

Profit Maximization



Assessment Objectives

Specific Expectations

AO2	Explain cost, revenue and profit concepts <ul style="list-style-type: none">- Total revenue, average revenue, and marginal revenue- Total cost, average cost, marginal cost- Abnormal profit, normal profit, loss
AO4	Calculations from data of profit, marginal cost, marginal revenue, average cost, average revenue

- **Revenues** are payments firms receive when they sell the goods and services they produce. There are three fundamental revenue concepts.
 1. **Total Revenue (TR)** is obtained by multiplying the price at which a good is sold (P) by the number of units of the good sold (Q).

$$TR = P \times Q$$

2. **Average Revenue (AR)** is revenue per unit of output sold, or total revenue (TR) divided by the units of output (Q)

$$AR = \frac{TR}{Q}$$

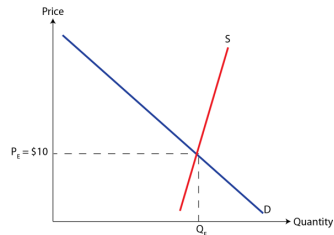
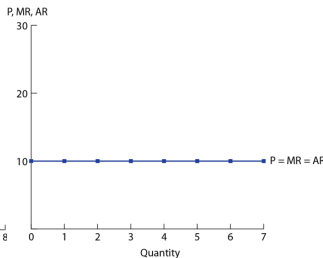
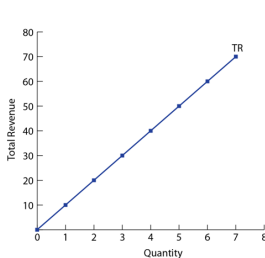
3. **Marginal Revenue (MR)** is the additional revenue arising from the sale of an additional unit of output.

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{\partial TR}{\partial Q}$$

Revenues: Perfect Competition

- ▶ Perfectly competitive firms are unable to control price; price is constant as output varies.

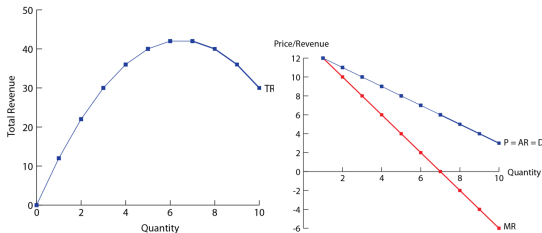
Output (Q)	Price (P)	Total Revenue (TR)	Marginal Revenue (MR)	Average Revenue (AR)
1	10	10	10	10
2	10	20	10	10
3	10	30	10	10
4	10	40	10	10
5	10	50	10	10
6	10	60	10	10
7	10	70	10	10



Revenues: Imperfect Competition

- Imperfectly competitive firms have control over price; price varies with output varies.

Output (Q)	Price (P)	Total Revenue (TR)	Marginal Revenue (MR)	Average Revenue (AR)
1	12	12	12	12
2	11	22	10	11
3	10	30	8	10
4	9	36	6	9
5	8	40	4	8
6	7	42	2	7
7	6	42	0	6
8	5	40	-2	5



Costs of Production: Short-run

- **Costs of production** are payments by firms to obtain and use factors of production in their production processes.
 - ▶ When the firm uses resources it does not own, it buys them from outsiders and makes payments of money to the resource suppliers.
 - Such payments made by a firm to outsiders to acquire resources for use in production are known as **explicit costs**.
 - **Example:** A firm hires labour and pays a wage.
 - ▶ On the other hand, when the firm uses resources it owns there is still a cost, which consists of the income that is sacrificed when the firm uses such self-owned resource.
 - The sacrificed income arising from the use of self-owned resources by a firm is an **implicit cost** (opportunity cost).
 - **Example:** In the case of an office building owned and used by the firm, the cost is the rental income that could have been earned if the building were rented out.

Costs of Production: Short-run

- ▶ The sum of explicit and implicit costs incurred by a firm for its use of resources, whether purchased or self-owned, are known as economic costs. When economists refer to “costs” they mean “economic costs”.

$$\text{Economic Costs} = \text{Explicit costs} + \text{Implicit costs}$$

- **Fixed costs (FC)** are costs that do not vary with changes in output.
 - ▶ **Example:** Rental payments, interest on a firm's debt, depreciation, and insurance premiums.
- **Variable costs (VC)** are costs that change with the level of output.
 - ▶ **Example:** Materials, labour, and fuel
- **Total cost (TC)** are all costs of production incurred by a firm. It the sum of all total fixed costs (FC) and total variable costs (VC) at each quantity of output.

$$\text{TC} = \text{FC} + \text{VC}$$

Costs of Production: Short-run

- **Average cost (AC)** are costs per unit of output, or the cost of each unit of output on average. They are calculated by dividing total cost by the number of units of output produced.

