Price Takers and the Competitive Process

CHAPTER 9

Chapter Focus

- How do firms that are price takers differ from those that are price searchers?
- What determines the output of a price taker?
- How do price takers respond to changes in price in the short run? In the long run?
- How does time influence the elasticity of supply?
- What must firms do in order to make profits? How do profits and losses influence the supply and market price of a product?
- How does competition provide an incentive for producers to supply goods that consumers want at a low cost?

Competition means decentralized planning by many separate persons.

—Friedrich A. von Hayek[1]

[I]t is competition that drives down costs and prices, induces firms to produce the goods consumers want, and spurs innovation and the expansion of new markets. . . .

—President's Council of Economic Advisers[2]

[1]F. A. von Hayek, "The Use of Knowledge in Society," *American Economic Review* 35 (September 1945): 521.

[2]President s Council of Economic Advisers *Economic Report of the President,* 1996 (Washington, D.C.: U.S. Government Printing Office, 1996), 155

In the previous chapter, we focused on cost conditions of business firms. In this chapter and the next two, we will take a closer look at the price and output decisions of the firm, and analyze how they are influenced by market conditions. We will also consider how the structure of a market — for example, the number of firms, the control they have over price, and the ease of entry into the market — influences the decision making of firms. What determines the profitability of firms, and how does the level of profit influence the market supply? When goods and services are allocated by markets, will resources be allocated efficiently? Is there any reason to believe that there will be a link between market allocation and economic prosperity? These are the major questions that we will address in the next several chapters.

PRICE TAKERS AND PRICE SEARCHERS

Price takers
Sellers who must take the market price in order to sell their product. Because each price taker's output is small relative to the total market. price takers can sell all their output at the market price. but they are unable to sell any of their output at a price higher than the market price.

This chapter will focus on markets in which the firms are **price takers:** they simply take the price that is determined in the market. ***In a price-taker market, the firms all produce identical products (for example, wheat, eggs, or regular unleaded gasoline), and each seller is small relative to the total market. Thus, the output of any single firm has little or no effect on the market price. Each firm can sell all its output at the market price, but cannot sell any of its output at a higher price.*** When a firm is a price taker, there is no pricing decision to be made. Price takers try to choose the output level that will maximize profit. given their costs and the price determined by the market.

Price takers, like all other profit-seeking firms, cannot thrive (or even survive) in a competitive environment unless they are sensitive to cost. However, price-taker markets and price-searcher markets have differing degrees of competition, differing ease of entry, and perhaps differing scale economies, too. To compete, each firm has to provide a high level of delivered benefits per dollar, compared to what consumers can find elsewhere. No firm can force consumers to purchase its product, and all products have many substitutes. Successful firms are those that stay ahead of competitors and potential competitors.

APPLICATIONS IN ECONOMICS

The Aalsmeer Flower Auction: An Illustration of a Competitive Market

The Aalsmeer Flower Auction, located near Amsterdam, is a highly competitive market with a large number of both buyers and sellers. Approximately 5,000 growers from the Netherlands and other countries like Israel, Kenya, and Zambia supply their products to this market. On a typical day, several thousand buyers representing wholesale florists around the world participate in the auction. More than 18 million flowers and 2 million plants are sold each day from a building equal in size to 125 football fields.

The 50,000 daily transactions are made possible by the Dutch auction system. Under this system, a clock runs backward from the highest to the lowest price per unit. The buyer pushes a button indicating his or her willingness to purchase when the clock reaches an acceptable per-

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unit price. The purchaser is the first buyer to push the button. Flowers and plants auctioned in the morning at Aalsmeer will be available in shops around the world within twenty-four hours.

In the real world, most firms are not price takers. In most cases, firms that lower their prices are able to attract additional customers. Correspondingly, firms are usually able to increase their prices, at least a little, without losing all their customers. For example, if Nike increased the price of its athletic shoes by 10 percent, the number of shoes sold would decline, but it would not fall to zero. Firms like Nike are not price takers. They are **price searchers**: they choose the price that they will charge for their product, but the quantity that they are able to sell is very much related to that price. To maximize their profits, price searchers must not only decide how much to produce, but also what price to charge. We will examine markets in which the firms are price searchers in the following two chapters.

Price searchers
Firms that face a downward-sloping demand curve for their product. The amount the firm is able to sell is inversely related to the price it charges.

If most real-world firms are price searchers, not price takers, why take the time to analyze the latter? There are several reasons. First, even though most firms are not price takers, there are a number of important markets, particularly in agriculture, in which the firms do essentially take the price determined in the market. Second, the price-taker model helps clarify the relationship between the decision making of individual firms and the market supply in both price-taker and price-searcher markets. Finally, and perhaps most important, the study of markets in which firms are price takers enhances our knowledge of **competition as a dynamic process.** Understanding how the competitive process works when firms are price takers will also contribute to our understanding of the process as it applies to many price searchers.

Competition as a dynamic process
Rivalry or competitiveness between or among parties (for example, producers or input suppliers) *to* deliver a better deal to buyers in terms of quality, price, and product information.

Historically, the term **pure competition** has been used to refer to markets in which firms are price takers. However, these markets are increasingly referred *to* as "price-taker markets" because this expression is more descriptive. Furthermore, this label avoids the implication that competitive forces are necessarily less pure or less intense in price-searcher markets. Often this is not the case. Many price searchers use a broad array of competitive weapons—for example, quality of product, style, convenient location, advertising, and price—all in an effort to attract consumers. When **barriers to entry** are low, the competitive process is just as important in price-searcher markets as it is when the firms are price takers.

Pure competition
A market structure Characterized by a large number of small firms producing an identical product in an industry (market area) that permits complete freedom of entry and exit. Also called price-taker markets.

Nonetheless, it should be noted that price-taker markets and purely competitive markets are really alternative names for the same thing. So when you hear people talk about pure competition or purely competitive markets, they mean markets with characteristics like those analyzed in this chapter.

Barriers to entry
Obstacles that limit the freedom of potential rivals to enter and compete in an industry or market

WHAT ARE THE CHARACTERISTICS OF PRICE-TAKER MARKETS?

Consider the situation of Les Parrot, a Texas cattle rancher. In the financial pages of the local newspaper, he finds that the current market price of quality steers is 88 cents per pound. Even if his ranch is quite large, there is little that Parrot can do to change the market price of beef cattle. After all, there are tens of thousands of farmers who raise cattle. Thus, Parrot supplies only a small portion of the total cattle market. The amount that he sells will exert little or no effect on the market price of cattle. Parrot is a price taker.

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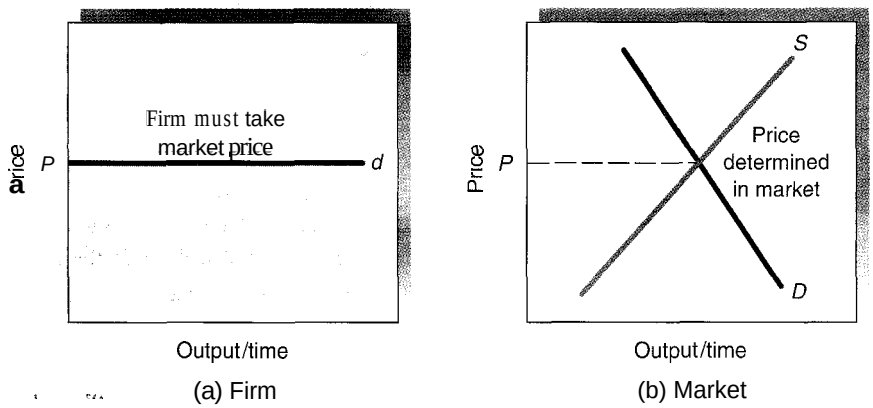
Producers in the wheat-farming and beef cattle markets are price takers. If they are going to sell their output, they must do so at the price determined by the market. Because individual producers are small relative to the total market, they can sell as many units as they like at the market price.

EXHIBIT 1
The Price Taker's Demand Curve

The market forces of supply and demand determine price (b). Price takers have no control over price. Thus, the demand for the product of the firm is perfectly elastic (a).



The firms in a market will be price takers when the following four conditions are met:

1. All the firms in the market are producing an identical product (for example, beef, or cattle, of a given grade).
2. A large number of firms exist in the market.
3. Each firm supplies only a very small portion of the total amount supplied to the market.
4. No barriers limit the entry or exit of firms in the market.

When these conditions are met, firms selling in the market must accept the market price. This is why they are called price takers. **Exhibit 1** illustrates the relationship between the market forces (part b) and the demand curve facing the price-taking firm (part a). If the firm sets a price above the market level, consumers will simply buy from other sellers. Why pay the higher price when the identical good is available elsewhere at a lower price? For example, if the price of wheat were $5.00 per bushel, a farmer would be unable to find buyers for wheat at $5.50 per bushel. A firm would gain nothing by setting its price below the market level, because any small firm in the market can already sell as much as it wants at the market price. A price reduction would only reduce revenues. A firm that is a price taker thus faces a perfectly elastic demand for its product. (In Exhibit 1, note that a lowercase *d* is used to denote the demand curve faced by the *firm,* whereas an uppercase *D* indicates the ***market*** demand curve.)

