



## Answers to the Review Quizzes

### Page 275

**1. Why is a firm in perfect competition a price taker?**

One firm's output is a perfect substitute for another firm's output and each firm is a small part of the market. These points imply that each firm cannot unilaterally influence the market price at which it can sell its good or service. It must accept, or "take" the market equilibrium price—hence the term, *price taker*.

**2. In perfect competition, what is the relationship between the demand for the firm's output and the market demand?**

The *market* demand curve for the goods and services in a perfectly competitive market is downward sloping. However, no single firm in this market can influence the price at which it sells its output. This point means a firm that is a price taker must take the equilibrium market price as given, and the *firm* faces a perfectly elastic demand.

**3. In perfect competition, why is a firm's marginal revenue curve also the demand curve for the firm's output?**

A perfectly competitive firm's demand curve is a horizontal line at the market price. This result means that the price it receives is the same for every unit sold. The marginal revenue received by the firm is the change in total revenue from selling one more unit, which is the constant market price. So a perfectly competitive firm's demand curve is the same as its marginal revenue curve.

**4. What decisions must a firm make to maximize profit?**

The firm has three decisions it must make. First it must determine how to produce at the minimum cost. Then it must determine how much to produce. Finally it must decide whether to enter or exit a market.

### Page 279

**1. Why does a firm in perfect competition produce the quantity at which marginal cost equals price?**

A firm's total profit is maximized by producing the level of output at which marginal revenue for the last unit produced equals its marginal cost, or  $MR = MC$ . In a perfectly competitive market,  $MR$  is equal to the market price  $P$  for all levels of output. These points imply that a perfectly competitive firm will maximize profit by producing output where  $P = MC$ .

**2. What is the lowest price at which a firm produces an output? Explain why.**

The lowest price at which a firm will produce output is the price that equals the firm's minimum  $AVC$ . At this price the firm has just enough total revenue to cover its total variable costs. The firm's loss is equal to its fixed costs. At any lower market price the firm's loss would be greater than its fixed costs. In this case the firm can avoid losses that are greater than its fixed cost by shutting down.

**3. What is the relationship between a firm's supply curve, its marginal cost curve, and its average**

**variable cost curve?**

The firm will produce output as long as the price is greater than the minimum  $AVC$ . It will choose the level of output where  $MC = P$ , which means the firm's supply curve is the firm's  $MC$  curve above minimum  $AVC$ .

**Page 283****1. How do we derive the short-run market supply curve in perfect competition?**

The short-run market supply curve is the horizontal sum of each individual firm's supply curve. That is, the amount supplied by the total market equals the sum of what each firm in the industry supplies at a given price.

**2. In perfect competition, when market demand increases, explain how the price of the good and the output and profit of each firm changes in the short run.**

When market demand increases, the market price of the good rises, and the market quantity increases. Because price equals marginal revenue, the rise in the price means marginal revenue rises. As a result, each firm moves up its marginal cost curve and increases the quantity it produces. The firm's profit rises (or its economic loss decreases). If the firm had been making zero economic profit before the increase in demand, after the increase the firm earns an economic profit.

**3. In perfect competition, when market demand decreases, explain how the price of the good and the output and profit of each firm changes in the short run.**

When market demand decreases, the market price of the good falls and the market quantity decreases. Because the price equals marginal revenue, the fall in the price means marginal revenue falls. As a result, each firm moves down its marginal cost curve so each firm decreases the quantity it produces. The firm's profit falls (or its economic loss increases). If the firm had been making zero economic profit before the decrease in demand, after the decrease the firm incurs an economic loss.

**Page 285****1. What triggers entry in a competitive market? Describe the process that ends further entry.**

When firms in a competitive market make an economic profit, the economic profit serves as an inducement to other firms to enter the market. As the other firms enter, the supply increases and the price falls. The fall in the price eventually eliminates the economic profit, at which time entry stops.

**2. What triggers exit in a competitive market? Describe the process that ends further exit.**

When firms in a competitive market are incurring an economic loss, some of the firms will exit the market. As these firms exit, the supply decreases and the price rises. The rise in the price eventually eliminates the economic loss, at which time exit stops.

**Page 289****1. Describe the course of events in a competitive market following a permanent decrease in demand. What happens to output, price, and economic profit in the short run and in the long run?**

Starting from an initial point of long-run equilibrium, a permanent decrease in demand decreases the market quantity, and the market price falls below  $ATC$  for each firm. *In the short run*, firms in the industry experience an economic loss, which leads to firms exiting the market in the long run. This exit shifts the market supply curve leftward, raising the market price and continuing to decrease the market quantity. The increase in market price shrinks the economic loss for each remaining firm. Exit continues until the price again equals the minimum point on each firm's  $ATC$  curve. At this point, firms return to zero economic

profit and exit stops. *In the long run*, with no external economies or diseconomies the market price returns to the original level, market output is less than the original amount, and economic profit for each firm returns to zero.

2. **Describe the course of events in a competitive market following a permanent increase in demand. What happens to output, price, and economic profit in the short run and in the long run?**

A permanent increase in demand increases the market quantity, and the market price rises above *ATC* for each firm. *In the short run*, firms in the industry experience an economic profit, attracting firms from outside the industry to enter the industry in the long run. This entry shifts the industry supply curve rightward, lowering the market price as the market quantity continues to increase. The fall in the market price shrinks the firms' economic profit until the price again equals the minimum point on each firm's *ATC* curve. At this point, firms return to zero economic profit and entry stops. *In the long run*, with no external economies or diseconomies the market price returns to the original level, market output is larger than the original amount, and economic profit for each firm returns to zero.

3. **Describe the course of events in a competitive market following the adoption of a new technology. What happens to output, price, and economic profit in the short run and in the long run?**

Technological advances result in lower costs for the firm that adopts them and initially these firms make an economic profit. This causes *two* actions to occur in the market: i) firms from outside the industry that have adopted the new technology enter the market; ii) firms with old technology either exit the market or adopt the new technology. These two actions shift the industry supply rightward, decreasing market price and increasing market quantity. In the long run, all firms in the industry will be new technology firms, economic profit for each firm will return to zero, market quantity will increase, and market price will fall to the new minimum *ATC* for each firm.

