

**Costs and the Supply of Goods**

**Full Length Text** — Part: 5 Chapter: 20  
**Micro Only Text** — Part: 3 Chapter: 8

To Accompany "Economics: Private and Public Choice 12th ed."  
James Gwartney, Richard Stroup, Russell Sobel, & David Macpherson  
Slides authored and animated by:  
James Gwartney, David Macpherson, & Charles Skipton

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**Organization of the Business Firm**

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**Residual Claimants**

- In a market economy, firm owners are **residual claimants**.
- They have the right to any revenue after costs have been paid.
- This provides a strong incentive for owners to keep the costs of producing output low.

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### Methods of Production and Shirking

- Two principal methods of production:
  - **Contracting**
    - Owner contracts with individual workers who work independently.
  - **Team Production**
    - Workers are hired by a firm to work together under supervision.
- With team production owners must reduce the problem of **shirking** – employees working at less than the normal rate of productivity.
  - Example: long coffee break
  - Owners will attempt to control shirking through both incentives and monitoring.

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### Principal-Agent Problem

- **Principal-Agent Problem:**

The incentive problem that arises when the lack of information makes it difficult for the purchaser (*principal*) to determine whether the seller (*agent*) is acting in the principal's best interest.
- Firm owners face this problem when dealing with employees.

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### Three Types of Business Firms

- **Proprietorship:**
  - owned by a single individual
  - make up 72% of the firms in the market, but account for only 4% of total business revenue
- **Partnership:**
  - owned by two or more persons
  - 8% of the firms; 12% of business revenues
- **Corporation:**
  - owned by stockholders
  - In contrast to the unlimited liability of proprietorships and partnerships, the owners' liability is limited to their explicit investment.
  - 20% of the firms; 84% of business revenue

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## Costs, Competition, and the Corporation

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## Costs, Competition, & the Corporation

- Factors that promote cost efficiency and customer service but limit shirking by corporate managers include:
  - competition among firms for investment funds and customers
  - compensation and management incentives
  - the threat of corporate takeover

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## The Economic Role of Costs

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### The Economic Role of Costs

- The demand for a product indicates the intensity of consumers' desires for an item.
- Production of a good requires resources. The opportunity cost of these resources represents the desire of consumers for other goods that might have been produced instead.

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### Explicit and Implicit Costs

- Costs may be either *explicit* or *implicit*.

$$\text{Total Cost} = \text{explicit costs} + \text{implicit costs}$$

- **Explicit costs** result when a monetary payment is made.
- **Implicit costs** involve resources owned by the firm that do not involve a monetary payment.
  - *Examples:*
    - time spent by owner running the firm
    - the foregone normal rate of return on the owner's financial investment (*opportunity cost of equity capital*)

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### Accounting and Economic Profit

- **Economic profit** is total revenues minus total costs (including all opportunity costs).
  - **Economic profit** occurs only when the rate of return is above the normal market rate of return (the opportunity cost of capital).
    - Firms earning **zero economic profit** are earning exactly the **market** (normal) **rate of return**.
- **Accounting profit** is total revenue minus the expenses of the firm over a time period.
  - often excludes implicit costs such the opportunity cost of equity capital
  - **Accounting profit** is generally greater than **economic profit**.

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**Accounting versus Economic Profit**

<b>Total Revenue</b>			
Sales (groceries)	\$170,000		
<b>Costs (Explicit)</b>			
Groceries (wholesale)	\$76,000		
Utilities	4,000		
Taxes	6,000		
Advertising	2,000		
Labor (employees)	12,000		
<b>Total (explicit) costs</b>	<b>\$100,000</b>		
		<b>Additional (implicit) costs</b>	
		Interest (personal investment)	\$7,000
		Rent (owner's building)	18,000
		Salary (owner's labor)	50,000
		<b>Total (implicit) costs</b>	<b>\$75,000</b>
		<b>Total Explicit and Implicit costs:</b>	<b>\$175,000</b>
<b>Accounting Profit:</b>	\$70,000	<b>Economic Profit:</b>	-\$5,000

- To calculate **accounting profit**, subtract the explicit costs from total revenue.
- To calculate **economic profit**, subtract both the explicit and implicit costs from total revenue.
- Notice how economic profits are less than the accounting profits (because of the implicit costs).
- What does it mean for economic profits to be negative (as in this example) when accounting profits are positive?

