

Introduction to Economics

Lecture 7

MGM112

Production, and Cost

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Chapter 07

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.

Chapter
07

Production, and Cost

1) Calculating Profit

Chapter
07

1) Calculating Profit



VS



1) Calculating Profit

Accounting Profit =
Total Revenue - Explicit Costs

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

Chapter
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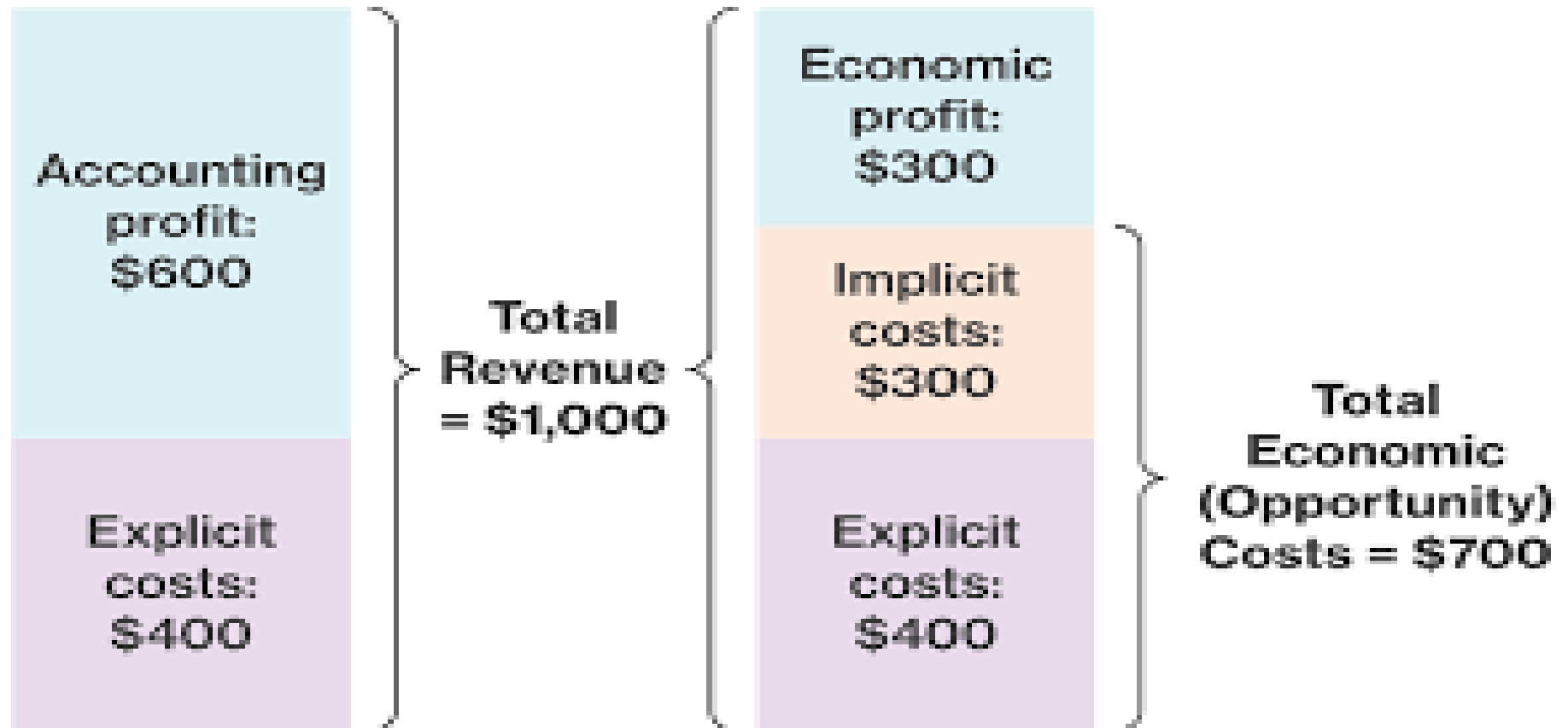
1) Calculating Profit

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.