## Page 291

1. **State the conditions that must be met for resources to be allocated efficiently.**

Resource use is efficient when the economy produces the goods and services that people value most highly. This situation requires that consumers are on their demand curves, thereby allocating their budgets to get the most possible value from their income. If the people who consume a good or service are the only ones who benefit from it, then the market demand curve measures the benefit to the entire society and is the marginal social benefit curve. Efficient resource use also requires that firms are on their supply curves, thereby getting the most value out of their resources. If the firms that produce a good or service bear all the costs of producing it, then the market supply curve measures the marginal cost to the entire society and the market supply curve is the marginal social cost curve. And resources are used efficiently when marginal social benefit equals marginal social cost.

2. **Describe the choices that consumers make and explain why consumers are efficient on the market demand curve.**

Consumers allocate their budgets so they get the most value from their budgets. When consumers are on their demand curves, they are getting the most value out of their resources and are efficient.

3. **Describe the choices that producers make and explain why producers are efficient on the market supply curve.**

Competitive firms maximize profit. To do so, they must be technologically efficient and economically efficient. As a result, when competitive firms are on their supply curves maximizing their profit, they are getting the most value out of their resources and are efficient.

**4. Explain why resources are used efficiently in a competitive market.**

Resources are used efficiently in a competitive market because the market demand curve is the same as the marginal social benefit curve and the market supply curve is the same as the marginal social cost curve. The equilibrium quantity, determined by where the demand and supply curves intersect, is the same quantity where the marginal social benefit and marginal social cost curves intersect, which is the efficient quantity.

## Answers to the Problems and Applications

1. **Lin’s fortune cookies are identical to the fortune cookies made by dozens of other firms and there is free entry in the fortune cookie market. Buyers and sellers are well informed about prices.**
  - a. **In what type of market does Lin’s operate?**  
Lin is operating in a perfectly competitive market.
  - b. **What determines the price of fortune cookies?**  
The equilibrium price is determined at the equilibrium between the market demand and the market supply.
  - c. **What determines Lin’s marginal revenue of fortune cookies?**  
Lin’s marginal revenue equals the market price of a box of cookies.
  - d. **If fortune cookies sell for \$10 a box and Lin offers his cookies for sale at \$10.50 a box, how many boxes does he sell?**  
Lin will sell no boxes of fortune cookies.
  - e. **If fortune cookies sell for \$10 a box and Lin offers his cookies for sale at \$9.50 a box, how many boxes does he sell?**  
*All* buyers will want to buy Lin’s cookies so the demand for Lin’s cookies is essentially infinite. More realistically, Lin would probably sell the quantity that maximizes his profit but that profit will be less than if he sells at the going market price of \$10 a box.
  - f. **What is the elasticity of demand for Lin’s fortune cookies and how does it differ from the elasticity of the market demand for fortune cookies?**  
The elasticity of demand for Lin’s cookies is infinite. The elasticity of demand in the market for cookies is not infinite.

2. **Pat’s Pizza Kitchen is a price taker. Its costs are in the table.**

Output (pizzas per hour)	Total cost (dollars per hour)
0	10
1	21
2	30
3	41
4	54
5	69

- a. **Calculate Pat’s profit-maximizing output and economic profit if the market price is**
  - (i) **\$14 a pizza.**
  - (ii) **\$12 a pizza.**
  - (iii) **\$10 a pizza.**
    - (i) At \$14 a pizza, Pat’s profit-maximizing output is 4 pizzas an hour and economic profit is \$2 an hour. Pat’s maximizes its profit by producing the quantity at which marginal revenue equals marginal cost. In perfect competition, marginal revenue equals price, which is \$14 a pizza. The marginal cost is the change in total cost when output is increased by 1 pizza an hour. The marginal cost of increasing output from 3 to 4 pizzas an hour is \$13 (\$54 minus \$41). The marginal cost of increasing output from 4 to 5 pizzas an hour is \$15 (\$69 minus \$54). So the marginal cost of the fourth pizza is half-way between \$13 and \$15, which is \$14. Marginal cost equals marginal revenue when Pat produces 4 pizzas an hour. Economic profit equals total revenue minus total cost. Total revenue equals \$56 (\$14 multiplied by 4). Total cost is \$54, so economic profit is \$2.
    - (ii) At \$12 a pizza, Pat’s profit-maximizing output is 3 pizzas an hour and economic profit is -\$5. Pat’s maximizes its profit by producing the quantity at which marginal revenue equals marginal cost. Marginal revenue equals price, which is \$12 a pizza. The marginal cost of increasing output from 2 to 3 pizzas an hour is \$11 (\$41 minus \$30). The marginal cost of increasing output from 3 to 4

pizzas an hour is \$13. So the marginal cost of the third pizza is half-way between \$11 and \$13, which is \$12. Marginal cost equals marginal revenue when Pat produces 3 pizzas an hour. Economic profit equals total revenue minus total cost. Total revenue equals \$36 (\$12 multiplied by 3). Total cost is \$41, so economic profit is  $-\$5$ .

- (iii) At \$10 a pizza, Pat's profit-maximizing output is 2 pizzas an hour and economic profit is  $-\$10$ . Pat's maximizes its profit by producing the quantity at which marginal revenue equals marginal cost. Marginal revenue equals price, which is \$10 a pizza. The marginal cost of increasing output from 1 to 2 pizzas an hour is \$9 (\$30 minus \$21). The marginal cost of increasing output from 2 to 3 pizzas an hour is \$11. So the marginal cost of the second pizza is half-way between \$9 and \$11, which is \$10. Marginal cost equals marginal revenue when Pat produces 2 pizzas an hour. Economic profit equals total revenue minus total cost. Total revenue equals \$20 (\$10 multiplied by 2). Total cost is \$30, so economic profit is  $-\$10$ .

**b. What is Pat's shutdown point and what is Pat's economic profit if it shuts down temporarily?**

The shutdown point is the price that equals minimum average variable cost. To calculate total variable cost, subtract total fixed cost (\$10—when output is zero, total variable cost is \$0, so total cost at zero output equals total fixed cost) from total cost. Average variable cost equals total variable cost divided by the quantity produced. The average variable cost of producing 2 pizzas is \$10 a pizza. Average variable cost is a minimum when marginal cost equals average variable cost. The marginal cost of producing 2 pizzas is \$10. So Pat's shutdown point is a price of \$10 a pizza. When Pat shuts down the economic "profit" is actually an economic loss equal to Pat's fixed cost. In particular Pat's economic loss is \$10.

