

# Introduction to Economics

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## Lecture 7



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## MGM112

### Production, and Cost

- Explain how economists measure a firm's cost of production and profit.
- Explain the firm's Production
- Explain the relationship between a firm's output and labor employed in the short run.
- Explain the firm's costs in the short run.

## 1) Calculating Profit

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Accounting  
Profit

VS



Economic  
Profit

## 1) Calculating Profit

Accounting Profit =  
Total Revenue - Explicit Costs

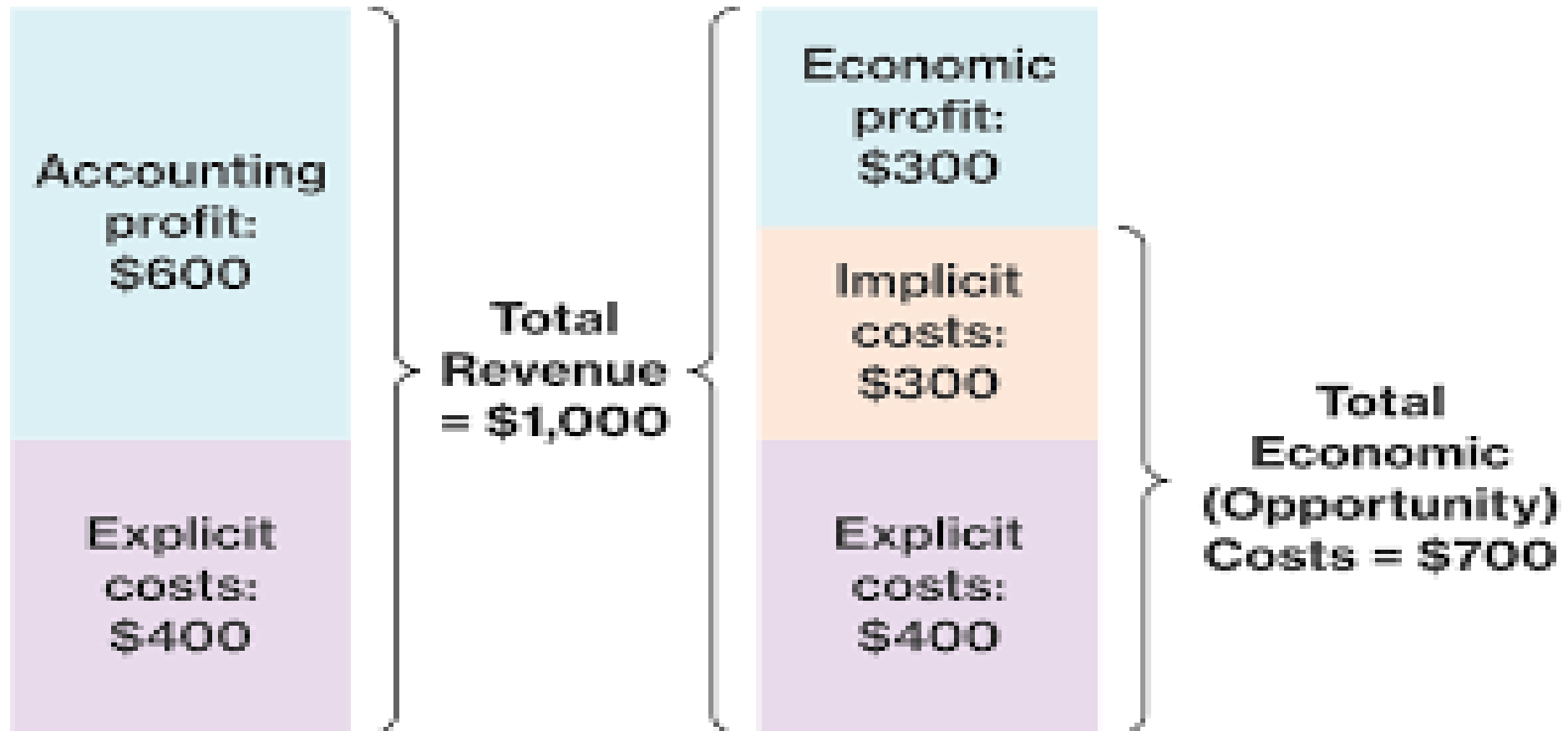
Economic Profit =  
Total Revenue - (Explicit Costs + Implicit Costs)

## 1) Calculating Profit

| Explicit Cost                                                                                                              | Implicit Cost                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| It includes actual money expenditure incurred by a firm in hiring or buying the factors it needs in the production process | It is not actual money expenditure but is the cost of factors owned by the firm and used by the firm in its production process |
| It is explicitly shown in the firm's books of accounts and is thus, called accounting costs                                | It does not enter in the firm's books of accounts                                                                              |
| It is a payment concept                                                                                                    | It is a receipt concept, i.e., the payments are received by producer for supplied services                                     |
| Examples: Wages, rent, interest, insurance, etc                                                                            | Examples: Wages of self labor, rent for self owned premises, etc                                                               |

The cost of treating diseases that result from pollution would be considered an Economic implicit cost of production.

## 1) Calculating Profit



## 1) Calculating Profit

An owner of a lumber store reported the following financials for last year. If the owner closed the store, he would be working at Home Depot earning \$80,000 a year and be able to rent the store's property (building and land) for \$50,000 a year.

Revenue \$1,000,000

Wages paid to store employees \$300,000

Utilities (water, sewer, telephone, electricity) \$10,000

Insurance \$20,000

Purchases of supplies (lumber, paint, drywall) \$500,000

Calculate accounting profit?

Acct. profit = Revenue – Explicit Costs

$$= \$1,000,000 - 300,000 - 10,000 - 20,000 - 500,000 = \$170,000$$

Calculate Economic Profit?

