A2 – ECONOMICS (9708)

MICRO

CHAPTER 2
Production, Costs, Revenues and Profits

TOPIC 1: PRODUCTION

3 Key relationships
1. Marginal and Total
The marginal shows what happens to totals. Example: If marginal cost is increasing total is increasing. Example Marginal cost goes up by $5 total cost will go up by $5 and vice versa.   Marginal is increasing and +ve → Total Increases with an Increasing Rate   Marginal is decreasing and +ve → Total Increases with a Decreasing Rate   Marginal = 0 → Total is at its Maximum   Marginal -ve → Total Decreases
2. Marginal and Average
If the marginal is above average the average will increase. If the marginal is below average, average will decrease. Where marginal will equal average, average is constant.   Marginal > Average → Average ↑   Marginal < Average → Average ↓   Marginal = Average → Average Constant
3. Average and Total
Average is the total divided by the number of units. Example: Average revenue is total revenue divided by total units. Average cost is total cost divided by total units.

1. PRODUCTION

Short run: It is a time period during which at least one factor of production is fixed. Usually labor is variable.

Long Run: It is a time period where all inputs can be changed. All Factors of production are variable.

Definition | Long-Run Production Function: It is the relationship between a firm's output and the quantities of factor inputs that it employs.

1. Law of Diminishing Return

Definition: Also known as the law of diminishing marginal product), as more and more units of a variable input (such as labor) are added to one or more fixed inputs (such as land), the marginal product of the variable input at first increases, but there comes a point when it begins to decrease. This relationship presupposes that that the fixed input(s) remain fixed, and that the technology of production is also fixed. The output is increasing a diminishing rate. There are THREE assumptions:
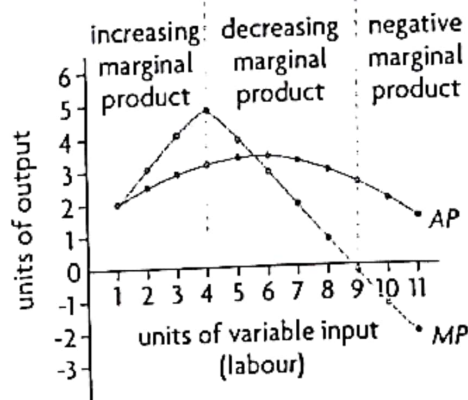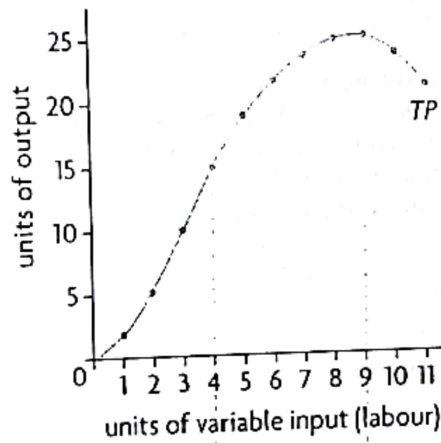
1. At least one factor is fixed which is usually capital
2. Each unit of Factor of production is the same. Example: Every labor is equally trained.
3. Level of technology and efficiency of machines are all held constant.

2. Total Product, Marginal Product, Average Product

Definition	Explanation
1. Total Product	The total quantity of output produced by a firm.
2. Marginal Product	The extra or additional output resulting from one additional unit of the variable input, labor; it tells us by how much output increases as labor increases by one worker.
3. Average Product	The total quantity of output per unit of variable input, or labor; this tells us how much output each unit of labor (each worker) produces on average.

3. Total Product, Marginal Product, Average Product | Curves

Quantity of labour	Total product	Marginal Product	Average product
0	0	—	—
1	2	2	2
2	5	3	2.5
3	9	4	3
4	14	5	3.5
5	18	4	3.6
6	21	3	3.5
7	23	2	3.3
8	24	1	3
9	24	0	2.7
10	23	−1	2.3
11	21	−2	1.9

Marginal and Total Product

1. Increasing Marginal Product	This is where every unit of labor added increases the total product. [From unit 0-4]
2. Decreasing Marginal Product	This is where every unit of labor added increases the total product but a decreasing rate. This because marginal product is still positive. [From units 4-9]
3. Negative Marginal Product	This is where every unit of labor added will decrease the total product. [After unit 9]

Marginal and Average Product

Average product also rises at first and then falls. The relationship between the average and marginal product curves:

$$If\ MP > AP \rightarrow AP\ Increases$$
$$If\ MP < AP \rightarrow AP\ Decreases$$

This means the marginal product curve always intersects the average product curve when this is at its maximum. The reason lies in the mathematical relationship between the average and marginal values of any variable.

Consider a simple example involving test scores. Say you have an average of 80 in your tests and you would like to increase your average. If your next text score (the 'marginal' score) is greater than your average of 80, your average will increase. If your next test score is lower than your average of 80, then your average will fall. This relationship between average and marginal test scores is exactly the same as the relationship between average and marginal products.

