

GLOBAL  
EDITION



# Microeconomics

**EIGHTH EDITION**

**Jeffrey M. Perloff**



Pearson

# **Microeconomics**

8th edition

Global edition

the daily cost of the machine is 1,200 and the daily cost of one worker is 600, what is the equation of the isocost line for the unassisted crew and for the machine-assisted crew? Comparing the two isocost

lines, which technology will a cost-minimizing firm use to harvest its crops? Draw a diagram showing the isoquants and isocost curves associated with 2.5 and 5 units of output per day.

# Competitive Firms and Markets



*Competition produces the best in markets and the worst in humans.*

Businesses complain constantly about the costs and red tape that government regulations impose on them. U.S. truckers and trucking firms have a particular beef. In recent years, federal and state fees have increased substantially and truckers have had to adhere to many new regulations.

The Federal Motor Carrier Safety Administration (FMCSA), along with state transportation agencies in 41 states, administers interstate trucking licenses through the Unified Carrier Registration Agreement. According to FMCSA's website in 2013, it has 27 types of driver regulations, 16 types of vehicle regulations, 42 types of company regulations, 4 types of hazardous materials regulations, and 14 types of other regulatory guidance. (Of course, they may have added some additional rules while I wrote this last sentence.<sup>1</sup>) A trucker must also maintain minimum insurance coverage, pay registration fees, and follow policies that differ across states before the FMCSA will grant permission to operate. The registration process is so complex and time-consuming that firms pay substantial amounts to brokers who expedite the application process and take care of state licensing requirements.

For a large truck, the annual federal interstate registration fee can exceed \$8,000. To operate, truckers and firms must pay for many additional fees and costly regulations. These largely lump-sum costs—which are not related to the number of miles driven—have increased substantially in recent years. During the 2007–2009 financial crisis, many states raised their annual fee from a few hundred to several thousand dollars per truck. Before going into the interstate trucking business, a firm must participate in the New Entrant Safety Assurance Process, which raised the standard of compliance for passing the new entrant safety audit starting in 2009. By 2017, each truck will have to add an electronic onboard recorder, which documents travel time and distance with an annualized cost of between \$165 and \$832 per truck.

What effect do these new fixed costs have on the trucking industry's market price and quantity? Are individual firms providing more or fewer trucking services? Does the number of firms in the market rise or fall? (As we'll discuss at the end of the chapter, the answer to one of these questions is surprising.)

## Challenge

The Rising Cost of Keeping On Truckin'



<sup>1</sup>Indeed, the first time I checked after writing that sentence, I found that they had added a new rule forbidding truckers from texting while driving. (Of course, many of these rules and regulations help protect society and truckers in particular.)

**market structure**

the number of firms in the market, the ease with which firms can enter and leave the market, and the ability of firms to differentiate their products from those of their rivals

One of the major questions a trucking or other firm faces is “How much should we produce?” To pick a level of output that maximizes its profit, a firm must consider its cost function and how much it can sell at a given price. The amount the firm thinks it can sell depends in turn on the market demand of consumers and its beliefs about how other firms in the market will behave. The behavior of firms depends on the **market structure**: the number of firms in the market, the ease with which firms can enter and leave the market, and the ability of firms to differentiate their products from those of their rivals.

In this chapter, we look at a *competitive market structure*, one in which many firms produce identical products and firms can easily enter and exit the market. Because each firm produces a small share of the total market output and its output is identical to that of other firms, each firm is a *price taker* that cannot raise its price above the market price. If it were to try to do so, this firm would be unable to sell any of its output because consumers would buy the good at a lower price from the other firms in the market. The market price summarizes all a firm needs to know about the demand of consumers *and* the behavior of its rivals. Thus, a competitive firm can ignore the specific behavior of individual rivals in deciding how much to produce.<sup>2</sup>

In this chapter, we examine four main topics

1. **Perfect Competition.** A competitive firm is a price taker, and as such, it faces a horizontal demand curve.
2. **Profit Maximization.** To maximize profit, any firm must make two decisions: how much to produce and whether to produce at all.
3. **Competition in the Short Run.** Variable costs determine a profit-maximizing, competitive firm’s supply curve and market supply curve, and with the market demand curve, the competitive equilibrium in the short run.
4. **Competition in the Long Run.** Firm supply, market supply, and competitive equilibrium are different in the long run than in the short run because firms can vary inputs that were fixed in the short run.

## 8.1 Perfect Competition

Competition is a common market structure that has very desirable properties, so it is useful to compare other market structures to competition. In this section, we describe the properties of competitive firms and markets.