Economic Profit = Revenue – Explicit Cost – Implicit Cost

$$= \$1,000,000 - 300,000 - 10,000 - 20,000 - 500,000 - 80,000 - 50,000 = \$40,000$$

## 2) Production

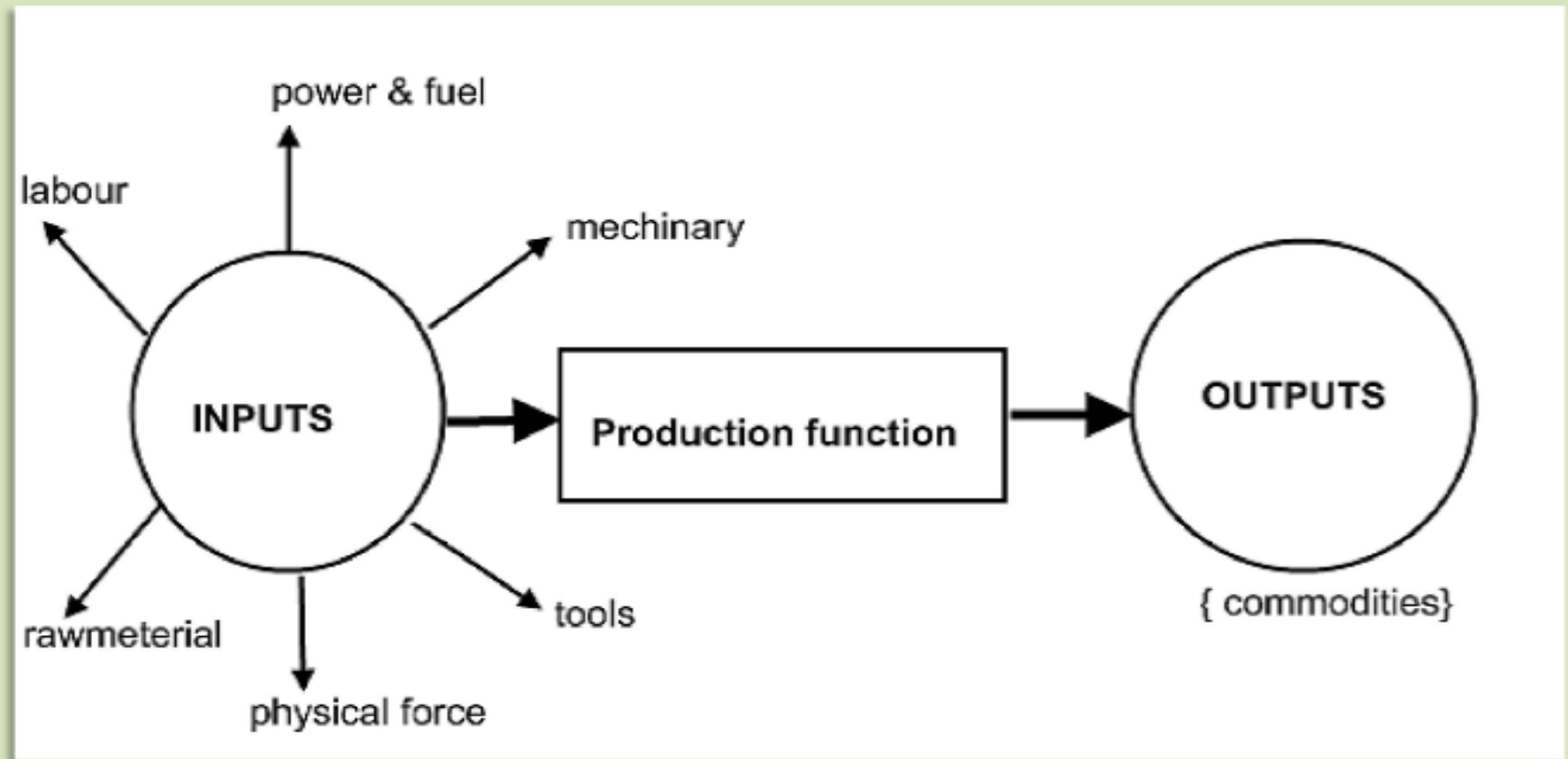


# Production: Meaning

- **Any activity which creates value is production.**
- In other words, production is **transformation of inputs** (such as capital, equipment, labour, and land etc ) **into output** such as good or service .



## Production Function



## Concept of Product

- **There are three concepts of product such as:**
- Total Product
- Average Product
- Marginal Product

## (1)

### Total Product

- **Total Product refers (TP)** to the total volume of goods and services produced by a firm during a given period of time.

(2)

## Average Product

- **Average Product (AP)** is output (total product) per unit of a factor.

Where,

- i.e. AP

$$\text{i.e. } AP_L = \frac{Q}{L}$$

- **Q** is total product
- **L** is quantity of a factor input

## Marginal Product

(3)

- **Marginal Product (MP)** is rate of change in total product with respect to a factor.
- **Concept of Product contd.**
- In other words, marginal product is the addition to total product by utilizing one more one unit of variable input to the production process, keeping other factor fixed.

$$\text{i.e. } MP_L = \frac{dQ}{dL}$$

Where ,

- **dQ** is change in total product
- **dL** is change in quantity of a factor input.

## A) The relationship between a firm's output and labor employed

- **In Short run:** :It is a time frame in which to increase output with a fixed capital, a firm must increase the quantity of labor it uses

The short run is a time period in which some resources are fixed, and other variables

|                                    | <b>L</b> | <b>TP</b> | MP |
|------------------------------------|----------|-----------|----|
| <b>Increasing marginal returns</b> | <b>1</b> | <b>1</b>  | 1  |
|                                    | <b>2</b> | <b>3</b>  | 2  |
|                                    | <b>3</b> | <b>6</b>  | 3  |
| <b>Decreasing marginal returns</b> | <b>4</b> | <b>8</b>  | 2  |
|                                    | <b>5</b> | <b>9</b>  | 1  |
|                                    | <b>6</b> | <b>9</b>  | 0  |
| <b>Negative marginal returns</b>   | <b>7</b> | <b>8</b>  | -1 |

### As ( $L$ ) increases:

#### 1) Initially

- TP increases at increasing rate (Steep)
- MP increases

#### 2) At the point where:

- MP reaches its maximum value ( $L=3$ ,  $MP=3$ )
- TP starts to increase at a decreasing rate. (the law of diminishing returns).