Lecture 1

AATIK TASNEEM

TOPIC 2: COSTS (SHORT-RUN)

Definition | Costs: These are expenses of a firm. which include money payments to buy resources plus anything else given up by a firm for the use of resources. These include the production cost and the opportunity costs. Example: Labor, Machinery, opportunity cost of capital etc.

1. Total Costs

| 1. Total Fixed Costs	These are the costs that do not change with output. Example Salaries, Rent, etc. The TFC curve is parallel to the horizontal axis, as it represents a fixed amount of costs that do not change as output changes.
2. Total Variable Costs	These are costs which do vary with output. Example: Material, labor etc. The TVC curve shows that TVC increases as output increases. However, it does not increase at a constant rate; this is due to the law of diminishing marginal returns.
3. Total Cost	TC = Fixed Cost + Variable Cost. The TC curve is the vertical sum of TFC and TVC, and so the vertical difference between TC and TVC is equal to TFC.
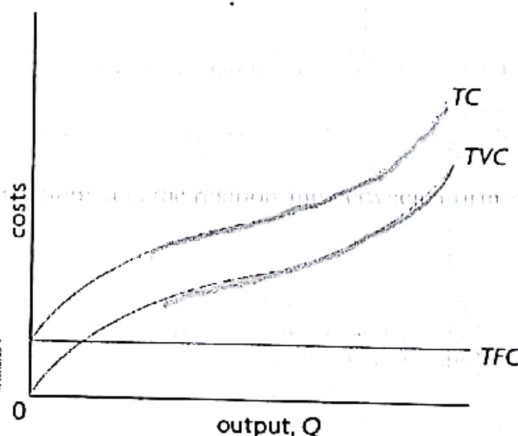
2. Average Costs

Definition: These are the per unit costs. Against the Three total costs above, if every cost is divided by output we will get the average costs.

1. Average Fixed Cost	This is fixed cost per unit. The AFC curve indicates that AFC falls continuously as output increases, because it represents the amount of fixed costs (TFC) divided by an ever growing quantity of output.
2. Average Variable Cost	This is the variable cost per unit. It is a "U" Shaped curve. On average the variable factor becomes more productive at first and then becomes less productive. The average cost of variable factor per unit of output falls when the factor is more productive and rises when the factor is less productive.
3. Average Total Cost	This is the total cost per unit. ATC = AFC + AVC The ATC curve is the vertical sum of AFC and AVC, and so the vertical difference between the ATC and the AVC curves at any level of output is equal to AFC.

3. Marginal Cost

Definition: This is the cost of production another unit. It is a "U" Shaped curve. The marginal cost curve in the short run is inversely related to the marginal product. When marginal product increases, the marginal cost falls and vice versa. Suppose the variable factor is labor. When each extra worker is more productive less time is needed to make an extra unit. Assuming wages are constant the extra cost per unit will fall. Example: When each extra worker is less productive more of their time will be need to make an extra unit so the marginal cost of the unit will rise. The same logic applies to the AVC and AP curve.

↓ minor image
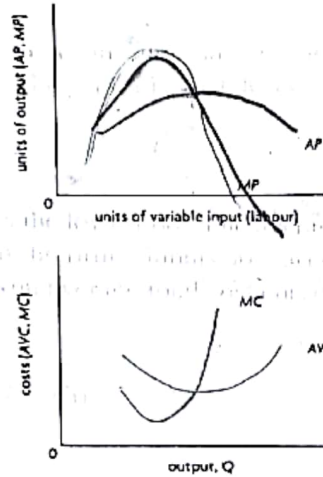
Average and Marginal Cost Curve
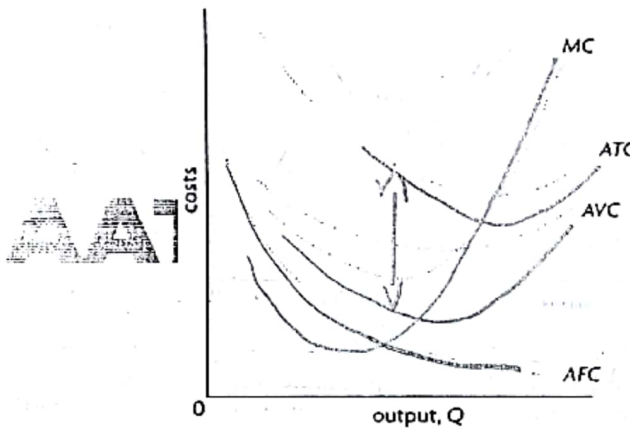
$$TC = TVC + TFC$$
$$ATC = AVC + AFC$$
$$AFC = \frac{FC}{Q}$$

gap b/w ATC + AVC shrinking as AFC↓

Note: The U-shape of the AVC, ATC and MC curves is due to the law of diminishing returns. This law also explains why the AVC and MC curves are mirror images of the AP and MP curves.