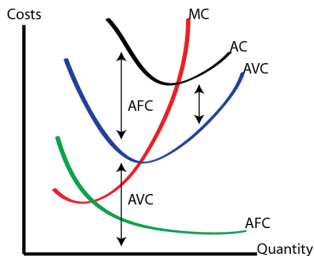
$$AC = \frac{TC}{Q}$$

- **Marginal cost (MC)** is the extra or additional cost of producing one more unit of output. It tells us by how much total costs increase if there is an increase in output by one unit.

$$MC = \frac{\Delta TC}{\Delta Q}$$

Relationship between Marginal Costs and Average Costs

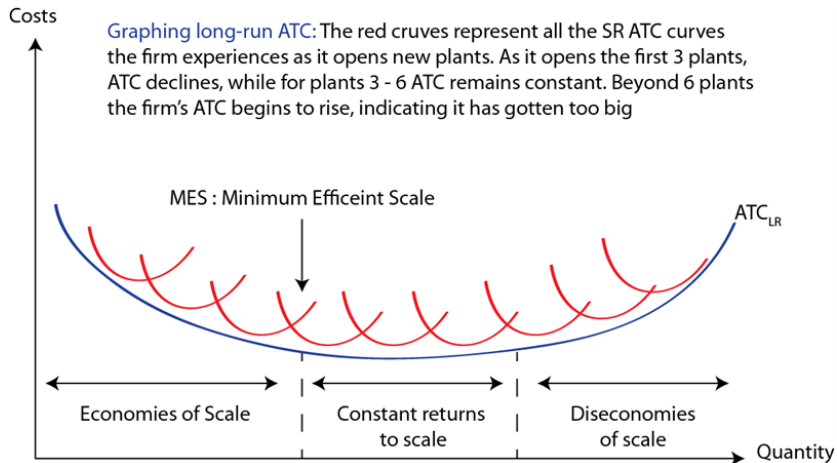
- ▶ It is important to note the relationship between the average cost and marginal cost curves.
 - When the marginal cost curve lies below the average cost curve ($MC < AC$) then average cost is falling.
 - When the marginal cost curve lies above the average cost curve ($MC > AC$) then average cost is increasing.
 - The marginal cost curve always intersects the average cost curve when this is at its minimum.



Costs of Production: Long-run

- ▶ The long-run is the period of time when the firm varies (changes) all its factors of production.
 - We are interested in examining how the firm's average costs, or costs per unit of output, change when it grows larger by increasing all of its factors of production.
- ▶ At any moment in time, when the firm is in the short run, it has a particular short-run AC curve which we can call its short-run average cost (SRAC).
- ▶ When it grows over time, we can think of it as going into the long-run, increasing all of its factors of production, and then going into a new short-run with a new SRAS.
- ▶ The long-run average cost curve (LRAC) is derived from the locus of points created by the minimum of the SRAC curves at each level of output.
 - The U-shape of the LRAC curve can be found in **economies of scale** and **diseconomies of scale**

Costs of Production: Long-run



- **Economies of Scale** decreases in the average costs of production that occur as a firm increases its output by varying all its inputs
 - ▶ Explains the downward-sloping portion of the long-run average total cost curve.
 - ▶ As a firm increases its size, the costs per unit of output fall.

1. Specialization of labour

- As the scale of production increases, more workers must be employed, allowing for greater specialization.
- Each worker specializes in performing tasks that make use of skills, interests and talents, thus increasing efficiency and allowing output to be produced at a lower average cost.

2. Bulk buying of inputs (factors of production)

- As quantities of inputs purchased increase, the price per unit drops.

3. Specialization of management

- Larger scales of production allow for more managers to be employed, each of whom can be specialize in a particular area (such as production, sales, and finance), again resulting in greater efficiency and lower average cost.

4. Financing economies

- Larger firms may have lower interest rates, thus contributing to lower costs per unit of output.

5. Spreading certain costs over larger volumes of output

- Costs of certain activities such as marketing and advertising, design, research and development, result in lower average costs if they can be spread over large volumes output.

Diseconomies of Scale

- **Diseconomies of Scale** are increases in the average costs of production in the long-run as a firm increases its output by increasing all its inputs.
 - ▶ They are responsible for the upward-sloping part of the LRAC curve
 - ▶ As a firm increases its scale of production, average costs increase.

1. Coordination and monitoring difficulties

- As a firm grows large, its management may run into difficulties of co-ordination, organization, cooperation and monitoring.
- The result involves growing inefficiencies causing average costs to increase as the firm expands.

