8

Supply in a Competitive Market

Introduction

8

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8.2	Profit Maximization in a Perfectly Competitive Market
8.3	Perfect Competition in the Short Run
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Introduction

8

The previous chapters introduced the various costs that firms must contend with when producing goods and services.

- Firms minimize costs at every level of production.

But how do firms choose an optimal amount to produce?

- Depends on the price they expect to receive for goods and services.
  - This, in turn, depends on market conditions.

In this chapter, we introduce the concept of **Profit Maximization.**

- **Given a price and cost structure, firms choose a quantity of output that maximizes profits (or minimizes losses).**
  - The result of the analysis is a characterization of the supply curves introduced in Chapter 2.

This chapter focuses on the case of **Perfect Competition.**

Market Structures and Perfect Competition in the Short Run

8.1

Market Structure refers to the competitive environment in which firms operate; three major primary characteristics broadly define market structure.

1. **Number of Firms:** In general, the more companies in a given market, the more competitive it is.
2. **Differentiation of Products:** In general, when products from different companies are more difficult to distinguish from one another, a market is more competitive.
3. **Barriers to Entry:** If new firms can enter the market easily, the market is more competitive.

Market Structures and Perfect Competition in the Short Run

8.1

Table 8.1 Four Basic Market Structures

	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of Firms	Many	Many	Few	One
Type of Products Sold	Identical	Differentiated	Identical or differentiated	Unique
Barriers to Entry	None	None	Some	Many

Market Structures and Perfect Competition in the Short Run

8.1

Under **Perfect Competition** (PC), a market is composed of many firms producing identical products, with no barriers to entry.

The implication of these assumptions is that firms are **Price Takers.**

- Individual firms are unable to influence market price by altering the quantity produced; market supply is largely relative to firm supply.
  - A classic example is a small farmer producing a commodity crop (e.g., corn, tomatoes, watermelon, etc.)
  - For most goods and services, however, these conditions are *rarely* met.

✓ **Why do we focus on perfect competition?**

- Ease, similar to some markets, and useful for comparisons

Market Structures and Perfect Competition in the Short Run

8.1

Perfect competition is straightforward; starting here eases the transition to more complicated market structures.

There are some competitive markets; it is useful to see how they work.

Many markets are close to perfect competition; the model provides a good approximation of how these markets work.

Finally, perfect competition is a good point of comparison, particularly for measures of efficiency.

- Perfect competition is assumed to be the most "efficient" market structure from a welfare perspective.
- Consumer surplus is maximized, and firms produce at the lowest possible cost.

Market Structures and Perfect Competition in the Short Run

8.1

The Demand Curve as Seen by a Price Taker

If a firm must sell its product at the same price, no matter the quantity produced, what does that imply for the shape of the demand curve as seen by an individual firm?

It must be horizontal, and therefore is *perfectly elastic.*

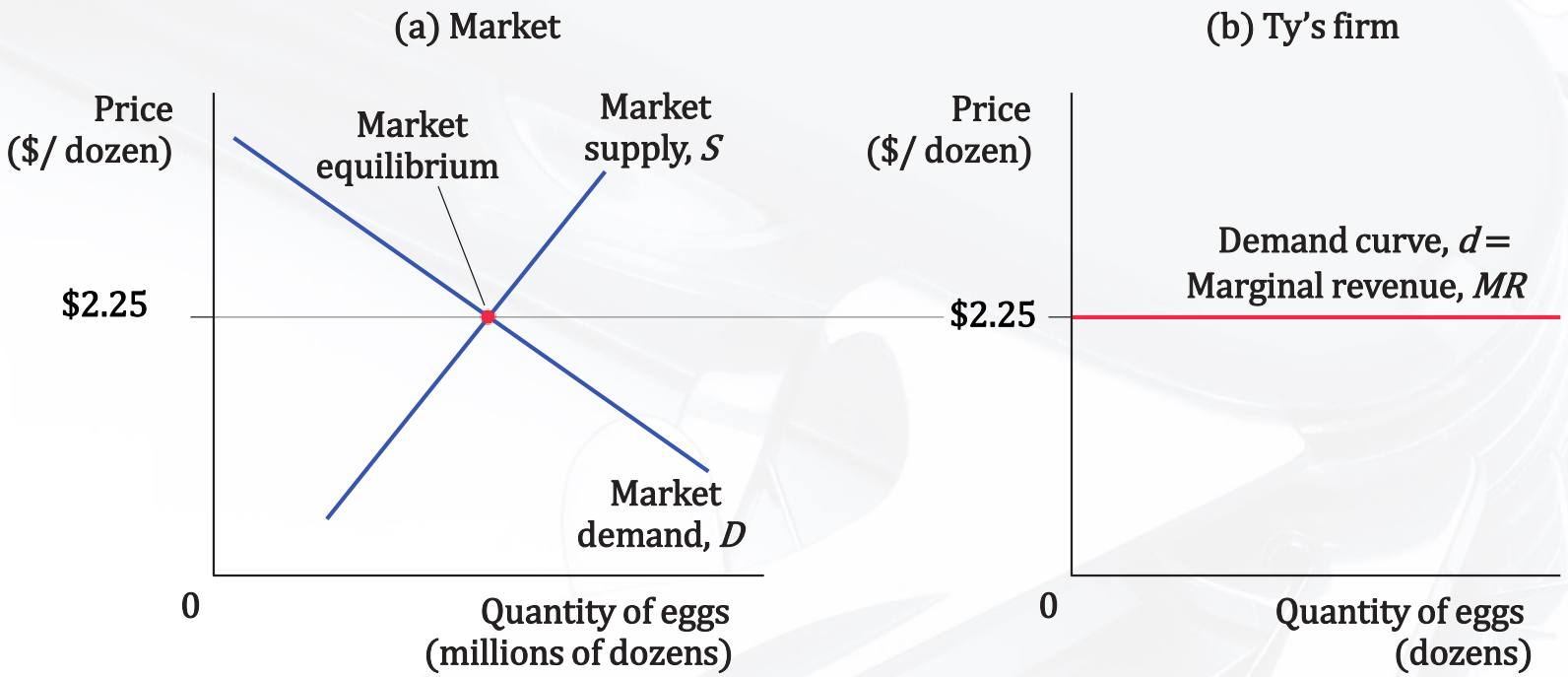
This is a *fundamental assumption*.

