This part focuses on different types of markets, each defined by a set of characteristics that determine corresponding demand and supply conditions. Chapter 8 describes a highly competitive market consisting of an extremely large number of competing firms, and Chapter 9 explains the theory for a market with only a single seller. Between these extremes, Chapter 10 discusses two markets that have some characteristics of both competition and monopoly. The part concludes by developing labor market theory in Chapter 11.
Ostrich farmers in Iowa, Texas, Oklahoma, and other states in the Midwest “stuck their necks out.” Many invested millions of dollars converting a portion of their farms into breeding grounds for ostriches. The reason was that mating pairs of ostriches were selling for $75,000. During the late 1980s, ostrich breeders dubbed ostrich meat the low-cholesterol health treat of the 1990s, and ostrich prices rose. The high prices for ostriches fueled profit expectations, and many cattle ranchers deserted their cattle and went into the ostrich business.

Adam Smith concluded that competitive forces are like an “invisible hand” that leads people who simply pursue their own interests and, in the process, serve the interests of society. In a competitive market, when the profit potential in the ostrich business looked good, firms entered this market and started raising ostriches. Over time more and more ostrich farmers flocked to this market, and the ostrich population exploded. As a result, prices and profits tumbled, and the number of ostrich farms declined in the late 1990s. In 2001, demand increased unexpectedly because with the mad cow disease plaguing Europe, people bought alternatives to beef. Profits rose again, causing farmers to increase supply by investing in more ostriches.

This chapter combines the demand, cost of production, and marginal analysis concepts from previous chapters to explain how competitive markets determine prices, output, and profits. Here firms are small, like an ostrich ranch or an alligator farm, rather than huge, like Sears, ExxonMobil, or IBM. Other types of markets in which large and powerful firms operate are discussed in the next two chapters.
In this chapter, you will learn to solve these economics puzzles:

- Why is the demand curve horizontal for a firm in a perfectly competitive market?
- Why would a firm stay in business while losing money?
- In the long run, can alligator farms earn an economic profit?

Perfect Competition

Firms sell goods and services under different market conditions, which economists call market structures. A market structure describes the key traits of a market, including the number of firms, the similarity of the products they sell, and the ease of entry into and exit from the market. Examination of the business sector of our economy reveals firms operating in different market structures. In this chapter and the two chapters that follow, we will study four market structures. The first is perfect competition, to which this entire chapter is devoted. Perfect, or pure, competition is a market structure characterized by (1) a large number of small firms, (2) a homogeneous product, and (3) very easy entry into or exit from the market. Let’s discuss each of these characteristics.

Characteristics of Perfect Competition

Large Number of Small Firms. How many sellers is a large number? And how small is a small firm? Certainly, one, two, or three firms in a market would not be a large number. In fact, the exact number cannot be stated. This condition is fulfilled when each firm in a market has no significant share of total output and, therefore, no ability to affect the product’s price. Each firm acts independently, rather than coordinating decisions collectively. For example, there are thousands of independent egg farmers in the United States. If any single egg farmer raises the price, the going market price for eggs is unaffected.

Conclusion The large-number-of-sellers condition is met when each firm is so small relative to the total market that no single firm can influence the market price.

Homogeneous Product. In a perfectly competitive market, all firms produce a standardized or homogeneous product. This means the good or service of each firm is identical. Farmer Brown’s wheat is identical to Farmer Jones’s wheat. Buyers may believe the transportation services of one independent trucker are about the same as another’s services. This assumption rules out rivalry among firms in advertising and quality differences.

Conclusion If a product is homogeneous, buyers are indifferent as to which seller’s product they buy.
Very Easy Entry and Exit. Very easy entry into a market means that a new firm faces no barriers to entry. Barriers can be financial, technical, or government-imposed barriers, such as licenses, permits, and patents. Anyone who wants to try his or her hand at raising ostriches needs only a plot of land and feed.

Conclusion  Perfect competition requires that resources be completely mobile to freely enter or exit a market.

No real-world market exactly fits the three assumptions of perfect competition. The perfectly competitive market structure is a theoretical or ideal model, but some actual markets do approximate the model fairly closely. Examples include farm products markets, the stock market, and the foreign exchange market.

The Perfectly Competitive Firm as a Price Taker

For model-building purposes, suppose a firm operates in a market that conforms to all three of the requirements for perfect competition. This means that the perfectly competitive firm is a price taker. A price taker is a seller that has no control over the price of the product it sells. From the individual firm’s perspective, the price of its products is determined by market supply and demand conditions over which the firm has no influence. Look again at the characteristics of a perfectly competitive firm: a small firm that is one among many firms, sells a homogeneous product, and is exposed to competition from new firms entering the market. These conditions make it impossible for the perfectly competitive firm to have the market power to affect the market price. Instead, the firm must adjust to or “take” the market price.

Exhibit 1 is a graphical presentation of the relationship between the market supply and demand for electronic components and the demand curve facing a firm in a perfectly competitive market. Here we will assume that the electronic components industry is perfectly competitive, keeping in mind that the real-world market does not exactly fit the model. Exhibit 1(a) shows market supply and demand curves for the quantity of output per hour. The theoretical framework for this model was explained in Chapter 4. The equilibrium price is $70 per unit, and the equilibrium quantity is 60,000 units per hour.

Because the perfectly competitive firm “takes” the equilibrium price, the individual firm’s demand curve in Exhibit 1(b) is perfectly elastic (horizontal) at the $70 market equilibrium price. (Note the difference between the firm’s units per hour and the industry’s thousands of units per hour.) Recall from Chapter 5 that when a firm facing a perfectly elastic demand curve tries to raise its price one penny higher than $70, no buyer will purchase its product [Exhibit 2(a) in Chapter 5.] The reason is that many other firms are selling the same product at $70 per unit. Hence, the perfectly competitive firm will not set the price above the prevailing market price and risk selling zero output. Nor will the firm set the price below the market price because the firm can sell all it wants to at the going price; therefore, a lower price would reduce the firm’s revenue.

