ACOs / SIQ

PROFIT MAXIMIZATION
AND
EQUILIBRIUM OF FIRM

condition
MC = MR
MC must
intersect ME from
Firm below   *Best Position*

A firm is an economic unit, which is independent to take decisions regarding the production and sale of goods. In economics the firm has a wider meaning and covers a large variety of business enterprises. It can be a big car manufacturing company or a small mutton shop. It can be a farm, a medical store, a hospital, a private school, a bank, a transport company, a petrol pump, an industrial unit or some import-export business. Size and type of management are not important to decide whether a firm exists.[1] The only important thing is that the firm must be independent in taking business decisions. The functioning of a firm may be influenced by several factors like laws of the country, social customs, production techniques etc. However our **basic assumption is that the firm takes decision in such a way that total profits are maximized or losses are reduced to the minimum.** It is necessary to make this assumption about the motivation of firm to analyze its behavior under different conditions. But we must bear this in mind that the rule of **profit maximization is just an assumption.** Otherwise, according to modern economic theory, there are many situations in business world where the firms do not aim at profit maximization. (This is especially true about big multinational corporations — MNC's, like Nokia and Honda that have spread their business to different countries). Rather they have other considerations such as maintaining their dominant position in the industry or charging a price, which just covers average cost as done by public utilities like WAPDA.

Equilibrium of the Firm

Firms enter the business to earn profits. The only inducement to establish some firm is the expectation of profit. However the amount of profit earned by a firm will not be the same at all levels of production. So naturally every firm chooses that level of output which ensures maximum profit. In case the market conditions are such that loss is unavoidable, the firm adjusts its output to reduce the loss to the minimum. When a firm succeeds in this aim (i.e. maximization of profit), it is called in equilibrium position.

There are two methods to explain the equilibrium of a firm.

(i) Total revenue – total cost method   (ii) Marginal revenue – marginal cost method.

Total Revenue and Total Cost approach

Profit is the difference between total revenue and total cost of a firm.

$$\textbf{Profit} = \textbf{TR} - \textbf{TC}$$

Every firm tries to make this difference maximum. It adopts such policies, which reduce cost and increase revenue. [2]Table 14.1, gives total revenue and total cost of a firm.

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[1] A firm may have assets of only 100 rupees like that of a vendor on the street or 100 billion rupees like that of General Motors of America, Sony of Japan or Pakistan Steel.

[2] They have the motto, 'Buy low and sell high'
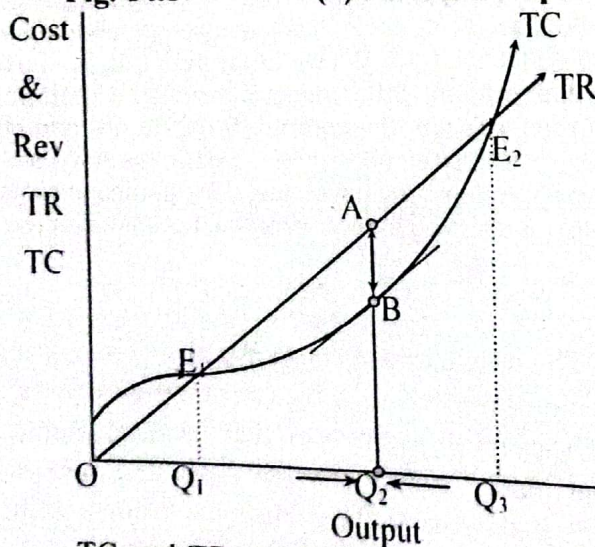
MR = $\dfrac{\Delta TR}{\Delta Q}$

Table 14.1

Output Q	Price P	TR (P×Q)	TC	MR	MC	PRPFIT (TR − TC)	
0	10	0	3	-	-	−3	} Loss
1	10	10	18	10	15	−8	
2	10	20	28	10	10	−8	
3	10	30	35	10	7	−5	
4	10	40	40	10	5	0	→Break-even
5	10	50	44	10	4	6	
6	10	60	49	10	5	11	}
7	10	70	56	10	7	14	
8	10	80	66	10 = 10	10	14	→ Profit maximum
9	10	90	80	10	14	10	
10	10	100	100	10	20	0	→Break-even
11	10	110	130	10	30	−20	→Loss

