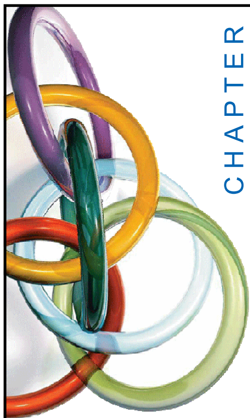


CHAPTER 8

Profit Maximization and Competitive Supply

Prepared by:
Fernando & Yvonn Quijano

CHAPTER 8 OUTLINE

8.1 PERFECTLY COMPETITIVE MARKETS

The model of perfect competition rests on three basic assumptions:
(1) price taking,
(2) product homogeneity, and
(3) free entry and exit.

Price Taking

Because *each individual firm sells a sufficiently small proportion of total market output, its decisions have no impact on market price.*

- **price taker** Firm that has no influence over market price and thus takes the price as given.

Product Homogeneity

When *the products of all of the firms in a market are perfectly substitutable with one another—that is,* when they are *homogeneous—* no firm can raise the price of its product above the price of other firms without losing most or all of its business.

8.1 PERFECTLY COMPETITIVE MARKETS

Free Entry and Exit

- **free entry (**or **exit)** Condition under which there are no special costs that make it difficult for a firm to enter (or exit) an industry.

When Is a Market Highly Competitive?

Because firms can implicitly or explicitly collude in setting prices, the presence of many firms is not sufficient for an industry to approximate perfect competition.

Conversely, the presence of only a few firms in a market does not rule out competitive behavior.

8.2 PROFIT MAXIMIZATION

Do Firms Maximize Profit?

The assumption of *profit maximization* is frequently used in microeconomics because it predicts business behavior reasonably accurately and avoids unnecessary analytical complications.

For smaller firms managed by their owners, profit is likely to dominate almost all decisions.

In larger firms, however, managers who make day-to-day decisions usually have little contact with the owners (i.e. the stockholders).

In any case, firms that do not come close to maximizing profit are not likely to survive.

Firms that do survive in competitive industries make long-run profit maximization one of their highest priorities.

Alternative Forms of Organization

- **cooperative** Association of businesses or people jointly owned and operated by members for mutual benefit.

8.2 PROFIT MAXIMIZATION

EXAMPLE 8.1 Condominiums versus Cooperatives in New York City

Nationwide, condos are a far more common than co-ops, outnumbering them by a factor of nearly 10 to 1. In this regard, New York City is very different from the rest of the nation—co-ops are more popular, and outnumber condos by a factor of about 4 to 1.

What accounts for the relative popularity of housing cooperatives in New York City? Part of the answer is historical. Housing cooperatives are a much older form of organization in the U.S.

The building restrictions in New York have long disappeared, and yet the conversion of apartments from co-ops to condos has been relatively slow.

The typical condominium apartment is worth about 15.5 percent more than a equivalent apartment held in the form of a co-op.

It appears that in New York, many owners have been willing to forgo substantial amounts of money in order to achieve non-monetary benefits.

8.3 MARGINAL REVENUE, MARGINAL COST, AND PROFIT MAXIMIZATION

- **profit** Difference between total revenue and total cost.

$$\pi(q) = R(q) - C(q)$$

- **marginal revenue** Change in revenue resulting from a one-unit increase in output.

Figure 8.1

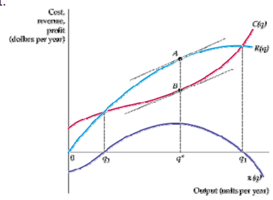
Profit Maximization in the Short Run

A firm chooses output q^*, so that profit, the difference AB between revenue R and cost C, is maximized.