- The demand curve facing a firm in a perfectly competitive market is perfectly elastic at the market equilibrium price.

Market Structures and Perfect Competition in the Short Run

8.1

Figure 8.1 Market and Firm Demand in Perfect Competition



Profit Maximization in a Perfectly Competitive Market

8.2

Economists generally assume firms choose how much to produce with the goal of maximizing profits.

Profit is the difference between a firm's total revenue and total cost.

- Profit is maximized when the marginal cost of production is equal to the market price ($MC = P$).
  - Marginal revenue is equal to price under perfect competition.
  - ***P = MC = MR***

You will see that a perfectly competitive firm maximizes its profit when it produces the quantity of output at which the marginal cost of production equals the market price.

Profit Maximization in a Perfectly Competitive Market

8.2

Total Revenue, Total Cost, and Profit Maximization

Mathematically, profit is given by

$$\pi = TR - TC$$

where TR is total revenue, and TC is total cost.

To determine the level of output that maximizes profit, think about how TR and TC change as output increases.

From Chapter 7, $$MC = \frac{\Delta TC}{\Delta Q}$$

Profit Maximization in a Perfectly Competitive Market

8.2

Total Revenue, Total Cost, and Profit Maximization

Similarly, the additional revenue from selling one additional unit of output is referred to as **marginal revenue.**

$$MR = \frac{\Delta TR}{\Delta Q}$$

In perfect competition,

$$MR_{PC} = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(P \times Q)}{\Delta Q} = P\frac{\Delta Q}{\Delta Q} = P$$

or, marginal revenue is simply equal to market price in a perfectly competitive market structure.

- Recall the fundamental assumption of a perfectly elastic demand curve.

Profit Maximization in a Perfectly Competitive Market

8.2

How a Perfectly Competitive Firm Maximizes Profit

To maximize profit, a firm will produce until the marginal cost of producing one more unit of output is equal to the marginal revenue (in this case, price)

$$\frac{\Delta TR}{\Delta Q} = P = \frac{\Delta TC}{\Delta Q} = MC$$

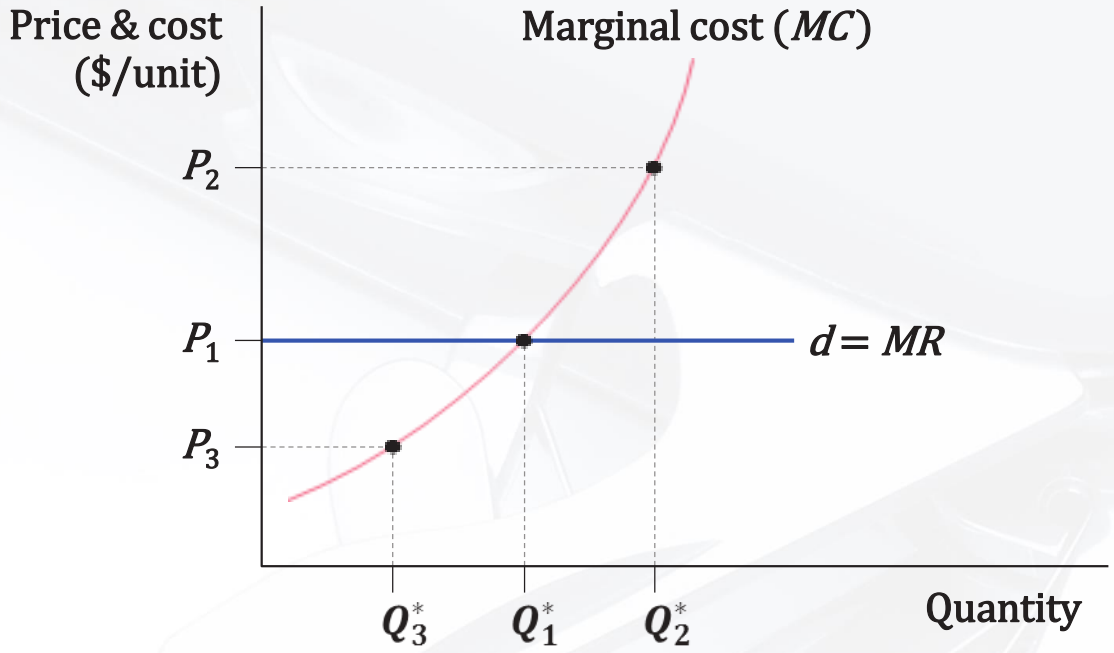
- ✓ **What happens if $MC < P$?**
  - Profit could be increased by producing additional units.
- ✓ **Conversely, what if $MC > P$?**
  - Profit could be increased by reducing production.
  - Currently *additional* units will cost you more to produce than you are selling them for