Price taker
A seller that has no control over the price of the product it sells.

Auctions are often considered to be competitive markets. Auctions over the Internet are now quite common. For example, visit eBay (http://pages.ebay.com/) and click on Live Auctions. To see another live Internet auction, visit “ON-SALE Interactive Marketplace,” a live Internet auction house offering computers and electronics (http://www.onsale.com/). For more about how auctions work, visit the Auction Marketing Institute (AMI), a nonprofit professional educational organization (http://www.auctionmarketing.org/).
Short-Run Profit Maximization for a Perfectly Competitive Firm

Since the perfectly competitive firm has no control over price, what does the firm control? The firm makes only one decision—what quantity of output to produce that maximizes profit. In this section, we develop two profit maximization methods that determine the output level for a competitive firm. We begin by examining the total revenue–total cost approach for finding the profit-maximizing level of output. Next, we use marginal analysis to show another method for determining the profit-maximizing level of output. The framework for our analysis is the short run with some fixed input, such as factory size.

The Total Revenue–Total Cost Method

Exhibit 2 provides hypothetical data on output, total revenue, total cost, and profit for our typical electronic components producer—Computech. Using Computech as our example allows us to extend the data and analysis.
The total revenue in column 2 of Exhibit 2 and is computed as the product price times the quantity. In this case, we assume the market equilibrium price is $70 per unit, as determined in Exhibit 1. Because Computech is a price taker, the total revenue from selling 1 unit is $70, from selling 2 units is $140, and so on. Subtracting total cost in column 3 from total revenue in column 2 gives the total profit or loss (column 4) that the firm earns at each level of output. From zero to 2 units, the firm incurs losses, and then a break-even point (zero economic profit) occurs at about 3 units per hour. If the firm produces 9 units per hour, it earns the maximum profit of $205 per hour. As output expands, between 9 and 12 units of output, the firm’s profit diminishes. Exhibit 3 illustrates graphically that the maximum profit occurs where the vertical distance between the total revenue and the total cost curves is at a maximum.

**The Marginal Revenue Equals Marginal Cost Method**

A second approach uses *marginal analysis* to determine the profit-maximizing level of output by comparing marginal revenue (marginal benefit) and marginal cost. Column 5 of Exhibit 2 gives marginal cost data calculated in

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**EXHIBIT 2 Short-Run Profit Maximization Schedule for Computech as a Perfectly Competitive Firm**

<table>
<thead>
<tr>
<th>(1) Output (units per hour)</th>
<th>(2) Total revenue</th>
<th>(3) Total cost</th>
<th>(4) Profit [(2) − (3)]</th>
<th>(5) Marginal cost ([\Delta(3)/\Delta(1)])</th>
<th>(6) Marginal revenue ([\Delta(2)/\Delta(1)])</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>840</td>
<td>712</td>
<td>128</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

presented in previous chapters. The total cost figures in column 3 are taken from Exhibit 3 in Chapter 7. Total fixed cost at zero output is $100.
This exhibit shows the profit-maximizing level of output chosen by a perfectly competitive firm, Computech. Part (a) shows the relationships among total revenue, total cost, and output, given a market price of $70 per unit. The maximum profit is earned by producing 9 units per hour. At this level of output, the vertical distance between the total revenue and the total cost curves is the greatest.

Profit maximization is also shown in part (b). The maximum profit of $205 per hour corresponds to the profit-maximizing output of 9 units per hour, represented in part (a).
column 5 of Exhibit 3 in Chapter 7. Recall that marginal cost is the change in total cost as the output level changes one unit. As in Exhibit 3 in Chapter 7, these marginal cost data are listed between the quantity of output line entries.

Now we introduce marginal revenue \((MR)\), a concept similar to marginal cost. Marginal revenue is the change in total revenue from the sale of one additional unit of output. Stated another way, marginal revenue is the ratio of the change in total revenue to a one-unit change in output. Mathematically,

\[
MR = \frac{\text{change in total revenue}}{\text{one-unit change in output}}
\]

As shown in Exhibit 1(b), the perfectly competitive firm faces a perfectly elastic demand curve. Because the competitive firm is a price taker, the sale of each additional unit adds to total revenue an amount equal to the price (average revenue, \(TR/Q\)). In our example, Computech adds $70 to its total revenue each time it sells one unit. Therefore, $70 is the marginal revenue for each additional unit of output in column 6 of Exhibit 2.

**Conclusion** In perfect competition, the firm’s marginal revenue equals the price that the firm views as a horizontal demand curve.

Columns 2 and 3 in Exhibit 2 show that both total revenue and total cost rise as the level of output increases. Now compare marginal cost and marginal revenue in columns 5 and 6. As explained, marginal revenue remains equal to the price, but marginal cost follows the J-shaped pattern introduced in Exhibit 3 in Chapter 7. At first, marginal cost is below marginal revenue, and this means that producing each additional unit adds less to total cost than to total revenue. Economic profit therefore increases as output expands from zero until the output level reaches 9 units per hour. Over this output range, Computech moves from a $100 loss to a $205 profit per hour. Beyond an output level of 9 units per hour, marginal cost exceeds marginal revenue, and profit falls. This is because each additional unit of output raises total cost by more than it raises total revenue. In this case, profit falls from $205 to only $128 per hour as output increases from 9 to 12 units per hour.