**c. Derive Pat's supply curve.**

Pat's supply curve is the same as the marginal cost curve at prices equal to or above \$10 a pizza. The supply curve is the  $y$ -axis (0 pizzas) at prices below \$10 a pizza.

**d. At what price will firms with costs identical to Pat's exit the pizza market in the long run?**

Pat's and firms with the same costs as Pat's will exit the pizza market if the price is less than \$13 a pizza in the long run. Pat's Pizza Kitchen and other firms with the same costs will leave the market if they incur an economic loss in the long run. To incur an economic loss, the price must be below the minimum average total cost. Average total cost equals total cost divided by the quantity produced. For example, the average total cost of producing 2 pizzas is \$15 a pizza. Average total cost is a minimum when it equals marginal cost. The average total cost of producing 3 pizzas is \$13.67, and the average total cost of producing 4 pizzas is \$13.50. Marginal cost when Pat's produces 3 pizzas is \$12 and marginal cost when Pat's produces 4 pizzas is \$14. At 3 pizzas, marginal cost is less than average total cost; at 4 pizzas, marginal cost exceeds average total cost. So minimum average total cost occurs between 3 and 4 pizzas—\$13 at 3.5 pizzas an hour.

**e. At what price will firms with costs identical to Pat's enter the pizza market in the long run?**

Pat's and firms with the same costs as Pat's will enter the pizza market if the price is greater than \$13 a pizza in the long run. The reasoning is essentially the reverse of the reasoning behind the answer to part d. Pat's Pizza Kitchen and other firms with the same costs will enter the industry if they can make an economic profit. To make an economic profit, the price must be above the minimum average total cost. Average total cost equals total cost divided by the quantity produced. For example, the average total cost of producing 2 pizzas is \$15 a pizza. Average total cost is a minimum when it equals marginal cost. The average total cost of producing 3 pizzas is \$13.67, and the average total cost of producing 4 pizzas is \$13.50. Marginal cost when Pat's produces 3 pizzas is \$12 and marginal cost when Pat's produces 4 pizzas is \$14. At 3 pizzas, marginal cost is less than average total cost; at 4 pizzas, marginal cost exceeds average total cost. So minimum average total cost occurs between 3 and 4 pizzas—\$13 at 3.5 pizzas an hour.

3. The market is perfectly competitive and there are 1,000 firms that produce paper. The first table sets out the market demand schedule for paper. Each producer of paper has the costs in the second table when it uses its least-cost plant.

Price (dollars per box)	Quantity demanded (thousands of boxes per week)
3.65	500
5.20	450
6.80	400
8.40	350
10.00	300
11.60	250
13.20	200

a. What is the market price of paper?

The market price is \$8.40 per box of paper. The market price is the price at which the quantity demanded equals the quantity supplied. The firm's supply curve is the same as its marginal cost curve at prices above minimum average variable cost. Average variable cost is at its minimum when marginal cost equals average variable cost. Marginal cost equals average variable cost at the quantity 250 boxes a week. So the firm's supply curve is the same as the marginal cost curve for the outputs equal to 250 boxes or more. When the price is \$8.40 a box, each firm produces 350 boxes and the quantity supplied by the 1,000 firms is 350,000 boxes a week. The quantity demanded at \$8.40 is 350,000 a week.

Output (boxes per week)	Marginal cost (dollars per additional box)	Average variable cost (dollars per box)	Average total cost
200	6.40	7.80	12.80
250	7.00	7.00	11.00
300	7.65	7.10	10.43
350	8.40	7.20	10.06
400	10.00	7.50	10.00
450	12.40	8.00	10.22
500	20.70	9.00	11.00

b. What is the market's output?

The market output is 350,000 boxes a week.

c. What is the output produced by each firm?

Each firm produces 350 boxes a week.

d. What is the economic profit made or economic loss incurred by each firm?

Each firm incurs an economic loss of \$581 a week. Each firm produces 350 boxes at an average total cost of \$10.06 a box. The firm sells the 350 boxes for \$8.40 a box. The firm incurs a loss on each box of \$1.66 and incurs a total economic loss of \$581 a week.

e. Do firms have an incentive to enter or exit the market in the long run?

In the long run, some firms exit the industry because they are incurring an economic loss.

f. What is the number of firms in the long run?

The number of firms in the long run is 750. In the long run, as firms exit the industry, the price rises. In the long-run equilibrium the price will equal the minimum average total cost. When output is 400 boxes a week, marginal cost equals average total cost and average total cost is a minimum at \$10 a box. In the long run, the price is \$10 a box. Each firm remaining in the industry produces 400 boxes a week. The quantity demanded at \$10 a box is 300,000 boxes a week. The number of firms is 300,000 boxes divided by 400 boxes per firm, which is 750 firms.

g. What is the market price in the long run?

In the long run, the price equals the minimum average total cost, \$10 a box.

h. What is the equilibrium quantity of paper produced in the long run?

In the long run, the 750 firms together produce the equilibrium quantity of 300,000 boxes.

4. **Never Pay Retail Again**

Not only has scouring the Web for the best possible price become standard protocol before buying a big-ticket item, but more consumers are employing creative strategies for scoring hot deals. ... Comparison shopping, haggling and swapping discount codes are all becoming mainstream marks of savvy shoppers... online shoppers can check a comparison service like Price Grabber before making a purchase...

CNN, May 30, 2008

a. **Explain the effect of the Internet on the degree of competition in the market.**

The Internet increases the amount of competition in the market because buyers can search for a seller on the Internet as well as in the local area.

b. **Explain how the Internet influences market efficiency.**

By making the market more competitive the Internet increases the market's efficiency.

