

ECO1104E- Introduction to Microeconomics

Chapter 13



ECO1104 Microeconomics

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THE COSTS OF PRODUCTION

- In this chapter and the ones that follow, we examine firm behaviour in more detail.
- This topic will give you a better understanding of what decisions lie behind the supply curve in a market.
- In addition, it will introduce you to a part of economics called **industrial organization**: the study of how firms' decisions regarding prices and quantities depend on the market conditions they face.

THE COSTS OF PRODUCTION

- How does this difference in the number of firms affect the prices in these markets and the efficiency of the market outcomes?
- The field of industrial organization addresses exactly this question.

WHAT ARE COSTS?

- We begin our discussion of costs at Hungry Helen's Cookie Factory.
- Helen, the owner of the firm, buys flour, sugar, chocolate chips, and other cookie ingredients.
- She also buys the mixers and ovens and hires workers to run this equipment.
- She then sells the resulting cookies to consumers.

Total Revenue, Total Cost, and Profit

- **Total revenue** (for a firm): the amount a firm receives for the sale of its output
- **Total cost**: the market value of the inputs a firm uses in production
- **Profit**: total revenue minus total cost

Costs as Opportunity Costs

- The cost of something is what you give up to get it. Recall that the opportunity cost of an item refers to all those things that must be forgone to acquire that item.
- When economists speak of a firm's cost of production, they include all the opportunity costs of making its output of goods and services.

Costs as Opportunity Costs

- **Explicit costs:** input costs that require an outlay of money by the firm
- **Implicit costs:** input costs that do not require an outlay of money by the firm

The Cost of Capital as an Opportunity Cost

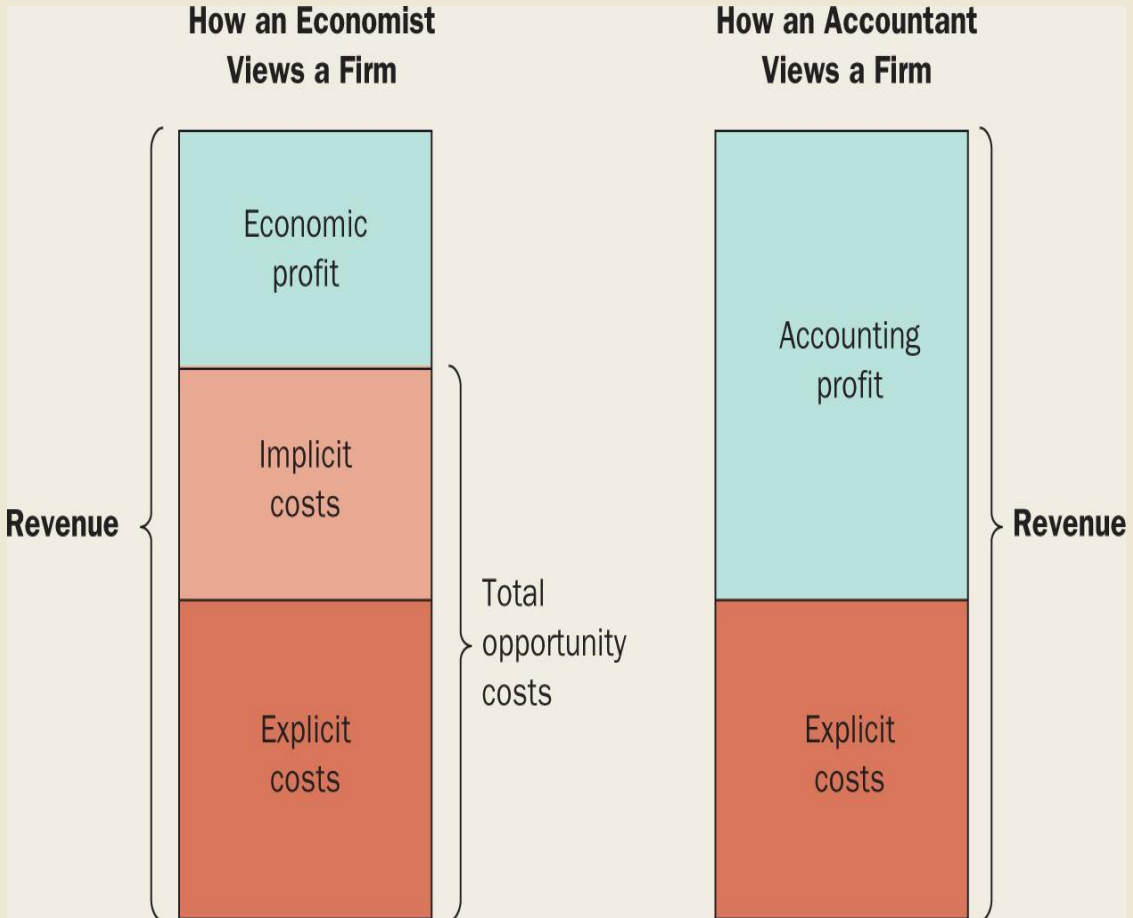
- An important implicit cost of almost every business is the opportunity cost of the financial capital that has been invested in the business.
- Helen used \$300 000 of her savings to buy her factory.
- If Helen had instead left this money in a savings account that pays an interest rate of 5 percent, she would have earned \$15 000 per year.
- This forgone \$15 000 is one of the implicit opportunity costs of Helen's business.