Marginal and Average Costs

Average and Marginal costs first decreases and then increases. The relationship between the average and marginal cost curves:

If MC < AC → AC Decreases
If MC > AC → AC Increases

This means the marginal cost curve always intersects the average cost curve when this is at its minimum. The reason lies in the mathematical relationship between the average and marginal values of any variable.

Lecture 2

TOPIC 3: COSTS (LONG-RUN)

Lecture 3

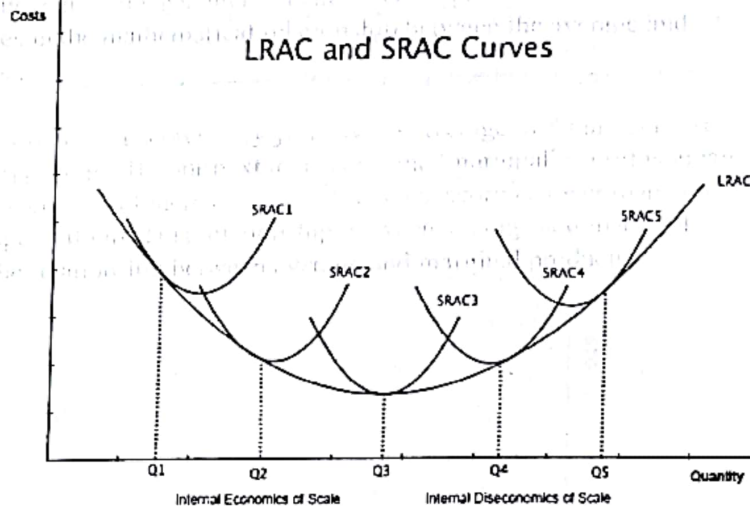### 1. LONG-RUN AVERAGE COST & SHORT-RUN AVERAGE COST

1. In the long run there are no fixed inputs and therefore no fixed costs; all inputs are variable. Hence the long-run is when your fixed factors of short-run start to increase. When a firm varies inputs that were fixed in the short run, it changes its size or scale.

2. As the firm plans its future activities in the long run, it can select any size or scale of operation depending on the quantity of output it is aiming for. The particular size it selects will be the one that minimizes costs for that level of output.

Long-Run Average Cost Curve

Definition: LRATC is defined as a curve that shows the lowest possible average cost that can be attained by a firm for any level of output when all of the firm's inputs are variable. It is a curve that just touches (is tangent to) each of many short-run average total cost curves. It is also known as a planning curve.


From Q1 to Q3	At Q3	Q3 to Q5
When the firm expands it moves to a new lower short-run average cost curve.	When the firm expands it stays on the same average cost level.	When the firm expands it moves to a higher short-run average cost curve.
Internal Economics of Scale	**Constant Returns to Scale**	**Internal Diseconomies of Scale**

MCQ

2. RETURNS TO SCALE

Definition: This is analyzing what happens to output when firm changes all of its inputs. There are <u>THREE</u> possibilities:

Possibility	Description
1. Increasing Returns to Scale	This means that a proportionate increase in all factors of production leads to a more than proportionate increase in output. Example: Inputs (land, labor and capital) increase by 10% the output will increase by 20%. This leads to a **reduction** in Average Cost. Input 10% ↑ < Output 20% ↑ = IRTS → AC ↓
2. Constant Returns to Scale	This means that a proportionate increase in all factors of production leads to an equal proportionate increase in output. Example: Inputs (land, labor and capital) increase by 10% the output will increase by 10%. This leads to **no change** in Average Cost. Input 10% ↑ = Output 10% ↑ = CRTS → AC same
3. Decreasing Returns to Scale	This means that a proportionate increase in all factors of production leads to a decrease increase in output. Example: Inputs (land, labor and capital) increase by 10% the output will increase by 5%. This leads to **increase in Average** Cost. Input 10% ↑ > Output 5% ↑ = DRTS → AC ↑
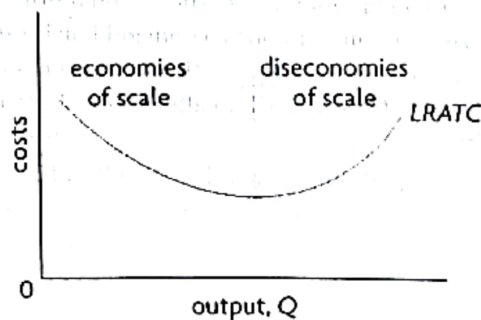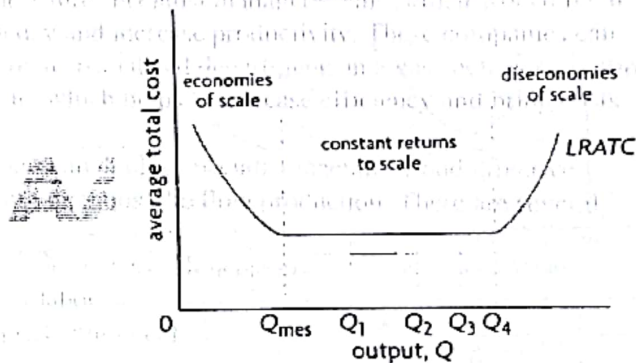
3. ECONOMIES OF SCALE   (Impact)

Definition: This is a situation where average cost decreases due to an increase in the scale of production. They can therefore only incur in the long-run.