HOW DOES THE PRICE TAKER MAXIMIZE PROFIT?

The firm's output decision is based on comparing benefits with costs. A firm that decides to enter a market will expand its output as long as the benefits (additional revenues) from the production and sales of the additional units exceed their marginal costs. How will changes in output change the firm's costs? In the preceding chapter, we discovered that the firm's short-run marginal costs will eventually increase as the firm expands its output by working its fixed plant facilities more intensively. The law of diminishing marginal returns assures us that this will be the case. Eventually, both the firm's short-run marginal and average total cost curves will turn upward.

Marginal revenue (*MR*)
The incremental change in total revenue derived from the sale of one additional unit of a product.

What about the benefits or additional revenues from output expansion? **Marginal revenue** (*MR*) is the change in the firm's total revenue per unit of output. It is the additional revenue derived from the sale of an additional unit of output. Mathematically,

$$MR = \text{Change in total revenue/Change in output}$$

Since the price taker sells all units at the same price, its marginal revenue will be equal to the market price.

In the short run, the price taker will expand its output until marginal revenue (price) just equals marginal cost. This decision-making rule will maximize the firm's profits (or minimize its losses).

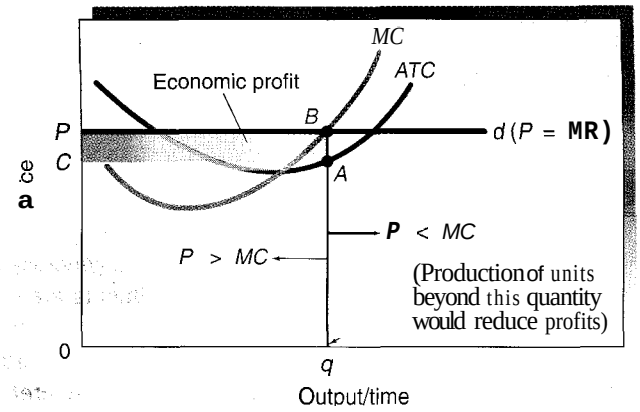


EXHIBIT 2
Profit Maximization When the Firm Is a Price Taker

The price taker will maximize profits by producing the output level q, where $P = MC$.

Exhibit 2 helps explain why. Since the firm can sell as many units as it would like at the market price, the sale of one additional unit will increase revenue by the price of the product. Does the firm gain by producing an extra unit? The answer is "Yes," as long as the marginal revenue (price. for the price taker) is greater than or equal to the marginal cost of that unit. Profit is simply the difference between total revenue and total cost. Profit will increase as long as the production and sale of a unit add more to revenue than to cost. Thus, the firm will gain from an increase in output as long as marginal revenue exceeds marginal cost. Eventually, however, as the firm produces a larger and larger quantity with its fixed-size plant, marginal costs will rise and exceed the price and marginal revenues. When the production of an additional unit adds more to cost than it adds to revenue, the firm's profit will be reduced if the unit is produced. Thus, the profit of the price taker is maximized at the output rate at which $P = MR = MC$. In Exhibit 2. this occurs at output level q.

A profit-maximizing firm with the cost curves shown in Exhibit 2 would produce exactly q units. The total revenue of the firm would be the sales price of each unit. P, multiplied by output sold, q. Total revenue is represented by the area $P0qB$. The firm's total cost, on the other hand, can be found by multiplying the average total cost (ATC) by the output level. Total cost is represented by the area $C0qA$. Because the firm's total revenues exceed its total costs, it is making short-run economic profit (the shaded area).

In the real world, of course, decisions are not made by entrepreneurs who spend time drawing demand and marginal cost curves. Many entrepreneurs have never even heard of these concepts. A business decision maker who has never heard of the $P = MR = MC$ rule for profit maximization, however, probably has another rule that yields approximately the same outcome. For example, the rule might be to produce those units, and only those units, that add more to revenue than to cost. This ensures maximum profit (or minimum loss). It also happens to be the point at which $P = MR = MC$. Why? To stop short of that point would mean that the firm would not be producing some profitable units that would add more to revenue than to cost. Similarly, the firm should not go beyond that point because producing more units would add more to cost than to revenue. This commonsense rule thus leads to the same outcome as our model, even when the decision maker knows none of the technical jargon of economics. No wonder economics is sometimes thought of as "organized common sense."

Just how accurate is the price taker's competitive model in predicting behavior in real markets? Do other models, which assume that sellers collude to eliminate competition, yield better predictions? Direct scientific evidence would help us answer these questions. As the Applications in Economics feature about the significance of competition shows, this evidence has, indeed, been produced repeatedly in recent decades by people working in the relatively new subdiscipline of experimental economics. The evidence indicates that the general implications of the price-taker model are valid under a variety of circumstances.

APPLICATIONS IN ECONOMICS

Experimental Economics: The Significance of Competition

A normal economic event observed in the real world can have more than one potential cause. An economist seeking to isolate the effect of a single variable—a change in price, for example—must therefore try to either hold other potential causal factors constant or adjust for their expected impact. This is not an easy task. In other disciplines, scientists use carefully designed laboratory experiments, which hold other factors constant, to test and verify the basic principles on which their science is built.

In the midtwentieth century, economists also began to conduct laboratory experiments. A good many experiments have been conducted to investigate the predictive power of the price-taker model. In one of the earliest, conducted in 1956 by leading experimental economist Vernon Smith, then at Purdue University, individuals were brought into a laboratory setting and arbitrarily assigned roles as buyers and sellers in a gamelike setting. Each buyer was given a different "limit price" (a maximum price he or she was allowed to pay) for a paper asset. Any buyer who could purchase the paper commodity for less than the limit price received a cash payment equal to the difference between the limit price and the amount actually paid. Each buyer gained financially by purchasing at lower prices—just as buyers and sellers do in real markets. The sellers were treated similarly. Each had a "limit price" (a minimum selling price) and received in cash any extra revenue above that price. In turn, buyers and sellers were free to make verbal offers and enter into exchanges at any mutually agreeable price.

The price-taker model predicts that all mutually advantageous trades among buyers and sellers will occur and that, as trades occur, the price of the good will converge toward a single price—the market price. Prior to the work in experimental economics, many economists thought this model was relevant only under highly restrictive conditions. Experimental researchers, however, have found that outcomes approximating those of the price-taker model generally emerge even when the strict assumptions of the model are absent. For example, even if the number of sellers is relatively small, say ten to fifteen, outcomes similar to those predicted by the price-taker model generally occur.

Participants in these experiments are often startled to discover that their competitive trading generated the largest possible joint income gain and, furthermore, that the competitive model presented in this chapter predicted this occurrence. Vernon Smith, who now directs the Interdisciplinary Center for Economic Studies at George Mason University, cites cases in which, after the experiment, participants describe the experimental market as "unorganized, unstable, chaotic, and confused." Generally, they are amazed when shown that their actions (trades) achieved the maximum income for the group, and that a sealed envelope, given to them prior to the experiment, predicted the approximate amount of their (maximum) joint gain.

At first, Smith himself was surprised that efficient outcomes were achieved under a wide variety of conditions, but after numerous experiments, he stated:

> In many experimental markets, poorly informed, error-prone, and uncomprehending human agents interact through the trading rules to produce social algorithms which demonstrably approximate the wealth maximizing outcomes traditionally thought to require complete information and cognitively rational actors.[1]

In addition to analyzing the exchange process, experimental research has addressed numerous other topics, including the impact of alternative auction rules, the likelihood of a stock market or real estate bubble, and the provision of public goods. In 2002, Vernon Smith was awarded the Nobel Prize for his path-breaking work in this area. Clearly, experimental economics is now one of the most exciting and fruitful areas of current economic research.

[1] Vernon L Smth, "Economics in the Laboratory," *Journal of Economic Perspectives* 8, no. 1 (Winter 1994): 118.

Profit Maximizing—A Numeric Example

Exhibit 3 uses numeric data to illustrate profit-maximizing decision making for a firm that is a price taker. Put yourself in the place of the owner of this firm. Your short-run total and marginal cost schedules have the general characteristics we discussed in the previous chapter. Since the firm confronts a market price of $5 per unit, its marginal revenue is $5. Total revenue thus increases by $5 per additional unit of output produced and sold. You will maximize your profit when you supply an output of 15 units.