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Economic Profit versus Accounting Profit

- Because economists and accountants measure costs differently, they also measure profit differently.
- An economist measures a firm's economic profit as the firm's total revenue minus all the opportunity costs (explicit and implicit) of producing the goods and services sold.
- An accountant measures the firm's accounting profit as the firm's total revenue minus only the firm's explicit costs.

FIGURE 13.1: Economists versus Accountants



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PRODUCTION AND COSTS

- In the analysis that follows, we make an important simplifying assumption: We assume that the size of Helen's factory is fixed and that Helen can vary the quantity of cookies produced only by changing the number of workers.
- This assumption is realistic in the short run but not in the long run.

The Production Function

- **Production function:** the relationship between the quantity of inputs used to make a good and the quantity of output of that good

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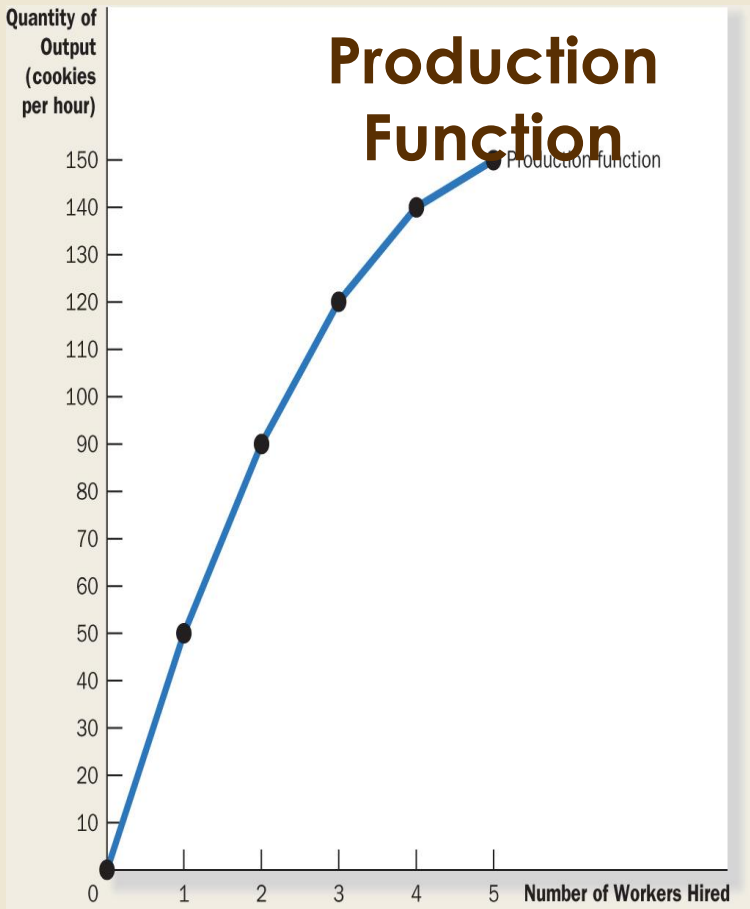
TABLE 13.1:

A Production Function and Total Cost: Hungry Helen's Cookie Factory

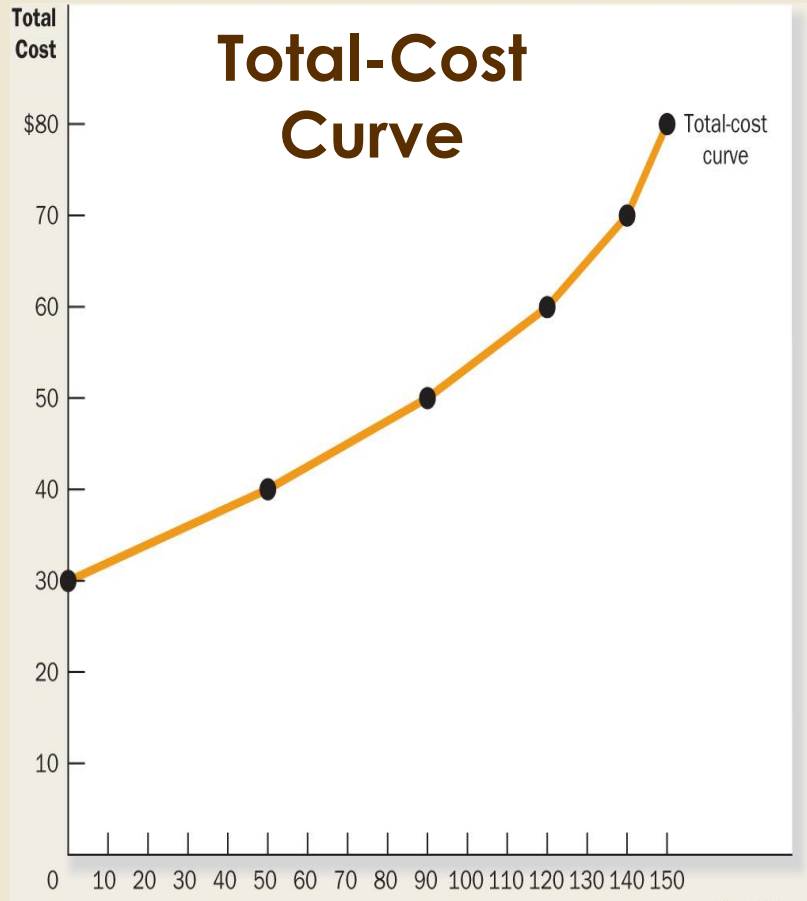
Number of Workers	Output (quantity of cookies produced per hour)	Marginal Product of Labour	Cost of Factory	Cost of Workers	Total Cost of Inputs (cost of factory + cost of workers)
0	0		\$30	\$ 0	\$30
		50			
1	50		30	10	40
		40			
2	90		30	20	50
		30			
3	120		30	30	60
		20			
4	140		30	40	70
		10			
5	150		30	50	80

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FIGURE 13.2: Hungry Helen's Cookie Factory



(a)



(b)

The Production Function

- **Marginal product:** the increase in output that arises from an additional unit of input
- **Diminishing marginal product:** the property whereby the marginal product of an input declines as the quantity of the input increases

From the Production Function to the Total-Cost Curve

- The last three columns of Table 13.1 show Helen's cost of producing cookies.
- The cost of Helen's factory is \$30 per hour, and the cost of a worker is \$10 per hour.
- If she hires one worker, her total cost is \$40.
- If she hires two workers, her total cost is \$50, and so on.
- With this information, the table now shows how the number of workers Helen hires is related to the quantity of cookies she produces and to her total cost of production.

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THE VARIOUS MEASURES OF COST

- From data on a firm's total cost, we can derive several related measures of cost, which will turn out to be useful when we analyze production and pricing decisions in future chapters.