Internal Economies of Scale

Definition: These are the economies of scale that are available to the firm that grows in size. Economies of scale explain the downward-sloping portion of the LRATC curve. There are several types of internal economies of scale:

Type	Description
1. Purchasing	A large firm requires raw material in bulk which encourages suppliers to offer discounts. This reduces the unit cost of each item.
2. Marketing	The cost of advertising and distribution rises at a lower rate rather than increase in output and sales. Furthermore, a large business can afford to purchase its own vehicles and does not depend on other firms.
3. Financial	Large business raise finance at a lower cost of borrowing. Banks are willing to give more capital at a lower interest rate and investors invest at a cheaper rate. This is because a large business is less risky due to low chances of failure. Furthermore they have access to more sources of finance example a plc can raise funds through the stock exchange, debentures, loans etc.
4. Managerial	Large business hire specialist managers. This skilled workforce helps being efficiency and increase productivity. These companies can afford their own specialized departments in areas such as marketing, operations etc. which helps to increase efficiency and bring costs down.
5. Technical *due to advance machines*	Large business can deploy specialist machinery and effective manufacturing methods like flow production. There are several forms: 1. Economies of increases dimensions 2. Division of labor 3. Large capital equipment 4. Research and Development
6. Risk-Bearing *benefit of diversifying*	These occur when a large firm tends to produce a wide range of products, expand into non-related businesses and operate in many locations. The diversity spreads the risk. If one product doesn't work, the company can compensate form the others. Example: Unilever has multiple products in in portfolio.
7. Research and Development *benefits of developing high end products*	Large firms can spend several millions of dollars in product innovation and create products that give them a competitive advantage. GSK invests $6.26 billion on R&D.

Term for MCQS

Internal Diseconomies of Scale

Definition: This is when by increasing the scale of production average cost per unit starts to increase. Diseconomies of scale are responsible for the upward-sloping part of the LRATC curve. There are several types of internal diseconomies of scale:

Type	Description
1. Poor Communication	In large business sending and receiving messages becomes a problem. This results in mistakes and leads to lower efficiency.
2. Clash of Cultures	A merger between the two firms may be unsuccessful due to clash of cultures. Usually in this situation a firm prefers to demerge.
3. ~~New Resources~~ *Expensive FOPs*	When a firm expands it needs more capital, land and labor. This results in the overall cost of the firm to increase, which in return increases the average cost.
4. Low Morale	Large businesses are usually structured hierarchically where workers might never see the top managers. This makes the worker feel unimportant which reduces his motivation resulting in low productivity.
5. Slow Decision Making	A large company would need to do research, create an assembly line, determine which distribution chains to use, plan an advertising campaign, etc., before any changes could be made. By this time, the smaller competitors may well have grabbed that market niche.

External Economies of Scale

Definition: External economies of scale occur based on larger changes outside of the firm. External economies of scale are generally described as having an effect on the whole industry. They shift the LRAC downwards.

| Type	Description
1. Ancillary Services	An expanding industry is often assisted by other supporting industries that provide ancillary services such as maintaining an uninterrupted supply of raw material. Example: Leather for footwear industry.
2. Availability of Skilled Labor	Industries are usually concentrated in areas where there is skilled labor. Example: Sialkot in Pakistan for sports goods.
3. Reputation of Geographical Area	This provides the firm with exposure and publicity. Example: Silicon Valley in California for IT firms.
4. Access to *commercial* Services	Industries in tertiary sector offer commercial services like insurance, transportation, advertising to the industries.

External Diseconomies of Scale

Definition: External diseconomies of scale are the result of outside factors beyond the control of a company increasing its total costs, as output in the rest of the industry increases. The increase in costs can be associated with market prices increasing for some or all of the factors of production. They shift the LRAC upwards.

Type	Description
1. Pollution	When firms of a particular industry locate in a particular place or region it tends to pollute the environment. The polluted environment acts as health hazard for the laborer. Thus, the social cost of production rises.
2. Strains on Infrastructure	The localization of an industry puts excessive pressure on transportation facilities in the region. As a result of this, the transportation of raw materials and finished goods gets delayed. The communication system in the region is also overtaxed. As a result of the strains on infrastructure, monetary as well as the real costs of production rise.
3. High Factor Prices	The excessive concentration of an industry in a particular industrial area leads to keener competition among the firms for the factors of production. As a result of this, the prices of the factors of production go up. Hence, the expansion and growth of an industry would lead to rise in costs of production.

