but because of the trust worthness of the player and government restriction cooperative games are not usually played.

### Self-Assessment Questions:

- i) Explain how non zero sum game is different from zero sum game.
- ii) Can you describe prisoners dilemma pertaining to pepsi and coca cola in the soft drinks market.
- iii) What do you mean by co-operative (collusive) and non-cooperative (competitive or non collusive) games.

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### 24.8 Let us Summarize:

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In this unit you studied the behavioural models of the firm. These models focused on the nature and process of decision making and implementation within the firm. So as to achieve multiple goals rather than a single goal of profit maximization. The models add to the existing theory some of the phenomena like multiple stakeholders; conflicting interests satisfying behaviour of the firms, searching for information, its efficient flow and effective utilization; organizational goals and slacks; and the business environment of the firm. Significantly enough the game theoretic approach

attempts at analyzing strategy formulation by oligopoly firms adoption of counter strategies by the rivals non-collusion co-operation of the firms and thereby earning, the expected level of profits. Notwithstanding the above the models do not help us in getting a stable equilibrium solution for the industry as a whole and more so in the long run. These models have low predictive power as compared to the traditional models lastly these models have revealed the complexity of decision making process by firms in the real world as it exists today.

### Review Questions:

- i) Examine the reason for 'satisfying' behaviour of the firms.
- ii) Briefly explain the decision making process as in herent in the behavioural models.
- iii) Explain the usefulness of the theory of games in understanding the firm behaviour in the real world.

### Key-words.

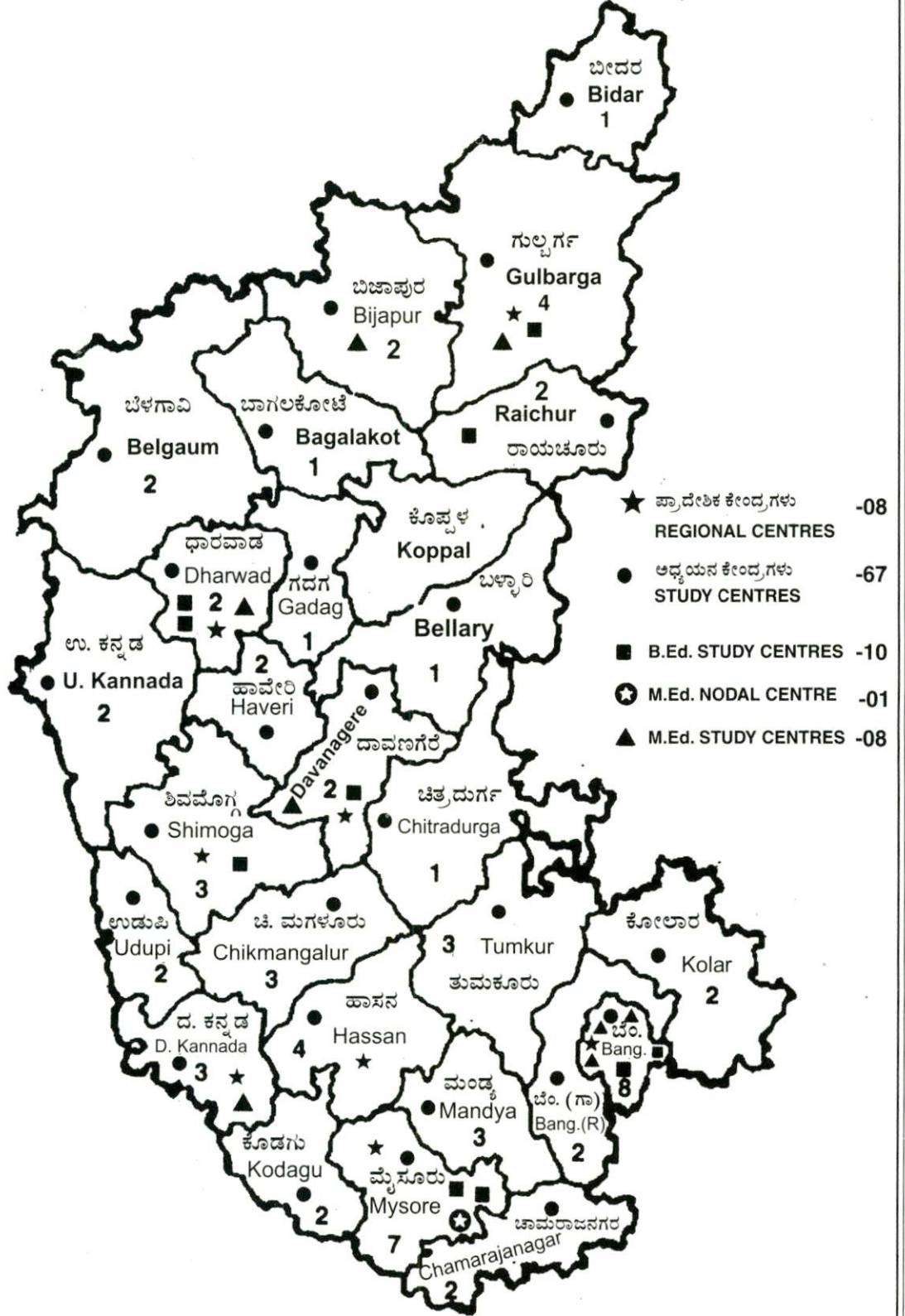
Stakeholders, aspirations, search activity, internal decision variable , external shocks, Coalition, multiple goals , organizational goals , organizational slack, Games, strategy, counter strategy, saddle point mixed strategy prisoner's dilemma.

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