5. **As the quality of computer monitors improves, more people are reading documents online rather than printing them out. The demand for paper permanently decreases and the demand schedule becomes the schedule shown in the table. If each firm producing paper has the costs set out in problem 3,**

Price (dollars per box)	Quantity demanded (thousands of boxes per week)
2.95	500
4.13	450
5.30	400
6.48	350
7.65	300
8.83	250
10.00	200
11.18	150

a. **What is the market price, market output, and economic profit or loss of each firm?**

The market price is \$7.65 a box, the equilibrium market quantity is 300,000 boxes a week, and each firm incurs an economic loss of \$834 a week. When the price is \$7.65 a box, each firm produces 300 boxes and the total quantity supplied by the 1,000 firms is 300,000 boxes a week. The market quantity demanded at \$7.65 is 300,000 boxes a week. Each firm produces 300 boxes at an average total cost of \$10.43 a box. The firm sells the 300 boxes for \$7.65 a box. At this price and quantity the firm incurs a loss on each box of \$2.78 and incurs an economic loss of \$834 a week.

b. **What is the long-run equilibrium price, market output, and economic profit or loss of each firm?**

In the long run, the price equals the minimum average total cost, which is \$10.00 a box, the equilibrium industry quantity is 200,000 boxes a week, and each firm makes zero economic profit, that is, it breaks even.

c. **Does this market experience external economics, external diseconomies, or constant cost? Illustrate by drawing the long-run supply curve.**

Figure 12.1 shows the short-run and long-run supply curves. This industry has constant costs because the cost schedule does not change as the number of firms changes. The long-run supply curve is horizontal at a price of \$10 per box. In

FIGURE 12.1  
Problem 5c

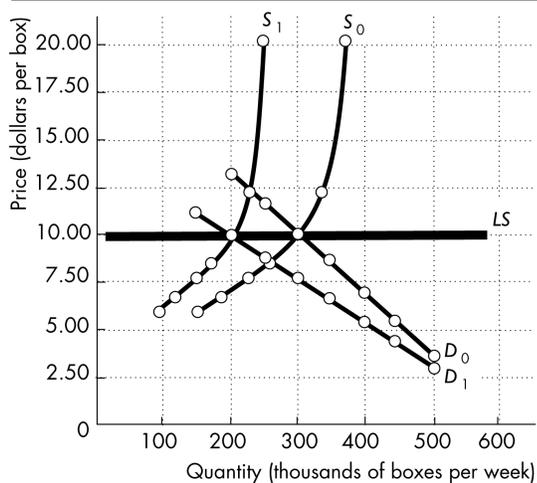


Figure 12.1 the short-run supply curve and the demand curve from Problem 3 are  $S_0$  and  $D_0$ , and the short-run supply and the demand curve from this problem are  $S_1$  and  $D_1$ . The long-run supply curve is illustrated as the thicker line labeled  $LS$ .

**6. St. Thomas Plant Cuts Shift and 720 Jobs**

**Sterling Trucks is eliminating one of its two remaining shifts and laying off another 720 workers as ... [it] joins the growing ranks of companies being squeezed by an economic slowdown in the United States.**

A year ago, Sterling laid off an additional 600 people in St. Thomas when another shift was cut, ... Back when there were three shifts, “We built trucks pretty much 24 hours a day, five days a week,” Elliott said.

But with the economy in a slump, “freight's not moving, construction is down—nobody is buying trucks. “We really need the economy to turn around ... and hopefully the price of fuel can drop and people will start buying again.”

The president of the St. Thomas Chamber of Commerce called the layoffs “devastating” news for the town. ... “no way to understate how much impact 720 relatively high-paying positions have in a community.” Each one of those jobs, he said, “can spin to touch at least seven others that sell vehicles, that sell groceries right down to the neighbourhood gas station.”

*The Canadian Press July 18, 2008*

- a. **Explain how economic slowdown in the United States might cause a producer of trucks to change its output in the short run.**

The slowdown in the United States will decrease the demand for trucks. The market demand for trucks decreases, which decreases the market price of a truck. The truck producer’s marginal revenue decreases, so to maximize economic profit, the truck producers cut its output.

- b. **Draw a graph to show the economic slowdown on Sterling’s output in the short run.**

Figure 12.2 shows the fall in the truck producer’s marginal revenue. The producer cuts its output from 13 to 12 trucks a week.

- c. **Explain how a rise in the price of fuel might cause a producer of trucks to change its output in the short run.**

When the price of fuel rises, the cost of trucking goods increases, so transportation companies cut the amount of trucking they do. These transportation companies delay their purchases of new trucks, so the market demand for new trucks decreases. The market price of a truck falls, and truck producers cut production in the short run.

- d. **Draw a graph to show the rise in fuel prices on Sterling’s output in the short run.**

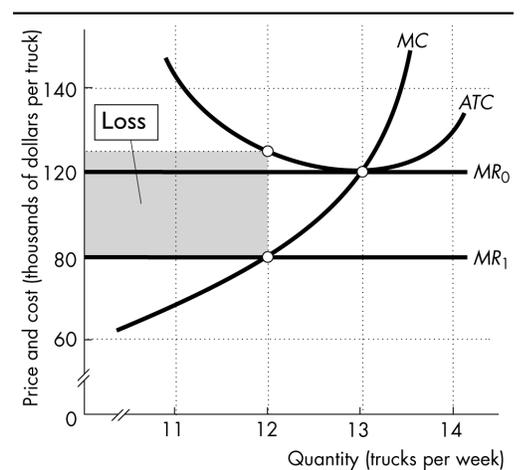
Figure 12.2 shows the effect of the decrease in market demand on Sterling’s output.

- e. **Explain why a producer of trucks might incur an economic loss in the short run as the price of fuel rises.**

If before the rise in the price of fuel, the firm was in long-run equilibrium, the fall in the market price in the short run leads the firm to incur an economic loss.

- f. **If some truck producers decide to exit the market before the price of fuel falls, explain how**

**FIGURE 12.2**  
**Problem 6**



**the economic profit or loss of the remaining truck producers will change.**

When firms exit the market, the market supply of trucks decreases, and the market price of a truck begins to rise. The higher price reduces the economic loss of firms remaining in the market. Firms will continue to exit until the firms remaining in the market are making zero economic profit.

**g. Explain how the loss of high-paying jobs will affect the economic profit of grocery stores in St. Thomas in the short run.**

When workers lose their good-paying jobs, income decreases and the market demand for groceries decreases. Grocery stores will make less economic profit and incur economic losses in the short run.

**h. Draw a graph to show the effects of the loss of high-paying jobs on the economic profit of local grocery stores in the short run.**

Figure 12.2a shows the effect of the decrease in income on the economic profit of grocery stores.

**7. In a perfectly competitive market in long-run equilibrium can**

**a. Consumer surplus be increased?**

Once at the competitive equilibrium quantity, which is the same as the efficient quantity, the sum of consumer surplus plus producer surplus is as large as possible. If the price is lowered, consumer surplus increases but only at the expense of a larger decrease in producer surplus. And the lower price is not the long-run equilibrium price.