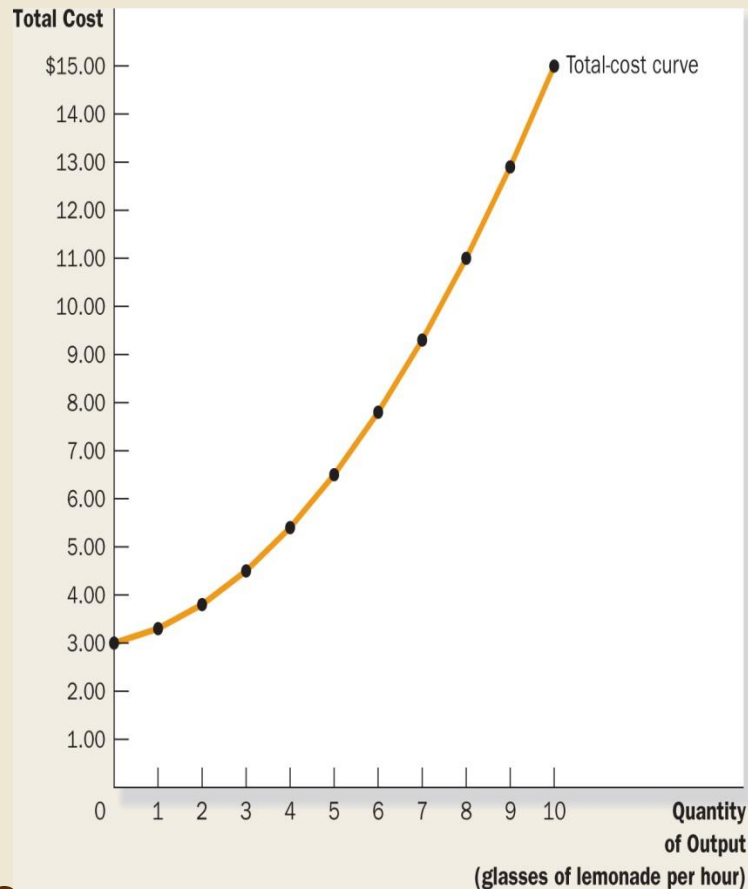
TABLE 13.2:

The Various Measures of Cost: Thirsty Thelma's Lemonade Stand

Quantity of Lemonade (glasses per hour)	Total Cost	Fixed Cost	Variable Cost	Average Fixed Cost	Average Variable Cost	Average Total Cost	Marginal Cost
0	\$3.00	\$3.00	\$0.00	—	—	—	
1	3.30	3.00	0.30	\$3.00	\$0.30	\$3.30	\$0.30
2	3.80	3.00	0.80	1.50	0.40	1.90	0.50
3	4.50	3.00	1.50	1.00	0.50	1.50	0.70
4	5.40	3.00	2.40	0.75	0.60	1.35	0.90
5	6.50	3.00	3.50	0.60	0.70	1.30	1.10
6	7.80	3.00	4.80	0.50	0.80	1.30	1.30
7	9.30	3.00	6.30	0.43	0.90	1.33	1.50
8	11.00	3.00	8.00	0.38	1.00	1.38	1.70
9	12.90	3.00	9.90	0.33	1.10	1.43	1.90
10	15.00	3.00	12.00	0.30	1.20	1.50	2.10

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FIGURE 13.3: Thirsty Thelma's Total-Cost Curve



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Fixed and Variable Costs

- **Fixed costs:** costs that do not vary with the quantity of output produced
- **Variable costs:** costs that do vary with the quantity of output produced
- A firm's total cost is the sum of fixed and variable costs.

Average and Marginal Costs

- As the owner of her firm, Thelma has to decide how much to produce.
- Thelma might ask her production supervisor the following two questions about the cost of producing lemonade:
 1. How much does it cost to make the typical glass of lemonade?
 2. How much does it cost to increase production of lemonade by one glass?

Average and Marginal Costs

- **Average total cost (ATC):** total cost divided by the quantity of output
- **Average fixed cost (AFC):** fixed costs divided by the quantity of output
- **Average variable cost (AVC):** variable costs divided by the quantity of output
- **Marginal cost (MC):** the increase in total cost that arises from an extra unit of production

Average and Marginal Costs

$$ATC = TC/Q$$

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

Active Learning

Calculating Costs

Fill in the blank spaces of this table.

Q	VC	TC	AFC	AVC	ATC	MC
0		\$50	n/a	n/a	n/a	
1	10			\$10	\$60.00	\$10
2	30	80				30
3			16.67	20	36.67	
4	100	150	12.50		37.50	
5	150			30		60
6	210	260	8.33	35	43.33	