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**Questions for Thought:**

- What is the principal-agent problem? Why might there be a principal-agent problem between the stockholder-owners and the managers of a large corporation?
- Which of the following is true?
  - Business owners have a strong incentive to promote the public interest and they recognize that operational efficiency will help them achieve this goal.
  - Since business owners are **residual income claimants**, they have a strong incentive to produce efficiently because lower costs will enhance their personal income.

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**Questions for Thought:**

- “When an economist says a firm is earning zero economic profit, this implies that the firm will be forced out of business in the near future unless market conditions change.” -- Is this statement *true or false*?
- Paul’s Plumbing is a small business that employs 12 people. Which of the following is the best example of an **implicit cost** incurred by this firm?
  - tax payments on property owned by the firm
  - payroll taxes on the wages of the 12 employees
  - accounting services provided free of charge to the firm by Paul’s wife, who is an accountant

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## Short-Run and Long-Run Time Periods

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## The Short Run

- The **short run** is a period of time so short that the firm's level of plant and heavy equipment (capital) is fixed.
- In the **short run**, output can only be altered by changing the usage of variable resources such as labor and raw materials.

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## The Long Run

- The **long run** is a period of time sufficient for the firm to alter all factors of production.
- In the **long run**, firms can freely enter and exit the industry.
- The time duration of the **short run** and the **long run** will differ across industries.

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## Categories of Cost

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## Total and Average Fixed Costs

- **Total Fixed Costs (TFC):**  
costs that remain unchanged in the short run when output is altered
  - *Examples:*
    - insurance premiums
    - property taxes
    - the opportunity cost of fixed assets
- **Average Fixed Costs (AFC):**  
Fixed costs per unit (i.e.  $TFC / \text{output}$ ).
  - decline as output expands

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## Total and Average Variable Costs

- **Total Variable Costs (TVC):**  
sum of costs that increase as output expands
  - *Examples:*
    - cost of labor
    - raw materials
- **Average Variable Costs (AVC):**  
variable costs per unit (i.e.  $TVC / \text{output}$ )

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### Total and Marginal Cost

- **Total Costs (TC):**  
Total Fixed Cost + Total Variable Cost
- **Average Total Costs (ATC):**  
Average Fixed Cost + Average Variable Cost
- **Marginal Cost (MC):**  
the increase in **Total Cost** associated with a one-unit increase in production
  - Typically, **MC** will decline initially, reach a minimum, and then rise.

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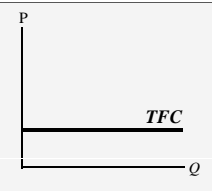
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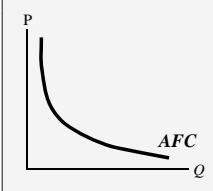
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### Short-Run Cost Curves



• **Total Fixed Costs:**  
do not vary with output; hence, they are the same whether output is set to 100,000 units or 0.



• **Average Fixed Costs:**  
will be high for small rates of output (as total fixed costs are divided by few units), but will always decline with output (as total fixed costs are divided by more and more units).

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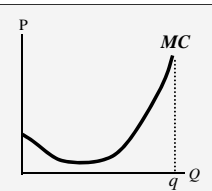
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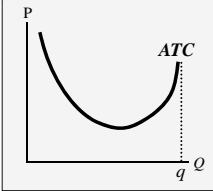
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### Short-Run Cost Curves



• **Marginal Costs:**  
rise sharply as the plant's production capacity ( $q$ ) is approached.



• **Average Total Costs:**  
will be a U-shaped curve since **AFC** will be high for small rates of output and **MC** will be high as the plant's production capacity ( $q$ ) is approached.

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## Output and Costs In the Short Run

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## Shape of the ATC Curve

- The *ATC* curve is U-shaped.
  - *ATC* is high for an underutilized plant because *AFC* is high.
  - *ATC* is high for an over-utilized plant because *MC* is high.