Chapter
07

1) Calculating Profit



Chapter
07

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

Chapter
07

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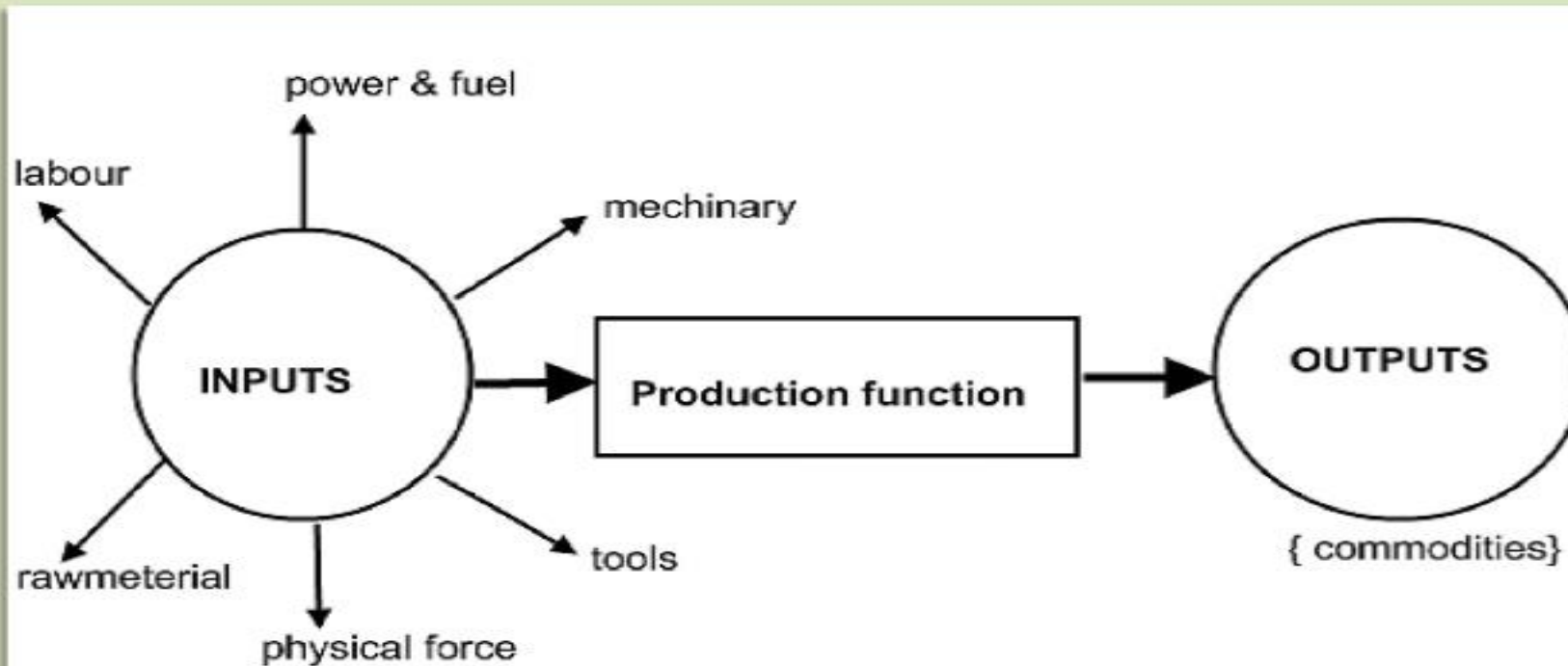
2) Production

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

Production Function



Concept of Product

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

Production

(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.

Production

(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

Production

(3)**Marginal Product**

- **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.

Production

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

Chapter
07

Production

	L	TP	MP
Increasing marginal returns	1	1	1
	2	3	2
	3	6	3
Decreasing marginal returns	4	8	2
	5	9	1
	6	9	0
Negative marginal returns	7	8	-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).