These results follow from the assumption that the marginal cost curve approaches the marginal revenue curve from below.

Profit Maximization in a Perfectly Competitive Market

8.2

Figure 8.3 Profit Maximization for a Perfectly Competitive Firm Occurs Where *MR* = *P* = *MC*



Profit Maximization in a Perfectly Competitive Market

8.2

Measuring a Firm's Profit

To measure profit, simply subtract total cost from total revenue

$$\begin{aligned}\pi &= TR - TC \\ &= (P \times Q) - (ATC \times Q) \\ &= (P - ATC) \times Q\end{aligned}$$

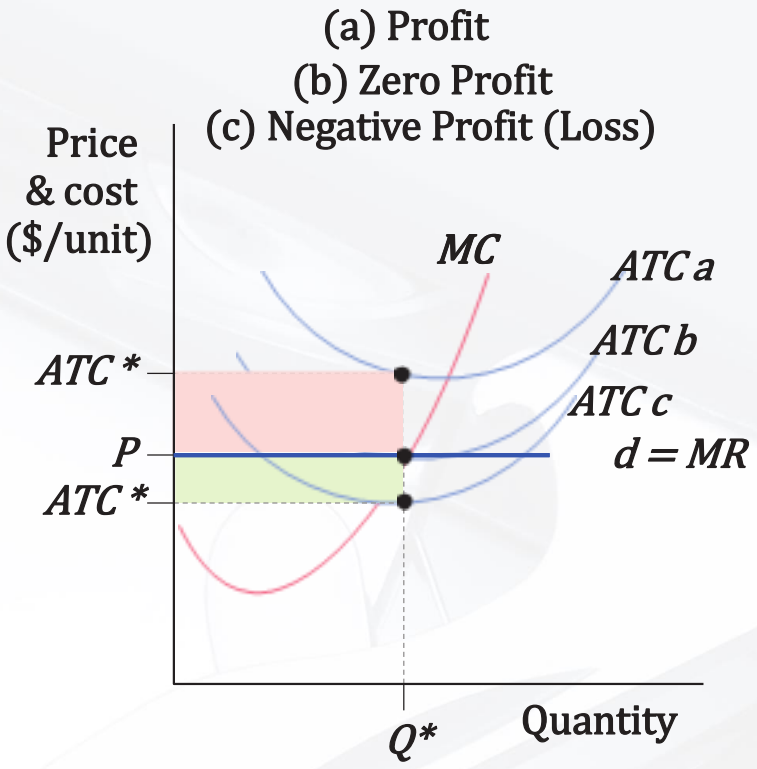
Graphically, profit is measured by computing the area of a rectangle.

- Length = Q
- Height = the difference between P and ATC.

Profit Maximization in a Perfectly Competitive Market

8.2

Figure 8.4 Measuring Profit



Profit Maximization in a Perfectly Competitive Market

8.2

Determining Whether to Shut Down

What happens if profit is negative? Should a firm shut down?

In the short run, the firm still has to pay its fixed costs. If the firm shuts down, profits are given by

$$\pi_{\text{shut down}} = TR - TC = TR - (FC + VC)$$
$$= 0 - (FC + 0) = -FC$$

Alternatively, if the firm continues operating,

$$\pi_{\text{operate}} = TR - TC = TR - (FC + VC)$$

The difference is given by $\pi_{\text{operate}} - \pi_{\text{shut down}} = TR - VC$

In general, firms should remain open and operating in the *short run* as long as revenue can cover variable costs, even if net profit is negative.