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## Law of Diminishing Returns and Cost Curves

- **Law of Diminishing Returns:**  
As more units of a variable resource are applied to a fixed resource, output will eventually increase by a smaller and smaller amount.
- When a firm faces diminishing returns, **marginal Costs (*MC*)** will rise with output.
  - As *MC* continues to rise, it will eventually exceed **average total costs (*ATC*)** and cause *ATC* to rise.
    - Before that point, *MC* is below *ATC* and is causing *ATC* to decline.

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**Product Curves**

- **Total Product:** total output of a good associated with different levels of a variable input
- **Marginal Product:** the change in total product due to a one unit increase in the variable input
- **Average Product:** total product divided by the number units of the variable input

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**Product Curve Approach**

As units of variable input (labor) are added to a fixed input, **total product** will increase first at an increasing rate ... then at a declining rate.

Note that the **Total Product** curve is smooth, indicating that labor can be increased by amounts of less than a single unit (it is a continuous function).

Units of variable resource	Total Product (output)	Marginal Product	Average Product
0	0		
2	20		
4	46		
6	64		
8	74		
10	73		

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**Product Curve Approach**

**Marginal Product** will first increase (when **TP** is increasing at an increasing rate), reach a maximum, and then fall (as **TP** increases at a decreasing rate).

**Average Product** will have the same general form except that its maximum point will be at a larger output level.

Average and/or marginal product

Note: **MP** always crosses **AP** at its maximum point.

Units of variable resource	Total Product (output)	Marginal Product	Average Product
0	0		
1	8	8	8.0
2	20	12	10.0
3	34	14	11.3
4	46	12	11.5
5	56	10	11.2
6	64	8	10.7
7	70	6	10.0
8	74	4	9.3
9	75	1	8.3
10	73	-2	7.3

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**12<sup>th</sup> Edition** Short Run Cost Curves

- The average variable cost curve (*AVC*) is the total variable cost (*TVC*) divided by the output level. It is higher either for a few or a lot of units and has some minimal point between the two where, when graphed later, marginal costs (*MC*) will cross.

TVC	Output per day	= AVC
0	0	---
15	1	\$ 15.00
25	2	\$ 12.50
42	4	\$ 10.50
64	6	\$ 10.67
98	8	\$ 12.25
152	10	\$ 15.20

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- To calculate the marginal cost curve (*MC*) we take the change in *TC* ( $\Delta TC$ ) and divide that by the change in output. Note: our increments for increasing output here are 1 (↘ ↗ 1).
- Note that *MC* starts low and increases as output increases. It also crosses *AVC* at its minimum point.

TC	$\Delta TC / \Delta \text{Output} = MC$	
50		
65 ↘	15 ↗ 1	\$ 15.00
75 ↘	10 ↗ 1	\$ 10.00
84 ↘	8 ↗ 1	\$ 8.00
92 ↘	8 ↗ 1	\$ 8.00
102 ↘	12 ↗ 1	\$ 12.00
114 ↘	12 ↗ 1	\$ 12.00
129 ↘	19 ↗ 1	\$ 19.00
148 ↘	19 ↗ 1	\$ 19.00
172 ↘	30 ↗ 1	\$ 30.00
202 ↘	30 ↗ 1	\$ 30.00

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- The average total cost curve (*ATC*) is simply *TC* divided by the output.
- When output is low, *ATC* is high because *AFC* is high. Also, *ATC* is high when output is large as *MC* grows large when output is high.
- These two relationships explain the distinct U-shape of the *ATC* curve.

TC	Output per day	= ATC
50	0	---
65	1	\$ 65.00
75	2	\$ 37.50
92	4	\$ 23.00
114	6	\$ 19.00
148	8	\$ 18.50
202	10	\$ 20.20

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**Questions for Thought:**

1. Which of the following must be true when average total costs are declining?

- a. average variable cost (*AVC*) must be greater than average total cost (*ATC*)
- b. marginal cost (*MC*) must be declining
- c. marginal cost (*MC*) must be less than average total cost (*ATC*)
- d. average variable cost (*AVC*) must be less than average total costs (*ATC*)

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**Questions for Thought:**

2. The short run average total cost (*ATC*) curve of a firm will tend to be U-shaped because

- a. larger firms always have lower per unit costs than smaller firms.
- b. at small output rates, average fixed costs (*AFC*) are high; at large output rates marginal costs (*MC*) are high due to diminishing returns and over-utilization of the plant.