**b. Producer surplus be increased?**

Once at the competitive equilibrium quantity, which is the same as the efficient quantity, the sum of consumer surplus plus producer surplus is as large as possible. If the price is raised, producer surplus increases but only at the expense of a larger decrease in consumer surplus. And the higher price is not the long-run equilibrium price.

**c. A consumer become better off by making a substitution away from this market?**

In the long-run equilibrium, consumers cannot become better off by substituting away from this market. Demand curves reflect consumers allocating their budget to get the most value possible from their budget. Therefore in the long-run equilibrium consumers have already allocated their budgets so that they cannot make themselves better off by substituting away from this market.

**d. The average total cost be reduced?**

No, the good cannot be produced at a lower average total cost. In the long run perfectly competitive firms produce at minimum average total cost.

8. Explain and illustrate graphically how the growing world population is influencing the world market for wheat and a representative individual wheat farmer.

FIGURE 12.3a

Problem 9

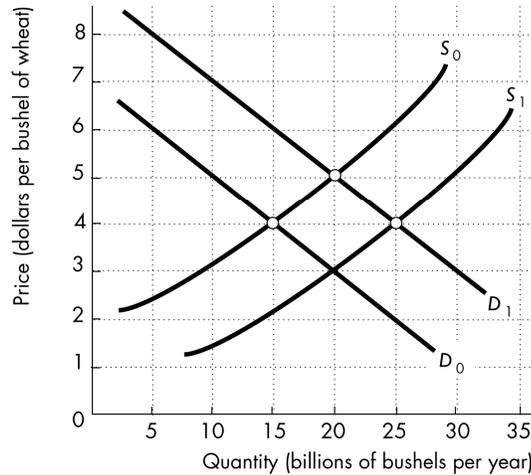
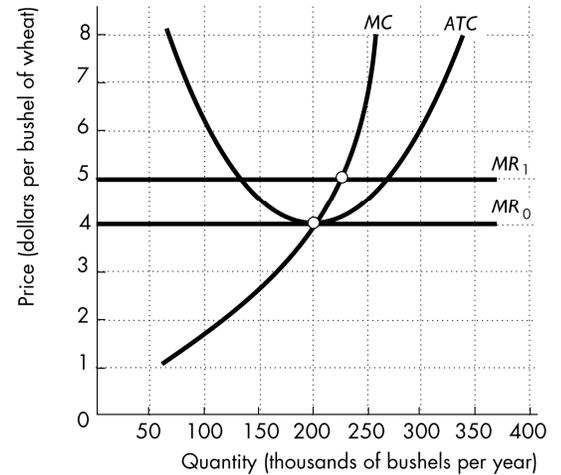


FIGURE 12.3b

Problem 9



The increase in the world population increases the market demand for wheat. The price of wheat rises so that wheat farmers increase the quantity of wheat they produce and make an economic profit. The economic profit attracts entry by new farmers, which increases supply, lowers the price, and eliminates economic profit. Figure 12.3a and 12.3b illustrate this process. In Figure 12.3a the market demand increases and the market demand curve shifts rightward from  $D_0$  to  $D_1$ . Initially the supply curve remains  $S_0$ . The increase in demand raises the price of a bushel of wheat to \$5 and increases the quantity to 20 billion bushels. In Figure 12.3b the higher price raises the firm's marginal revenue and the marginal revenue curve shifts upward from  $MR_0$  to  $MR_1$ . The firm responds by increasing the quantity it produces from 200,000 bushels to 225,000 bushels. It makes an economic profit because the price exceeds its average total cost. The economic profit attracts entry by new firms. Entry increases the market supply and shifts the supply curve rightward, in Figure 12.3a, from  $S_0$  to  $S_1$ . Assuming the industry has neither external economies nor external diseconomies, entry takes place until the price falls back to the initial price, \$4 a bushel. The market equilibrium quantity increases to 25 billion bushels. Figure 12.3b shows that at this lower price each firm decreases the quantity it produces back to its original amount, 200,000 bushels. The firms now make zero profit and there is no longer an incentive for new firms to enter the market.

9. Airlines in Trouble: A Timeline

Vancouver-based Harmony Airways announces it will suspend all schedule service by April 9 [2007].

*CBC News, March 27, 2007*

Harmony Airways exited the air-travel market before the jet-fuel price rocketed. Illustrate the market and Harmony's situation in April 2007.

The market price was such that Harmony Air way incurring an economic loss in the short run. Figure 12.4 shows that with an increase in the supply of flights, the market price fell. Harmony could break even at \$100 a seat, but not at \$75 a seat. The decision to exit, rather than continue to incur economic losses must have been taken because the firm did not expect the market price to rises soon. Figure 12.4 illustrates the market and the firm situation.

FIGURE 12.4a

**Problem 9**

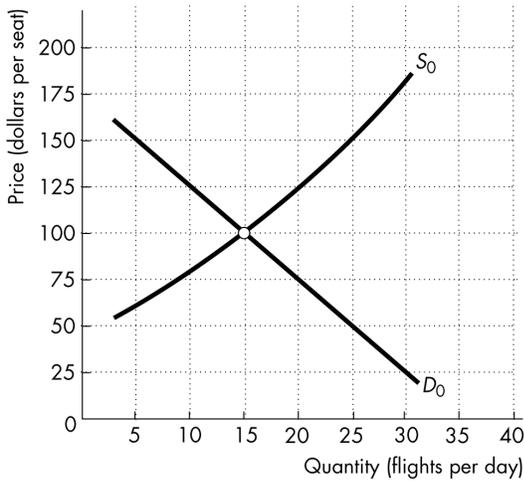
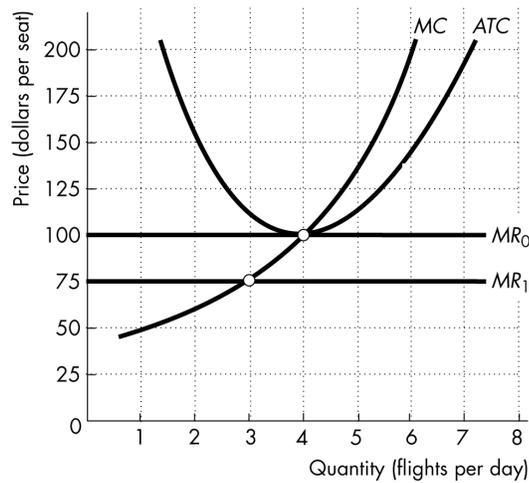


FIGURE 12.4b

**Problem 9**



10. The market demand for smoothies is in the first table. The market is perfectly competitive, and each firm has the costs in the second table when it uses its least cost plant. There are 100 smoothie sellers in the market.