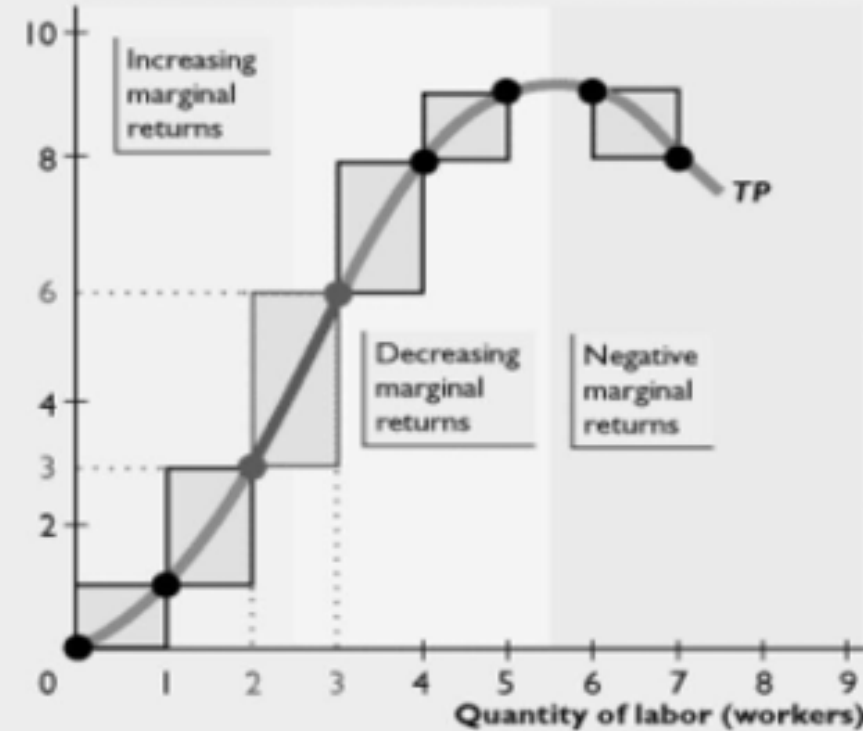
3) When $MP = 0$

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

4) $MP < 0$ is negative

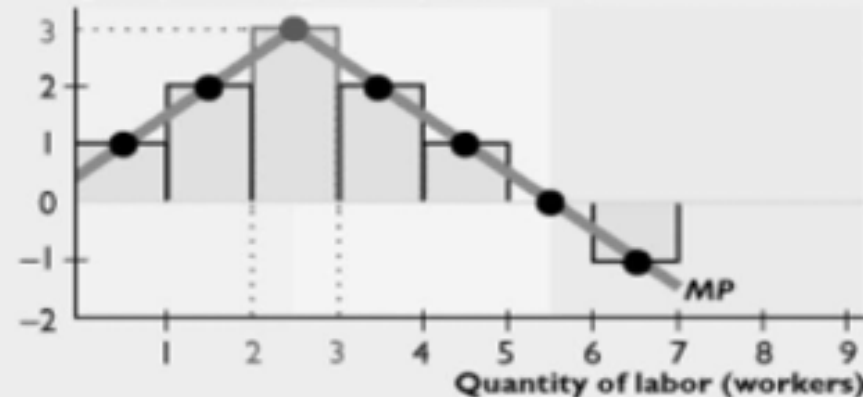
- TP decreases ($L=7$, $TP=8$).

Total product (gallons per hour)



(a) Total product curve

Marginal product (gallons per worker)