There are two ways to look at this profit-maximizing output rate. First, profit is equal to the difference between total revenue and total cost. Thus, profit will be maximized at the output rate at which this difference (*TR* minus *TC*) is greatest. Column 6 of Exhibit 3

EXHIBIT 3
Profit Maximization for a Price Taker: A Numeric Illustration

(1) OUTPUT (PER DAY)	(2) TOTAL REVENUE (*TR*)	(3) TOTAL COST (*TC*)	(4) MARGINAL REVENUE (*MR*)	(5) MARGINAL COST (*MC*)	(6) PROFIT (*TR* – *TC*)
0	$ 0.00	$ 25.00	$0.00	$ 0.00	$-25.00
1	5.00	29.80	5.00	4.80	-24.80
2	10.00	33.75	5.00	3.95	-23.75
3	15.00	37.25	5.00	3.50	-22.25
4	20.00	40.25	5.00	3.00	-20.25
5	25.00	42.75	5.00	2.50	-17.75
6	30.00	44.75	5.00	2.00	-14.75
7	35.00	46.50	5.00	1.75	-11.50
8	40.00	48.00	5.00	1.50	– 8.00
9	45.00	49.25	5.00	1.25	– 4.25
10	50.00	50.25	5.00	1.00	– 0.25
11	55.00	51.50	5.00	1.25	3.50
12	60.00	53.25	5.00	1.75	6.75
13	65.00	55.75	5.00	2.50	9.25
14	70.00	59.25	5.00	3.50	10.75
15	75.00	64.00	5.00	4.75	11.00
16	80.00	70.00	5.00	6.00	10.00
17	85.00	77.25	5.00	7.25	7.75
18	90.00	85.50	5.00	8.25	4.50
19	95.00	95.00	5.00	9.50	0.00
20	100.00	108.00	5.00	13.00	– 8.00
21	105.00	125.00	5.00	17.00	-20.00

provides this information. For small output rates (less than eleven units). you **and** your firm would actually experience losses. But at fifteen units of output, an $1 1 profit is earned ($75 total revenue minus $64 total cost). A look at the profit figures of column 6 shows that it's impossible to earn a profit larger than $11 at any other rate of output.

In **Exhibit 4,** part (a) presents the total revenue and total cost approach in graph form. (However, the curves are drawn smoothly, as though output could be increased by tin) amounts, not just in whole-unit increments like those shown in Exhibit 3.) Profits will be greatest when the total revenue line lies above the total cost curve by the largest vertical amount. That takes place, of course, at fifteen units of output.

You can also use the marginal approach to determine the profit-maximizing rate of output for the firm. Remember, as long as price (marginal revenue) exceeds marginal cost. production and sale of additional units will add to the firm's profit (or reduce its losses). A look at columns 4 and 5 of Exhibit 3 reveals that *MR* is greater than *MC* for the first fifteen units of output. Producing these units will expand the firm's profit. In contrast. producing any unit beyond fifteen adds more to cost than to revenue. Profit will therefore decline if you expand output beyond fifteen units. Given the firm's cost and revenue schedule, you will maximize profit by producing fifteen, and only fifteen, units per day.

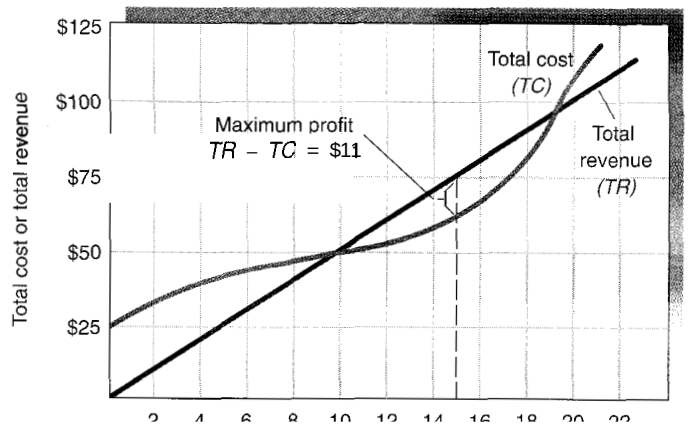
Part (b) of Exhibit 4 graphically illustrates the marginal approach. Note here that the output rate (fifteen units) at which the marginal cost and marginal revenue curves intersect coincides with the output rate in part (a) at which the total revenue curve exceeds the total cost curve by the largest amount. Beyond that output rate, *MR* is less than *MC*, so profit will decline.

Losses and When to Go Out of Business

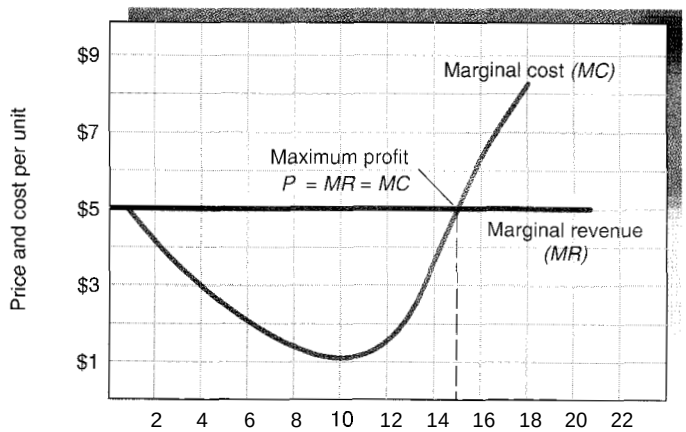
Suppose that market changes cause the price to drop below a firm's average total cost at all possible output levels. How will a profit maximizer (or loss minimizer) respond to this situation? The answer to this question depends both on the firm's current sales revenues relative to its variable cost and on its expectations about the future. The firm's owner has three options: (1) continue to operate in the short run, (2) shut down temporarily, or (3) go out of business.

EXHIBIT 4
The Firm's Profit-Maximizing Output Level—Total and Marginal Approaches

Using the data of Exhibit 3, we can find the profit-maximizing output of a price taker using either the total approach or the marginal approach. Using the total approach, we find that profits are maximized when the firm's total revenues exceed its total costs by the greatest amount (a). Using the marginal approach, we find that profits are maximized by comparing marginal revenue and marginal costs (b).



(a) Total revenue/total cost approach



(b) Marginal revenue/marginal cost approach

If the firm anticipates that the lower market price is temporary, it may want to continue operating in the short run as long as it can cover its variable cost.[3] **Exhibit 5** illustrates why. The firm shown in this exhibit would minimize its loss at output level q, where $P = MR = MC$. But at q, total revenues ($0qBP_1$) are less than total costs ($0qAC$). The firm faces short-run economic losses. Even if it shuts down completely, it will still incur fixed costs, *unless the firm goes out of business.* If it anticipates that the market price will increase enough to allow the firm to cover its average total costs in the future, it may not want to terminate operations and sell its assets. It may choose to produce q units in the short run, even though it will incur losses. At price P_1, producing output q is clearly more advantageous than shutting down, because the firm is able to cover its variable costs and have revenue remaining to pay some of its fixed costs. If it were to shut down but not sell out, the firm would lose the entire amount of its fixed cost.

What if the market price drops below the firm's average variable cost (for example, to P_2)? When this happens, not only is the firm not covering its fixed costs, it's not fully covering its variable, or per-unit, costs either. In other words, the more units the firm produces, the more money it loses. Under these circumstances, a temporary **shutdown** is preferable to short-run operation. Even if the firm's owner expects the market price to increase later, enabling the firm to survive and prosper in the future, shutting down in the short run will

Shutdown
A temporary halt in the operation of a firm. Because the firm anticipates operating in the future, it does not sell its assets and go out of business. The firm's variable cost is eliminated by the shutdown, but its fixed costs continue.

Going out of business
The sale of a firm's assets, and its permanent exit from the market. By going out of business, a firm is able to avoid its fixed costs, which would continue during a shutdown.

[3]Keep in mind the opportunity-cost concept The firm's fixed costs are opportunity costs that do not vary with the level of output They can be avoided if, and only if, the firm goes out of business To specify fixed costs, we need to know (1) how much the firm's fixed assets would bring if they were sold or rented to others and (2) any other costs, such as operating license fees and debts, that could he avoided if the firm declared bankruptcy and/or went out of business Since fixed costs can be avoided if the firm goes out of business, the firm will foresee greater losses from operating even in the short run if it does not expect conditions to improve.

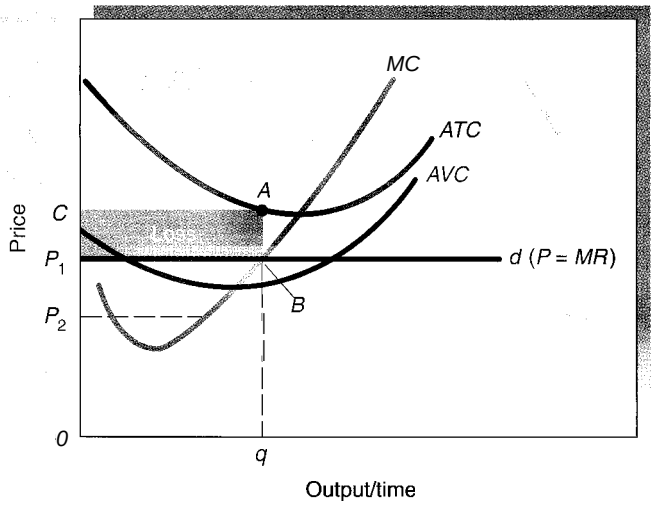


EXHIBIT 5
Operating with Short-Run Losses

A firm making losses will operate in the short run if it (1) can cover its variable costs now and (2) expects price to be high enough in the future to cover all its costs.

hold the line on its losses. The firm will still have to pay its fixed costs, but it won't be taking an additional loss on each unit it produces. Temporary shutdowns are actually regularly planned in some markets. For example, many ski resorts, golf courses, hotels, and restaurants in vacation areas plan to shut down in slow seasons, operating only when tourists or other seasonal purchasers provide enough demand. The price-taker model predicts that these firms will operate only when they expect to cover at least their variable costs.