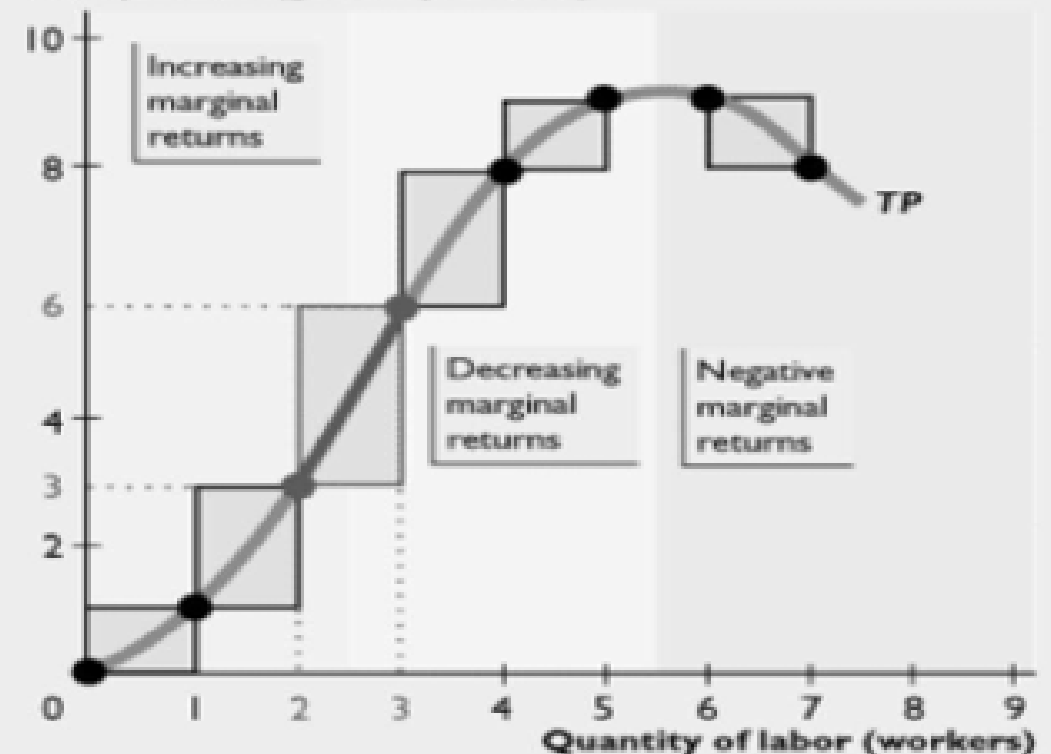
#### 3) When $MP = 0$

- TP reaches its maximum value ( $L=6$ ,  $TP=9$ )

#### 4) $MP < 0$ is negative

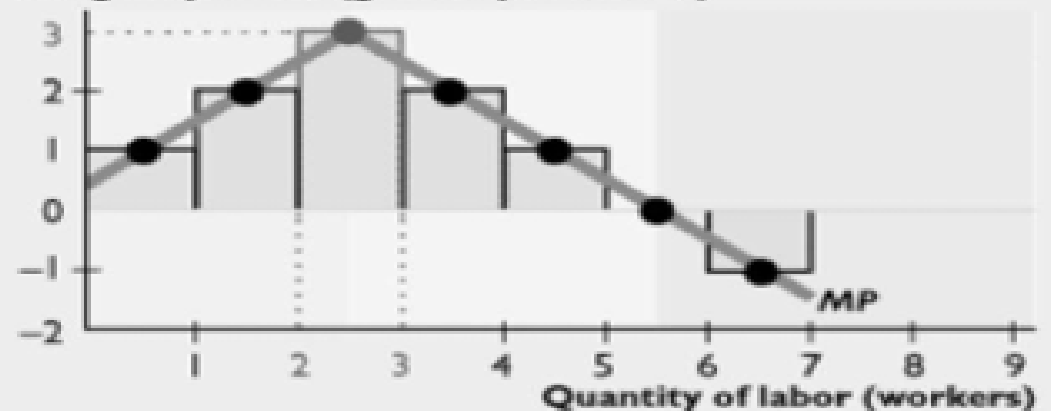
- TP decreases ( $L=7$ ,  $TP=8$ ).

Total product (gallons per hour)