### Price Taking

When most people talk about “competitive firms,” they mean firms that are rivals for the same customers. By this interpretation, any market with more than one firm is competitive. However, to an economist, only some of these multifirm markets are competitive.

<sup>2</sup>In contrast, each oligopolistic firm must consider the behavior of each of its small number of rivals, as we discuss in Chapter 13.

Economists say that a market is *competitive* if each firm in the market is a *price taker*: a firm that cannot significantly affect the market price for its output or the prices at which it buys inputs. Why would a competitive firm be a price taker? Because it has no choice. The firm is a price taker because it faces a demand curve that is horizontal at the market price. If the demand curve is horizontal at the market price, the firm can sell as much as it wants at that price, so it has no incentive to lower its price. Similarly, the firm cannot increase the price at which it sells by restricting its output because it faces an infinitely elastic demand (see Chapter 3): A small increase in price results in its demand falling to zero.

### Why the Firm's Demand Curve Is Horizontal

Perfectly competitive markets have five characteristics that force firms to be price takers:

1. The market consists of many small buyers and sellers.
2. All firms produce identical products.
3. All market participants have full information about price and product characteristics.
4. Transaction costs are negligible.
5. Firms can freely enter and exit the market.

**Many Small Buyers and Sellers** If the sellers in a market are small and numerous, no single firm can raise or lower the market price. The more firms in a market, the less any one firm's output affects the market output and hence the market price.

For example, the 316,000 U.S. corn farmers are price takers. If a typical grower were to drop out of the market, market supply would fall by only  $1/316,000 \approx 0.00032\%$ , so the market price would not be noticeably affected. Each soybean farm can sell as much output as it can produce at the prevailing market equilibrium price, so each farm faces a demand curve that is a horizontal line at the market price.

Similarly, perfect competition requires that buyers be price takers as well. For example, if firms sell to only a single buyer—such as producers of weapons that are allowed to sell to only the government—then the buyer can set the price and the market is not perfectly competitive.

**Identical Products** Firms in a perfectly competitive market sell *identical* or *homogeneous* products. Consumers do not ask which farm grew a Granny Smith apple because they view all Granny Smith apples as essentially identical. If the products of all firms are identical, it is difficult for a single firm to raise its price above the going price charged by other firms.

In contrast, in the automobile market—which is not perfectly competitive—the characteristics of a BMW 5 Series and a Honda Civic differ substantially. These products are *differentiated* or *heterogeneous*. Competition from Civics would not be very effective in preventing BMW from raising its price.

**Full Information** If buyers know that different firms are producing identical products and they know the prices charged by all firms, no single firm can unilaterally raise its price above the market equilibrium price. If it tried to do so, consumers would buy the identical product from another firm. However, if consumers are unaware that products are identical or they don't know the prices charged by other firms, a single firm may be able to raise its price and still make sales.

**Negligible Transaction Costs** Perfectly competitive markets have very low transaction costs. Buyers and sellers can easily find each other and can trade without hiring lawyers to write contracts.<sup>3</sup> If transaction costs are low, it is easy for a customer to buy from a rival firm if the customer's usual supplier raises its price.

In contrast, if transaction costs are high, customers might absorb a price increase from a traditional supplier. For example, because some consumers prefer to buy milk at a local convenience store rather than travel several miles to a supermarket, the convenience store can charge slightly more than the supermarket without losing all its customers.

In some perfectly competitive markets, many buyers and sellers are brought together in a single room, so transaction costs are virtually zero. For example, transaction costs are very low at FloraHolland's daily flower auctions in the Netherlands, which attract 7,000 suppliers and 4,500 buyers from around the world. It has 125,000 auction transactions every day, with 12 billion cut flowers and 1.3 billion plants trading in a year.

**Free Entry and Exit** The ability of firms to enter and exit a market freely leads to a large number of firms in a market and promotes price taking. Suppose a firm can raise its price and increase its profit. If other firms can quickly and easily enter the market, the higher profit encourages entry by new firms until the price falls to the original level. Free exit is also important: If firms can freely enter a market but cannot exit easily if prices decline, they are reluctant to enter the market in response to a possibly temporary profit opportunity.<sup>4</sup> More generally, we assume perfect mobility of resources, which allows firms to alter their scale of production and to enter and exit an industry.