At that output, marginal revenue (the slope of the revenue curve) is equal to marginal cost (the slope of the cost curve).

$$\Delta\pi/\Delta q = \Delta R/\Delta q - \Delta C/\Delta q = 0$$

$$\boxed{\mathrm{MR}(q) = \mathrm{MC}(q)}$$



Chapter 8: Profit Maximization and Competitive Supply

8.3 MARGINAL REVENUE, MARGINAL COST, AND PROFIT MAXIMIZATION

Demand and Marginal Revenue for a Competitive Firm

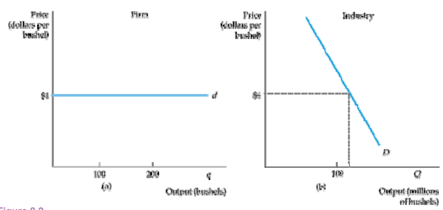


Figure 8.2

Demand Curve Faced by a Competitive Firm

A competitive firm supplies only a small portion of the total output of all the firms in an industry. Therefore, the firm takes the market price of the product as given, choosing its output on the assumption that the price will be unaffected by the output choice.

In **(a)** the demand curve facing the firm is perfectly elastic, even though the market demand curve in **(b)** is downward sloping.

Chapter 8: Profit Maximization and Competitive Supply

8.3 MARGINAL REVENUE, MARGINAL COST, AND PROFIT MAXIMIZATION

Demand and Marginal Revenue for a Competitive Firm

The demand *d* curve facing an individual firm in a competitive market is both its average revenue curve and its marginal revenue curve. Along this demand curve, marginal revenue, average revenue, and price are all equal.

Profit Maximization by a Competitive Firm

$$\mathrm{MC}(q) = MR = P$$

Chapter 8: Profit Maximization and Competitive Supply

8.4 CHOOSING OUTPUT IN THE SHORT RUN

Short-Run Profit Maximization by a Competitive Firm

Marginal revenue equals marginal cost at a point at which the marginal cost curve is rising.

Output Rule: If a firm is producing any output, it should produce at the level at which marginal revenue equals marginal cost.

8.4 CHOOSING OUTPUT IN THE SHORT RUN

The Short-Run Profit of a Competitive Firm

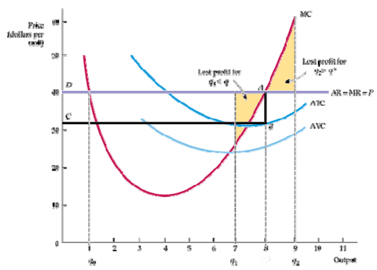
Figure 8.3

A Competitive Firm Making a Positive Profit

In the short run, the competitive firm maximizes its profit by choosing an output q^* at which its marginal cost MC is equal to the price P (or marginal revenue MR) of its product.

The profit of the firm is measured by the rectangle *ABCD*.

Any change in output, whether lower at q_1 or higher at q_2, will lead to lower profit.



8.4 CHOOSING OUTPUT IN THE SHORT RUN

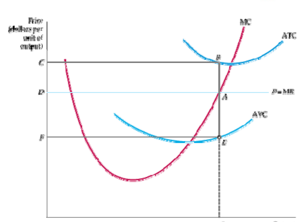
The Short-Run Profit of a Competitive Firm

Figure 8.4

A Competitive Firm Incurring Losses

A competitive firm should shut down if price is below AVC.

The firm may produce in the short run if price is greater than average variable cost.



Shut-Down Rule: The firm should shut down if the price of the product is less than the average variable cost of production at the profit-maximizing output.

8.4 CHOOSING OUTPUT IN THE SHORT RUN

EXAMPLE 8.2 The Short-Run Output Decision of an Aluminum Smelting Plant

How should the manager determine the plant's profit maximizing output? Recall that the smelting plant's short-run marginal cost of production depends on whether it is running two or three shifts per day.

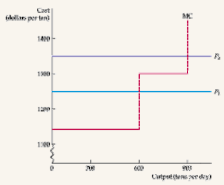
Figure 8.5

The Short-Run Output of an Aluminum Smelting Plant

In the short run, the plant should produce 600 tons per day if price is above $1140 per ton but less than $1300 per ton.

If price is greater than $1300 per ton, it should run an overtime shift and produce 900 tons per day.