It is an example of a firm operating under **perfect competition**. The price and marginal revenue remain the same at all levels of output. We find that the firm would go up to eighth unit of output only. When it produces 8 units, the difference between total revenue and total cost is maximum which is 14. This is the highest profit.[3]
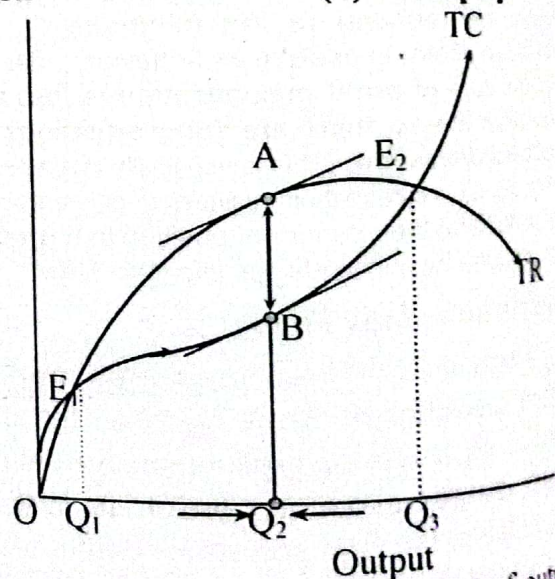
Profit maximization may also be explained in a diagram. Fig. 14.1 (a) represents perfect competition while fig. 14.1 (b) shows a monopoly firm.

Fig. 14.1   **(a) Perfect Competition**   **(b) Monopoly**

TC and TR are the total cost and total revenue curves. Up to OQ₁ level of output, TC> TR and the firm has to bear loss. At OQ₁, TR and TC are equal. So E₁ shows first break-even point (zero profit). When the firm produces more than OQ₁, it starts earning profits. When output reaches OQ₂, the distance between TR and TC curves becomes greatest, i.e. the profit reaches the maximum. At this level of output TR and TC increase at the same rate. This is indicated by the fact that tangents at A and B become parallel and have same slope. If the firm produces beyond OQ₂, the profit starts diminishing. At OQ₃, there is again zero profit. So E₂ is next break- even point.

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[3] The table shows maximum profit not only at output 8 units but also at output 7 units. This happens because we are taking discrete units. If we use infinitesimal change(continuous variable) in output only one point will have highest profit. But to do so we have to use mathematical concept of derivative and differential. In our introductory study we don't need that. The graphical analysis shows only one point of maximum profit.

Limitation: The firms generally use this method to decide the output. But it has two drawbacks. *Firstly,* it is difficult to find maximum difference between TR and TC at first glance. *Secondly,* the price per unit is not easily known at various levels of output.

Marginal Revenue and Marginal Cost Approach

A firm can also determine optimum level of output by comparing the marginal revenue and marginal cost at various quantities of output. MR is the increase in TR when one additional unit is produced. Therefore, MR curve can be derived from TR curve. Similarly MC is derived from TC. To decide the profit maximizing quantity when MC and MR are given, we proceed as follows.

(i) If a firm finds that a new unit will add more to the total revenue than to the total cost (i.e. MR>MC) it will expand output. Every new unit will increase profit.

(ii) If it feels that the new unit will add more to its total cost than total revenue (MR<MC), it will try to reduce output. (By producing less, the firm can decrease its cost more than revenue).

(iii) Firm will go on increasing output only up to that level where MR = MC. At this quantity its profit has reached the maximum point.

In table 14.1 above, we find that when 8 units of output are produced, MR = MC and profit is maximum. We see that MC and MR also equal at 2 units of output. Although the firm faces loss but it does not stop. This is because the firm finds that MC is still falling. When MC has fallen below MR profits arise. After touching a minimum level, MC starts rising. So long as MC remains below MR, every new unit adds to profit and the firm has inducement to produce more.
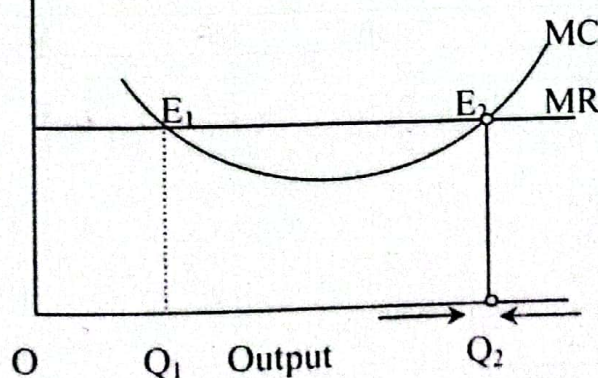
To get maximum profit and achieve equilibrium a firm expands production to the point where two conditions are met.