(a) Total product curve

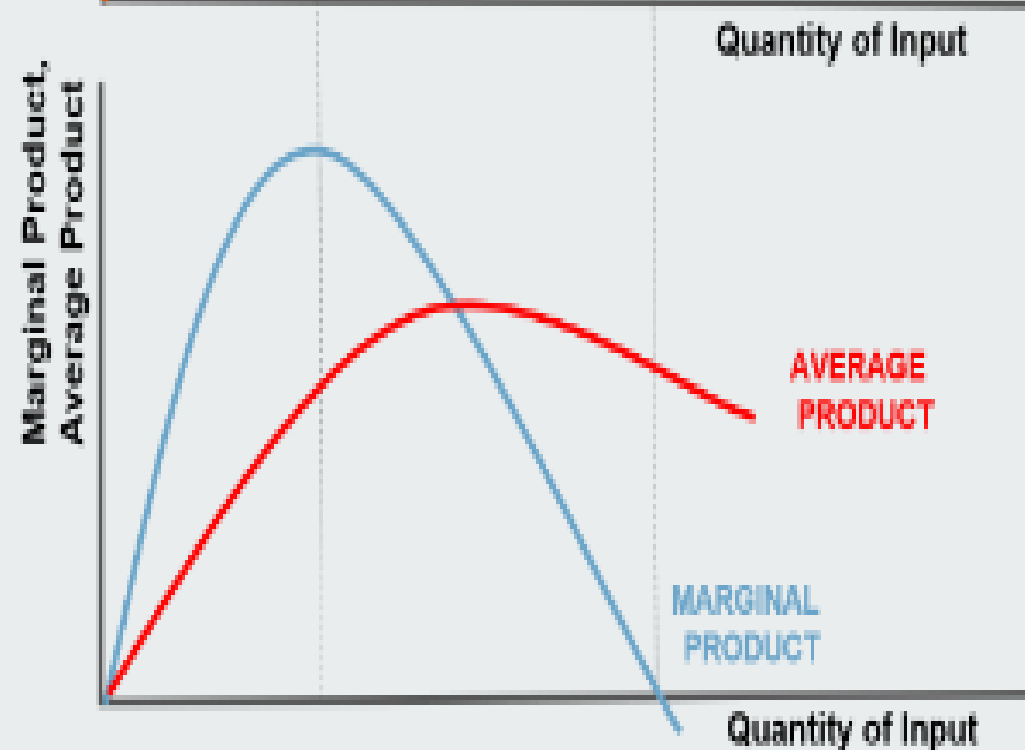
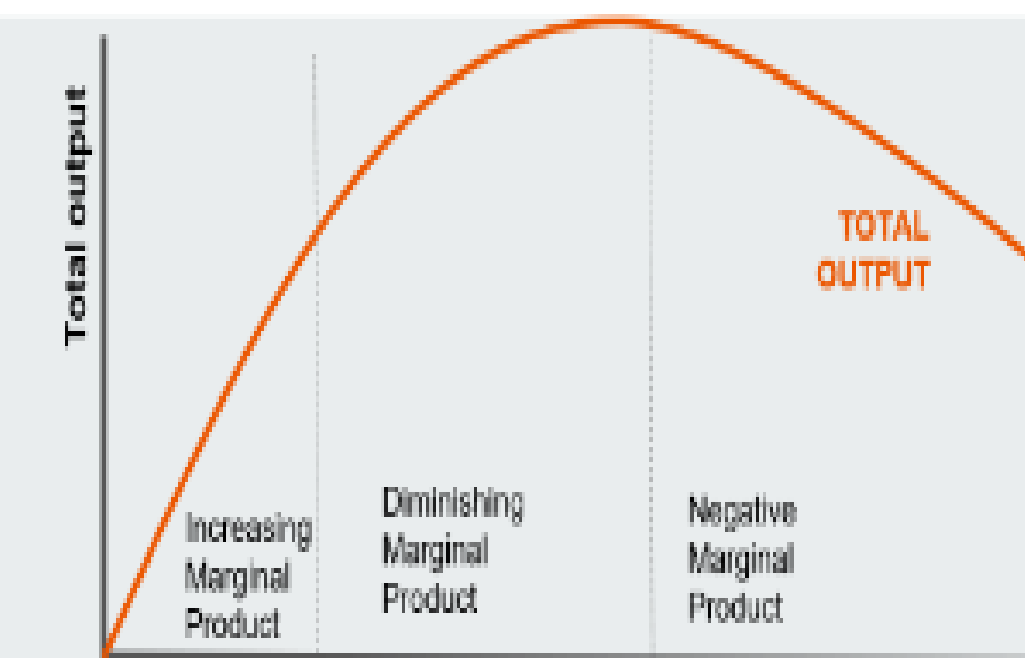
Marginal product (gallons per worker)



(b) Marginal product curve

## B) The relationship between total, marginal and average productivity TP, AP, MP

| Inputs |   | TP = Q | MP<br>$\Delta TP / \Delta L$ | AP<br>TP / L | Level of production                                                                                                                                                                               |
|--------|---|--------|------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L      | K |        |                              |              |                                                                                                                                                                                                   |
| 0      | 5 | 0      | —                            | 0            | <b>Increasing Marginal Returns</b> <ul style="list-style-type: none"> <li>TP ↑ at increasing <u>rate</u></li> <li>MP↑ &gt; AP↑</li> </ul>                                                         |
| 1      | 5 | 500    | 500                          | 500          |                                                                                                                                                                                                   |
| 2      | 5 | 1200   | 700                          | 600          |                                                                                                                                                                                                   |
| 3      | 5 | 1800   | 600                          | 600          | <b>The law of decreasing returns</b><br><b>①</b> <ul style="list-style-type: none"> <li>MP reaches t its max then starts to ↓</li> <li>AP↓ (MP&lt;AP)</li> <li>TP ↑ at decreasing rate</li> </ul> |
| 4      | 5 | 2200   | 400                          | 550          |                                                                                                                                                                                                   |
| 5      | 5 | 2500   | 300                          | 500          |                                                                                                                                                                                                   |
| 6      | 5 | 2700   | 200                          | 450          |                                                                                                                                                                                                   |
| 7      | 5 | 2800   | 100                          | 400          |                                                                                                                                                                                                   |
| 8      | 5 | 2800   | 0                            | 350          | <b>②</b> <ul style="list-style-type: none"> <li>MP = 0</li> <li>TP reaches to its <u>max</u></li> <li>AP↓</li> </ul>                                                                              |
| 9      | 5 | 2700   | -100                         | 300          |                                                                                                                                                                                                   |
| 10     | 5 | 2500   | -200                         | 250          |                                                                                                                                                                                                   |
|        |   |        |                              |              | <b>③</b> <ul style="list-style-type: none"> <li>MP ↓ &lt; 0</li> <li>AP ↓ &gt; 0</li> <li>TP ↓</li> </ul>                                                                                         |