**Perfect Competition in the Chicago Mercantile Exchange** The Chicago Mercantile Exchange, where buyers and sellers can trade wheat and other commodities, exhibits the characteristics of perfect competition including thousands of buyers and sellers who are price takers. Anyone can be a buyer or a seller. Indeed, a trader might buy wheat in the morning and sell it in the afternoon. They trade virtually *identical products*. Buyers and sellers have *full information* about products and prices, which are posted for everyone to see. Market participants waste no time finding someone who wants to trade and they can easily place buy or sell orders in person, over the telephone, or electronically without paperwork, so *transaction costs are negligible*. Finally, *buyers and sellers can easily enter this market and trade wheat*. These characteristics lead to an abundance of buyers and sellers and to price-taking behavior by these market participants.

## Deviations from Perfect Competition

Many markets possess some but not all the characteristics of perfect competition. Such markets are still highly competitive so that buyers and sellers are, for all practical purposes, price takers. For example, a government may limit entry into a market, but if the market has many buyers and sellers, they may still be price takers. Many cities use zoning laws to limit the number of certain types of stores or motels, yet such cities still have a large number of these firms. Other cities impose moderately large transaction costs on entrants by requiring them to buy licenses, post bonds, and deal with a slow-moving city bureaucracy, yet a significant number of firms

<sup>3</sup>Average number of hours per week that an American and a Chinese person, respectively, spend shopping: 4, 10.—*Harper's Index*, 2008.

<sup>4</sup>For example, many governments require that firms give workers six months' warning before they exit a market or pay them a severance fee.

enter the market. Similarly, even if only some customers have full information, that may be sufficient to prevent firms from deviating significantly from price taking. For example, tourists do not know the prices at various stores, but locals do and they use their knowledge to prevent one store from charging unusually high prices.

Economists use the terms *competition* and *competitive* more restrictively than do others. To an economist, a competitive firm is a price taker. In contrast, when most people talk about competitive firms, they mean that firms are rivals for the same customers. Even in a market with only a few firms, the firms compete for the same customers so they are competitive in this broader sense. From now on, we will use the terms *competition* and *competitive* to refer to all markets in which no single buyer or seller can significantly affect the market price—they are price takers—even if the market is not perfectly competitive.

### Derivation of a Competitive Firm's Demand Curve

Are the demand curves faced by individual competitive firms actually flat? To answer this question, we use a modified supply-and-demand diagram to derive the demand curve for an individual firm.

**residual demand curve**  
the market demand that is not met by other sellers at any given price

An individual firm faces a **residual demand curve**: the market demand that is not met by other sellers at any given price. The firm's residual demand function,  $D^r(p)$ , shows the quantity demanded from the firm at price  $p$ . A firm sells only to people who have not already purchased the good from another seller. We can determine how much demand is left for a particular firm at each possible price using the market demand curve and the supply curve for all *other* firms in the market. The quantity the market demands is a function of the price:  $Q = D(p)$ . The supply curve of the other firms is  $S^o(p)$ . The residual demand function equals the market demand function,  $D(p)$ , minus the supply function of all other firms:

$$D^r(p) = D(p) - S^o(p). \quad (8.1)$$

At prices so high that the amount supplied by other firms,  $S^o(p)$ , is greater than the quantity demanded by the market,  $D(p)$ , the residual quantity demanded,  $D^r(p)$ , is zero.

In Figure 8.1 we derive the residual demand for a Canadian manufacturing firm that produces metal chairs. Panel b shows the market demand curve,  $D$ , and the supply of all but one manufacturing firm,  $S^o$ .<sup>5</sup> At  $p = \$66$  per chair, the supply of other firms, 500 units (where one unit is 1,000 metal chairs) per year, exactly equals the market demand (panel b), so the residual quantity demanded of the remaining firm (panel a) is zero.

At prices below \$66, the other chair manufacturers are not willing to supply as much as the market demands. At  $p = \$63$ , for example, the market demand is 527 units, but other firms want to supply only 434 units. As a result, the residual quantity demanded from the individual firm at  $p = \$63$  is 93 ( $= 527 - 434$ ) units. Thus, the residual demand curve at any given price is the horizontal difference between the market demand curve and the supply curve of the other firms.

The residual demand curve the firm faces in panel a is much flatter than the market demand curve in panel b. As a result, the elasticity of the residual demand curve is much higher than the market elasticity.

<sup>5</sup>The figure uses constant elasticity demand and supply curves. The elasticity of supply,  $\eta = 3.1$ , is based on the estimated cost function from Robidoux and Lester (1988) for Canadian office furniture manufacturers. I estimate that the elasticity of demand is  $\epsilon = -1.1$  using data from Statistics Canada, *Office Furniture Manufacturers*.