Profit Maximization in a Perfectly Competitive Market

8.2

Determining Whether to Shut Down

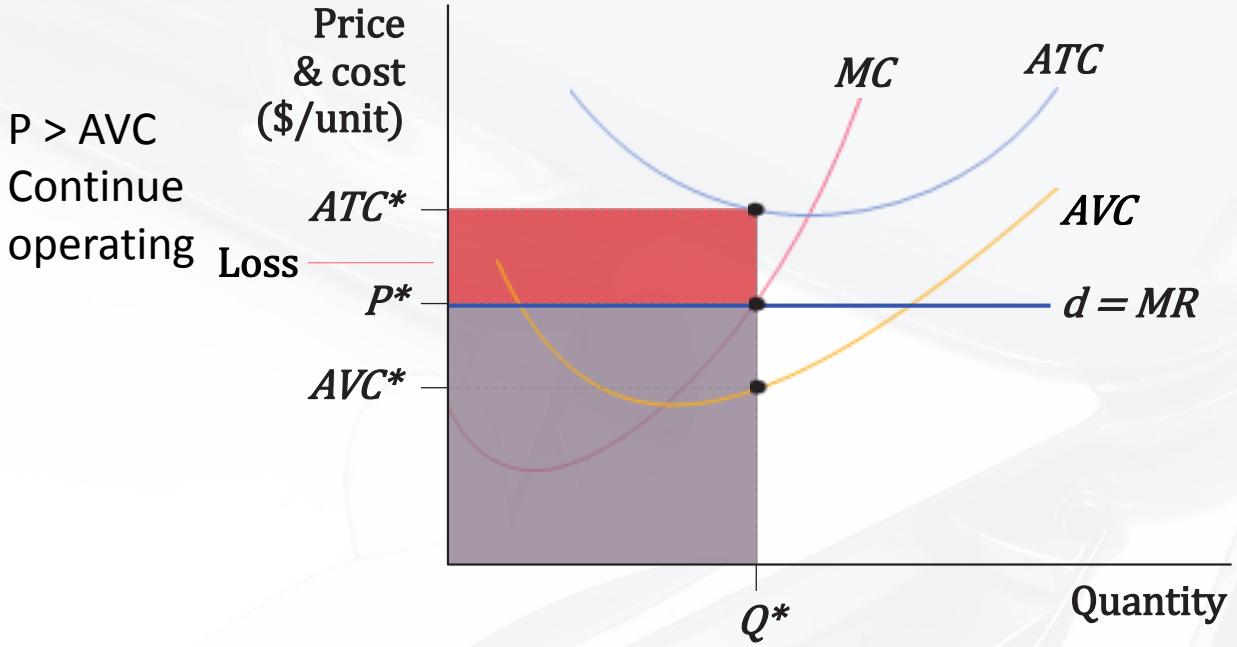
Table 8.2 Deciding Whether to Operate at a Loss or Shut Down in the Short Run

	Shut Down	Operate
Revenue	None	Some (*TR*)
Cost	Fixed (*FC*)	Fixed (*FC*) + Variable (*VC*)
Loss	$-FC$	$TR - FC - VC$

Profit Maximization in a Perfectly Competitive Market

8.2

Figure 8.5 Deciding Whether to Operate or Shut Down in the Short Run



Profit Maximization in a Perfectly Competitive Market

8.2

Determining Whether to Shut Down

Continue operating if $TR \geq VC$ or $P \geq AVC^*$

where the * indicates the profit-maximizing (or loss-minimizing) quantity.

Shut down if $TR < VC$ or $P < AVC^*$

Continue operating as long as you cover your variable costs!

Perfect Competition in the Short Run

8.3

A Firm's Short-Run Supply Curve in a Perfectly Competitive Market

The supply curve (from Chapter 2) shows the quantity supplied at each price.

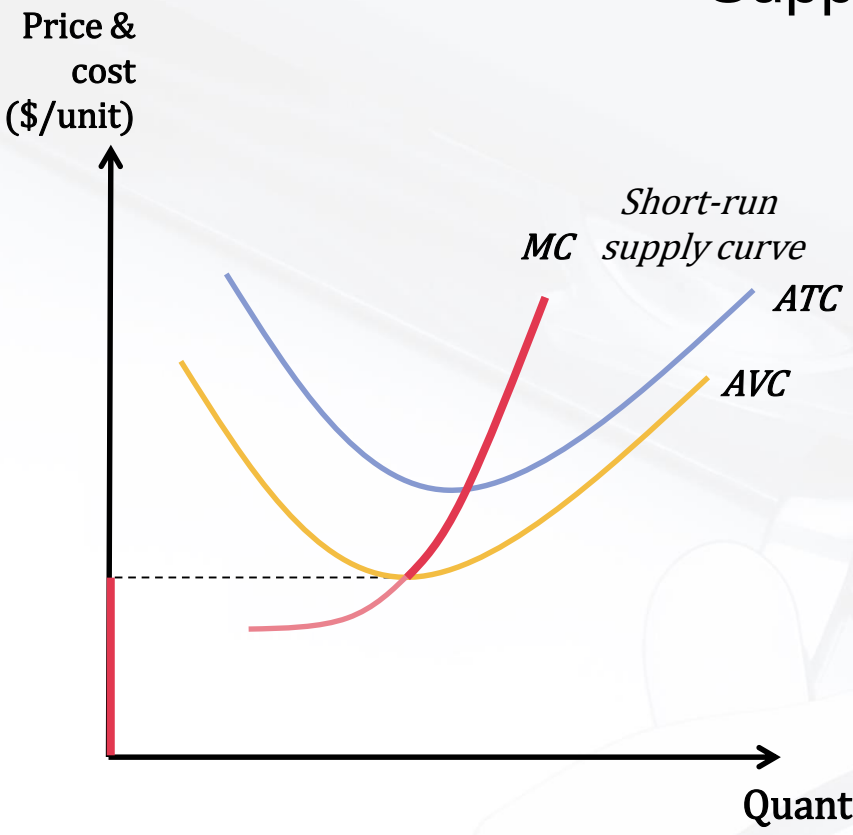
Individual firms will choose to produce where price equals marginal cost; the short-run supply curve is equal to the short-run marginal cost curve.