[handwritten: When an industry starts to expand, the suppliers exploit the firm by overcharging for raw materials or by increasing a shortage in the market to overprice their products.]

[handwritten labels: Internal economies - movement along the curve; LRATC₃ (external dis-econ); LRATC₂ (internal); LRATC₁ (external econ); LRATC₂; LRATC; LRATC₁]
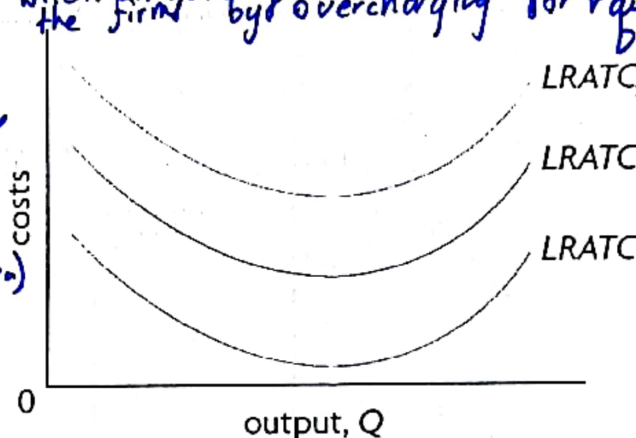
External Economics of Scale – Movement from LRATC → LRACT₁
External Diseconomies of Scale – Movement from LRATC → LRACT₂

4. ECONOMIES OF SCOPE

Definition: These are economies arising when average cost falls as a firm increases output across a range of different products. In this technique, the total cost of producing two products (related or unrelated) is less than the cost of producing each item individually. Economies of Scope focuses on better utilization of the firm's resources and common assets. In this way, the utilization of assets is spread over two or more products, i.e. shared by multiple products to decrease the overall cost of production. As the costs are spread over several products which lead to the decrease in the average cost per unit of each product.

Lecture 3

Lecture 4

TOPIC 4: REVENUES

Definition | Revenue: These are payments firms receive when they sell the goods and services they produce over a given time period. There are THREE types of Revenues:
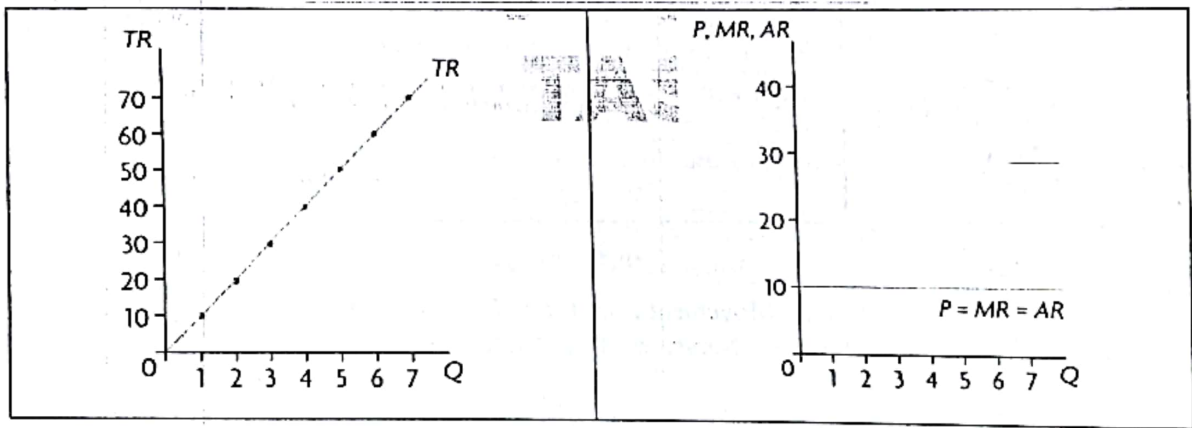
Type	Description
1. Total Revenue	TR is obtained by multiplying the price at which a good is sold (P) by the number of units of the good sold (Q) $$TR = P \times Q$$
2. Marginal Revenue	The firm's marginal revenue (MR) is the additional revenue arising from the sale of an additional unit of output
3. Average Revenue	The firm's average revenue (AR) is revenue per unit of output sold. $$AR = P$$

1. Revenue curves where the firm has no control over price

$\boxed{AR = P}$ ↴

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

$AR = \dfrac{P \times Q}{Q}$

→ proof

| Quantity	price	Total Revenue P×Q	Marginal Revenue	Average Revenue
0	10	-	-	-
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