Our example leads to this question: How does the firm use its marginal revenue and marginal cost curves to determine the profit-maximizing level of output? The answer is that the firm follows a guideline called the \(MR = MC\) rule: the firm maximizes profit by producing the output where marginal revenue equals marginal cost. Exhibit 4 relates the marginal revenue curve equals marginal cost curve condition to profit maximization. In Exhibit 4(a), the perfectly elastic demand is drawn at the industry-determined price of $70. The average total cost \((ATC)\) curve is traced from data given earlier in column 8 of Exhibit 3 in Chapter 7. Note that Exhibit 4(a) reproduces Exhibit 4(b) in Chapter 7, except for the omission of the \(AFC\) curve.
EXHIBIT 4  Short-Run Profit Maximization Using the Marginal Revenue Equals Marginal Cost Method

In addition to comparing total revenue and total cost, a firm can find the profit-maximizing level of output by comparing marginal revenue and marginal cost. As shown in part (a), profit is at a maximum where marginal revenue equals marginal cost at $70 per unit. The intersection of the marginal revenue and the marginal cost curves establishes the profit-maximizing output at 9 units per hour.

A profit curve is depicted separately in part (b) to show that the maximum profit occurs when the firm produces at the level of output corresponding to the marginal revenue equals marginal cost point.
Using marginal analysis, we can relate the \( MR = MC \) rule to the same profit curve given in Exhibit 3(b), which is reproduced in Exhibit 4(b). Between 8 and 9 units of output, the \( MC \) curve is below the \( MR \) curve ($59 < $70), and the profit curve rises to its peak. Beyond 9 units of output, the \( MC \) curve is above the \( MR \) curve, and the profit curve falls. For example, between 9 and 10 units of output, marginal cost is $75, and marginal revenue is $70. Therefore, if the firm produces at 9 units of output rather than, say, 8 or 10 units of output, the \( MR \) curve equals the \( MC \) curve, and profit is maximized.

You can also calculate profit directly from Exhibit 4(a). At the profit-maximizing level of output of 9 units, the vertical distance between the demand curve and the \( ATC \) curve is the average profit per unit. Multiplying the average profit per unit times the quantity of output gives the profit \([($70 - $47.22) \times 9 = $205.22]\).\(^1\) The shaded rectangle also represents the maximum profit of $205 per hour. Note that we have arrived at the same profit maximization amount ($205) derived by comparing the total revenue and the total cost curves.

### Short-Run Loss Minimization for a Perfectly Competitive Firm

Because the perfectly competitive firm must take the price determined by market supply and demand forces, market conditions can change the prevailing price. When the market price drops, the firm can do nothing but adjust its output to make the best of the situation. Here only the marginal approach is used to predict output decisions of firms. Our model therefore assumes that business managers make their output decisions by comparing the marginal effect on profit of a marginal change in output.

#### A Perfectly Competitive Firm Facing a Short-Run Loss

Suppose a decrease in the market demand for electronic components causes the market price to fall to $35. As a result, the firm’s horizontal demand curve shifts downward to the new position shown in Exhibit 5(a). In this case, there is no level of output at which the firm earns a profit because any price along the demand curve is below the \( ATC \) curve.

Since Computech cannot make a profit, what output level should it choose? The logic of the \( MR = MC \) rule given in the profit maximization case applies here as well. At a price of $35, \( MR = MC \) at 6 units per hour. Comparing parts (a) and (b) of Exhibit 5 shows that the firm’s loss will be minimized at this level of output. The minimum loss of $70 per hour is equal to the shaded area, which is the average loss per unit times the quantity of output \([($35 - $46.66) \times 6 = -$70]\).

\(^1\)In Exhibit 3 in Chapter 7, the average total cost figure at 9 units of output was rounded to $47. It also should be noted that there is often no level of output for which marginal revenue exactly equals marginal cost when dealing with whole units of output.
Note that although the price is not high enough to pay the average total cost, the price is high enough to pay the average variable cost. Each unit sold also contributes to paying a portion of the average fixed cost, which is the vertical distance between the ATC and the AVC curves. This analysis leads us to extend the MR = MC rule: The firm maximizes profit or minimizes loss by producing the output where marginal revenue equals marginal cost.

If the market price is less than the average total cost, the firm will produce a level of output that keeps its loss to a minimum. In part (a), the given price is $35 per unit, and marginal revenue equals marginal cost at an output of 6 units per hour.

Part (b) shows that the firm’s loss will be greater at any output other than where the marginal revenue and the marginal cost curves intersect. Because the price is above the average variable cost, each unit of output sold pays for the average variable cost and a portion of the average fixed cost.
A Perfectly Competitive Firm Shutting Down

What happens if the market price drops below the AVC curve, as shown in Exhibit 6? For example, if the price is $25 per unit, should Computech produce some level of output? The answer is no. The best course of action is for the firm to shut down. If the price is below the minimum point on the AVC curve, each unit produced would not cover the variable cost per unit, and, therefore, operating would increase losses. The firm is better off shutting down and producing zero output. While shut down, the firm might keep its factory, pay fixed costs, and hope for higher prices soon. If the firm does not believe market conditions will improve, it will avoid fixed costs by going out of business.

Short-Run Supply Curves Under Perfect Competition

The preceding examples provide a framework for a more complete explanation of the supply curve than was given earlier in Chapter 3. We now develop the short-run supply curve for an individual firm and then derive it for an industry.

The Perfectly Competitive Firm’s Short-Run Supply Curve

Exhibit 7 reproduces the cost curves from our Computech example. Also represented in the exhibit are three possible demand curves the firm might face—MR₁, MR₂, and MR₃. As the marginal revenue curve moves upward along the marginal cost curve, the MR = MC point changes.