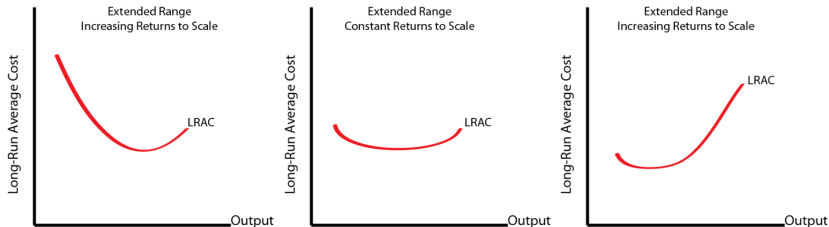
2. Communication difficulties

- A larger firm size may lead to difficulties in communication between various component part of the firm, resulting in inefficiencies and higher average costs.

Diseconomies of Scale

3. Poor worker motivation

- If workers begin to lose their motivation, to feel bored and to care little about their work, they become less efficient, resulting in higher average costs.

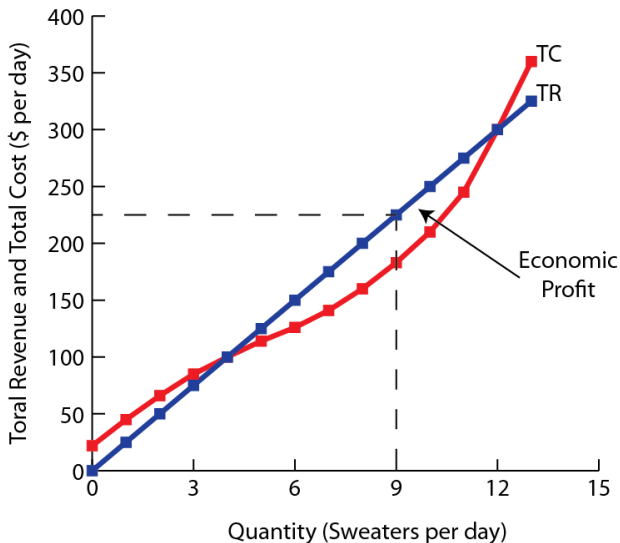


- Standard economic theory assumes that firms display rational behaviour by trying to maximize their profits.

$$\begin{aligned}\text{Profit} &= \text{Total revenue} - \text{Total cost} \\ &= \text{Total revenue} - \text{Explicit costs} - \text{Implicit costs}\end{aligned}$$

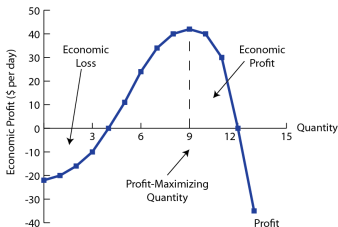
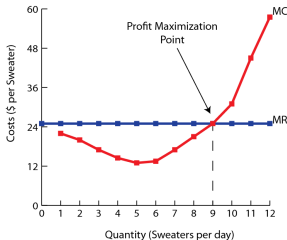
- ▶ **Profit maximization** involves determining the level of output that the firm should produce to make a profit as large as possible.
 - ▶ There are two equivalent approaches to analysing profit maximization.
1. **Total revenue & Total cost Approach** – profit maximization occurs at the level of output at which the difference between total revenue and the total cost is maximum.

Profits



2. Marginal revenue & Marginal cost Approach – firms maximize profits when they produce a quantity of output where $MR = MC$

- Where $MR > MC$ if a firm increases its output by one unit, the additional revenue it would receive (MR) will be greater than its additional costs so the incremental profit is positive and the firm should continue to increase output.
- If $MR < MC$ the additional revenue it would receive for an extra unit of output is less than the additional cost, so its incremental profit is negative and it should cut back output.



Profits

- Firms do not always make a profit and the theory of the firm is also concerned about how much output a loss-making firm should produce in order to minimize its loss.
- **Abnormal profit** arises when total revenue of a firm is greater than its total costs; alternatively when price is greater than average cost.
 - ▶ $TR > TC \Leftrightarrow P > ATC$
- **Normal profit** arises when total revenue of a firm is equal to its total costs; alternatively when price is equal to average cost.
 - ▶ $TR = TC \Leftrightarrow P = ATC$
 - ▶ Normal profit is earned when abnormal profit is zero.
 - ▶ It is the minimum amount of revenue that the firm must receive so that it will keep the business running (as opposed to shutting down).

Profits

- **Loss** arises when total costs of a firm are greater than its total revenue; alternatively when average cost is greater than price.

► $TR < TC \Leftrightarrow P < ATC$