Note: The price at which the good is sold does not change; this occurs only under **perfect competition**, where the firm has **no control over the price** at which it sells its product.
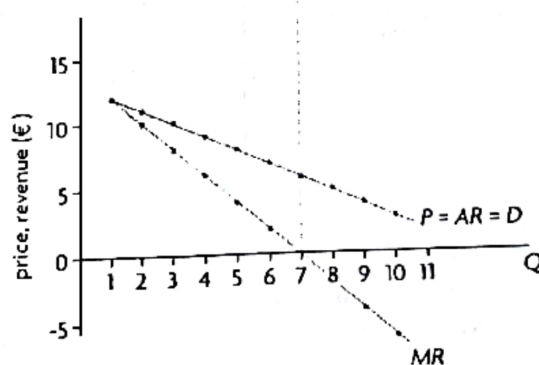
2. Revenue curves where the firm has some control over price

Unit of output	Price/ period	TR	MP	AR TR/Q
0	—	—	—	—
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
9	4	36	−4	4
10	3	30	−6	3

(a) Total revenue
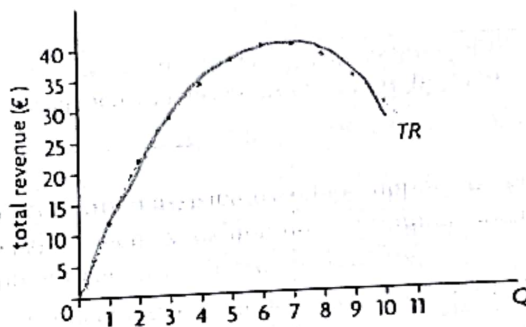
(b) Marginal and average revenue

Note: The price at which the good is sold changes as the quantity of output changes. This occurs under all market models **other than perfect competition.** This is where the firm **has control over price.**

TOPIC 5: PROFITS

Definition | Profit Maximization: It involves determining the level of output that the firm should produce to make profit as large as possible. There are **TWO** approaches to profit maximization:

1. Profit maximization based on the total revenue and cost approach
2. Profit maximization based on the marginal revenue and cost approach

1. Profit maximization based on the total revenue and cost approach

No control over price	Control over Price
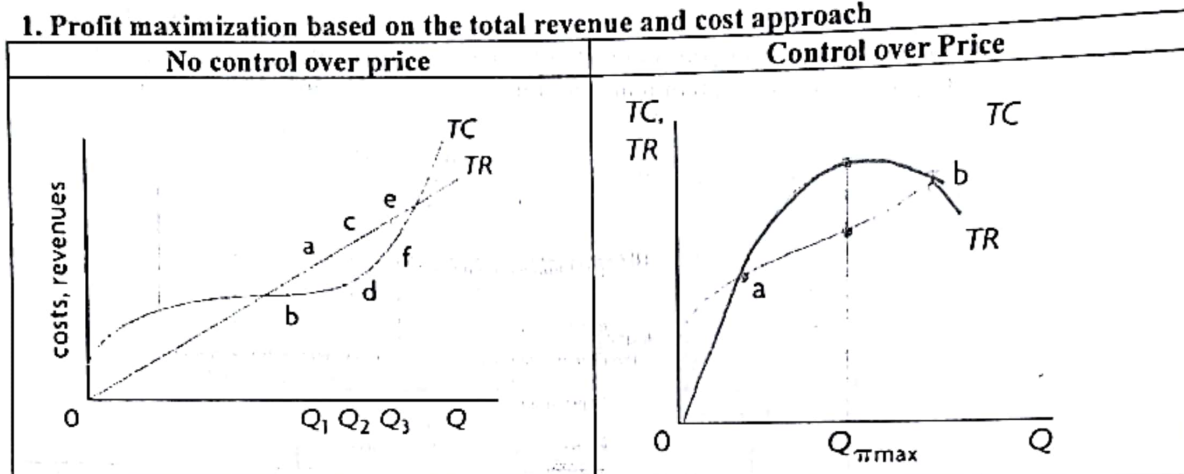
The firm's profit-maximization rule is to produce the level of output where:
TR − TC (= economic profit) is as large as possible.