The firm's third option is **going out of business** immediately. If the firm is sold, even the losses resulting from its fixed costs can be avoided. When market conditions are not expected to change for the better, going out of business is the preferred option.

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A Temporary Shutdown

A firm will temporarily shut down if it cannot cover its variable cost but does not want to go out of business because it expects to be able to operate profitably in the future. This Ice-cream store in Morgantown, West Virginia, closes for several months each winter and reopens during the summer. During these short-run shutdowns, the store still pays its fixed costs, such as its rent, taxes, and insurance. The store avoids only variable costs during the winter months.

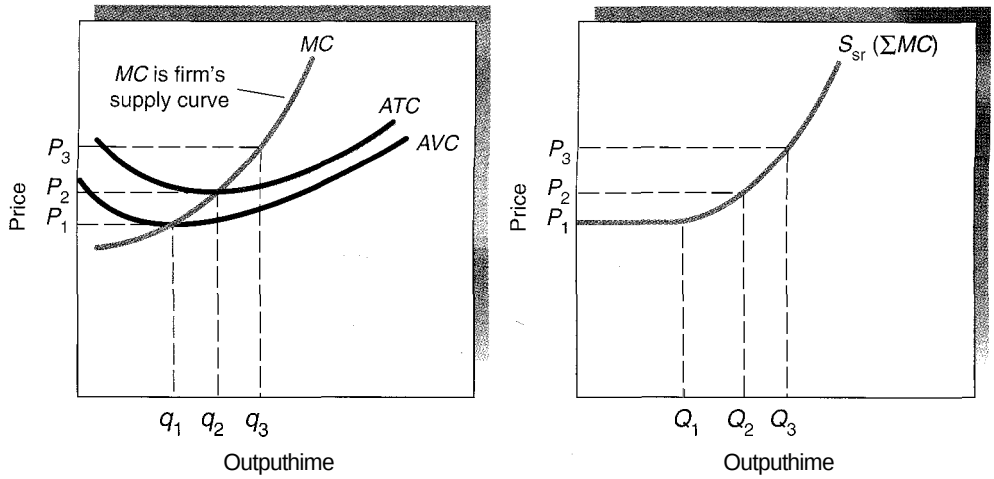
THE FIRM'S SHORT-RUN SUPPLY CURVE

The price taker that intends to stay in business will maximize profits (or minimize losses) when it produces the output level at which* P = MR = MC *and variable costs are covered. Therefore, the portion of the firm's short-run marginal cost curve that lies above its average variable cost is the short-run supply curve of the firm.

Exhibit 6 illustrates that, as the market price increases, the firm will expand output along its *MC* curve. If the market price were less than P_1, the firm would shut down immediately because it would be unable to cover even its variable costs. Shutting down will hold its loss to the payment of fixed costs only. If the market price is P_1, however, a price equal to the firm's average variable cost, the firm may supply output q_1 in the short run. Economic losses will result, but the firm would incur similar losses if it shut down completely. As the market price increases to P_2, the firm will happily expand output along its *MC* curve to q_2. At P_2, price is equal to average total costs. At this point, the firm is making a "normal rate of return," or zero economic profits. Higher prices will result in a still larger short-run output. For example, when the price rises to P_3, the firm will supply Q_3 units. At this price, economic profits will result. At still higher prices, output will be expanded even more. As long as price exceeds average variable cost, higher prices will cause the firm to expand output along its *MC* curve, which therefore becomes the firm's short-run supply curve.

EXHIBIT 6
The Short-Run Supply Curve for the Firm and the Market

As price increases, firms will expand output along their *MC* curve. Thus, the firm's *MC* curve is also its supply curve (a). When resource prices are constant, the short-run market supply (a) is merely the sum of the supply produced by all the firms in the market (b).



THE SHORT-RUN MARKET SUPPLY CURVE

The short-run market supply curve shows the total quantity supplied at alternative market prices. ***When the firms are price takers, the short-run market supply curve is the horizontal summation of the marginal cost curves (ΣMC) above the level of average variable cost for all of the firms in the market. Since individual firms will supply a larger amount at a higher price, the short-run market supply curve will slope upward to the right.***

Exhibit 6 illustrates this relationship. As the price of the product rises from P_1 to P_2 to P_3, the individual firms expand their output along their marginal cost curves. Since the individual firms supply a larger output as the market price increases, the total amount supplied to the market also expands.

Our construction of the short-run market supply curve assumes that the prices of the resources used by the industry do not change with industry output. When the entire industry (rather than just a single firm) expands output, resource prices may rise. The reason, of course, is that when just one firm expands, it has a minuscule effect on the market for resources, but when the entire industry expands output, the rise in resource demand is larger, so resource prices are more likely to rise. When this happens, the short-run market supply curve (reflecting the higher prices of purchased inputs) will be slightly more inelastic (steeper) than the sum of the supply curves of the individual firms.

PRICE AND OUTPUT IN PRICE-TAKER MARKETS

The short-run market supply curve, together with the demand curve for the industry's product, will determine the market price. At the short-run equilibrium market price, each firm will have expanded output until marginal costs are equal to the market price. In the short run, the firms may experience either profits or losses, but they will not have enough time to alter the size of their plants.

In the long run, however, firms will have the opportunity to expand the sizes of their plants. Firms will also be able to enter and exit the industry in the long run. As long-run adjustments are made, output in the whole industry may either expand or contract.

Long-Run Equilibrium

In addition to the balance between quantity supplied and quantity demanded necessary for short-run equilibrium, firms that are price takers can earn the normal rate of return, and only the normal rate, when the market is in long-run equilibrium. Why? ***If economic profit***

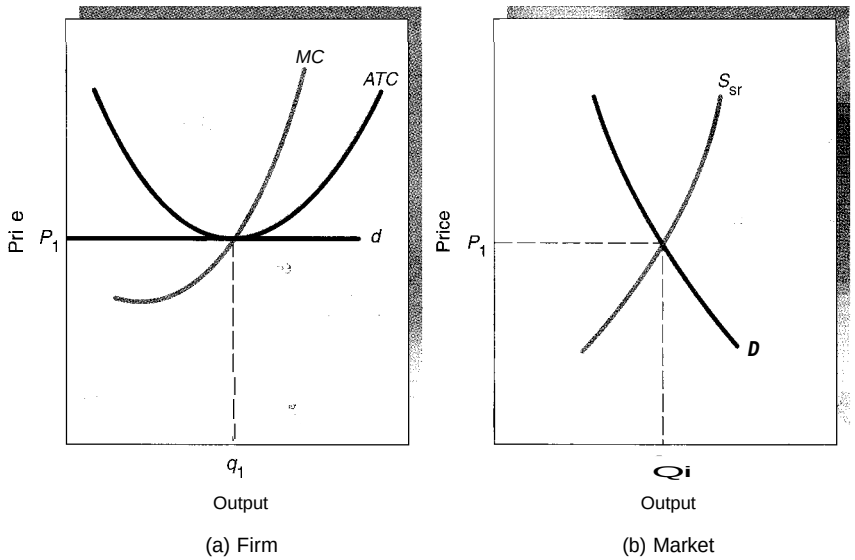


EXHIBIT 7
Long-Run Equilibrium in a Price-Taker Market

The two conditions necessary for equilibrium in a price-taker market are depicted here. First, quantity supplied and quantity demanded must be equal in the market (b). Second, the firms in the industry must earn zero economic profit (the "normal rate of return") at the established market price (a).

is present, new firms will enter the industry to capture some of those profits. Current producers will have an incentive to expand the scale of their operations to capture some of the additional profits, too. This increase in supply will put downward pressure on prices. In contrast, if firms in the industry are suffering economic losses, they will leave the market. This decrease in supply will put upward pressure on prices.

Therefore, as **Exhibit 7** shows, when a price-taker market is in long-run equilibrium, the quantity supplied and the quantity demanded will be equal at the market price (part b), and each firm in the industry will be earning normal (zero) economic profit (that is, its minimum *ATC* will just equal the market price) (part a). Firms will have no incentive to alter either their output levels or their plant sizes. Neither will there be incentive for net investment to flow into or away from the industry.

How Will the Market Respond to an Increase in Demand?