Price (dollars per smoothie)	Quantity demanded (smoothies per hour)
1.90	1,000
2.00	950
2.20	800
2.91	700
4.25	550
5.25	400
5.50	300

- a. What is the market price of a smoothie?

The market price is the price at which the market quantity demanded equals the market quantity supplied. The firm's supply curve is the same as its marginal cost curve at prices above minimum average variable cost. Average variable cost is a minimum when marginal cost equals average variable cost. Marginal cost equals average variable cost at the quantity 7 smoothies an hour. So the firm's supply curve is the same as the marginal cost curve for outputs greater than and equal to 7 smoothies. When the price is \$2.91 a

smoothie, each firm produces 7 smoothies and the market quantity supplied by the 100 firms is 700 smoothies an hour. The market quantity demanded at \$2.91 is 700 smoothies an hour so the market price is \$2.91.

- b. What is the market quantity of smoothies?

The market quantity of smoothies is 700 smoothies an hour.

Output (smoothies per hour)	Marginal cost (dollars per additional smoothie)	Average variable cost (dollars per smoothie)	Average total cost
3	2.50	4.00	7.33
4	2.20	3.53	6.03
5	1.90	3.24	5.24
6	2.00	3.00	4.67
7	2.91	2.91	4.34
8	4.25	3.00	4.25
9	8.00	3.33	4.44

**c. How many smoothies does each firm sell?**

Each firm sells 7 smoothies an hour.

**d. What is the economic profit made or economic loss incurred by each firm?**

Each firm incurs an economic loss. Each firm produces 7 smoothies at an average total cost of \$4.34 a smoothie. The firm sells the 7 smoothies for \$2.91 each. The firm incurs a loss on each smoothie of \$1.43 and incurs a total economic loss of \$10.01 an hour.

**e. Do firms enter or exit the market in the long run?**

In the long run, some firms exit the industry because they are incurring an economic loss.

**f. What is the market price and the equilibrium quantity in the long run?**

In the long run, the price equals the minimum average total cost, which is \$4.25 a smoothie. At this price, the quantity demanded is 550 smoothies an hour, so the equilibrium quantity is 550 smoothies an hour.

**11. Money in the Tank**

**In Marietta, where the road hugs the Susquehanna River, a Rutter's Farm Store gas station stands on one side, a Sheetz gas station on the other. Kelly Bosley, who manages Rutter's, doesn't even have to look across the highway to know when Sheetz changes its price for a gallon of gas. When Sheetz raises prices, her own pumps are busy. When Sheetz lowers prices, she has not a car in sight. ... You think you feel helpless at the pump? Bosley makes a living selling gas—and even she has little control over what it costs.**

*The Mining Journal, May 24, 2008*

**a. Describe the elasticity of demand that each of these gas stations face.**

Each station's elasticity of demand is very high. When one station raises its price even a bit, it loses a *lot* of customers to its competitors. And when one of the stations lowers its price, it gains a *lot* of customers from its competitor.

**b. Why does each of these gas stations have so little control over the price of the gasoline they sell?**

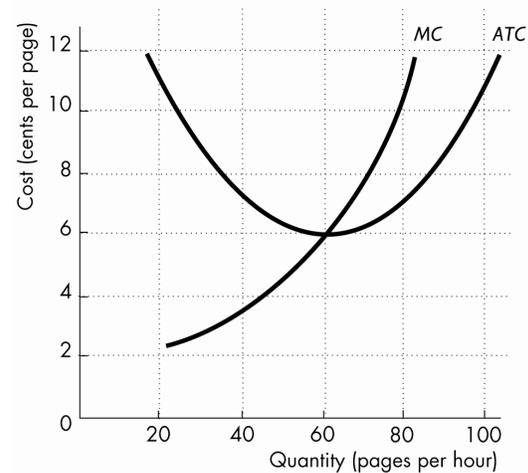
These stations face a large amount of competition, not only from each other but also from all nearby gas stations. If a firm raises its price it loses a vast number of customers so each firm is severely limited in raising its price. And there is no need for a firm to lower its price much below the going price because the firm can already increase its sales drastically with only a slight lowering of its price.

**c. How do these gas stations decide how much gasoline to make available for sale?**

A gas station will sell the amount of gasoline that maximizes its profit. To do so the firm will sell the quantity that sets its *MR* from selling another gallon of gasoline equal to the *MC* of selling another gallon.

12. **Quick Copy is one of the many copy shops near the campus. Figure 12.5 shows Quick Copy's cost curves. If the market price of copying a page is 10 cents, calculate Quick Copy's**