- One caveat: Only the portion of the short-run marginal cost curve *above* the average variable cost (*AVC*) curve will be on the firm's supply curve.
- Why?
  - **The firm won't produce (or will shutdown) if *P* < *AVC*.**

Perfect Competition in the Short Run

8.3

Figure 8.6 The Perfectly Competitive Firm's Short-Run Supply Curve



Below average variable cost (*AVC*), the firm will shut down (supply is zero).

Above average variable cost, the marginal cost (*MC*) curve is the short-run supply curve.

Perfect Competition in the Short Run

8.3

The Short-Run Supply Curve for a Perfectly Competitive Industry

We know individual firms cannot affect market price in a perfectly competitive industry.

Market price is instead determined by the interaction between market supply and market demand.

Market supply is the horizontal sum of all individual firms' supply curves.

Perfect Competition in the Short Run

8.3

Producer Surplus for a Competitive Firm

Marginal cost slopes upward; therefore, in most circumstances some output is being sold at a price above the cost of production.

Producer surplus is the sum of the differences between marginal cost and the price of output at every level of output.

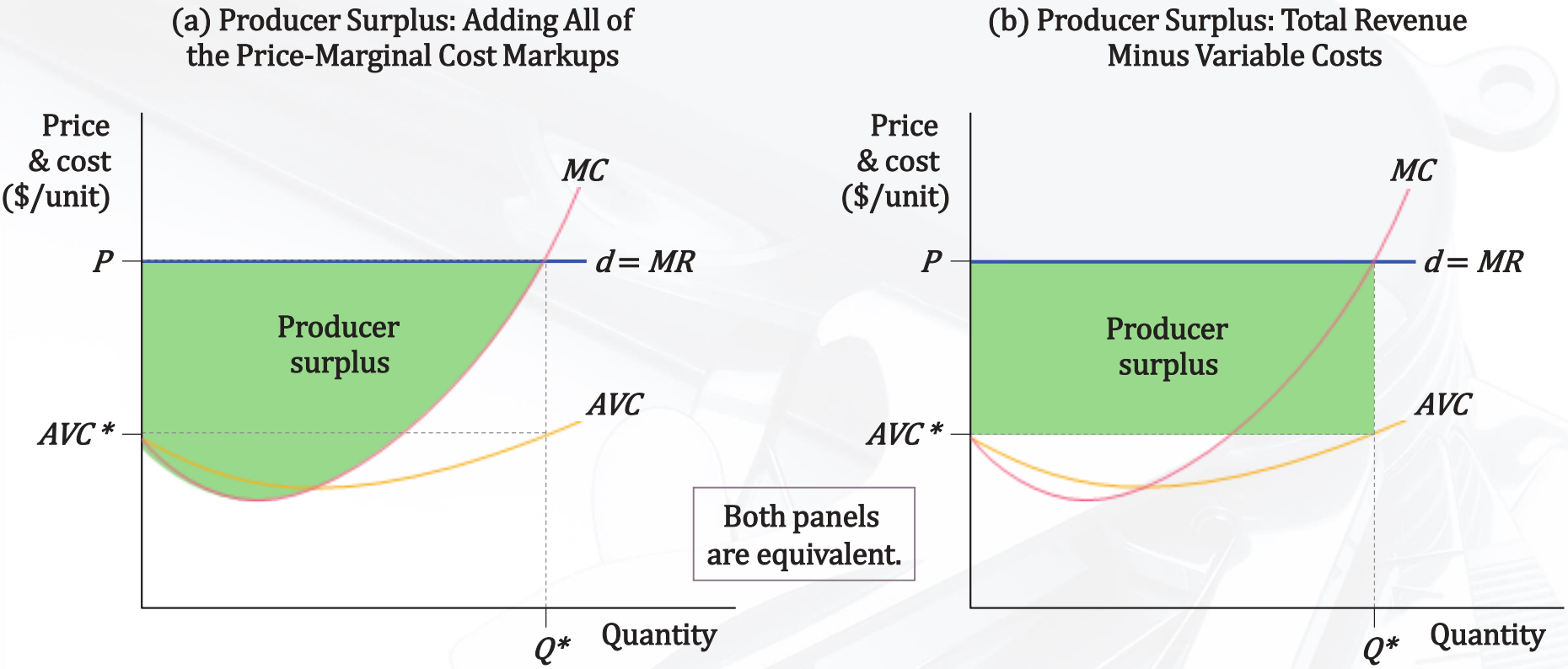
This is equivalent to the difference between total revenue and total variable cost.