Active Learning

Answers

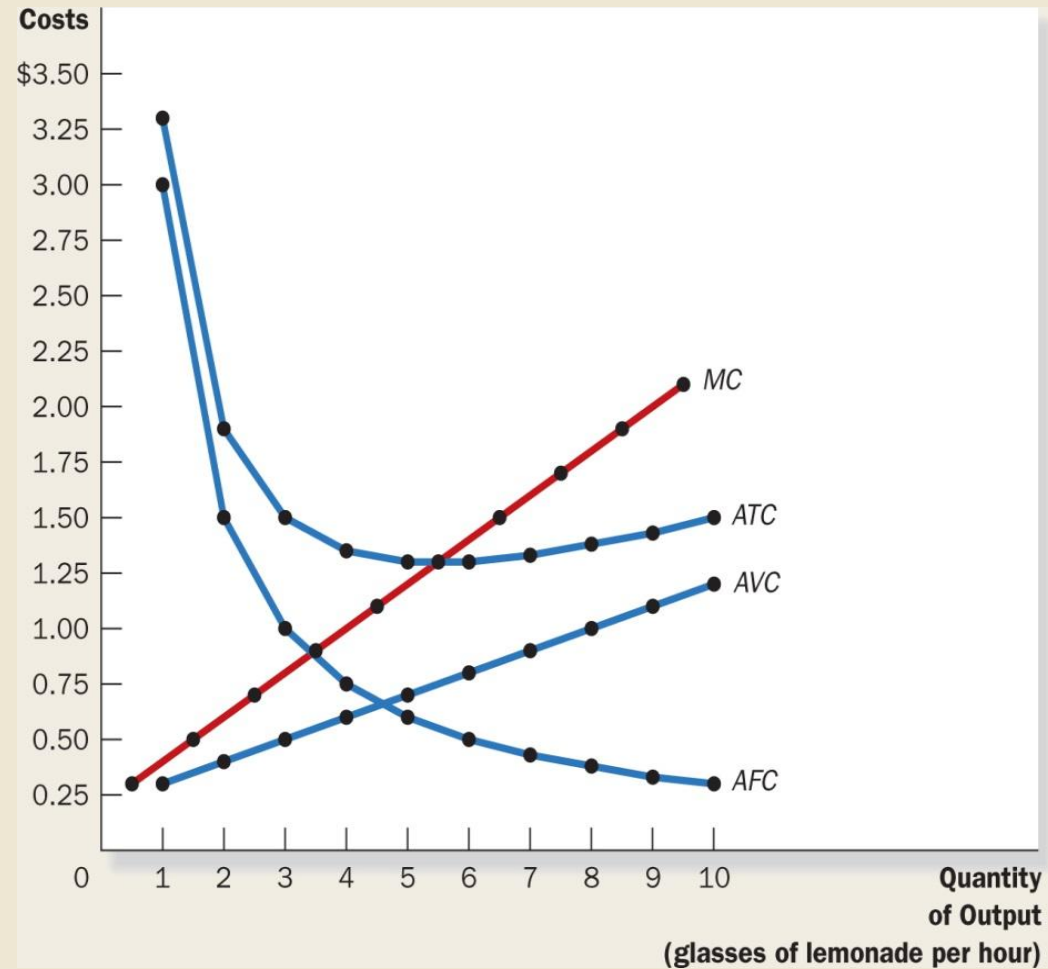
First, deduce $FC = \$50$ and use $FC + VC = TC$.

Q	VC	TC	AFC	AVC	ATC	MC
0	\$0	\$50	n/a	n/a	n/a	
1	10	60	50.00	\$10	60.00	\$10
2	30	80	25.00	15	40.00	20
3	60	110	16.67	20	36.67	30
4	100	150	12.50	25	37.50	40
5	150	200	10.00	30	40.00	50
6	210	260	8.33	35	43.33	60

Cost Curves and Their Shapes

- Graphs of average and marginal cost are useful when analyzing the behaviour of firms.

FIGURE 13.4: Thirsty Thelma's Average-Cost and Marginal-Cost Curves



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Cost Curves and Their Shapes

Rising Marginal Cost

- Thirsty Thelma's marginal cost rises with the quantity of output produced.
- This reflects the property of diminishing marginal product.

Cost Curves and Their Shapes

U-Shaped Average Total Cost

- To understand why this is so, remember that average total cost is the sum of average fixed cost and average variable cost.
- Average fixed cost always declines as output rises because the fixed cost is spread over a larger number of units.
- Average variable cost typically rises as output increases because of diminishing marginal product.