If price drops below $1140 per ton, the firm should stop producing, but it should probably stay in business because the price may rise in the future.



8.4 CHOOSING OUTPUT IN THE SHORT RUN

EXAMPLE 8.3 Some Cost Considerations for Managers

The application of the rule that marginal revenue should equal marginal cost depends on a manager's ability to estimate marginal cost.

To obtain useful measures of cost, managers should keep three guidelines in mind.

First, except under limited circumstances, *average variable cost should not be used as a substitute for marginal cost.*

Second, *a single item on a firm's accounting ledger may have two components, only one of which involves marginal cost.*

Third, *all opportunity costs should be included in determining marginal cost.*

8.5 THE COMPETITIVE FIRM'S SHORT-RUN SUPPLY CURVE

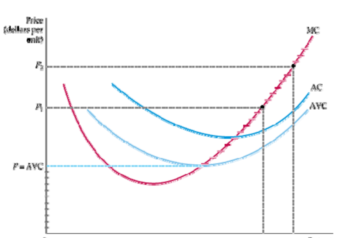
The firm's supply curve is *the portion of the marginal cost curve for which marginal cost is greater than average variable cost.*

Figure 8.6

The Short-Run Supply Curve for a Competitive Firm

In the short run, the firm chooses its output so that marginal cost MC is equal to price as long as the firm covers its average variable cost.

The short-run supply curve is given by the crosshatched portion of the marginal cost curve.



8.5 THE COMPETITIVE FIRM'S SHORT-RUN SUPPLY CURVE

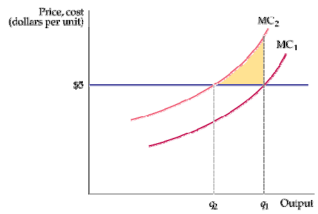
The Short-Run Profit of a Competitive Firm

Figure 8.7

The Response of a Firm to a Change in Input Price

When the marginal cost of production for a firm increases (from MC_1 to MC_2), the level of output that maximizes profit falls (from q_1 to q_2).

The shaded area in the figure gives the total savings to the firm (or equivalently, the reduction in lost profit) associated with the reduction in output from q_1 to q_2.



8.5 THE COMPETITIVE FIRM'S SHORT-RUN SUPPLY CURVE

EXAMPLE 8.4 The Short-Run Production of Petroleum Products

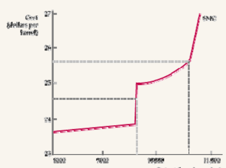
Although plenty of crude oil is available, the amount that you refine depends on the capacity of the refinery and the cost of production.

Figure 8.8

The Short-Run Production of Petroleum Products

As the refinery shifts from one processing unit to another, the marginal cost of producing petroleum products from crude oil increases sharply at several levels of output.

As a result, the output level can be insensitive to some changes in price but very sensitive to others.



8.6 THE SHORT-RUN MARKET SUPPLY CURVE

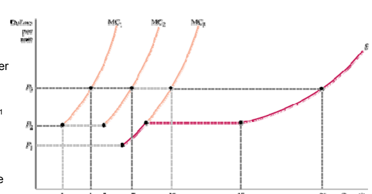
Figure 8.9

Industry Supply in the Short Run

The short-run industry supply curve is the summation of the supply curves of the individual firms.

Because the third firm has a lower average variable cost curve than the first two firms, the market supply curve S begins at price P_1 and follows the marginal cost curve of the third firm MC_3 until price equals P_2, when there is a kink.

For P_2 and all prices above it, the industry quantity supplied is the sum of the quantities supplied by each of the three firms.