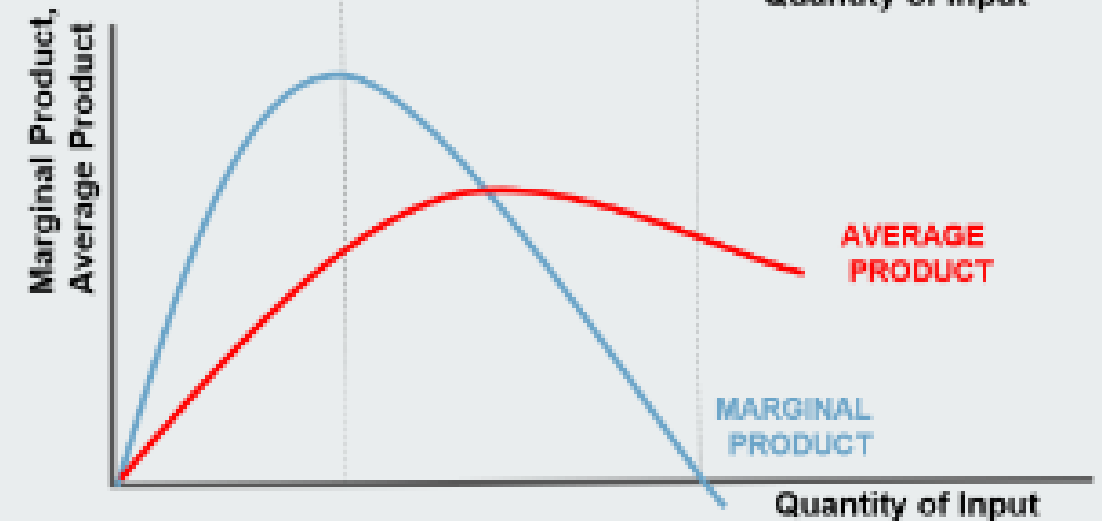
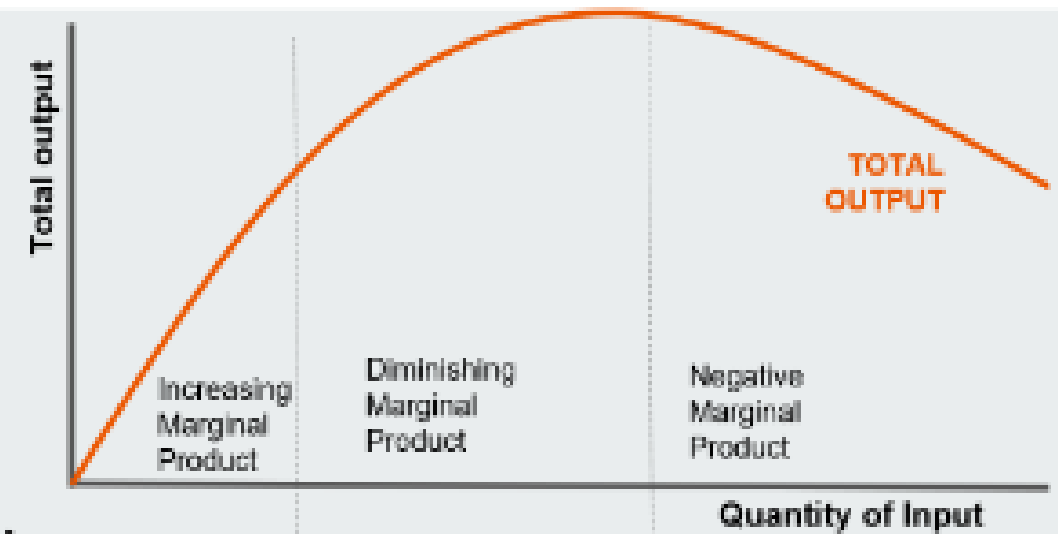
(b) Marginal product curve

Chapter
07

Production

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

Inputs		TP = Q	MP $\Delta TP / \Delta L$	AP TP / L	Level of production
L	K				
0	5	0	--	0	Increasing Marginal Returns - TP $\uparrow$ at increasing <u>rate</u> - MP$\uparrow$ > AP$\uparrow$
1	5	500	500	500	
2	5	1200	700	600	
3	5	1800	600	600	The law of decreasing returns ① - MP reaches t its max then starts to $\downarrow$ - AP$\downarrow$ (MP<AP) - TP $\uparrow$ at decreasing rate
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	② - MP =0 - TP reaches to its <u>max</u> - AP$\downarrow$
9	5	2700	-100	300	
10	5	2500	-200	250	
					③ - MP $\downarrow$ < 0 - AP $\downarrow$ > 0 - TP $\downarrow$