Suppose demand for electronic components begins at a market price close to $30. Point A therefore corresponds to a price equal to MR₁, which equals MC at the lowest point on the AVC curve. At any lower price, the firm cuts its loss by shutting down. At a price of about $30, however, the firm produces 5.5 units per hour. Point A is therefore the lowest point on the individual firm’s short-run supply curve.

CHECKPOINT

Should Motels Offer Rooms at the Beach for Only $50 a Night?

Myrtle Beach, South Carolina, with its famous Grand Strand and Calabash seafood, is lined with virtually identical motels. Summertime rates run about $200 a night. During the winter, one can find rooms for as little as $50 a night. Assume the average fixed cost of a room per night, including insurance, taxes, and depreciation, is $50. The average guest-related cost for a room each night, including cleaning service and linens, is $45. Would these motels be better off renting rooms for $50 in the off-season or shutting down until summer?
If the price rises to $45, represented in the exhibit by \( MR_2 \), the firm breaks even and earns a normal profit at point \( B \) with an output of 7 units per hour. As the marginal revenue curve rises, the firm’s supply curve is traced by moving upward along its \( MC \) curve. At a price of $90, point \( C \) is reached. Now \( MR_3 \) intersects the \( MC \) curve at an output of 10 units per hour, and the firm earns an economic profit. If the price rises higher than $90, the firm will continue to increase the quantity supplied and increase its maximum profit.

We can now define a perfectly competitive firm’s short-run supply curve. The perfectly competitive firm’s short-run supply curve is its marginal cost curve above the minimum point on its average variable cost curve.

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**Perfectly competitive firm’s short-run supply curve**

The firm’s marginal cost curve above the minimum point on its average variable cost curve.

---

<table>
<thead>
<tr>
<th>Price and cost per unit (dollars)</th>
<th>Quantity of output (units per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
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<td>110</td>
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<td>120</td>
<td>12</td>
</tr>
</tbody>
</table>

**EXHIBIT 6**

The Short-Run Shutdown Point

The shutdown point of $30 per unit is the minimum point on the average variable cost curve. If the price falls below this point, the firm shuts down. The reason is that operating losses are now greater than the total fixed cost. In this exhibit, the price of $25 per unit (MR) is below the average variable cost curve at any level of output, so the firm would shut down at this price.
The Perfectly Competitive Industry’s Short-Run Supply Curve

Understanding that the firm’s short-run supply curve is the segment of its \( MC \) curve above its \( AVC \) curve sets the stage for derivation of the perfectly competitive industry’s short-run supply curve. The perfectly competitive industry’s short-run supply curve is the horizontal summation of the marginal cost curves of all firms in the industry above the minimum point of each firm’s average variable cost curve.

In Exhibit 7 in Chapter 3, we drew a market supply curve. Now we will reconstruct this market, or industry, supply curve using more precision. Although in perfect competition there are many firms, we suppose for simplicity that the industry has only two firms, Computech and Western Computer Co. Exhibit 8 illustrates the \( MC \) curves for these two firms. Each firm’s \( MC \) curve is drawn for prices above the minimum point on the \( AVC \) curve. At a price of $40, the quantity supplied by Computech is 7 units, and the quantity supplied by Western Computer Co. is 11 units. Now we horizontally add these two quantities and obtain one point on the industry supply curve corresponding to a price of $40 and 18 units. Following this procedure for all prices, we generate the short-run industry supply curve.

Note that the industry supply curve derived above is based on the assumption that input prices remain unchanged as output expands. In the next section, we will learn how changes in input prices affect derivation of the supply curve.
Short-Run Equilibrium for a Perfectly Competitive Firm

Exhibit 9 illustrates a condition of short-run equilibrium under perfect competition. Exhibit 9(a) represents the equilibrium price and cost situation for one of the many firms in an industry. As shown in the exhibit, the firm earns an economic profit in the short run by producing 9 units. Exhibit 9(b) depicts short-run equilibrium for the industry. As explained earlier, the industry supply curve is the aggregate of each firm's MC curve above the minimum point on the AVC curve. Including industry demand establishes the equilibrium price of $60 that all firms in the industry must take. The industry's equilibrium quantity supplied is 60,000 units. This state of short-run equilibrium will remain until some factor changes and causes a new equilibrium condition in the industry.

Long-Run Supply Curves Under Perfect Competition

Recall from Chapter 7 that all inputs are variable in the long run. Existing firms in an industry can react to profit opportunities by building larger or smaller plants, buying or selling land and equipment, or varying other inputs that are fixed in the short run. Profits also attract new firms to an industry, while losses cause some existing firms to leave the industry. As you will now see, the free entry and exit characteristic of perfect competition is a crucial determinant of the shape of the long-run supply curve.
Long-Run Equilibrium for a Perfectly Competitive Firm

As discussed in Chapter 7, in the long run a firm can change its plant size or any input used to produce a product. This means that an established firm can decide to leave an industry if it earns below normal profits (negative economic profits) and that new firms may enter an industry in which earnings of established firms exceed normal profits (positive economic profits). This process of entry and exit of firms is the key to long-run equilibrium. If there are economic profits, new firms enter the industry and shift the short-run supply curve to the right. This increase in short-run supply causes the price to fall until economic profits reach zero in the long run. On the other hand, if there are economic losses in an industry, existing firms leave, causing the short-run supply curve to shift to the left, and the price rises. This adjustment continues until economic losses are eliminated and economic profits equal zero in the long run.

Exhibit 10 shows a typical firm in long-run equilibrium. Supply and demand for the market as a whole set the equilibrium price. Thus, in the long run, the firm faces an equilibrium price of $60. Following the MR = MC
rule, the firm produces an equilibrium output of 6 units per hour. At this output level, the firm earns a normal profit (zero economic profit) because marginal revenue (price) equals the minimum point on both the short-run average total cost ($SRATC$) curve and the long-run average cost ($LRAC$) curve. Given the U-shaped $LRAC$ curve, the firm is producing with the optimal factory size.