Elasticity of Market Supply

$$E_s = (\Delta Q/Q)/(\Delta P/P)$$

8.6 THE SHORT-RUN MARKET SUPPLY CURVE

Chapter 8: Profit Maximization and Competitive Supply

EXAMPLE 8.5 The Short-Run World Supply of Copper

Table 8.1 The World Copper Industry (2006)

Country	Annual Production (Thousand Metric Tons)	Marginal Cost (Dollars Per Pound)
Australia	950	1.15
Canada	600	1.30
Chile	5,400	0.80
Indonesia	800	0.90
Peru	1,050	0.85
Poland	530	1.20
Russia	720	0.65
US	1,220	0.85
Zambia	540	0.75

Source for Annual Production Data: U.S. Geological Survey, Mineral Commodity Summaries, January 2007.
http://minerals.usgs.gov/minerals/pubs/mcs/2007/mcs2007.pdf.
Source for Marginal Cost Data: Charles River Associates' Estimates.

8.6 THE SHORT-RUN MARKET SUPPLY CURVE

Chapter 8: Profit Maximization and Competitive Supply

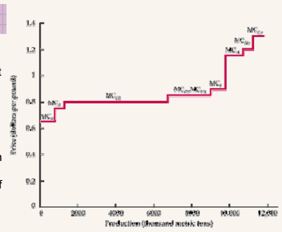
EXAMPLE 8.5 The Short-Run World Supply of Copper (continued)

Figure 8.10

The Short-Run World Supply of Copper

The supply curve for world copper is obtained by summing the marginal cost curves for each of the major copper-producing countries.

The supply curve slopes upward because the marginal cost of production ranges from a low of 65 cents in Russia to a high of $1.30 in Canada.



8.6 THE SHORT-RUN MARKET SUPPLY CURVE

Chapter 8: Profit Maximization and Competitive Supply

Producer Surplus in the Short Run

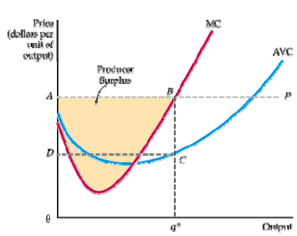
- **producer surplus** Sum over all units produced by a firm of differences between the market price of a good and the marginal cost of production.

Figure 8.11

Producer Surplus for a Firm

The producer surplus for a firm is measured by the yellow area below the market price and above the marginal cost curve, between outputs 0 and q^*, the profit-maximizing output.

Alternatively, it is equal to rectangle *ABCD* because the sum of all marginal costs up to q^* is equal to the variable costs of producing q^*.



8.6 THE SHORT-RUN MARKET SUPPLY CURVE

Producer Surplus in the Short Run

Producer Surplus versus Profit

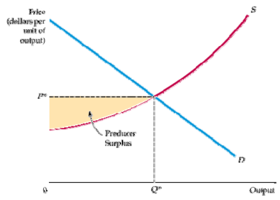
$$\text{Producer surplus} = \text{PS} = R - \text{VC}$$

$$\text{Profit} = \pi = R - \text{VC} - \text{FC}$$

Figure 8.12

Producer Surplus for a Market

The producer surplus for a market is the area below the market price and above the market supply curve, between 0 and output Q^*.



8.7 CHOOSING OUTPUT IN THE LONG RUN

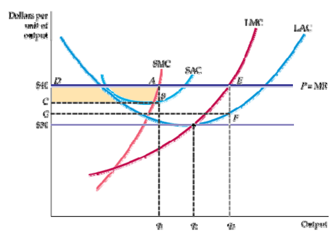
Long-Run Profit Maximization

Figure 8.13

Output Choice in the Long Run

The firm maximizes its profit by choosing the output at which price equals long-run marginal cost LMC.

In the diagram, the firm increases its profit from *ABCD* to *EFGD* by increasing its output in the long run.



The long-run output of a profit-maximizing competitive firm is the point at which long-run marginal cost equals the price.

8.7 CHOOSING OUTPUT IN THE LONG RUN

Long-Run Competitive Equilibrium

Accounting Profit and Economic Profit

$$\pi = R - wL - rK$$

Zero Economic Profit

- **zero economic profit** A firm is earning a normal return on its investment—i.e., it is doing as well as it could by investing its money elsewhere.