## 3) Cost



### Short-Run Cost

- Total Cost
  - A firm's **total cost** ( $TC$ ) is the cost of *all* resources used.
  - **Total fixed cost** ( $TFC$ ) is the cost of the firm's fixed inputs. Fixed costs do not change with output.
  - **Total variable cost** ( $TVC$ ) is the cost of the firm's variable inputs. Variable costs do change with output.
  - Total cost equals total fixed cost plus total variable cost. That is:

$$TC = TFC + TVC$$



# Chapter 5

## Cost

| Q  | FC | VC | TC  |
|----|----|----|-----|
| 0  | 30 | 0  | 30  |
| 4  | 30 | 10 | 40  |
| 14 | 30 | 20 | 50  |
| 27 | 30 | 30 | 60  |
| 43 | 30 | 40 | 70  |
| 58 | 30 | 50 | 80  |
| 72 | 30 | 60 | 90  |
| 81 | 30 | 70 | 100 |
| 86 | 30 | 80 | 110 |



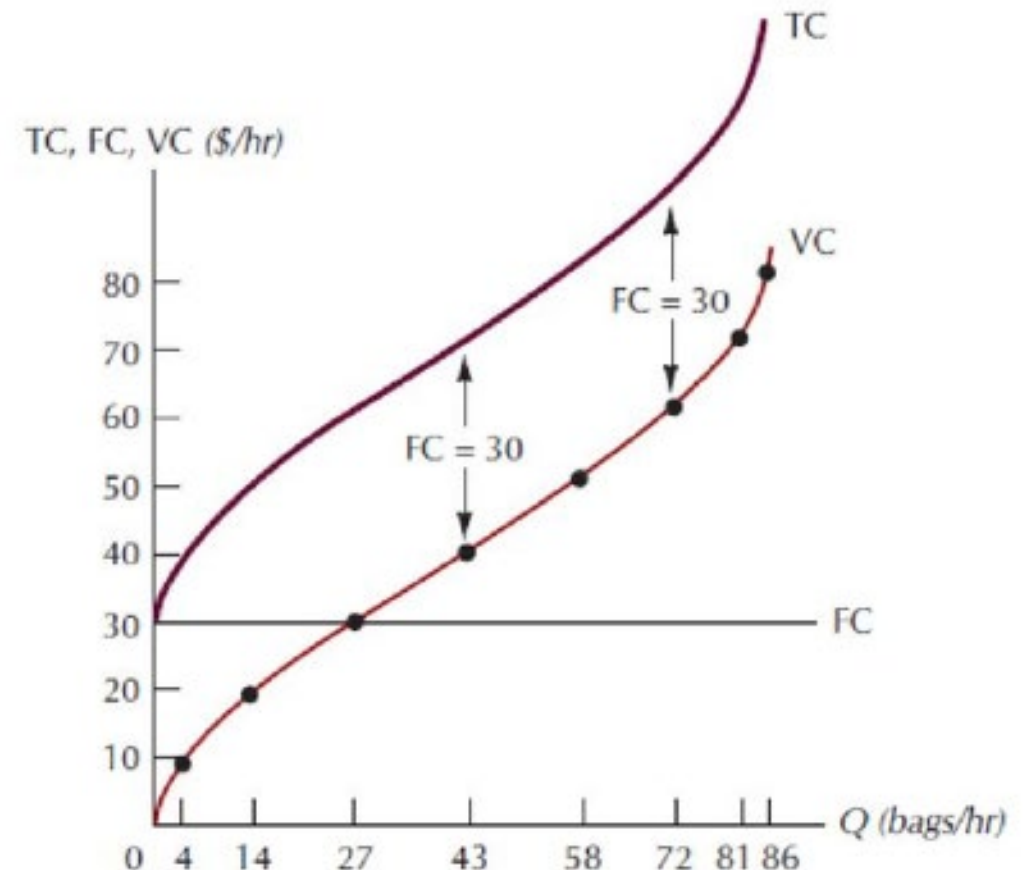
### Graphing The Total, Variable, and Fixed Cost Curves

(TC) increases as output increases.

TVC increases as output increases

(TFC) is constant—it graphs as a horizontal line

The vertical distance between the TC curve and the TVC curve is TFC as illustrated by the two arrows.  $TFC = TC - TVC$



## Other Short-Run Costs

- **Average fixed cost (AFC):** fixed cost divided by the quantity of output.

$$AFC_{Q_1} = \frac{FC}{Q_1}$$

- **Average variable cost (AVC):** variable cost divided by the quantity of output.

$$AVC_{Q_1} = \frac{VC_{Q_1}}{Q_1}$$

- **Average total cost (ATC):** total cost divided by the quantity of output.

$$ATC_{Q_1} = AFC_{Q_1} + AVC_{Q_1}$$

- **Marginal cost (MC):** change in total cost that results from a 1-unit change in output.