Cost Curves and Their Shapes

Efficient scale: the quantity of output that minimizes average total cost

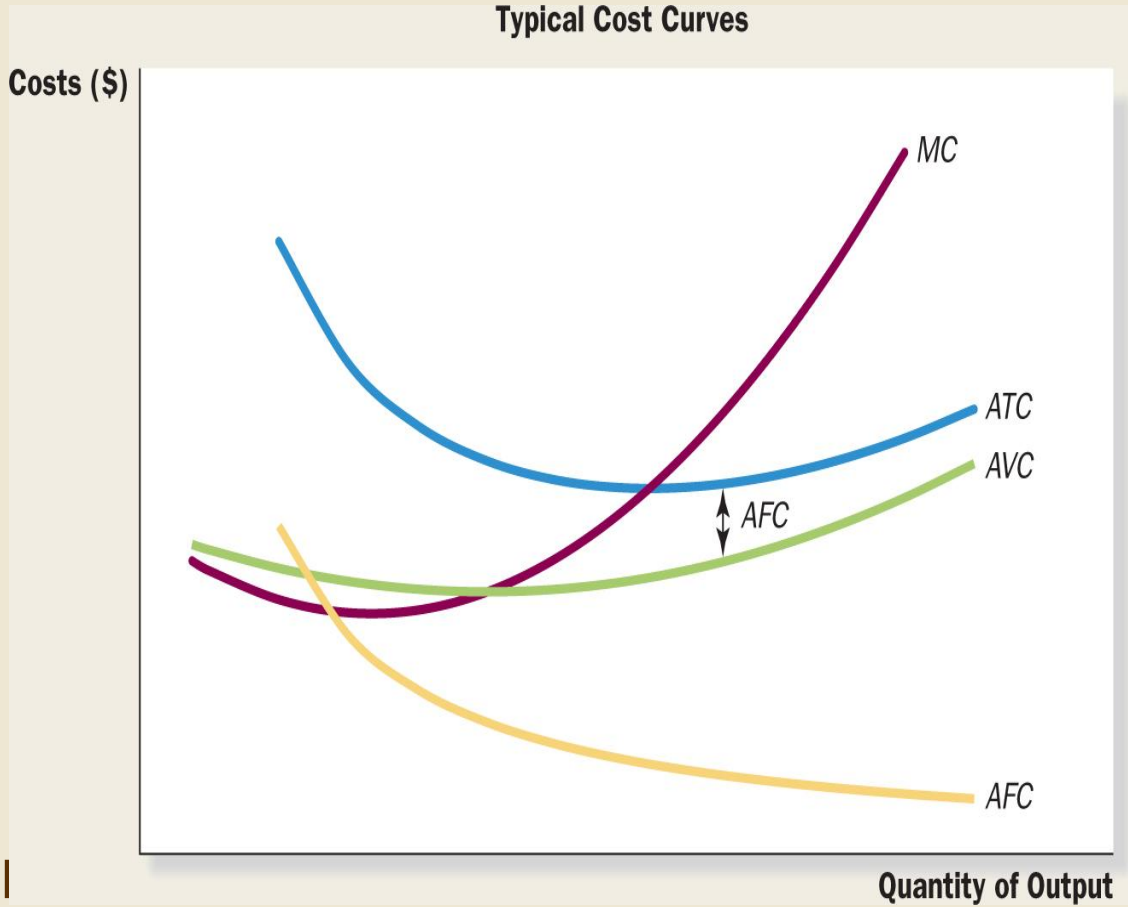
Cost Curves and Their Shapes

The Relationship between Marginal Cost and Average Total Cost

- Whenever marginal cost is less than average total cost, average total cost is falling.
- Whenever marginal cost is greater than average total cost, average total cost is rising.

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FIGURE 13.5: Cost Curves for a Typical Firm