Long-Run Competitive Equilibrium

Entry and Exit

Figure 8.14

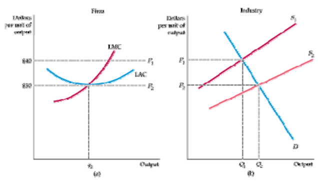
Long-Run Competitive Equilibrium

Initially the long-run equilibrium price of a product is $40 per unit, shown in (b) as the intersection of demand curve *D* and supply curve S_1.

In (a) we see that firms earn positive profits because long-run average cost reaches a minimum of $30 (at q_2).

Positive profit encourages entry of new firms and causes a shift to the right in the supply curve to S_2, as shown in (b).

The long-run equilibrium occurs at a price of $30, as shown in (a), where each firm earns zero profit and there is no incentive to enter or exit the industry.



Long-Run Competitive Equilibrium

Entry and Exit

In a market with entry and exit, a firm enters when it can earn a positive long-run profit and exits when it faces the prospect of a long-run loss.

- **long-run competitive equilibrium** All firms in an industry are maximizing profit, no firm has an incentive to enter or exit, and price is such that quantity supplied equals quantity demanded.

A long-run competitive equilibrium occurs when three conditions hold:

1. All firms in the industry are maximizing profit.
2. No firm has an incentive either to enter or exit the industry because all firms are earning zero economic profit.
3. The price of the product is such that the quantity supplied by the industry is equal to the quantity demanded by consumers.

Long-Run Competitive Equilibrium

Firms Having Identical Costs

To see why all the conditions for long-run equilibrium must hold, assume that all firms have identical costs.

Now consider what happens if too many firms enter the industry in response to an opportunity for profit.

The industry supply curve will shift further to the right, and price will fall.

Firms Having Different Costs

Now suppose that all firms in the industry do not have identical cost curves.

The distinction between accounting profit and economic profit is important here.

If a patent is profitable, other firms in the industry will pay to use it. The increased value of a patent thus represents an opportunity cost to the firm that holds it.

8.7 CHOOSING OUTPUT IN THE LONG RUN

Long-Run Competitive Equilibrium

The Opportunity Cost of Land

There are other instances in which firms earning positive accounting profit may be earning zero economic profit.

Suppose, for example, that a clothing store happens to be located near a large shopping center. The additional flow of customers can substantially increase the store's accounting profit because the cost of the land is based on its historical cost.

Economic Rent

- **economic rent** Amount that firms are willing to pay for an input less the minimum amount necessary to obtain it.

8.7 CHOOSING OUTPUT IN THE LONG RUN

Producer Surplus in the Long Run

In the long run, in a competitive market, *the producer surplus that a firm earns on the output that it sells consists of the economic rent that it enjoys from all its scarce inputs.*

8.7 CHOOSING OUTPUT IN THE LONG RUN

Producer Surplus in the Long Run

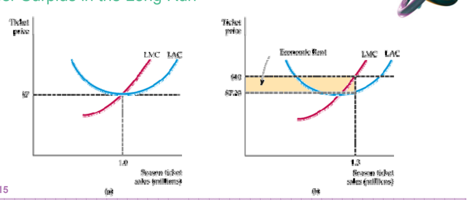


Figure 8.15

Firms Earn Zero Profit in Long-Run Equilibrium

In long-run equilibrium, all firms earn zero economic profit.

In **(a)**, a baseball team in a moderate-sized city sells enough tickets so that price ($7) is equal to marginal and average cost.

In **(b)**, the demand is greater, so a $10 price can be charged. The team increases sales to the point at which the average cost of production plus the average economic rent is equal to the ticket price.

When the opportunity cost associated with owning the franchise is taken into account, the team earns zero economic profit.

8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

Constant-Cost Industry

- **constant-cost industry** Industry whose long-run supply curve is horizontal.

Figure 8.16

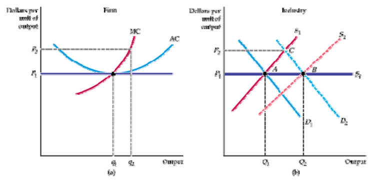
Long-Run Supply in a Constant-Cost Industry

In (b), the long-run supply curve in a constant-cost industry is a horizontal line S_L.