Suppose that a price-taker market is in equilibrium. What will happen if there is an increase in demand? **Exhibit 8** shows us. Suppose that an entrepreneur introduces a fantastic new candy. Consumers go wild over it. However, since it sticks to people's teeth, the market demand for toothpicks increases from D_1 to D,, pushing toothpick prices upward from P, to P,. What impact will the higher market price have on the output level of toothpick-producing firms? It will increase (from q_1 to q_2 in part a of the exhibit) as the firms expand output along their *MC* curves. In the short run, the toothpick producers will make economic profits. The profits will attract new toothpick producers to the industry and cause the existing firms to expand the scale of their plants. Hence. the **market supply** will increase (shift from S_1 to S_2) and eventually eliminate the short-run profits. **If** the prices of resources supplied to the industry are unchanged. the market supply will continue to expand (shift to the right) until the price of toothpicks **returns to** its initial level (P_1), even though output has expanded to Q_3.

How Will the Market Respond to a Fall in Demand?

Economic profits attract new firms to an industry. In contrast, economic losses (when they are expected to continue) encourage capital and entrepreneurship to move out of the industry and into other areas where the profitability potential is more favorable. Economic losses mean that the owners of capital in the industry (or firms that purchase the services of the capital) are earning less than the market rate of return. The opportunity cost of continuing in the industry exceeds the gain.

EXHIBIT 8
Market Response to Increased Demand

A new candy that sticks to people's teeth causes the demand for toothpicks to increase to D_2 (b). Toothpick prices rise to P_2, inducing firms to expand output. Toothpick firms make short-run profits (a), which draw new competitors into the industry. The toothpick supply then expands (shifts from S_1 to S_2). If cost conditions are unchanged, the expansion in supply will continue until the market price of toothpicks declines to its initial level of P_1.

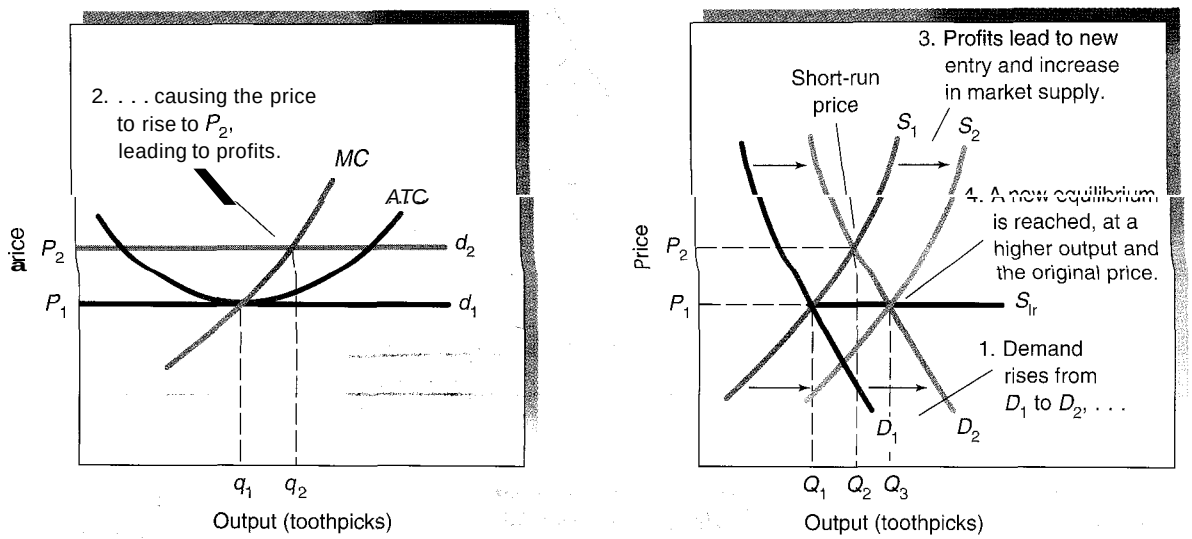


Exhibit 9 shows market forces reacting to economic losses. Initially, assume that an equilibrium price exists in the industry. The firms are able to cover their average costs of production. Now suppose that consumer incomes fall, lowering the product's demand and its market price. At the new, lower price, firms in the industry will not be able to cover their costs of production. In the short run, they will reduce output along their *MC* curves. The lower output by the individual firms results in a lower quantity supplied in the market.

In the face of short-run losses, the inflow of capital will decline and the industry's capital assets will shrink as firms fail to replace equipment when it wears out. Some firms will leave the industry as their fixed costs become variable—when machinery wears out and needs to be replaced, for example—and they are no longer able to cover their variable costs at the prevailing price. Others will reduce the scale of their operations, producing only those units for which the new, lower revenues can still justify the production costs. These factors will cause the industry supply to decline, indicated by the shift from S_1 to S_2. What impact will this have on price? It will rise. Over time, given no other shifts in demand, the short-run market supply curve will decline—continue shifting to the left—until the price rises enough that the firms remaining in the industry can once again earn "normal profits." At that point, a new long-run equilibrium is established. For a real-world example of how a market adjusts to changing demand and cost conditions, see the Applications in Economics feature on coffee production in a price takers' market.

The Long-Run Market Supply Curve

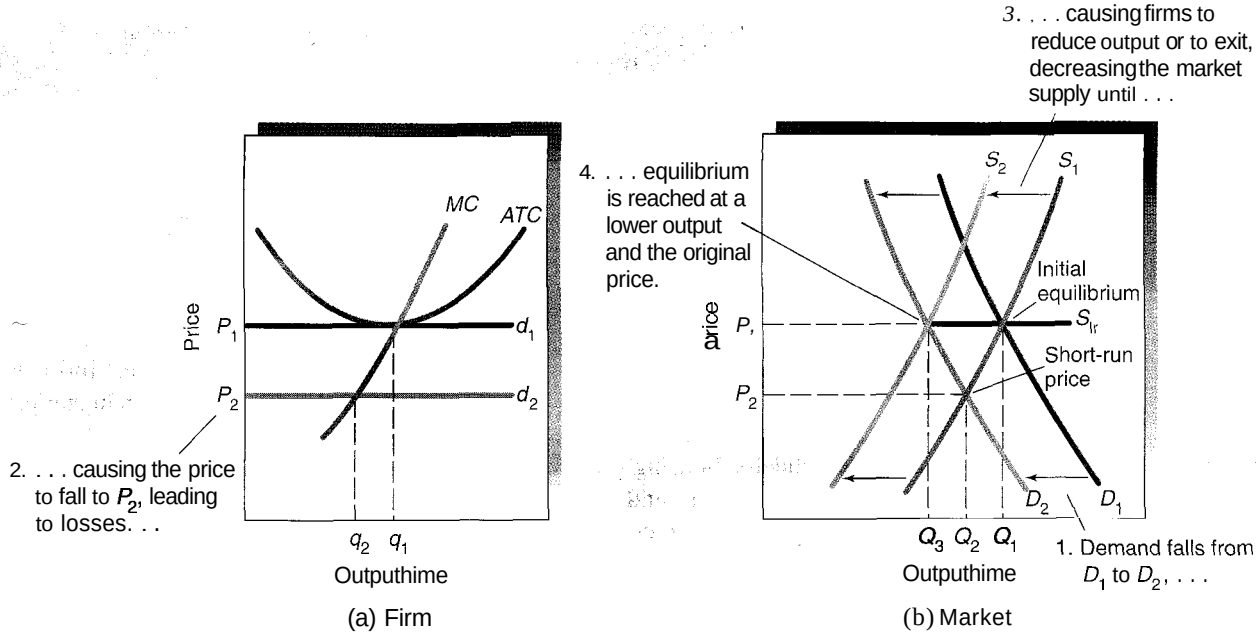
The *long-run market supply curve* shows the minimum price at which firms will supply various market output levels, given enough time to adjust the sizes of their plants (or other fixed factors) and to enter or exit the industry. The shape of the curve depends on what happens to the cost of production as the *industry's* output is altered. Three possibilities emerge, although one is far more likely than the other two.

Constant-cost industry
An industry for which factor prices and costs of production remain constant as market output is expanded. The long-run market supply curve is therefore horizontal in these Industries.

Long-Run Supply in Constant-Cost Industries If resource prices remain unchanged, the long-run market supply curve will be perfectly elastic. In terms of economics, this describes a constant-cost industry. Exhibits 8 and 9 both depict constant-cost industries.

EXHIBIT 9
The Impact of a Fall in Demand

Lower market demand will cause the price to fall and short-run losses to occur. The losses will cause some firms to go out of business and others to reduce their output. In the long run, the market supply will fall, causing the market price to rise. The supply will continue to decline and price will continue to rise until the short-run losses have been eliminated.



APPLICATIONS IN ECONOMICS

Coffee Production in a Price Takers' Market

Sellers in the world's coffee market are price takers. Hundreds of thousands of farmers produce coffee beans, and no grower has a significant impact on the world price. Each grower selling in the world market takes the price as given and is free to respond to any price change. Changes can be dramatic in the coffee market. For example, the market price rose from less than $1 per pound on average early in the 1990s to nearly $2 in early 1997.

As growing coffee became more profitable, coffee production around the world expanded. For example, Vietnamese growers more than quadrupled their coffee production, from 92.000 tons in 1990 to 487,000 tons in 1999. By 2000, Vietnam had become the world's second-largest coffee-producing nation.