    (a) MC = MR   and   (b) MC is rising

MR and MC approach for determination of firm's equilibrium is explained in fig. 14.2

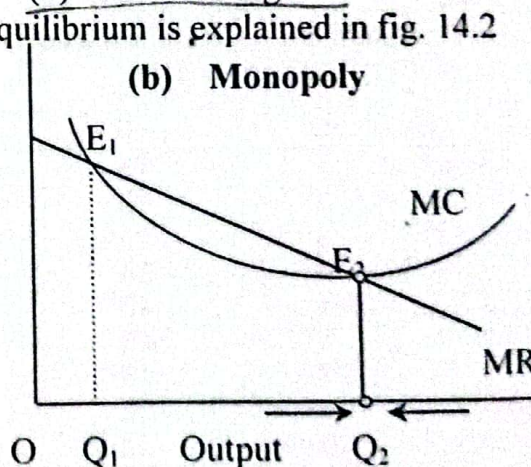Fig. 14.2   (a) **Perfect Competition**   (b) **Monopoly**

Fig. 14.2 (a) represents perfect competition where MR is a straight line parallel to x-axis showing that the firm has to sell every new unit at the same price. In fig. (b) it is a monopoly firm and MR is falling. This is because the monopolist can sell more only by lowering price.

If the firm produces less than Q_1 units of output, it will remain in loss. When it crosses this level, every new unit is profitable. Initially, by producing more, it will cover the previous loss. After that, profit will start adding till the firm reaches Q_2 level of output. At this point, total profit has reached the maximum. If the firm does not stop at Q_2

and produces more, total profits start falling. (Since every new unit adds more to total cost than to total revenue i.e. MC > MR, there is no need to exceed Q_2) In this way, we find that Q_2 output at which **MC curve intersects MR curve from below represents equilibrium position of the firm.** Thus we establish two conditions for equilibrium:

    i)   MR = MC   (First condition)

   ii) MC intersects MR curve from below.[4]   (Second condition)

We can see that at Q1 quantity of output, although the first condition is satisfied, the second is not. So Q1 does not represent equilibrium position.

Do Firms Really Maximize Profits?

In economic theory, it is usually assumed that firms seek to maximize profits. This assumption of a single objective is not fully true. It is only a useful simplification of reality. Some times the firms follow different motives e.g. maximization of sales. Similarly, many business executives might prefer to control the largest firm rather than the most profitable one.

EXERCISES

1. **Define the terms.**   Firm, Equilibrium, TR, TC
2. How can you find maximum profit of a firm under perfect competition? Explain with curves.
3. A firm gets maximum profit when its MC = MR. Explain by making diagrams.
4. Make two graphs for table 14.1, one for MC and MR and the other for TC and TR.
5. In the diagram shown below,
maximum profit will come at output level ....
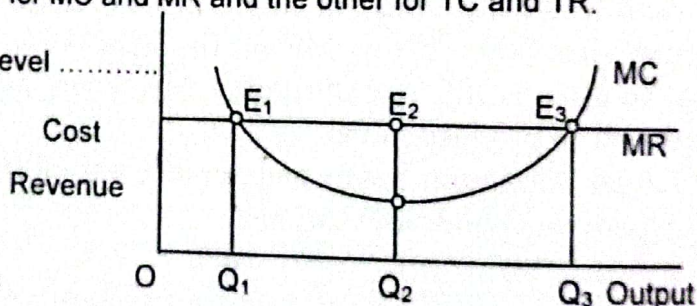
1. Complete the table and indicate
   (i)   maximum profit   (ii)   break-even point

Q	TR	TC	Profit	MR	MC
1	10	12	−2	–	–
2	19	19	0	9	7
3	27	24	3		5
4	34	28	....	....	....
5	40	32	....	....	....
6	45	37	....	....	....
7	49	44	....	....	....
8	52	54	....	....	....
9	54	70	....	....	....

2. During 2011-2012, ZAP company just covered average cost by selling 2000 units of output. According to economic theory, the company earned just a normal profit, why?
3. Why, under perfect competition, the demand curve facing the firm is perfectly elastic while the demand curve facing the industry is downward sloping?
4. Write down the equilibrium conditions of a firm under monopoly

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* Second condition for equilibrium is needed because it confirms the point beyond which the firm must not go is where MC rises above MR.