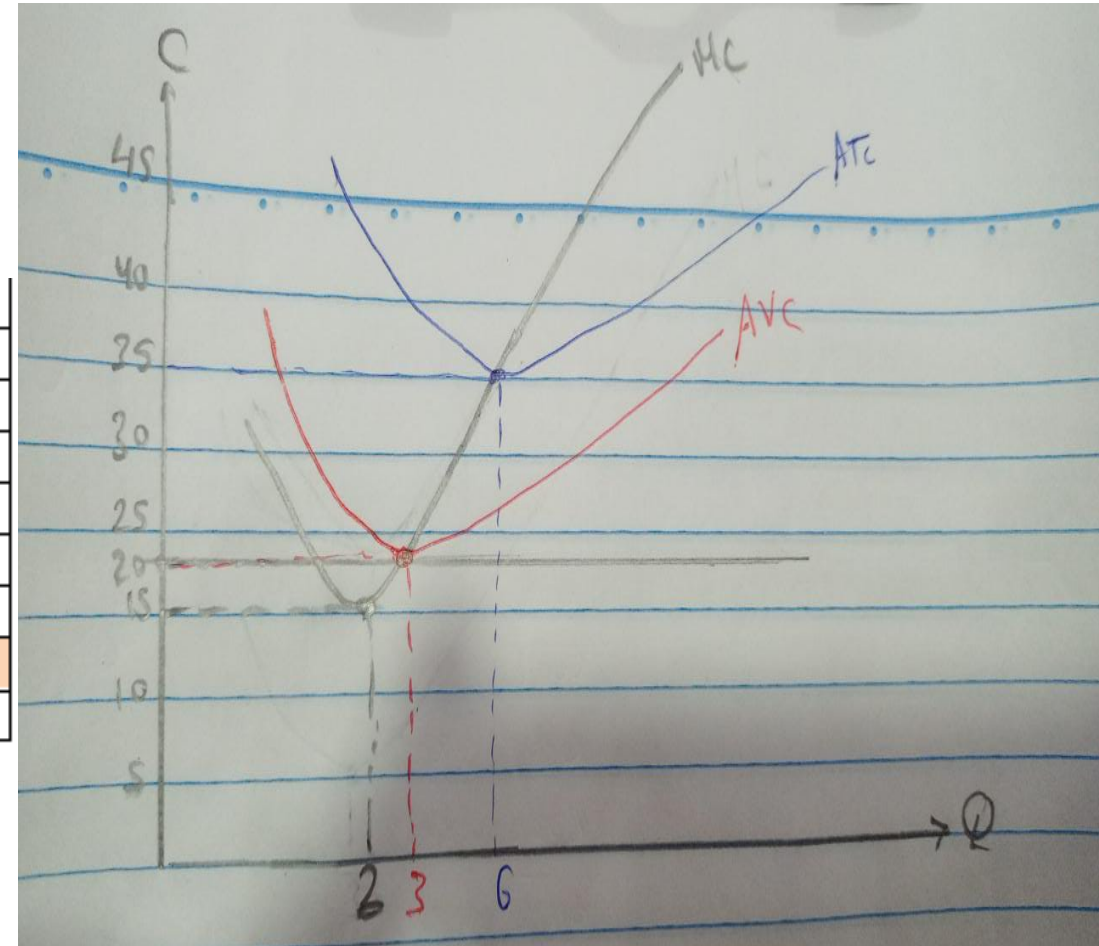
$$MC_{Q_1} = \frac{\Delta TC_{Q_1}}{\Delta Q}$$

# Chapter 5

## Cost

### Graphically

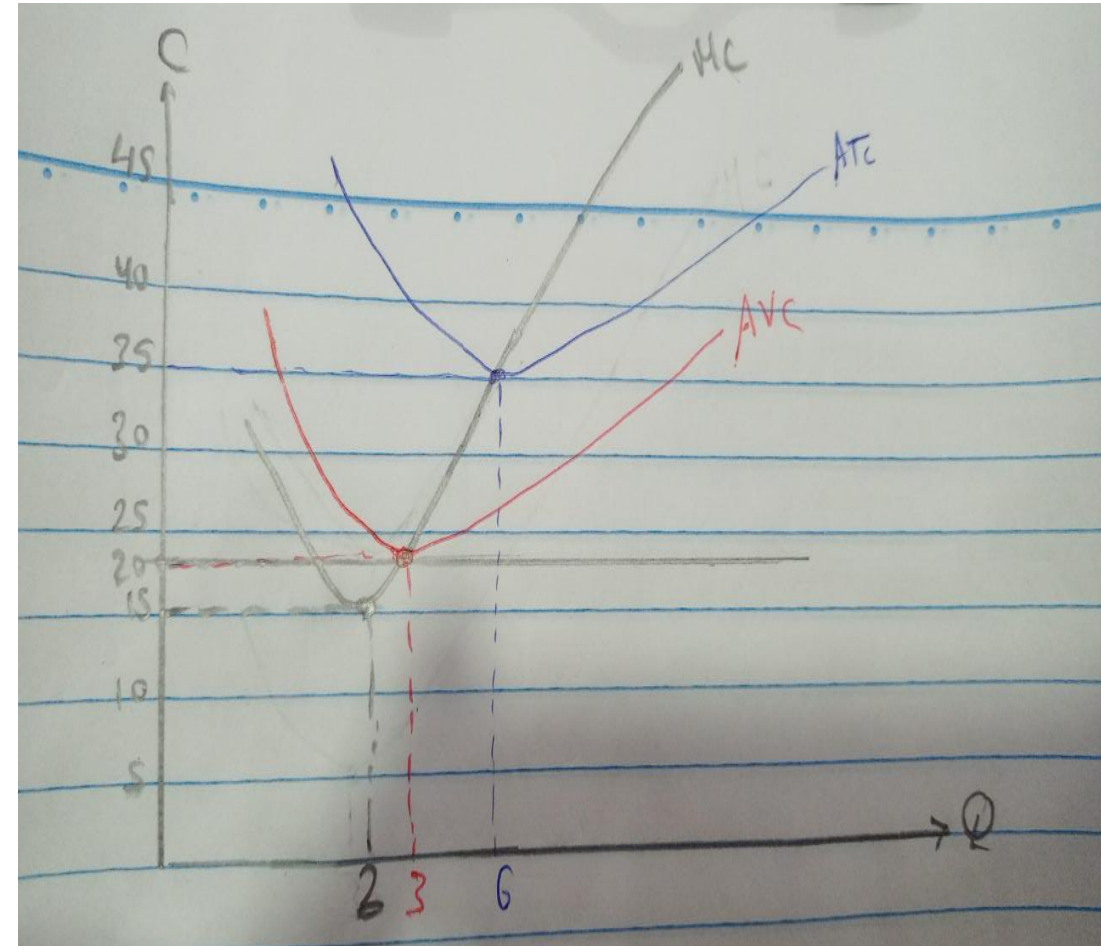
| $TP = Q$ | $FC$ | $VC$ | $TC$ | $MC$ | $AVC$ | $ATC$ |
|----------|------|------|------|------|-------|-------|
| 0        | 60   | 0    | 60   | -    | -     | -     |
| 1        | 60   | 25   | 85   | 25   | 25    | 85    |
| 2        | 60   | 40   | 100  | 15   | 20    | 50    |
| 3        | 60   | 60   | 120  | 20   | 20    | 40    |
| 4        | 60   | 85   | 145  | 25   | 21.25 | 36.24 |
| 5        | 60   | 115  | 175  | 30   | 23    | 35    |
| 6        | 60   | 150  | 210  | 35   | 25    | 35    |
| 7        | 60   | 190  | 250  | 40   | 27.14 | 35.71 |