$$PS = TR - VC$$

Perfect Competition in the Short Run

8.3

Figure 8.10 Producer Surplus for a Firm in Perfect Competition



Perfect Competition in the Short Run

8.3

Producer Surplus and Profit

Producer surplus is closely related to profit, but they are not the same thing.

$$PS = TR - VC,$$

$$\rho = TR - VC - FC = PS - FC$$

Firms will *operate* without making a profit, but they will *shut down* if they are not making any producer surplus.

Perfect Competition in the Short Run

8.3

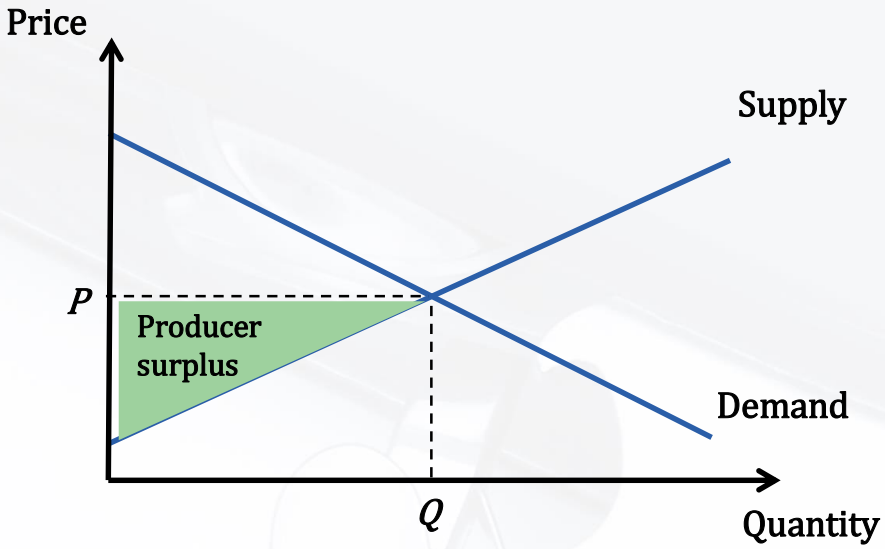
Producer Surplus for a Competitive Industry

Producer surplus for an entire industry is the sum of individual firms' surplus.

Perfect Competition in the Short Run

8.3

Figure 8.11 Industry Producer Surplus



Remember that in the PC industry the supply curve is the marginal cost curve above minimum *AVC*.

Perfectly Competitive Industries in the Long Run

8.4

The long run differs from the short run in a number of ways

1. In the short run, some costs are fixed; in the long run, all inputs, and therefore costs—may be adjusted.
2. In the long run, firms can enter and exit freely in response to market conditions.
3. The short-run supply curve is the portion of the short-run marginal cost curve above the short-run *average* variable cost curve.
   - In the long run, firms will not stay in business unless all costs can be covered by revenue, therefore
     - The long-run supply curve is the portion of the marginal cost curve above the long-run average *total* cost curve.

Perfectly Competitive Industries in the Long Run

8.4

Entry

Perfectly competitive markets are characterized by **free entry**

- The ability of a firm to enter an industry without encountering legal or technical barriers.

✓ **What market conditions would have to exist for a firm to decide to begin operation in a particular market?**

  – Firms will only enter if they see profit being made.