Chapter
07

Production, and Cost

3) Cost

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
07

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

Chapter
07

Cost

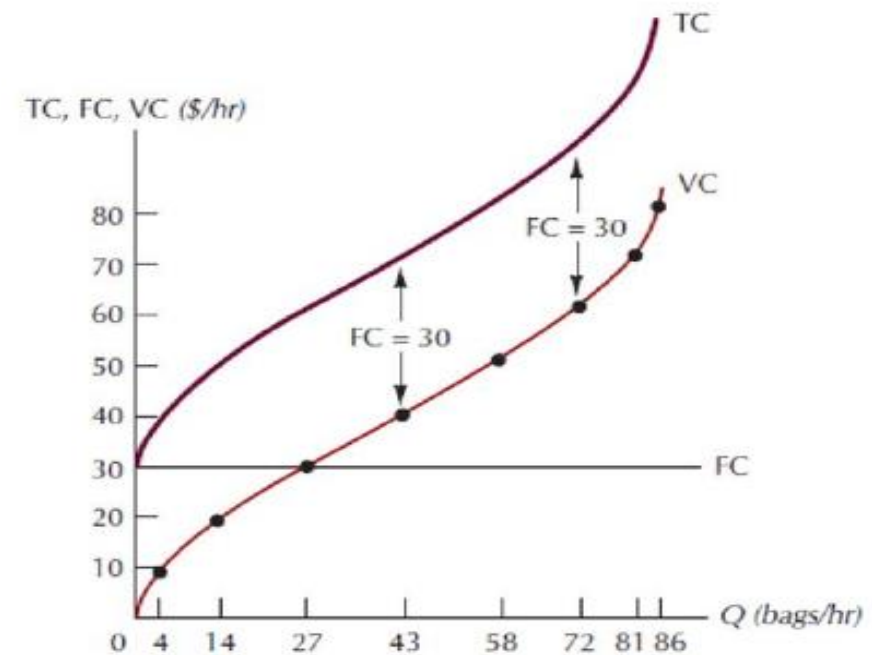
(TC) increases as output increases.