### The relation between AVC & MC with the help of the diagram

- MC curve is *U-shaped*.
- The *AVC* & *ATC* curves are *U-shaped*:
  - The outputs over which *AC* is falling, *MC* is below *AVC*.
  - The outputs over which *AVC* is rising, *MC* is above *AC*.
  - The output at which *AVC* is at the minimum, *MC* equals *AC*.
- a minimum are listed in order : **MC, AVC, ATC**

*Before Minimum  $MC < AVC$*   
*At minimum  $MC = AVC$*   
*After minimum  $MC > AVC$*



## Summary of the rules

$$\begin{aligned}TC &= VC + FC \\ TC &= ATC * Q\end{aligned}$$

$$\begin{aligned}VC &= TC - FC \\ VC &= AVC * Q\end{aligned}$$

$$\begin{aligned}FC &= TC - VC \\ FC &= AFC * Q\end{aligned}$$

$$\begin{aligned}ATC &= TC / Q \\ ATC &= AVC + AFC\end{aligned}$$

$$\begin{aligned}AVC &= VC / Q \\ AVC &= ATC - AFC\end{aligned}$$

$$\begin{aligned}AFC &= FC / Q \\ AFC &= ATC - AVC\end{aligned}$$

$$MC = \Delta TC / \Delta Q$$

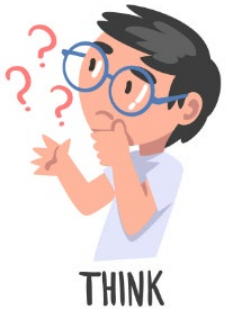
$$AP = TP / L$$

$$MP = \Delta TP / \Delta L$$

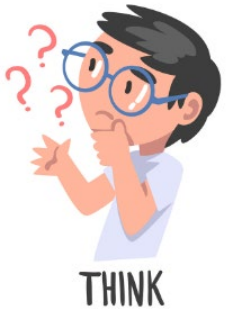


# Chapter 5

## Think



| <i>TP = Q</i> | <i>TFC</i> | <i>TVC</i>     | <i>TC</i>      | <i>MC</i>      | <i>AVC</i>   | <i>ATC</i>   |
|---------------|------------|----------------|----------------|----------------|--------------|--------------|
| 0             | 60         | 0              | 60             | -              | -            | -            |
| 1             | 60         | 25             | 60+25<br>=85   | 25             | 25           | 85           |
| 2             | 60         | 40             | 100            | 15             | 20           | 100/2<br>=50 |
| 3             | 60         | 120-60<br>= 60 | 120            | 120-100<br>=20 | 20           | 120/3<br>=40 |
| 4             | 60         | 85             | 145            | 25             | 21.25        | 36.24        |
| 5             | 60         | 115            | 60+115<br>=175 | 30             | 115/5<br>=23 | 35           |
| 6             | 60         | 210-60<br>=150 | 210            | 35             | 25           | 35           |
| 7             | 60         | 190            | 250            | 40             | 27.14        | 35.71        |



**A cost that can be easily adjusted is known as -----**

total cost.

**variable cost.**

fixed cost.

average fixed cost.

**The short run is a time frame in which**

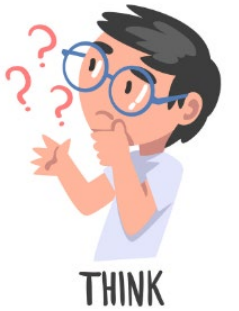
A) the firm is not able to hire more workers.

B) the amount of output produced is fixed.

C) there is a shortage of most factors of production.

**D) at least one factor of production is fixed.**





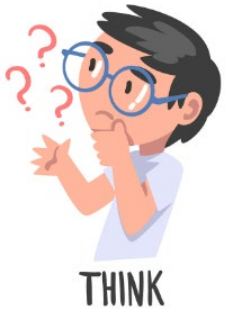
**The marginal cost (MC) curve intersects the**

- A) ATC, AVC, and AFC curves at their minimum points.
- B) ATC and AFC curves at their minimum points.
- C) AVC and AFC curves at their minimum points.
- D) ATC and AVC curves at their minimum points.**

**If ATC is falling, then MC must be.**

- A) rising
- B) falling.
- C) equal to ATC.
- D) above ATC.**



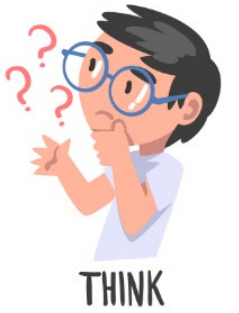


**At that amount of output where diminishing marginal returns first sets in,**

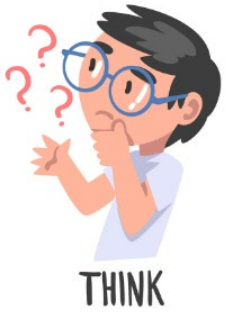
- A) average product begins to decrease.
- B) total product begins to decrease.
- C) marginal cost begins to decrease.
- D) marginal product begins to decrease.**

**Which one of the following statements is correct?**

- A) When marginal product is increasing, average product is decreasing.
- B) When average product is less than zero, marginal product is positive.
- C) When marginal product is increasing and greater than average product, average product is increasing.**
- D) When marginal product is zero, total product is at its minimum.