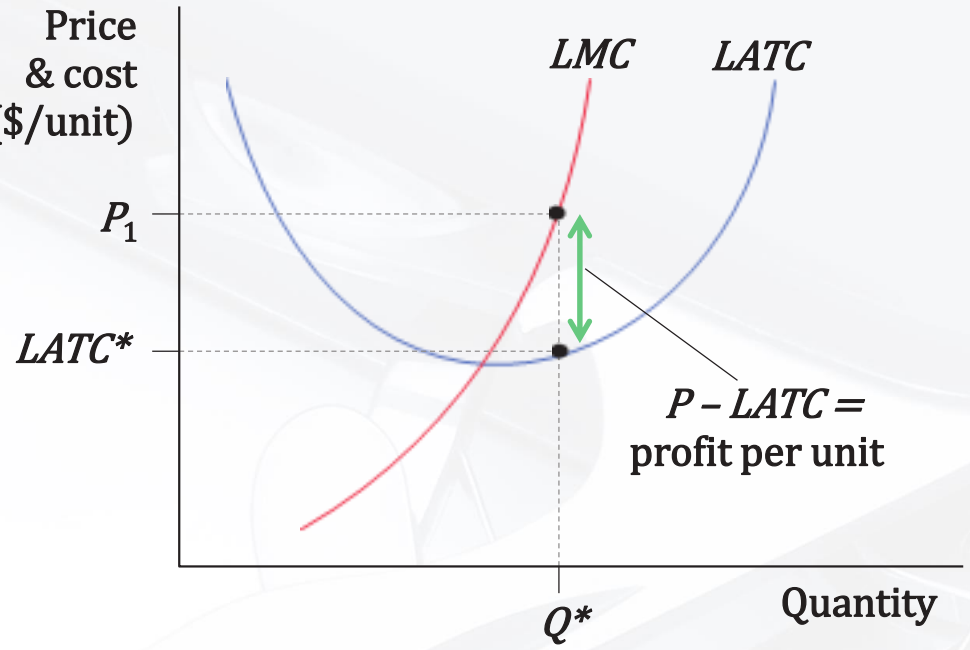
- Remember that the long-run *ATC* includes *all* costs, including opportunity costs.
- If there are positive economic "profits," new firms will enter.

When firms enter a market, the supply curve shifts outward.

Perfectly Competitive Industries in the Long Run

8.4

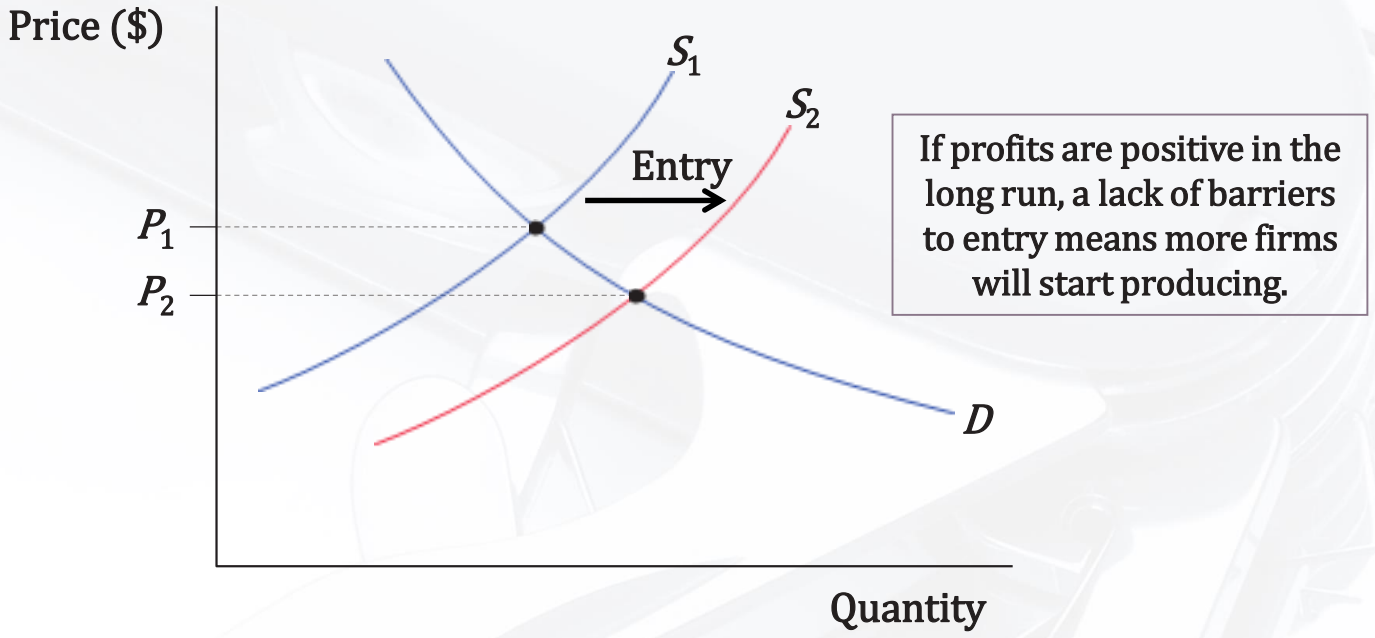
Figure 8.14 Positive Long-Run Profit



Perfectly Competitive Industries in the Long Run

8.4

Figure 8.15 Entry of New Firms Increases Supply and Lowers Equilibrium Price



Perfectly Competitive Industries in the Long Run

8.4

Exit

Perfectly competitive markets are characterized by **free exit.**

- The ability of a firm to exit an industry without encountering legal or technical barriers.