Profit Maximization Point → **TR − TC is maximum**

2. Profit maximization based on the marginal revenue and cost approach

No control over price	Control over Price
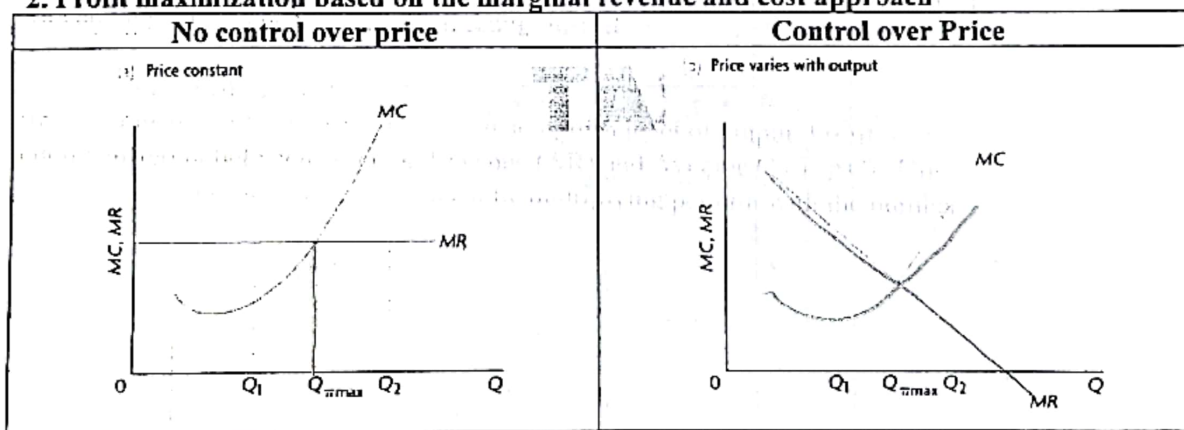
The firm's profit-maximization rule is to choose to produce the level of output where MC = MR. The same rule is used by the firm that is interested in minimizing its loss.

Profit Maximization Point → **MC = MR**

$MR > MC$ → The additional revenue it would receive (MR) will be greater than its additional cost (MC). It is therefore in the firm's interests to increase its level of output until it reaches $Q_{\pi max}$

$MR < MC$ → The additional revenue it would receive for an extra unit of output is less than the additional cost, and so it should cut back on its Q.

Lecture 4

Marginal approach steps 1) Always draw the MR and AR first 2) Draw the MC and make a Q* where MC cuts MR, 3) Compare the AR and AC on the Q* to determine profit, breakeven and loss situation

TOPIC 6: PRICE AND OUTPUT DECISIONS

1. MARGINAL AND AVERAGE CONDITION

There are TWO main decisions that the firms have to take in order to maximize their benefits.
1. Output Decision – This is calculated by the marginal condition
2. Profit Decision – This is calculated by the average condition

1. The Marginal Condition | Get the Q*

This shows firms where to produce. In other words it marks the level of **output** to produce. This would be at a point where the extra revenue (MR) from selling is equal to the extra cost (MC) of producing.

$$MC = MR$$
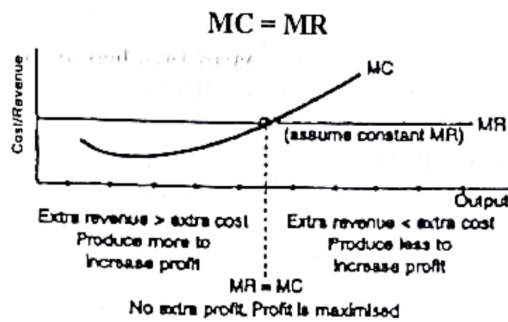
MR > MC	The firm will make extra profit by selling the unit. It should always make units where extra profit can be made. Hence will **increase output.**
MR < MC	The firm will make an extra loss by selling an extra unit. Hence they should cut back on production to maximize profits. Hence will **reduce output**
MR = MC	This is the point where the firm makes maximum profit possible because no extra profit can be made. Hence **profit maximizing output.**

2. The Average Condition | Profit or Loss

This shows the firm how much **profit or loss** it is making at a given level of output. Profit is calculated by taking the different between Average Revenue (AR) and Average Cost (AC). This will give us profit per unit. Total profit can be calculated by multiplying per unit with the number of units.

$$Profit = AR-AC$$
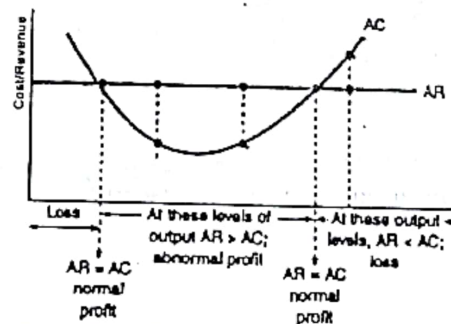
AR > AC	If AR > AC the firm is making **abnormal** profits on each unit.
AR < AC	If AR < AC the firm is making a **loss** on each unit.
AR = AC	The firm is making **normal** profits on each unit.

2. SHORT-RUN AND LONG RUN PRODUCTION DECISION

1. Short-Run Production Decision

In the short-run a firm will produce where the revenue is greater or equal to the variable cost.

$$P \geq AVC$$

— In the short-run the firm may stay in the industry even it is making a loss because of fixed costs. In the short-run fixed costs must be paid even if the production is stopped because other factors of production cannot be changed. Example: Even if a firm doesn't produce anything they might still be paying rent. Hence if the firm shuts down it will make a loss equal to its fixed cost.