- **Diminishing marginal returns occur when the marginal product of an additional worker is**
  - A. less than zero.
  - B. less than the marginal product of the previous worker.
  - C. equal to the marginal product of the previous worker.
  - D. greater than the marginal product of the previous worker.
- **When the average product is greater than the marginal product, then the average product is**
  - A. equal to zero.
  - B. falling.
  - C. not changing.
  - D. rising.

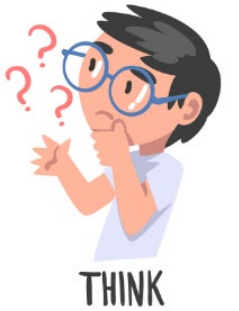


### Implicit costs are:

- A) equal to total fixed costs.
- B) comprised entirely of variable costs.
- C) "payments" for self-employed resources.**
- D) always greater in the short run than in the long run.

### Which would be an implicit cost for a firm? The cost:

- A) of worker wages and salaries for the firm.
- B) paid for leasing a building for the firm.
- C) paid for production supplies for the firm.
- D) of wages foregone by the owner of the firm**



**Suppose that a firm revenue is \$5,000,000. The explicit costs of production are \$2,500,000 and the implicit costs of production are \$200,000. The firm has an accounting profit of:**

- A) \$2,500,000 and an economic profit of \$2,300,000 .**
- B) \$6,000,000 and an economic profit of \$2,000,000.
- C) \$7,000,000 and an economic profit of \$4,000,000.
- D) \$8,000,000 and an economic profit of \$5,000,000.

### The Answer:

**TR= \$5,000,000**

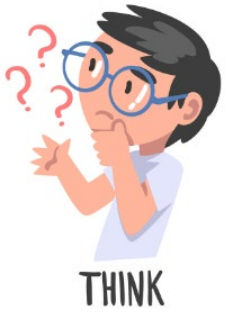
**The explicit costs= \$2,500,000**

**implicit costs= \$200,000**

**Eco. Profit = TR- (explicit + implicit) = \$5,000,000- (\$2,500,000 + \$200,000) = \$2,300,000**

**Acc. Profit = TR- explicit cost= \$5,000,000- \$2,500,000 = \$2,500,000**





**When marginal product reaches its maximum, what can be said of total product?**

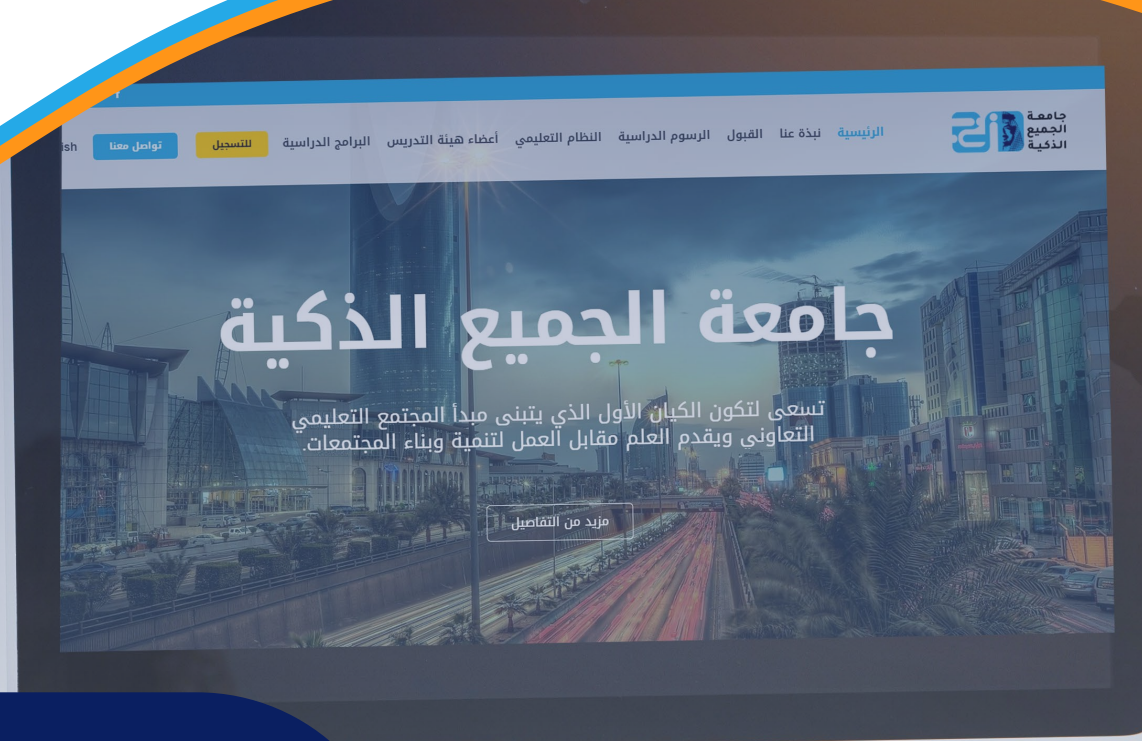
- A) total product must be at its maximum
- B) total product starts to decline even if marginal product is positive
- C) total product is increasing if marginal product is still positive**
- D) total product levels off

# Summary outlines

- **The difference between Accounting, and Economic profit**
- **Production:** Meaning, concepts of product
- **The relationship between a firm's output and labor employed.**
- **The relationship between total, marginal and average productivity (TP, AP, MP)**
- **Short run costs**



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