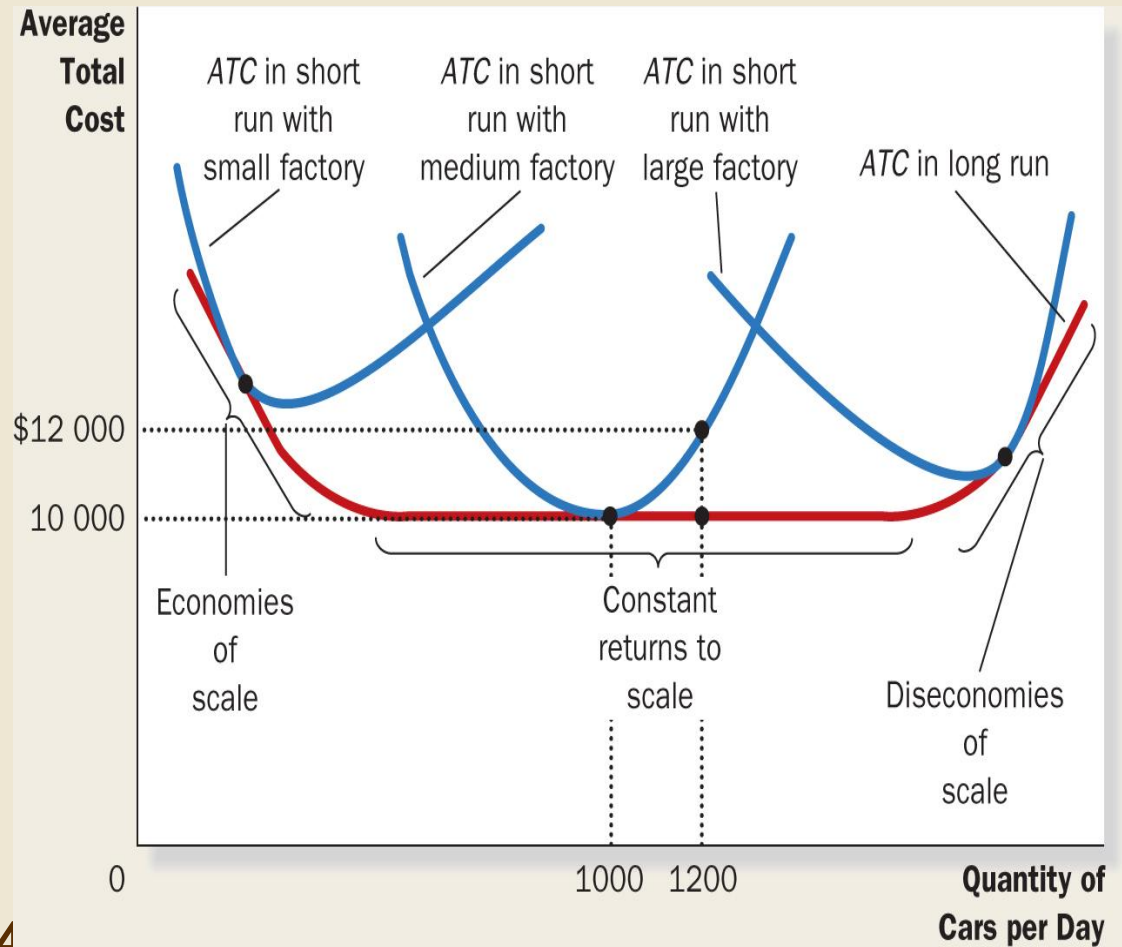
Typical Cost Curves

- The cost curves shown here share the three properties that are most important to remember:
 1. Marginal cost eventually rises with the quantity of output.
 2. The average-total-cost curve is U-shaped.
 3. The marginal-cost curve crosses the average-total-cost curve at the minimum of average total cost.

COSTS IN THE SHORT RUN AND IN THE LONG RUN

- We noted earlier in this chapter that a firm's costs might depend on the time horizon being examined.

FIGURE 13.6: Average Total Cost in the Short and Long Runs



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The Relationship between Short-Run and Long-Run Average Total Cost

- For many firms, the division of total costs between fixed and variable costs depends on the time horizon.
- Because many decisions are fixed in the short run but variable in the long run, a firm's long-run cost curves differ from its short-run cost curves.

Economies and Diseconomies of Scale

- **Economies of scale:** the property whereby long-run average total cost falls as the quantity of output increases
- **Diseconomies of scale:** the property whereby long-run average total cost rises as the quantity of output increases
- **Constant returns to scale:** the property whereby long-run average total cost stays the same as the quantity of output changes

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TABLE 13.3:

The Many Types of Cost: A Summary

Term	Definition	Mathematical Description
Explicit costs	Costs that require an outlay of money by the firm	—
Implicit costs	Costs that do not require an outlay of money by the firm	—
Fixed costs	Costs that do not vary with the quantity of output produced	FC
Variable costs	Costs that do vary with the quantity of output produced	VC
Total cost	The market value of all the inputs that a firm uses in production	$TC = FC + VC$
Average fixed cost	Fixed costs divided by the quantity of output	$AFC = FC/Q$
Average variable cost	Variable costs divided by the quantity of output	$AVC = VC/Q$
Average total cost	Total cost divided by the quantity of output	$ATC = TC/Q$
Marginal cost	The increase in total cost that arises from an extra unit of production	$MC = \Delta TC / \Delta Q$

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