But the greater supply of coffee turned out to be more than consumers were willing to buy. In 1997, the market price fell, along with the price paid to growers. By August 2001, coffee bean prices were averaging less than $.60 per pound. Many growers couldn't cover their costs at such low prices and began growing other crops Some landowners in Indonesia, for example, planted rice. Others, especially in Central and Latin America, began to plant organic and other specialty coffees, with lower yields but higher prices. Still other producers, including some in Vietnam, simply abandoned the least-profitable plantations, at least temporarily. In Mexico, more than an estimated 300,000 coffee farmers—unable to cover even their variable costs—left their farms to seek other opportunities.

The world coffee market illustrates very clearly how producers in price-taker markets can quickly expand production when rising prices are seen or expected but also contract production when prices and profits fall.

Source The information presented is from Howard LaFranchi, "Economic Upheaval over Coffee," *Christian Science Monitor* August 15, 2001, and from the BBC Web cite at http //www bbc co uk/worldservice/business/story_fdh200301 shtml (accessed September 17.2001) and from the Web site of the Intemational Coffee Organization at http://www.ico.org/. "Coffee Crisis" section (accessed June 16, 2004).

As Exhibit 8 shows. higher demand causes prices to increase *temporarily*. With time, however. the higher prices and profits will stimulate expansion and additional production, which will push the market price down to its initial level (and profitability to its normal rate). Because resource prices and the minimum per-unit cost remain constant as the market output expands, the larger supply will not require a permanent price increase. Similarly, Exhibit 9 illustrates the impact of a decline in demand in a constant-cost industry. Again, because resource prices and production costs are unaffected by the change in market output, the reduction in demand lowers the price in the short run, but not in the long run. Thus, in a constant-cost industry, the *long-run market supply curve* (S_{lr}) is perfectly elastic.

A constant-cost industry is most likely to arise when the industry's demand for resource inputs is quite small relative to the total demand for these resources. For example, the demand of the matches industry for wood, chemicals, and labor is very small relative to the total demand for these resources. Thus, doubling the output of matches would have very little effect on the price of the resources used by the industry. Matches therefore approximate a constant-cost industry.

Increasing-cost industry
An industry for which costs of production rise as output is expanded. In these industries, even in the long run, higher market prices will be needed to induce firms to expand total output in such industries. As a result, the long-run market supply curve in these industries will slope upward to the right.

Long-Run Supply in Increasing-Cost Industries In most industries, an increase in market demand and *industry* output will lead to higher per-unit production costs for all the firms in the industry. Economists refer to such industries as **increasing-cost industries**. The rising output and expanded resource demand in such industries result in higher prices for at least some resources, causing the firms' cost curves to shift upward. For example, a rising demand for housing places upward pressure on the prices of lumber, window frames, building sites, and construction labor, causing the cost of housing to rise. Similarly, an increase in demand (and market output) for beef will typically cause the prices of feed grains, hay, and grazing land to rise. Thus, the production costs of beef rise as more of it is produced.

For an increasing-cost industry, an expansion in market demand will bid up resource prices, causing the per-unit cost of the firms to rise. As a result, the market price will have to increase in order to induce firms to supply the larger output. The long-run market supply curve for the product will therefore slope upward.

Exhibit 10 depicts an increasing-cost industry. Greater demand causes higher prices and a larger market output. As the industry expands, the price of resources (factors of production) rises so that costs increase. What happens to the firm's cost curves? Both the average and marginal cost curves rise (shift to ATC_2 and MC_2). Greater production costs necessitate a higher long-run price (P_2), so the long-run supply curve slopes upward to the right.

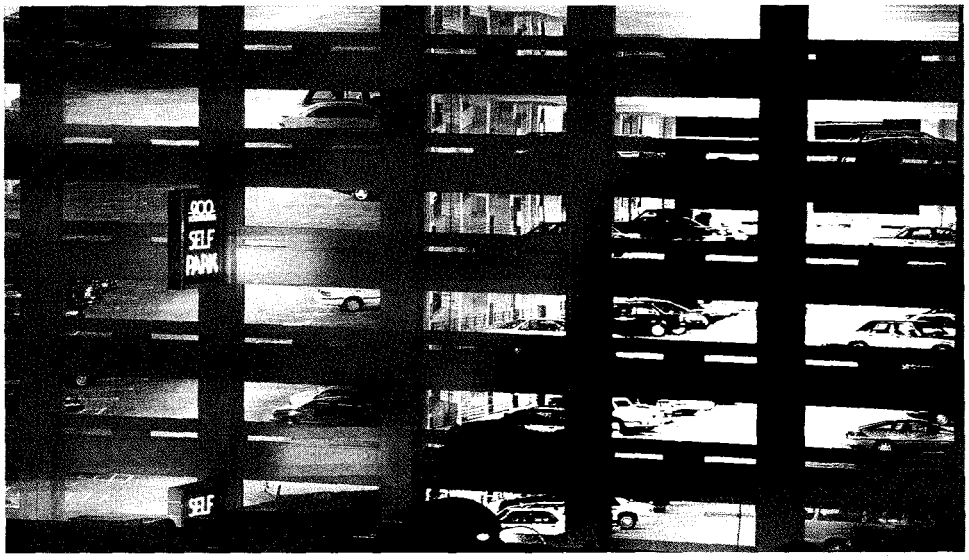
Decreasing-cost industry
An industry for which costs of production decline as the industry expands. The market supply is therefore inversely related to price. Such industries are atypical.

Long-Run Supply in Decreasing-Cost Industries Sometimes, factor prices will decline when the market output of a product is expanded. The lower resource prices will reduce the unit costs of the firms, placing them in a position to supply a larger market output at a lower price. In such **decreasing-cost industries**, the long-run (but not the short-run) market supply curve will slope downward to the right. For example, as the electronics industry expands, suppliers of certain components may be able to adopt large-scale production techniques that will lead to lower component prices. If rising electronics demand leads to reduced component cost (and if other resource prices do not rise to offset the reductions), then the cost curves of the electronics firms will shift downward. Under these circumstances, the industry supply curve for electronics products—reflecting the lower cost—will slope downward to the right.

In most industries, however, increases in demand and expansion in market output cause higher rather than lower input prices. Thus, increasing-cost industries are the norm, and decreasing-cost industries are rare.

Supply Elasticity and the Role of Time

It takes time for firms to adjust to a change in the price of a product. In the short run, firms are stuck with the existing sizes of their plants. If the price increases in the short run, they can expand output only by utilizing their existing plants more intensely. Thus, their output response will be limited. In the long run, however, they will have time to build new plants. This will allow them to expand output by a larger amount in response to an increase in price. Thus, the market supply curve will be more elastic in the long run than in the short run.

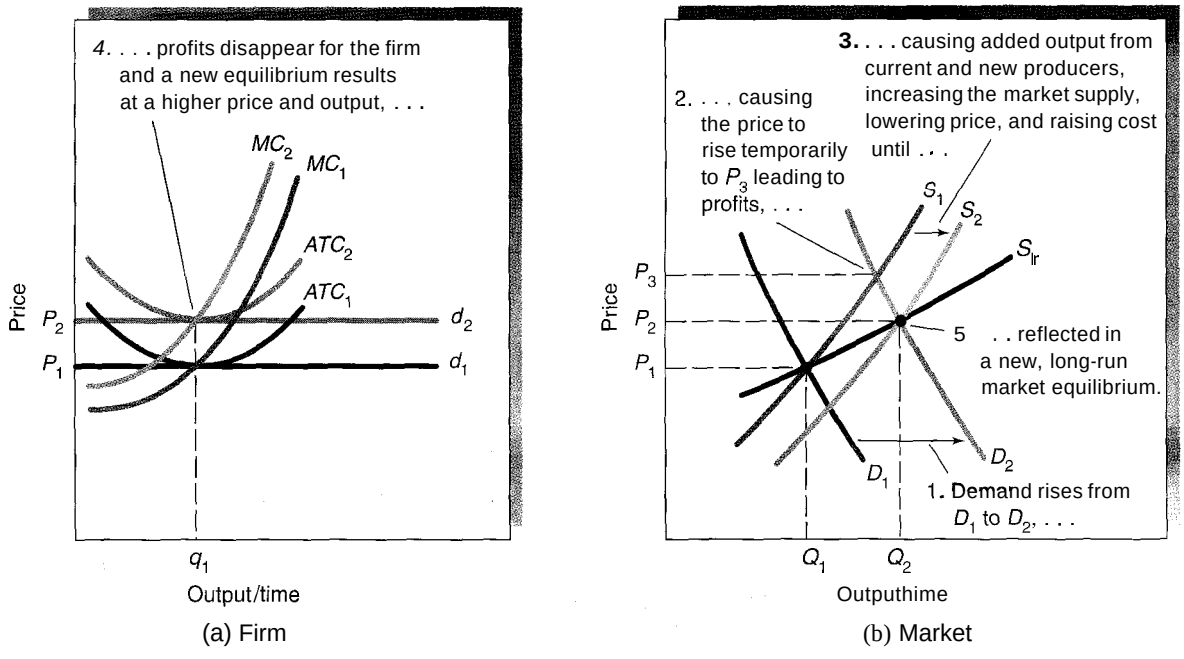


In central areas of large cities. the supply of parking spaces can be expanded only by using higher-cost space and higher-cost techniques, such as taller parking garages that use a large portion of the building for access ramps As a result, the unit cost of parking spaces increases as the total number is expanded Thus. provision of parking space is an increasing-cost industry

The short- and long-run distinction offers a convenient two-stage analysis, but in the real world there are many intermediate production "runs." The delivery rates for some factor inputs that could not be easily increased in a one-week time period can be increased over a two-week period. It might take two weeks, for example, to hire reliable workers who need no special skills. Expanding other factors might take a month, and still others, six months. Ordering a new custom-made machine tool at Boeing or hiring a competent new manager to expand an eastern Montana ranch operation might take a year. More precisely, the cost penalty for quicker availability is greater for some productive resources than others. In any case, a faster expansion usually means that greater cost penalties are encountered when a firm demands earlier availability of resources it needs for production.