With $SRMC$ representing short-run marginal cost, the conditions for long-run perfectly competitive equilibrium can also be expressed as an equality:

\[ P = MR = SRMC = SRATC = LRAC \]

As long as none of the variables in the above formula changes, there is no reason for a perfectly competitive firm to change its output level, factory size, or any aspect of its operation. Everything is just right! Because the typical firm is in a state of equilibrium, the industry is also at rest. Under long-run equilibrium conditions, there are neither positive economic profits to attract new firms to enter the industry nor negative economic profits to force existing firms to leave. In long-run equilibrium, maximum efficiency is achieved. The
adjustment process of firms moving into or out of the industry is complete, and the firms charge the lowest possible price to consumers. Next, we will discuss how the firm and industry adjust when market demand changes.

Three Types of Long-Run Supply Curves

There are three possibilities for a perfectly competitive industry’s long-run supply curve. The perfectly competitive industry’s long-run supply curve shows the quantities supplied by the industry at different equilibrium prices after firms complete their entry and exit. The shape of each of these long-run supply curves depends on the response of input prices as new firms enter the industry. The following sections discuss each of these three cases.

Constant-Cost Industry

In a constant-cost industry, input prices remain constant as new firms enter or exit the industry. A constant-cost industry is an industry in which the expansion of industry output by the entry of new firms has no effect on the firm’s cost curves. Exhibit 11(a) reproduces the long-run equilibrium situation from Exhibit 10.

Begin in part (b) of Exhibit 11 at the initial industry equilibrium point \( E_1 \) with short-run industry supply curve \( S_1 \) and industry demand curve \( D_1 \). Now assume the industry demand curve increases from \( D_1 \) to \( D_2 \). As a result, the industry equilibrium moves temporarily to \( E_2 \). Correspondingly, the equilibrium price rises from $60 to $80, and industry output increases from 50,000 to 70,000 units.

The short-run result for the individual firm in the industry happens this way. As shown in part (a) of Exhibit 11, the firm takes the increase in price and adjusts its output from 6 to 7 units per hour. At the higher price and output, the firm changes from earning a normal profit to making an economic profit because the new price is above its SRATC curve. All the other firms in the industry make the same adjustment by moving upward along their SRMC curves.

In perfect competition, new firms are free to enter the industry in response to a profit opportunity, and they will do so. The addition of new firms shifts the short-run supply curve rightward from \( S_1 \) to \( S_2 \). Firms will continue to enter the industry until profit is eliminated. This occurs at equilibrium point \( E_3 \), where short-run industry demand curve \( D_2 \) intersects short-run supply curve \( S_2 \). Thus, the entry of new firms has restored the ini-

Perfectly competitive industry’s long-run supply curve

The curve that shows the quantities supplied by the industry at different equilibrium prices after firms complete their entry and exit.

Constant-cost industry

An industry in which the expansion of industry output by the entry of new firms has no effect on the individual firm’s cost curve.

Are You in Business for the Long Run?

You are considering building a Rent Your Own Storage Center. You are trying to decide whether to build 50 storage units at a total economic cost of $200,000, 100 storage units at a total economic cost of $300,000, or 200 storage units at a total economic cost of $700,000. If you wish to survive in the long run, which size will you choose?
Part (b) shows an industry in equilibrium at point $E_1$, producing 50,000 units per hour and selling them for $60 per unit. In part (a), the firm is in equilibrium, producing 6 units per hour and earning a normal profit. Then industry demand increases from $D_1$ to $D_2$, and the equilibrium price rises to $80. Industry output rises temporarily to 70,000 units per hour and the individual firm increases output to 7 units per hour. Firms are now earning an economic profit, which attracts new firms into the industry. In the long run, the entry of these firms causes the short-run supply curve to shift rightward from $S_1$ to $S_2$, the price is reestablished at $60, and a new industry equilibrium point, $E_3$, is established. At $E_3$, industry output rises to 90,000 units per hour, and the firm’s output returns to 6 units per hour. Now the typical firm earns a normal profit, and new firms stop entering the industry. Connecting point $E_1$ to point $E_3$ generates the long-run supply curve.

The initial equilibrium price of $60. The firm responds by moving downward along its SRMC curve until it once again produces 6 units and earns a normal profit.

As shown in the exhibit, the path of these changes in industry short-run equilibrium points traces a horizontal line, which is the industry’s long-run supply curve.
Conclusion  The long-run supply curve in a perfectly competitive constant-cost industry is perfectly elastic.

Now we reconsider Exhibit 11 and ask what happens when the demand curve shifts leftward from \(D_2\) to \(D_1\). Beginning in part (b) at point \(E_3\), the decrease in demand causes the price to fall temporarily below $60. As a result, firms incur short-run losses, and some firms leave the industry. The exodus of firms shifts the short-run supply curve leftward from \(S_2\) to \(S_1\), establishing a new equilibrium at point \(E_4\). This decrease in supply restores the equilibrium price to the initial price of $60 per unit. Once equilibrium is reestablished at \(E_4\), there is a smaller number of firms, each earning a normal profit.

Decreasing-Cost Industry

Input prices fall as new firms enter a decreasing-cost industry, and output expands. A decreasing-cost industry is an industry in which the expansion of industry output by the entry of new firms decreases each individual firm’s cost curve (cost curve shifts downward). For example, as production of electronic components expands, the price of computer chips may decline. The reason is that greater sales volume allows the suppliers to achieve economies of scale and lower their input prices to firms in the electronic component industry. Exhibit 12 illustrates the adjustment process of an increase in demand based on the assumption that our example is a decreasing-cost industry.