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**Output and Costs  
In the Long Run**

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### Long Run ATC

- The long-run *ATC* shows the minimum average cost of producing each output level when a firm is able to choose plant size.

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### Planning Curve

- The *ATC* curve for the firm will depend upon the size of the plant.
- If the cost per unit varies according to the size of the facility, then a *Long Run Average Total Cost* curve (*LRATC*) can be mapped out as the surface of all the minimum points possible at all the possible degrees of scale.

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### Economies of Scale

- As output (plant size) is increased, per-unit costs will follow one of three possibilities:
  - Economies of Scale:** Reductions in per unit costs as output expands. This can occur for three reasons:
    - mass production
    - specialization
    - improvements in production as a result of experience
  - Diseconomies of Scale:** increases in per unit costs as output expands
  - Constant Returns to Scale:** unit costs are constant as output expands

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### Different Types of LRATC

- LRATC often have segments that represent: *economies of scale*, *constant returns to scale*, or *diseconomies of scale*.
- The LRATC represented below has a downward sloping segment demonstrating *economies of scale* for that range of output – meaning that an expansion of plant size can reduce per unit cost up to output level  $q$ .
- There is also an upward sloping segment, demonstrating *diseconomies of scale* – meaning that an expansion in plant size beyond output level  $q$  leads to higher per unit costs.

Cost per unit

Economies of Scale

Diseconomies of Scale

Plant of ideal size

LRATC

Output level

$q$

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### Different Types of LRATC

- The LRATC below has a downward sloping segment demonstrating *economies of scale*, an upward sloping segment, demonstrating *diseconomies of scale*, and a flat segment, demonstrating *constant returns to scale*.
- The flat region of the LRATC curve between  $q_1$  and  $q_2$  represents *constant returns to scale*. Any of the plant sizes in this region would be ideal because they minimize per unit costs.

Cost per unit

Economies of scale

Constant returns to scale

Diseconomies of scale

Plant of ideal size

LRATC

Output level

$q_1$   $q_2$

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### Different Types of LRATC

- Below, the LRATC represented has a downward sloping segment demonstrating *Economies of Scale* for the entire range of output, which implies that the most efficient size plant available would be the largest one possible.

Cost per unit

Economies of scale

Plant of ideal size

LRATC

Output level

$q$

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## What Factors Cause Cost Curves to Shift?

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## Cost Curve Shifters

- Prices of resources
- Taxes
- Regulations
- Technology

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## Higher Resource Prices and Cost

- If resource prices increase, the cost of production increases and thus the *ATC* and the *MC* shift upward simultaneously.

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## The Economic Way of Thinking about Costs

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## Sunk Costs

- **Sunk Costs** are historical costs associated with past decisions that can't be changed.
- **Sunk costs** may provide information, but are not relevant to current choices.
- Current choices should be made on current and expected future costs and benefits.

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## Cost and Supply

- When making output decisions in the short run, it is the firm's **marginal costs** that are most important.
- Additional units will not be supplied if they do not generate additional revenues that are sufficient to cover their **marginal costs**.
- For long-run output decisions, it is the firm's **average total costs** that are most important.
- Firms will not continue to supply output in the long run if revenues are insufficient to cover their **average total costs**.

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**Questions for Thought:**

1. "If a firm maximizes profit, it must minimize the cost of producing the profit-maximum output." Is this statement *true or false*?
2. Evaluate the following statement:  
"Firms that make a profit have increased the value of the resources they used; their actions created wealth. In contrast, the actions of firms that make losses reduce wealth. The discovery and undertaking of profit-making opportunities are key ingredients of economic progress."
3. Investors seeking to take over a firm often bid a positive price for the business even though it is currently experiencing losses. Why would anyone ever bid a positive price for a firm operating at a loss?

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**Questions for Thought:**

4. What is the difference between the short-run and long-run? Which of the following can be changed in the short run:  
(a) amount of heavy equipment in your plant,  
(b) the number workers employed, and,  
(c) quantity of raw materials used.
5. "The long-run average total cost (*LRATC*) curve indicates the per unit cost of producing various rates of output with a given size of plant." Is this statement *true or false*?

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**End  
Chapter 20**

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