FIGURE 12.5  
Problem 12



- a. **Marginal revenue.**  
Quick Copy's marginal revenue equals the market price so it is 10 cents per page.
- b. **Profit-maximizing output.**  
Quick Copy's profit-maximizing quantity is 80 pages an hour. Quick Copy maximizes its profit by producing the quantity at which marginal revenue equals marginal cost. In perfect competition, marginal revenue equals price, which is 10 cents a page. Marginal cost is 10 cents a page when Quick Copy produces 80 pages an hour.
- c. **Economic profit.**  
Quick Copy's economic profit is \$2.40 an hour. Economic profit equals total revenue minus total cost. Total revenue equals \$8.00 an hour (10 cents a page multiplied by 80 pages). The average total cost of producing 80 pages is 7 cents a page, so total cost equals \$5.60 an hour (7 cents multiplied by 80 pages). So economic profit equals \$8.00 minus \$5.60, which is \$2.40 an hour.
13. **Cadillac Plant Shuts Down Temporarily, Future Uncertain**  
**Delta Truss in Cadillac [Michigan] is shutting down in what [its] parent company, Pro-Build, calls "temporarily discontinuing truss production." Workers fear this temporary shut down will become permanent. About 60 people work at Delta Truss when it's in peak season. Right now, about 20 people work there. ... A corporate letter ... says "we are anticipating resuming production at these plants when the spring business begins."**  
*9&10 News, February 18, 2008*
- a. **Explain how the shutdown decision will affect Delta Truss'  $TFC$ ,  $TVC$ , and  $TC$ .**  
The shutdown decision has no effect on Delta Truss'  $TFC$ . It will lower Delta Truss'  $TVC$  and  $TC$ .
- b. **Under what conditions would this shutdown decision maximize Delta Truss' economic profit (or minimize its loss)?**  
Delta Truss will shut down its plant when the price of a truss is less than its average variable cost, that is, when  $P < AVC$ . By shutting down, Delta Truss incurs an economic loss equal to its total fixed cost, which is the minimum loss that it can incur.
- c. **Under what conditions will Delta Truss start producing again?**  
Delta Truss will reopen when the price of a truss exceeds its average variable cost, that is, when  $P > AVC$ . In this case, even if Delta Truss is still incurring an economic loss, its loss will be less if it produces than if it shuts down.
- d. **Under what conditions will Delta Truss make the shutdown permanent and exit the market?**  
Delta Truss will permanently shutdown and exit the market in the long run if the price of a truss is less than Delta Truss' average total cost.
14. **Exxon Mobil Selling All Its Gas Stations to Distributors**  
**Exxon Mobil Corp. said Thursday it's getting out of the retail gasoline business, following other major oil companies. ... "As the highly competitive fuels marketing business in the U.S.**

continues to evolve, we believe this transition is the best way for Exxon Mobil to compete and grow in the future,” said Ben Soraci, the director of Exxon Mobil’s U.S. retail sales. Exxon Mobil is not alone among Big Oil exiting the retail gas business, a market where profits have gotten tougher as crude oil prices have risen. ... Station owners say they’re struggling to turn a profit on gas because while wholesale gasoline prices have risen sharply, ... they’ve been unable to raise pump prices fast enough to keep pace.

*Houston Chronicle, June 12, 2008*

- a. **Is Exxon Mobil making a shutdown or exit decision in the retail gasoline market?**  
Exxon Mobil is making an exit decision. It is permanently leaving the market.
- b. **Under what conditions will this decision maximize Exxon Mobil’s economic profit?**  
This decision maximizes Exxon Mobil’s economic profit if Exxon Mobil’s retail gasoline operation is incurring an economic loss. In this case by closing its retail gasoline stations, Exxon Mobil increases its economic profit.
- c. **How might this decision by Exxon Mobil affect the economic profit made by other firms that sell retail gasoline?**  
Exxon Mobil’s exit will decrease the number of retail firms selling gasoline. The decrease in the number of firms decreases the supply and raises the market price of retail gasoline. As a result of the higher market price the surviving firms’ profits rise.

15. **Another DVD Format, but This One Says It’s Cheaper**

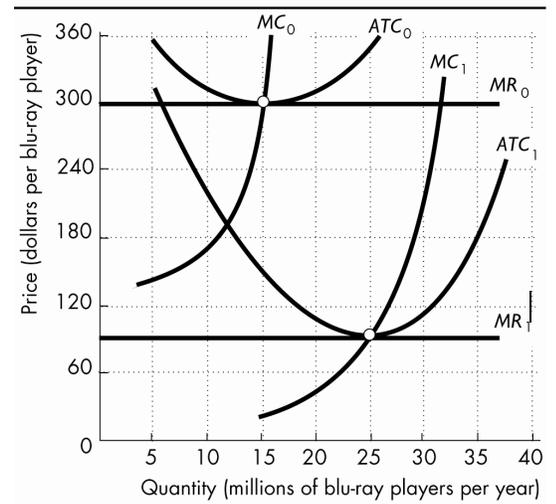
No sooner has the battle for the next-generation high definition DVD format ended, with Blu-ray triumphing over HD DVD, than a new contender has emerged. A new system ... called HD VMD ... is trying to find a niche. New Medium Enterprises, the London company behind HD VMD, says its system’s quality is equal to Blu-ray’s but it costs less. ... While Blu-ray players typically cost more than \$300, an HD VMD unit is priced at \$199. ... New Medium’s price strategy will fail, said Andy Parsons, chairman of the Blu-ray Disc Association, ... because it relies on a false assumption: Blu-ray technology will always be more expensive. “When you mass produce blue lasers in large quantities, hardware costs will absolutely come down,” Mr. Parsons said. “I’m sure we’ll eventually be able to charge \$90 for a Blu-ray player.”

*The New York Times, March 10, 2008*

- a. **Explain how technological change in Blu-ray production might support Mr. Parson’s predictions of lower prices in the long-run and illustrate your explanation with a graph.**

Technological change will decrease the firm’s average total cost and marginal cost. As more firms adopt the new technology, the market supply will increase, which drives down the price. Figure 12.6 shows the effect of the increase in technology. The firm’s average total cost curve and marginal cost curve shift downward from  $ATC_0$  and  $MC_0$  to  $ATC_1$  and  $MC_1$ . In the long run, competition forces the price to fall from \$300 per player to \$90 per player and so the marginal revenue curve falls from  $MR_0$  to  $MR_1$ .

FIGURE 12.6  
Problem 15a



- b. Even if Blu-ray prices do drop to \$90 in the long-run, why might the red-laser HD VMP still end up being less expensive at that time?

Quite likely there will be technological advances in the red-laser player which decrease its costs of production, increase its market supply, and lower its price. Additionally if there are only a few firms initially producing the red-laser player and these firms are making an economic profit, entry of new firms will increase market supply and also lower the price of a red-laser HD VMP.

16. Cell Phone Sales Hit 1 Billion Mark

More than 1.15 billion mobile phones were sold worldwide in 2007, a 16 percent increase from the 990.9 million phones sold in 2006. ... “Emerging markets, especially China and India, provided much of the growth as many people bought their first phone,” Carolina Milanesi, research director for mobile devices at Gartner, said in a statement. “In mature markets, such as Japan and Western Europe, consumers’ appetite for feature-laden phones was met with new models packed with TV tuners, global positioning satellite (GPS) functions, touch screens and high-resolution cameras.”

*CNET News, February 27, 2008*

- a. Explain the effects of the global increase in demand for cell phones on the market for cell phones and individual cell-phone producers in the short run.

In the short run the market demand for cell phones increases. The price of a cell phone rises and the market equilibrium quantity increases. Because the market price rises, individual cell phone producers increase the quantity they produce and make an economic profit.