When a firm has a longer time period to plan its output and adjust all of its productive inputs to their desired utilization levels, it will be able to produce any specific new rate of output at a lower cost. ***Because it* is *less costly to expand output slowly in response to a***

EXHIBIT 10
Increasing Costs and Long-Run Supply



demand increase, the expansion of output by firms will increase with time, as long as the price exceeds the cost. Therefore, the elasticity of the market supply curve will be greater when firms have more time to adjust their output.

Exhibit 11 shows the impact of time on producers' responses to an increase in price caused by greater demand. When the price of a product increases from P_1 to P_2, the immediate supply response of the firms is small, reflecting the high cost of hasty expansion. After one week, firms are willing to expand output only from Q_1 to Q_2. After one month, because of cost reductions made possible by the longer production-planning period, firms are willing to offer Q_3 units at the price P_2. After three months, the rate of output expands to Q_4. In the long run, when it is possible to adjust all inputs to the desired utilization levels (after a six-month time period, for example), firms are willing to supply Q_5 units of output at the market price of P_2. The supply curve for products is typically more elastic over a longer time period than over a shorter period.

THE ROLE OF PROFITS AND LOSSES

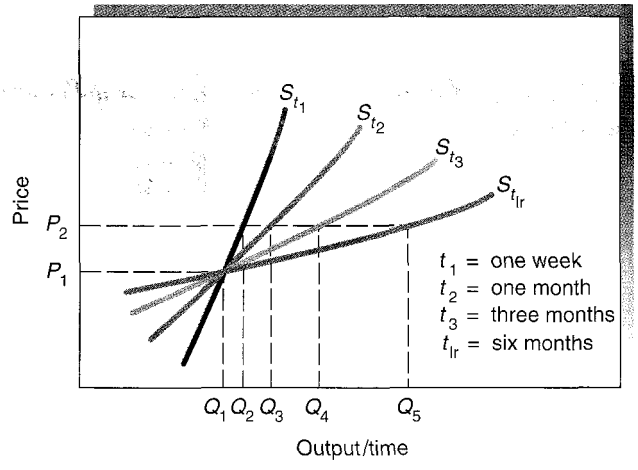
The price-taker model highlights the role of profits and losses: economic profits result when a firm or entrepreneur increases the value of resources. Business firms purchase resources and use them to produce a product or service that is sold to consumers. Costs are incurred as the business pays workers and other resource owners for the resources required to produce the product. If the sales revenue of the business firm exceeds the costs of employing all the resources required to produce the firm's output, then the firm will make a profit. ***In essence, profit is a reward that business owners will earn if they produce a good that consumers value more (as measured by their willingness to pay) than the resources required for the good's production (as measured by the cost of bidding the resources away from their alternative uses).***

For example, suppose that it costs a shirt manufacturer $20,000 per month to lease a building, rent the required machines, and purchase the labor, cloth, buttons, and other materials necessary to produce and market 1,000 shirts per month. Thus, the average cost of the shirts is $20 (the $20,000 monthly cost divided by the 1,000 monthly output). If the manufacturer sells the 1,000 shirts for $22 each, its actions create wealth. Consumers value the shirts more than they value the resources required for their production. The manufacturer's $2 profit per shirt is a reward received for increasing the value of the resources.

In contrast, losses are a penalty imposed on businesses that reduce the value of resources. Losses indicate that the value of the resources used by the firm (as measured by their cost) exceeds the price consumers are willing to pay for the product supplied. Losses, along with bankruptcies, are the market's way of providing signals and incentives to bring such wasteful activities to a halt.

EXHIBIT 11
Time and the Elasticity of Supply

The elasticity of the market supply curve usually increases when suppliers have more time to adjust to a change in the price.



We live in a world of changing tastes and technology, imperfect knowledge, and uncertainty. Business decision makers cannot be sure of either future market prices or costs of production. Their decisions must be based on expectations. Nonetheless, the reward-penalty structure of a market economy is clear. ***Firms that anticipate correctly the products and services for which future demand will be most urgent (relative to production costs), and produce and market them efficiently will make economic profits. Those that are inefficient and allocate resources incorrectly to areas of weak demand (relative to costs) will be penalized with losses.***

The firms most adept at giving consumers value for their money thrive and expand. Those less successful in doing so tend to shrink or even to disappear from the market. Free entry and the competitive process will protect the consumer from arbitrarily high prices. When profits are present, profit-seeking entrepreneurs will put more resources into these markets, supply will expand, and eventually the price will be driven down to the unit cost.

The Market Process in Action

When entry barriers are low, even small firms are often able to challenge and compete successfully against rivals that are much larger. Michael Dell's success in the personal computer market vividly illustrates this point. In 1984, Dell began producing and marketing personal computers while he was still a student at the University of Texas. At the age of nineteen, he began operations from his dormitory room with an investment of $1,000.[4] Then, as now, Dell Computer took orders for PCs, bought component parts from competing sellers, and custom-built the machines almost immediately to fill each order for quick delivery directly to consumers. This business strategy made it possible for the firm to keep inventories low and build the latest technical innovations into its products as soon as they were available. In contrast, IBM, Compaq, and Apple, the dominant firms during the 1980s, built specific PC models by the thousands and marketed them through retailers.

Dell's sales grew year after year and the firm eventually became the industry leader. By the first quarter of 2004, it was selling computers at a rate of $46 billion per year and Michael Dell was one of the world's richest individuals. On the other hand, IBM had exited from the PC market, a struggling Compaq had been bought out by Hewlett-Packard, and Apple's market share had declined substantially.

Although Dell Computer is not a price taker, it operates in a market with low entry barriers. Just as the price-taker model indicates, the low entry barriers will keep prices low and make sure that Dell and other producers in the industry stay on their toes. If Dell's cost efficiency were to fall or if it raised its prices significantly, rivals would expand, and new firms would be lured into the market. A higher price would be an open invitation for others to step in and steal Dell's customers, just as Dell has taken customers from others during the past two decades. And who knows, there may be another young college student among you with the engineering and an entrepreneurial genius needed to discover an even better way to make PCs.

COMPETITION PROMOTES PROSPERITY

Competition motivates businesses to produce efficiently, cater to the views of consumers, and search for innovative improvements.

Competition

The price-taker model highlights the importance of the competitive process. Competition puts pressure on producers to operate efficiently and use resources wisely. Each competing firm will have a strong tendency to produce its products as cheaply as possible. Holding quality constant, pursuit of profit will encourage each firm to minimize the cost of production — to use the set of resources least valued in other uses that can produce the desired output. Firms that fail to keep costs low will be driven from the market.

[4]These and other facts about Dell are from Michael Dell and Andrew Fisher, "It's Crunch Time for Your Competitors," *Financial Times* (London), Sept. 5, 2001, and also from the Dell Web site at `http://wwwl.us.dell.com/content/topics/global.aspxl` corp/pressoffice/en/2004/2004_05_13_rr_000?c=us&l=en&s=corp.

OUTSTANDING ECONOMIST

Friedrich A. von Hayek (1899–1992)

Remarkably, the writings of this 1974 Nobel Prize recipient spanned seven decades. Friedrich von Hayek's work on knowledge and markets helped us understand the competitive process and the fatal defects of central planning. Von Hayek also made important contributions to our understanding of monetary theory, law and economics, business cycles, and capital theory. He is also well known for the idea that market exchanges create an "extended order" where perfect strangers who never meet nonetheless cooperate with one another to achieve their individual goals. The market process described in this chapter is an integral part of that cooperative network.

Similarly, firms in competitive markets will be motivated to discover and produce goods that are valued more highly than the resources required to produce them. Thus, resources are drawn to those uses where they are most productive, as judged by the consumers' willingness to pay. The ability of firms freely to expand or contract their businesses and enter or exit markets means that resources will not be trapped unproductively in a particular industry when they're valued more highly elsewhere.