Conclusion  The long-run supply curve in a perfectly competitive decreasing-cost industry is downward sloping.

Increasing-Cost Industry

In an increasing-cost industry, input prices rise as new firms enter the industry, and output expands. As this type of industry uses more labor and machines, the demand for greater quantities of these inputs drives up input prices. An increasing-cost industry is an industry in which the expansion of industry output by the entry of new firms increases the individual firm’s cost curve (cost curve shifts upward). Suppose the electronic component disc business uses a significant proportion of all electrical engineers in the country. In this case, electrical engineering salaries will rise as firms hire more electrical engineers to expand industry output. In practice, most industries are increasing-cost industries, and, therefore, the long-run supply curve is upward sloping.

Exhibit 13 shows what happens in an increasing-cost industry when an increase in demand causes output to expand. In part (b), the industry is initially in equilibrium at point \(E_1\). As in the previous case, the demand curve shifts rightward from \(D_1\) to \(D_2\), establishing a new short-run equilibrium at \(E_2\). This movement upward along short-run industry supply curve \(S_1\) raises the price in the short run from $60 to $80, resulting in profit for the typical firm. Once again, new firms enter the industry, and the short-run supply curve shifts rightward from \(S_1\) to \(S_2\). Part (a) of Exhibit 13 shows that the
response of the firm’s SRATC curve to the industry’s expansion differs from the constant-cost industry case. In an increasing-cost industry, the firm’s SRATC curve shifts upward from \( SRATC_1 \) to \( SRATC_2 \), corresponding to the new short-run equilibrium at point \( E_3 \). At this final equilibrium point, the price of $70 is higher than the initial price of $60. Normal profits are re-established because profits are squeezed from both the price fall and the rise in the SRATC curve.

The long-run industry supply curve is drawn by connecting the two long-run equilibrium points of \( E_1 \) and \( E_3 \). Equilibrium point \( E_2 \) is not a long-run equilibrium point because it is not established after the entry of new firms has restored normal profits.
The long-run supply curve in a perfectly competitive increasing-cost industry is upward sloping. Finally, given the three models presented, you may ask which is the best choice. The answer is that all three versions are possible for any given industry. Only direct observation of the industry can tell which type of industry it is.

**Conclusion** The long-run supply curve in a perfectly competitive increasing-cost industry is upward sloping.

Finally, given the three models presented, you may ask which is the best choice. The answer is that all three versions are possible for any given industry. Only direct observation of the industry can tell which type of industry it is.
In the late 1980s, many farmers who were tired of milking cows, roping steers, and slopping hogs decided to try their hands at a new animal. However, this animal could require a gun for protection while someone feeds it.

Prior to the late 1980s, alligators were on the endangered species list. Under this protection, their numbers grew so large that wandering alligators became pests in Florida neighborhoods and police were exhausted chasing them around. Consequently, the ban on hunting was removed, and shrewd entrepreneurs began seeking big profits by turning gators into farm animals. In fact, gator farming became one of Florida’s fastest-growing businesses. The gators spawned several hot industries. The lizard “look” came back into vogue, and the fashionable sported gator-skin purses, shoes, and belts. Chic didn’t come cheap. In New York, gator cowboy boots sold for $1,800, and attaché cases retailed for $4,000. And you could order gator meat at trendy restaurants all along the East Coast. “Why not gator?” asked Red Lobster spokesman Dick Monroe. “Today’s two-income households are looking for more variety. And they think it’s neat to eat an animal that can eat them.”

To meet the demand, Florida doubled the number of its licensed alligator farms compared to the previous four years when they functioned almost entirely as tourist attractions. In 1985, Florida farmers raised 37,000 gators; in 1986, that figure increased by 50 percent. Revenues soared as well. Frank Godwin, owner of Gatorland in Orlando, netted an estimated $270,000 from the 1,000 animals he harvested annually. Improved technology was applied to gator farming in order to boost profits even higher. Lawler Wells, for example, owner of Hilltop Farms in Avon Park, raised 7,000 gators in darkened hothouses that accelerated their growth.1

Seven years later, a 1993 article in the Washington Post continued the gator tale: “During the late 1980s, gator ranching was booming, and the industry was being compared to a living gold mine. People rushed into the industry. Some farmers became temporarily rich.”2

In 1995, a USA Today interview with a gator hunter provided evidence of long-run equilibrium: “Armed with a pistol barrel attached to the end of an 8-foot wooden pole, alligator hunter Bill Chaplin fires his ‘bankstick’ and dispatches a six-footer with a single round of .44 magnum ammunition. What’s in it for him? Financially, very little. At $3.50 a pound for the meat and $45 a foot for the hide, an alligator is worth perhaps $100 a foot. After paying for skinning and processing, neither hunter nor landowner gets rich.”3

A 2000 article in the Dallas Morning News provides further evidence: “Mark Glass began raising gators in 1995 south of Atlanta. He stated ‘I can honestly say I haven’t made any money yet, but I hope that’s about to change.’”4

1. Draw short-run firm and industry competitive equilibriums for a perfectly competitive gator-farming industry before the number of alligator farms in Florida doubled. For simplicity, assume the gator farm is earning zero economic profit. Now show the short-run effect of an increase in demand for alligators.

2. Assuming gator farming is perfectly competitive, explain the long-run competitive equilibrium condition for the typical gator farmer and the industry as a whole.

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4“More Bite for the Buck,” Dallas Morning News, Dec. 6, 2000, p. 2A.
Market structure consists of three market characteristics: (1) the number of sellers, (2) the nature of the product, and (3) the ease of entry into or exit from the market.