— If the firm continues production and earns more than the AVC. If the revenue covers more the AVC the firm would be able to cover part of fixed cost, hence covering part of the fixed cost and reducing the loss by producing would be smaller than by closing down.

2. Long-Run Production Decision

In the long-run a firms will produce only if the revenue is greater or equal to the average cost. This is because if the firm is not able to cover its total costs till the long-run it shows that the firm is inefficient and mismanaged and is not able to earn any profits for a long period of time.
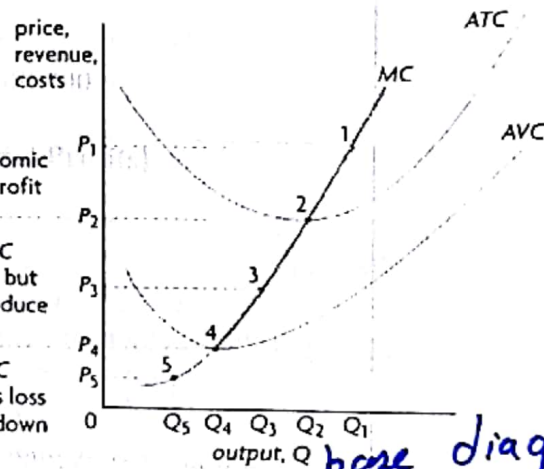
$$P \geq AC$$

P = minimum ATC = break-even price
firm makes normal profit.
or zero economic profit

P = minimum AVC = shut-down price
firm is indifferent between producing
at a loss or not producing

P > ATC
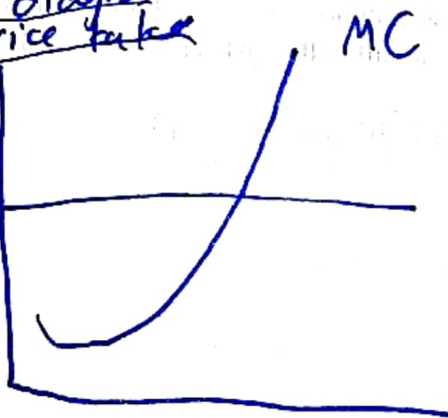firm makes economic
(supernormal) profit

ATC > P > AVC
firm makes loss but
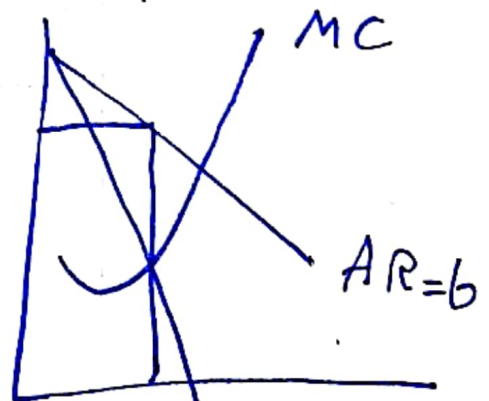continues to produce

P < AVC
firm makes loss
and shuts down

base diagram
of price taker

MC

MR=AR=D

base diagram
of price maker

MC

AR=b

Q* MR

(Table)
(Para) → situation → no opp. cost
explict → cost that occur
$ when firm does not own FOP

3. ACCOUNTING AND ECONOMIC PROFITS

Definition | Accounting Profit: An accountant calculates only explicit costs. These include the production expenses and ignores the implicit costs (opportunity cost of production). Hence for an accountant the profit would be:

Accounting Profit = Total Revenue -Total Cost

Definition | Economic Profit: An economist calculates explicit as well as implicit costs. This includes the production expenses as well as the implicit costs (opportunity cost of production). The implicit costs also include payments for entrepreneurship. Hence for an economist the profit would be:

Economic Profit = Total Revenue − (Total Cost + Implicit Costs (Opportunity Cost))

THREE Economic Profit Situations:

Positive Economic Profit	TR > Economic Costs [Abnormal Profits]
Example
Total Revenue = 100,000 Explicit Costs = 50,000 Implicit Costs = 10,000
Economic Profit = 100,000 − (50,000 + 10,000) = 40,000

Zero Economic Profit	TR = Economic Costs [Normal Profits]
Example
Total Revenue = 100,000 Explicit Costs = 50,000 Implicit Costs = 50,000
Economic Profit = 100,000 − (50,000 + 50,000) = 0
Note: The firm in this situation will not shut down even though it is earning zero economic profit, because it is able to cover all its costs. It is also called the break-even point.

Negative Economic Profit	TR < Economic Costs [Loss]
Example
Total Revenue = 100,000 Explicit Costs = 50,000 Implicit Costs = 60,000
Economic Profit = 100,000 − (50,000 + 60,000) = -10,000
Note: The firm in this situation will shut down as it is not able to cover all of its implicit costs.

Lecture 5