If firms are going to be successful in competitive markets, they must also be innovative and forward looking. The production techniques and product offerings that lead to success today will not necessarily pass the competitive market test tomorrow. Producers who survive in a competitive environment cannot become complacent. On the contrary, they must be willing to experiment and quick to adopt improved methods.

In competitive markets, business firms must serve the interests of consumers. As Adam Smith noted more than 200 years ago, competition harnesses personal self-interest and channels it into activities that enhance our living standards. Smith stated:

> It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own self-interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities, but of their advantages.[5]

Sellers, of course, profit when they supply products valued more highly than the resources needed to make them. But their actions also help the rest of us get more value from those resources than we would otherwise. Paradoxical as it may seem, personal self-interest—a characteristic many view as less than admirable—is a powerful source of economic progress when it is directed by the competitive market process.

LOOKING AHEAD

Consumers often seek variety in product design, style, durability, service, and location. Diferentiating products slightly gives firms some control over the prices they can charge for them. In the next two chapters, we will examine markets in which the firms are price searchers. We will also consider the impact entry barriers have on markets and pricing.

[5]Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776; Cannan's ed.. Chicago: University of Chicago Press, 1976), 18.

KEY POINTS

- A firm facing a perfectly elastic demand for its product is a price taker. A firm that can raise its price without losing all of its customers (and that must lower its price in order to sell more units) is a price searcher.
- To maximize profit, a price taker will expand its output as long as the sale of additional units adds more to revenues than to costs. Therefore, the profit-maximizing price taker will produce the output level at which marginal revenue (and price) equals marginal cost.
- The price taker's short-run marginal cost curve (above its average variable cost) is its supply curve. The short-run market supply curve is the horizontal summation of the marginal cost curves (above AVC) of the firms in the industry.
- A firm that experiences losses but that anticipates being able to cover its costs in the long run will operate in the short run if it can cover its average variable costs. Conversely, the firm will shut down if it cannot cover its average variable costs. A firm that does not anticipate being able to cover its average total cost even in the long run will minimize losses by immediately going out of business.
- When the market price exceeds the firm's average total cost, it will earn an economic profit. When entry barriers are absent, profits will attract new firms into the industry and stimulate the existing firms to expand. This increasing market supply continues and puts downward pressure on the price until it reaches the level of average total cost, eliminating the economic profit.
- When the market price is less than the firm's average total cost, the resulting losses imply that the resources could be used elsewhere to produce more value. Losses will cause firms to leave the industry or to reduce the scale of their operations. This declining market supply continues and puts upward pressure on price until the firms remaining in the market are able to earn normal returns (zero economic profit).
- As the output of an industry expands in response to rising demand, "fixed" resources like the size of the firm's plant will make it costly for firms to expand output quickly. The diminishing returns and rising marginal costs of firms explains why the short-run market supply curve slopes upward to the right.
- Normally, as industry output expands, rising factor prices push the costs of each firm upward, causing the long-run market supply curve to also slope upward to the right. However, in the long run, firms can alter the size of their plants and other resources that are fixed in the short run. As a result, the market supply curve is generally more elastic in the long run than the short run.
- Firms earn economic profit by producing goods that can be sold for more than the cost of the resources required to produce them. Profit is a reward people get for increasing the value of resources. Conversely, losses are a penalty imposed on those who use resources in a way that reduces their value.
- Competition motivates producers to operate efficiently and heed the views of consumers. Competition and the market process harness self-interest and direct producers toward wealth-creating activities.

CRITICAL ANALYSIS QUESTIONS

***1.** Farmers are often heard to complain about the high costs of machinery, labor, and fertilizer, suggesting that these costs drive down their profits. Does it follow that if, for example, the price of fertilizer fell by 10 percent, farming (a highly competitive industry with low barriers to entry) would be more profitable? Explain.

***2.** If the firms in a price-taker market are making short-run profits, what will happen to the market price in the long run? Explain.

3. "In a price-taker market, if a business operator produces efficiently—that is, if the cost of producing the good is minimized—the operator will be able to make at least a normal profit." True or false? Explain.

4. Suppose the government of a large city levies a 5 percent sales tax on hotel rooms. How will the tax affect (a) prices of hotel rooms, (b) the profits of hotel owners, and (c) gross (including the tax) expenditures on hotel rooms?

"5. If coffee suppliers are price takers, how will an unanticipated increase in demand for their product affect each of the following, in a market that was initially in long-run equilibrium?
   a. The short-run market price of the product
   b. Industry output in the short run
   c. Profitability in the short run
   d. The long-run market price in the industry
   e. Industry output in the long run
   f. Profitability in the long run

*6. Suppose that the development of a new drought-resistant hybrid seed corn leads to a 50 percent increase in the average yield per acre without increasing the cost to the farmers who use the new technology. If the producers in the corn production industry were price takers, what would happen to the following?
   a. The price of corn
   b. The profitability of corn farmers who quickly adopt the new technology
   c. The profitability of corn farmers who are slow to adopt the new technology
   d. The price of soybeans, a substitute product for corn

7. "When the firms in the industry are just able to cover their cost of production, economic profit is zero. Therefore, if demand falls, causing prices to go down even a little bit, all of the firms in the industry will be driven out of business." True or false? Explain.

8. Why does the short-run market supply curve for a product slope upward to the right? Why does the long-run market supply curve generally slope upward to the right? Why is the long-run market supply curve generally more elastic than the short-run supply curve?

*9. How does competition among firms affect the incentive of each firm to (a) operate efficiently (produce at a low per-unit cost) and (b) produce goods that consumers value? What happens to firms that fail to do these two things?

10. Will firms in a price-taker market be able to earn profits in the long run? Why or why not? What determines profitability? Discuss.

*11. During the summer of 1988, drought conditions throughout much of the United States substantially reduced the size of the corn, wheat, and soybean crops, three commodities for which demand is inelastic. Use the price-taker model to determine how the drought affected (a) prices of the three commodities, (b) revenue from the three crops, and (c) the profitability of those farming the three crops.

12. Why is competition in a market important? Is there a positive or negative effect on the economy when strong competitive pressures drive various firms out of business? Discuss.

13. Do business firms in competitive markets have a strong incentive to serve the interests of consumers? Are they motivated by a strong desire to help consumers? Are "good intentions" necessary if individuals are going to engage in actions that are helpful to others? Discuss.

*14. The accompanying table presents the expected cost and revenue data for the Tucker Tomato Farm. The Tuckers produce tomatoes in a greenhouse and sell them wholesale in a price-taker market.
   a. Fill in the firm's marginal cost, average variable cost, average total cost, and profit schedules.
   b. If the Tuckers are profit maximizers, how many tomatoes should they produce when the market price is $500 per ton? Indicate their profits.
   c. Indicate the firm's output level and maximum profit if the market price of tomatoes increases to $550 per ton.
   d. How many units would the Tucker Tomato Farm produce if the price of tomatoes fell to $450 per ton? What would be the firm's profits? Should the firm stay in business? Explain.

COST AND REVENUE SCHEDULES FOR TUCKER TOMATO FARM, INC.

OUTPUT (TONS PER MONTH)	TOTAL COST	PRICE PER TON	MARGINAL COST	AVERAGE VARIABLE COST	AVERAGE TOTAL COST	PROFITS (MONTHLY)
0	$1,000	$500	____	____	____	____
1	1,200	500	____	____	____	____
2	1,350	500	____	____	____	____
3	1,550	500	____	____	____	____
4	1,900	500	____	____	____	____
5	2,300	500	____	____	____	____
6	2,750	500	____	____	____	____
7	3,250	500	____	____	____	____
8	3,800	500	____	____	____	____
9	4,400	500	____	____	____	____
10	5,150	500	____	____	____	____

15. In the accompanying table, you are given information about two firms that compete in a price-taker market. Assume that fixed costs for each firm are $20.

a. Complete the table.

b. What is the lowest price at which firm A will produce?

c. How many units of output will it produce at that price? (Assume that it cannot produce fractional units.)

d. What is the lowest price at which firm B will produce?

e. How many units of output will it produce?

f. How many units will firm A produce if the market price is $20?

g. How many units will firm B produce at the $20 price? (Assume that it cannot produce fractional units.)

h. If each firm's total fixed costs are $20 and the price of output is $20, which firm would earn a higher net profit or incur a smaller loss?

i. How much would that net profit or loss be?

FIRM A

QUANTITY	TOTAL VARIABLE COST	MARGINAL COST	AVERAGE VARIABLE COST
1	$ 24	____	____
2	30	____	____
3	38	____	____
4	48	____	____
5	62	____	____
6	82	____	____
7	110	____	____

FIRM B

QUANTITY	TOTAL VARIABLE COST	MARGINAL COST	AVERAGE VARIABLE COST
1	$ 8	____	____
2	10	____	____
3	16	____	____
4	24	____	____
5	36	____	____
6	56	____	____
7	86	____	____

'Asterisk denotes questions for which answers are given in Appendix B