Perfect competition is a market structure in which an individual firm cannot affect the price of the product it produces. Each firm in the industry is very small relative to the market as a whole, all the firms sell a homogeneous product, and firms are free to enter and exit the industry.

A price-taker firm in perfect competition faces a perfectly elastic demand curve. It can sell all it wishes at the market-determined price, but it will sell nothing above the given market price. This is because so many competitive firms are willing to sell the same product at the going market price.

The total revenue–total cost method is one way the firm determines the level of output that maximizes profit. Profit reaches a maximum when the vertical difference between the total revenue and the total cost curves is at a maximum.

The marginal revenue equals marginal cost method is a second approach to finding where a firm maximizes profits. Marginal revenue is the change in total revenue from a one-unit change in output. Marginal revenue for a perfectly competitive firm equals the market price. The MR = MC rule states that the firm maximizes profit or minimizes loss by producing the output where marginal revenue equals marginal cost. If the price (average revenue) is below the minimum point on the average variable cost curve, the MR = MC rule does not apply, and the firm shuts down to minimize its losses.

**Marginal revenue equals marginal cost method**

![Graph showing marginal revenue and marginal cost for a perfectly competitive firm. The graph includes the total revenue and total cost curves, and the marginal revenue and marginal cost curves intersecting at the optimal output level. The maximum profit is marked at the intersection point, and the minimum cost per unit is also indicated.]
The perfectly competitive firm’s short-run supply curve is a curve showing the relationship between the price of a product and the quantity supplied in the short run. The individual firm always produces along its marginal cost curve above its intersection with the average variable cost curve. The perfectly competitive industry’s short-run supply curve is the horizontal summation of the short-run supply curves of all firms in the industry.

**Firm’s short-run supply curve**

![Graph showing firm's short-run supply curve]

- **Long-run perfectly competitive equilibrium** occurs when the firm earns a normal profit by producing where price equals minimum long-run average cost equals minimum short-run average total cost equals short-run marginal cost.

**Long-run perfectly competitive equilibrium**

![Graph showing long-run perfectly competitive equilibrium]

- In a **constant-cost industry**, total output can be expanded without an increase in the individual firm’s average total cost. Because input prices remain constant, the long-run supply curve in a constant-cost industry is perfectly elastic.

- In a **decreasing-cost industry**, lower input prices result in a downward-sloping industry long-run supply curve. As industry output expands, the individual firm’s average total cost curve declines (shifts downward), and the long-run equilibrium market price falls.

- In an **increasing-cost industry**, input prices rise as industry output increases. As a result, the individual firm’s average total cost curve rises (shifts upward), and the industry long-run supply curve for an increasing-cost industry is upward sloping.

**SUMMARY OF CONCLUSION STATEMENTS**

- The large-number-of-sellers condition is met when each firm is so small relative to the total market that no single firm can influence the market price.

- If a product is homogeneous, buyers are indifferent as to which seller’s product they buy.

- Perfect competition requires that resources be completely mobile to freely enter or exit a market.

- In perfect competition, the firm’s marginal revenue equals the price that the firm views as a horizontal demand curve.

- In perfect competition, the firm maximizes profit or minimizes loss by producing the output where marginal revenue equals marginal cost.
1. Explain why a perfectly competitive firm would or would not advertise.

2. Does a Kansas wheat farmer fit the perfectly competitive market structure? Explain.

3. Suppose the market equilibrium price of wheat is $2 per bushel in a perfectly competitive industry. Draw the industry supply and demand curves and the demand curve for a single wheat farmer. Explain why the wheat farmer is a price taker.

4. Assuming the market equilibrium price for wheat is $5 per bushel, draw the total revenue and the marginal revenue curves for the typical wheat farmer in the same graph. Explain how marginal revenue and price are related to the total revenue curve.

5. Consider the following cost data for a perfectly competitive firm in the short run:

   If the market price is $150, how many units of output will the firm produce in order to maximize profit in the short run? Specify the amount of economic profit or loss. At what level of output does the firm break even?

6. Consider this statement: “A firm should increase output when it makes a profit.” Do you agree or disagree? Explain.

7. Consider this statement: “When marginal revenue equals marginal cost, total cost equals total revenue, and the firm makes zero profit.” Do you agree or disagree? Explain.

8. Consider Exhibit 14, which shows the graph of a perfectly competitive firm in the short run.

   a. If the firm’s demand curve is \( MR_3 \), does the firm earn an economic profit or loss?

   b. Which demand curve(s) indicates the firm incurs a loss?

   c. Which demand curve(s) indicates the firm would shut down?

   d. Identify the firm’s short-run supply curve.

9. Consider this statement: “The perfectly competitive firm will sell all the quantity of output consumers will buy at the prevailing market price.” Do you agree or disagree? Explain your answer.

10. Suppose a perfectly competitive firm’s demand curve is below its average total cost curve. Explain the conditions under which a firm continues to produce in the short run.

11. Suppose the industry equilibrium price of residential housing construction is $100 per square foot and the minimum average variable cost for a residential construction contractor is $110 per square foot. What would you advise the owner of this firm to do? Explain.

12. Suppose independent truckers operate in a perfectly competitive industry. If these firms are earning positive economic profits, what happens in the long run to the following: the price of trucking services, the industry quantity of output, the profits of trucking firms? Given these conditions, is the independent trucking industry a constant-cost, an increasing-cost, or a decreasing-cost industry?
ONLINE EXERCISES

Exercise 1
View the Economic Report of the President at http://w3.access.gpo.gov/eop/. Click on Economic Report of the President and then scroll down to Table B-60 on page 343 and follow these steps.

1. Note the apparel and energy prices for the last 20 years.
2. Why does the price of energy fluctuate more than the price of apparel?