- b. Draw a graph to illustrate your explanation in a.

FIGURE 12.7a  
Problem 16b

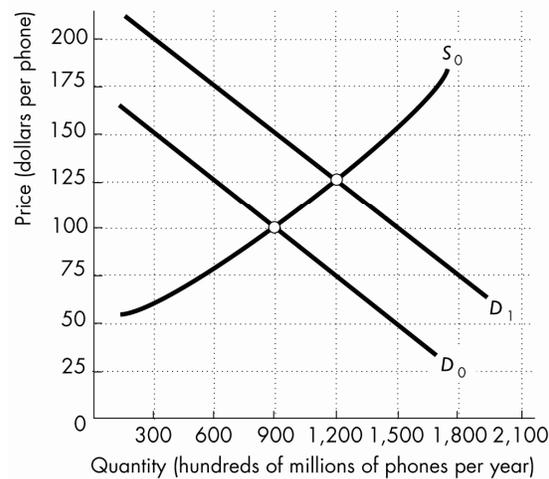
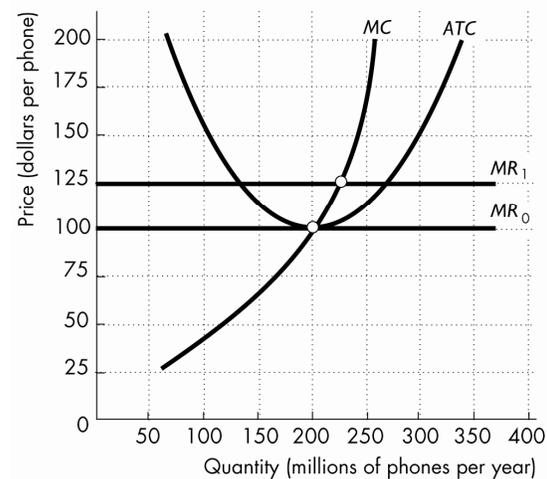


FIGURE 12.7b  
Problem 16b



Figures 12.7 shows the short-run outcome. Figure 12.7a shows the market equilibrium. In the market, demand increases and the demand curve shifts rightward from  $D_0$  to  $D_1$ . In the short run the supply curve remains  $S_0$ . As a result of the increase in demand the market price rises to \$125 a cell phone and the market quantity increases to 1,200 million. Figure 12.7b shows the situation at a representative firm. The rise in the market price raises the firm’s demand and marginal revenue curve from  $MR_0$  to  $MR_1$ . The firm

responds by increasing the quantity it produces from 200 million cell phones a year to 225 million cell phones a year. It makes an economic profit because the price exceeds the firm's average total cost.

- c. Explain the effects of the global increase in demand for cell phones on the market for cell phones in the long run.**

In the long run the economic profit attracts entry into the market. The market supply increases which drives the price down. The market equilibrium quantity increases. The fall in the price decreases and, in the long run, totally eliminates the firms' economic profit. If the industry is a constant cost industry, the price returns to its initial level and the firms' amount of production returns to the initial amount.

- d. What factors will determine whether the price of cell phones will rise, fall, or stay the same in the new long-run equilibrium?**

The presence or absence of external economies or diseconomies determines whether the price of a cell phone falls, rises, or stays the same in the new long-run equilibrium. If the industry is characterized by external economies, factors beyond the control of an individual firm that lower the firm's costs as the *market* output increases, the long-run equilibrium price falls. If the industry is characterized by external diseconomies, factors beyond the control of an individual firm that raise the firm's costs as the *market* output increases, the long-run equilibrium price rises. If the industry has neither external economies nor diseconomies, the long-run equilibrium price is the same as the initial equilibrium price.

- 17. Study Reading Between the Lines about the market for long-distance air travel on pp. 292–293, and then answer the following questions.**

- a. What are the features of the market for air travel that make it highly competitive?**

The market for air travel is competitive because there are many airlines providing these services and there is no barriers to entry into the market. In addition, the service provided by all long-distance airlines is essentially the same.

- b. Explain how the market for long-distance discount air travel will get back to a long-run equilibrium if the price of jet fuel falls to \$70 a barrel.**

If the market demand remains constant, airlines will break even when jet fuel is \$70 a barrel. The market price of a flight will not change, but as jet fuel becomes cheaper, each firm's marginal cost and average total cost will decrease and airlines remaining in the market will break even.

- c. Draw a graph of the cost and revenue curves of an airline to illustrate the situation in the new long-run equilibrium.**

If the market demand remains constant when jet fuel remains above \$70 a barrel, airlines will incur economic losses. In the long run, some airlines will exit the market. As they exit, the market supply decreases and the market price rises. Firms remaining in the industry will incur small losses. But in long-run equilibrium, the market will have risen to the point that firms remaining in the market break even.

**d. Explain how the market for long-distance air travel gets back to a long-run equilibrium.**

Figure 12.8 illustrates. Initially, the price is \$200 a seat and airlines are making zero economic profit. The price of jet fuel rises and the airline's cost curves shift upward in 12.8(b). The airlines incur economic losses. As some exit the market, the market supply curve shifts leftward. As it does the market price rises and the losses incurred by the airlines remaining in the market get smaller. Airlines will continue to exit the market until the remaining firms break even.

**e. Draw a graph of the cost and revenue curves of an airline to illustrate the situation in the long-run equilibrium in d.**

FIGURE 12.8a

Problem 17d

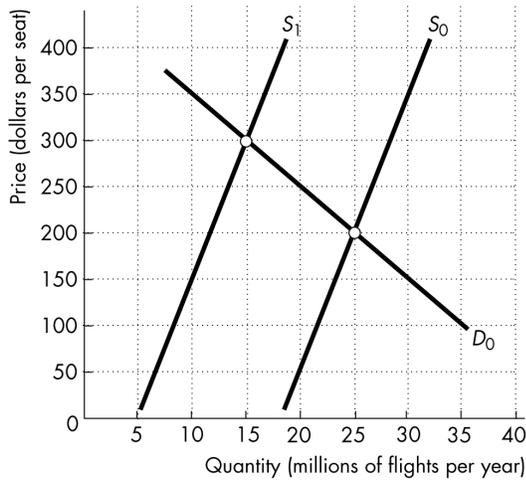


FIGURE 12.8b

Problem 17d