When demand increases, initially causing a price rise (represented by a move from point *A* to point *C*), the firm initially increases its output from q_1 to q_2, as shown in (a).

But the entry of new firms causes a shift to the right in industry supply.

Because input prices are unaffected by the increased output of the industry, entry occurs until the original price is obtained (at point *B* in (b)).



The long-run supply curve for a constant-cost industry is, therefore, a horizontal line at a price that is equal to the long-run minimum average cost of production.

8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

Increasing-Cost Industry

- **increasing-cost industry** Industry whose long-run supply curve is upward sloping.

Figure 8.17

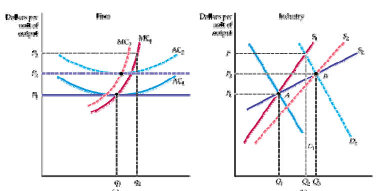
Long-Run Supply in an Increasing-Cost Industry

In (b), the long-run supply curve in an increasing-cost industry is an upward-sloping curve S_L.

When demand increases, initially causing a price rise, the firms increase their output from q_1 to q_2 in (a).

In that case, the entry of new firms causes a shift to the right in supply from S_1 to S_2.

Because input prices increase as a result, the new long-run equilibrium occurs at a higher price than the initial equilibrium.



In an increasing-cost industry, the long-run industry supply curve is upward sloping.

8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

Decreasing-Cost Industry

- **decreasing-cost industry** Industry whose long-run supply curve is downward sloping.

EXAMPLE 8.6 Constant-, Increasing-, and Decreasing-Cost Industries: Coffee, Oil, and Automobiles

You have been introduced to industries that have constant, increasing, and decreasing long-run costs.

We saw that the supply of coffee is extremely elastic in the long run. The reason is that land for growing coffee is widely available and the costs of planting and caring for trees remains constant as the volume grows. Thus, coffee is a constant-cost industry.

The oil industry is an increasing-cost industry because there is a limited availability of easily accessible, large-volume oil fields.

Finally, a decreasing-cost industry. In the automobile industry, certain cost advantages arise because inputs can be acquired more cheaply as the volume of production increases.

8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

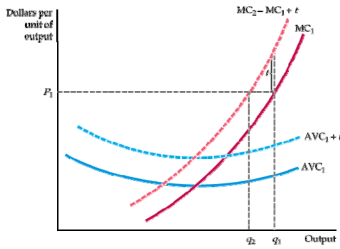
The Effects of a Tax

Figure 8.18

Effect of an Output Tax on a Competitive Firm's Output

An output tax raises the firm's marginal cost curve by the amount of the tax.

The firm will reduce its output to the point at which the marginal cost plus the tax is equal to the price of the product.



8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

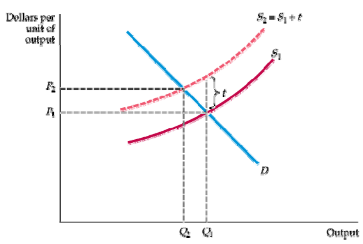
The Effects of a Tax

Figure 8.19

Effect of an Output Tax on Industry Output

An output tax placed on all firms in a competitive market shifts the supply curve for the industry upward by the amount of the tax.

This shift raises the market price of the product and lowers the total output of the industry.



8.8 THE INDUSTRY'S LONG-RUN SUPPLY CURVE

Long-Run Elasticity of Supply

EXAMPLE 8.7 The Long-Run Supply of Housing

Owner-occupied and rental housing provide interesting examples of the range of possible supply elasticities.

If the price of housing services were to rise in one area of the country, the quantity of services could increase substantially.

Even when elasticity of supply is measured within urban areas, where land costs rise as the demand for housing services increases, the long-run elasticity of supply is still likely to be large because land costs make up only about one-quarter of total housing costs.

The market for rental housing is different, however. The construction of rental housing is often restricted by local zoning laws.