Exercise 2
Visit USA Today (http://www.usatoday.com). Click on Markets and study the Dow Jones Industrial Average fluctuation in the chart. Apply the characteristics of a perfectly competitive market structure to the stock market. Why do stock prices fluctuate so much?

Exercise 3
The dream of many people is to start their own business; to be an entrepreneur. Visit the following Internet sites and answer the following questions. Home-Based Resource Center (http://www.be-your-own-boss.com/) contains information about how to start and operate a home-based business. Entrepreneur’s Help page (http://www.tannedfeet.com/) is created by a group of corporate attorneys, financial industry professionals, business owners, and consultants who are all in their twenties or early thirties.

1. What economic factors do entrepreneurs need to consider when starting businesses?
2. How can entrepreneurs maximize the profit generated by their businesses?
3. What resources are available for entrepreneurs and small businesses?

CHECKPOINT ANSWERS

Should Motels Offer Rooms at the Beach for Only $50 a Night?
As long as price exceeds average variable cost, the motel is better off operating than shutting down. Since $50 is more than enough to cover the guest-related variable costs of $45 per room, the firm will operate. The $5 remaining after covering variable costs can be put toward the $50 of fixed costs. Were the motel to shut down, it could make no contribution to these overhead costs. If you said the Myrtle Beach motels should operate during the winter because they can get a price that exceeds their average variable cost, YOU ARE CORRECT.

Are You in Business for the Long Run?
In the long run, surviving firms will operate at the minimum of the long-run average cost curve. The average cost of 50 storage units is $4,000 ($200,000/50), the average cost of 100 storage units is $3,000 ($300,000/100), and the average cost of 200 storage units is $3,500 ($700,000/200). Of the three storage-unit quantities given, the one with the lowest average cost is closest to the minimum point on the LRAC curve. If you chose 100 storage units, YOU ARE CORRECT.
PRACTICE QUIZ

For a visual explanation of the correct answers, visit the tutorial at http://tucker.swcollege.com.

1. A perfectly competitive market is not characterized by
   a. many small firms.
   b. a great variety of different products.
   c. free entry into and exit from the market.
   d. any of the above.

2. Which of the following is a characteristic of perfect competition?
   a. Entry barriers
   b. Homogeneous products
   c. Expenditures on advertising
   d. Quality of service

3. Which of the following are the same at all levels of output under perfect competition?
   a. Marginal cost and marginal revenue
   b. Price and marginal revenue
   c. Price and marginal cost
   d. All of the above

4. If a perfectly competitive firm sells 100 units of output at a market price of $100 per unit, its marginal revenue per unit is
   a. $1.
   b. $100.
   c. more than $1, but less than $100.
   d. less than $100.

5. Short-run profit maximization for a perfectly competitive firm occurs where the firm's marginal cost equals
   a. average total cost.
   b. average variable cost.
   c. marginal revenue.
   d. all of the above.

6. A perfectly competitive firm sells its output for $100 per unit, and the minimum average variable cost is $150 per unit. The firm should
   a. increase output.
   b. decrease output, but not shut down.
   c. maintain its current rate of output.
   d. shut down.

7. A perfectly competitive firm's supply curve follows the upward sloping segment of its marginal cost curve above the
   a. average total cost curve.
   b. average variable cost curve.
   c. average fixed cost curve.
   d. average price curve.

8. Assume the price of the firm's product in Exhibit 15 is $15 per unit. The firm will produce
   a. 500 units per week.
   b. 1,000 units per week.
   c. 1,500 units per week.
   d. 2,000 units per week.
   e. 2,500 units per week.

9. In Exhibit 15, the lowest price at which the firm earns zero economic profit in the short run is
   a. $5 per unit.
   b. $10 per unit.
   c. $20 per unit.
   d. $30 per unit.

10. Assume the price of the firm's product in Exhibit 15 is $6 per unit. The firm should
    a. continue to operate because it is earning an economic profit.
    b. stay in operation for the time being even though it is incurring an economic loss.
    c. shut down temporarily.
    d. shut down permanently.

11. Assume the price of the firm's product in Exhibit 15 is $10 per unit. The maximum profit the firm earns is
    a. zero.
    b. $5,000 per week.
    c. $1,500 per week.
    d. $10,500 per week.
12. In Exhibit 15, the firm’s total revenue at a price of $10 per unit pays for
   a. a portion of total variable costs.
   b. a portion of total fixed costs.
   c. none of the total fixed costs.
   d. all of the total fixed costs and total variable costs.

13. As shown in Exhibit 15, the short-run supply curve for this firm corresponds to which segment of its marginal cost curve?
   a. A to D and all points above
   b. B to D and all points above
   c. C to D and all points above
   d. B to C only

14. In long-run equilibrium, the perfectly competitive firm’s price is equal to which of the following?
   a. Short-run marginal cost
   b. Minimum short-run average total cost
   c. Marginal revenue
   d. All of the above

15. In a constant-cost industry, input prices remain constant as
   a. the supply of inputs fluctuates.
   b. firms encounter diseconomies of scale.
   c. workers become more experienced.
   d. firms enter and exit the industry.

16. Suppose that, in the long run, the price of feature films rises as the movie production industry expands. We can conclude that movie production is a(an)
   a. increasing-cost industry.
   b. constant-cost industry.
   c. decreasing-cost industry.
   d. marginal-cost industry.

17. Which of the following is true of a perfectly competitive market?
   a. If economic profits are earned, then the price will fall over time.
   b. In long-run equilibrium, \( P = MR = SRMC = SRATC = LRAC \).
   c. A constant-cost industry exists when the entry of new firms has no effect on their cost curves.
   d. All of the above are true.