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. **$TFC = TC - TVC$**

Graphing The Total, Variable, and Fixed Cost Curves



Cost

Other Short-Run Costs

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

$$AFC_{Q_1} = \frac{FC}{Q_1} = \frac{rK_0}{Q_1}$$

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

$$AVC_{Q_1} = \frac{VC_{Q_1}}{Q_1} = \frac{wL_1}{Q_1}$$

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

$$ATC_{Q_1} = AFC_{Q_1} + AVC_{Q_1} = \frac{rK_0 + wL_1}{Q_1}$$

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

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

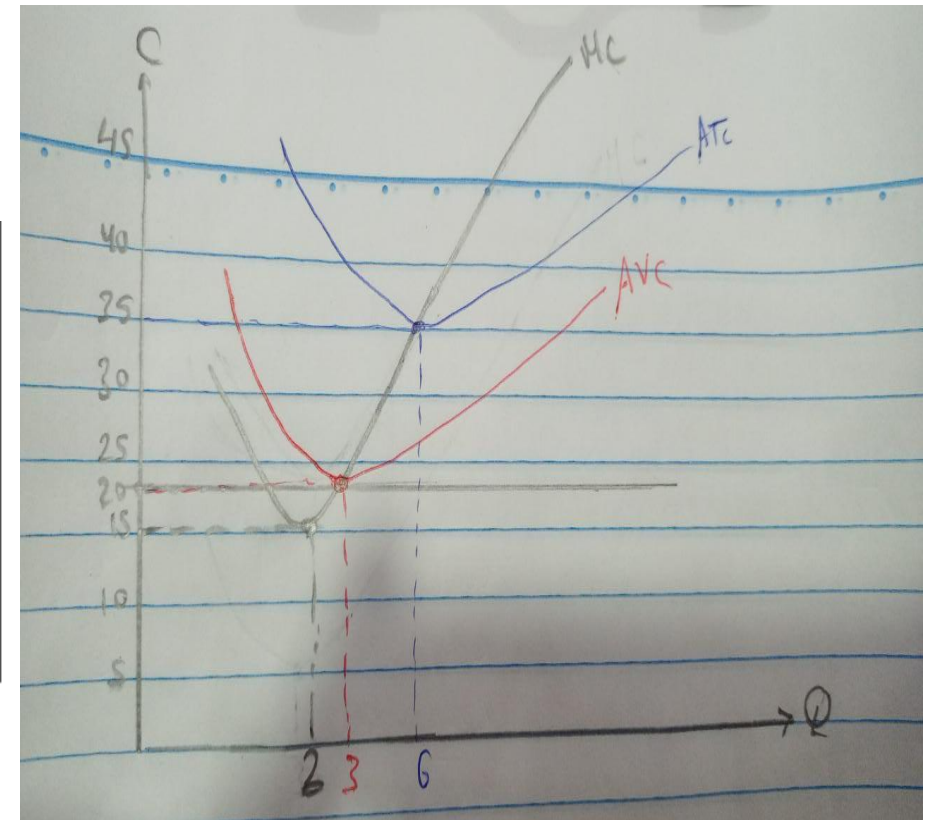


Chapter
07

Cost

Graphically

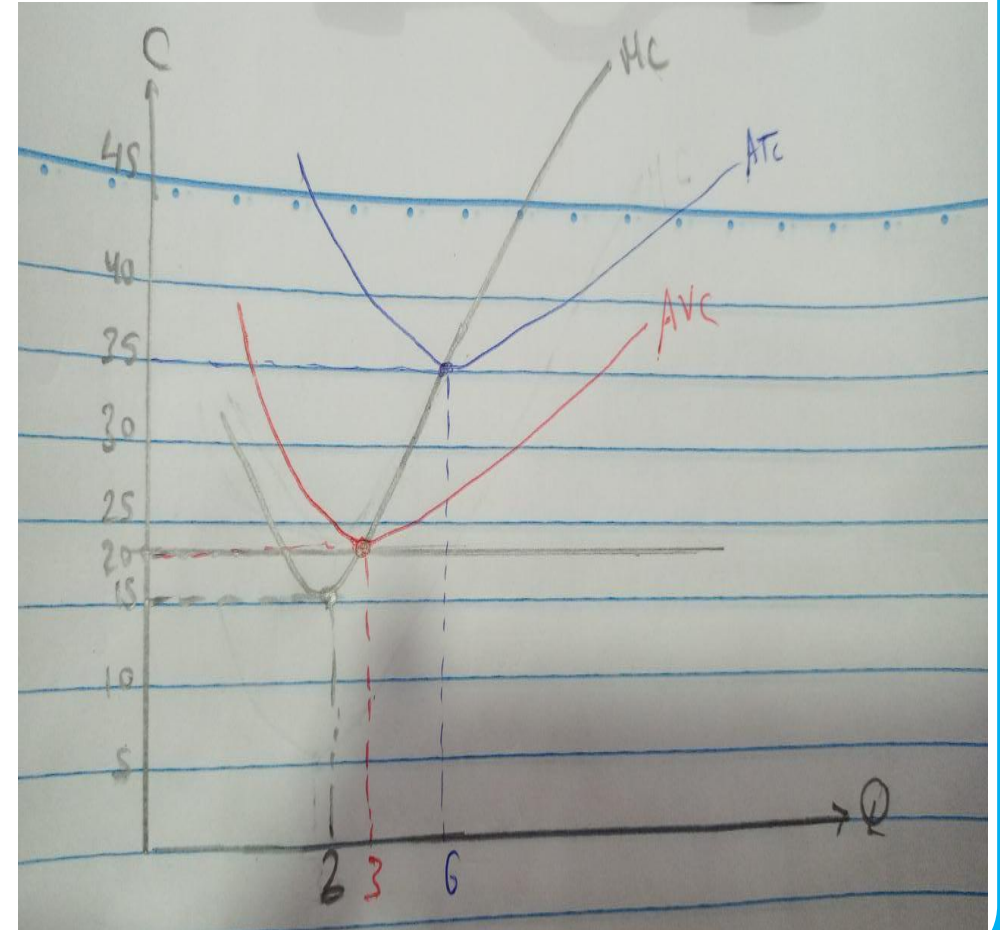
$TP = Q$	FC	VC	TC	MC	AVC	ATC
0	60	0	60	-	-	-
1	60	25	85	25	25	85
2	60	40	100	15	20	50
3	60	60	120	20	20	40
4	60	85	145	25	21.25	36.24
5	60	115	175	30	23	35
6	60	150	210	35	25	35
7	60	190	250	40	27.14	35.71



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 $MC > AVC$*



Chapter
07

Cost

$$TC = VC + FC$$

$$TC = ATC * Q$$

$$VC = TC - FC$$

$$VC = AVC * Q$$

$$FC = TC - VC$$

$$FC = AFC * Q$$

$$ATC = TC / Q$$

$$ATC = AVC + AFC$$

$$AVC = VC / Q$$

$$AVC = ATC - AFC$$

$$AFC = FC / Q$$

$$AFC = ATC - AVC$$

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

$$AP = TP / L$$

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

Think

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



Think

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.



Think

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.**



Think

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.**



Think

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.



Think

- **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.



Think

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**



Think

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.



Think

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



Think

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



Chapter
07

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**



Thank You