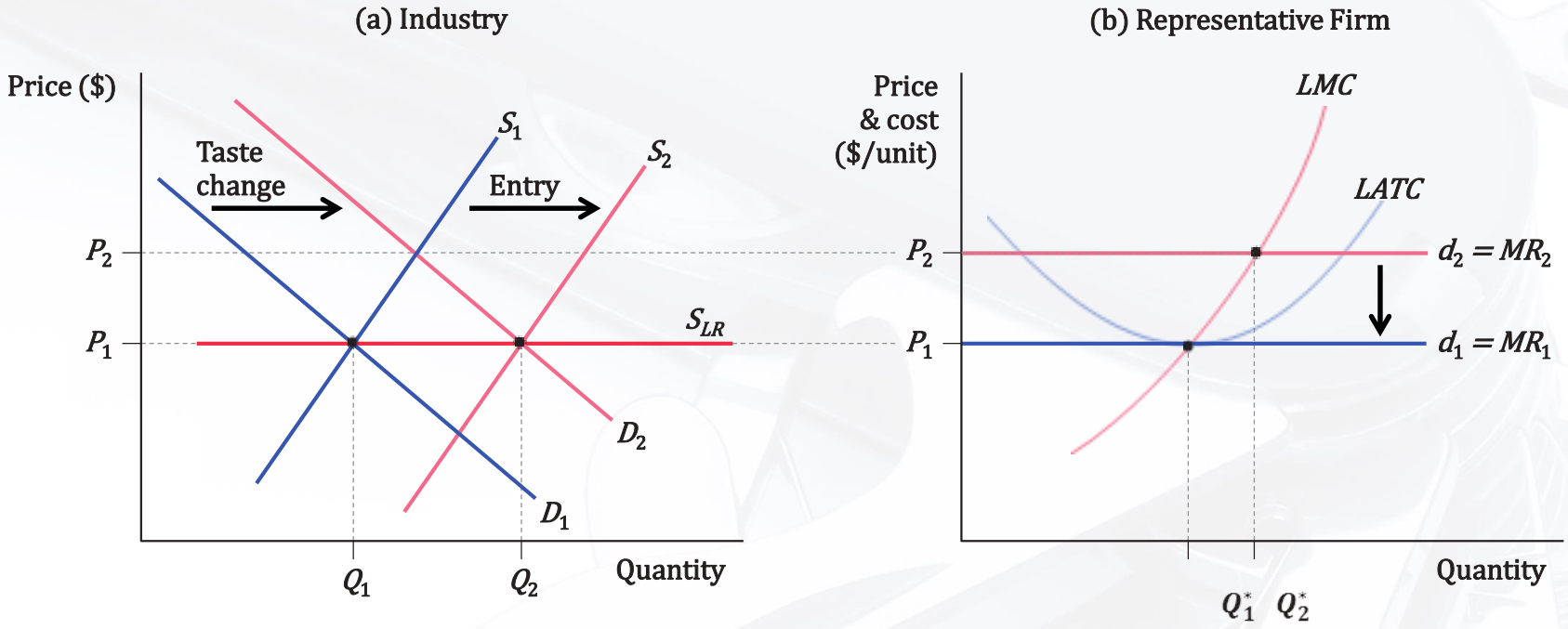
Opposite of entry, exit causes the industry supply curve to shift inward.

- Firms will exit (and market price will rise) until market price equals minimum of the long-run average total cost curve.

Perfectly Competitive Industries in the Long Run

8.4

Figure 8.16 Deriving the Long-Run Industry Supply Curve



Perfectly Competitive Industries in the Long Run

8.4

Adjustments Between Long-Run Equilibria

Describe the process of adjustment to a new market equilibrium in response to the following:

An increase in demand: like the earlier graphs

- Existing firms enjoy positive economic profits in the short run because $P > LRATC$.
- New firms eventually enter the market, supply shifts out, and price falls to minimum long-run average total cost.

An increase in production costs:

- Some firms will experience negative economic profits in the short run.
- Eventually these firms will exit the industry and supply will shift inward, driving up the market price until it is equal to long-run average total cost.

Perfectly Competitive Industries in the Long Run

8.4

Long-Run Supply in Constant-Cost, Increasing-Cost, and Decreasing-Cost Industries

The analysis so far describes the case in which long-run average cost is constant, no matter the amount of total production.

- Implies a horizontal long-run supply curve
- Called a **constant-cost** industry

Increasing-cost industries are characterized by long-run average costs that increase with industry output.

- Possibly due to competition over a scarce input (e.g., oil production)
  - Results in an upward-sloped long-run supply curve

Decreasing-cost industries are characterized by long-run average costs that fall with industry output.

  - Results in a downward-sloped long-run supply curve… Why might this occur?

Producer Surplus, Economic Rents, and Economic Profits

8.5

Cost Differences and Economic Rent in Perfect Competition

In the long run, there is no potential for economic profit in a perfectly competitive industry.

- Assumes producers have identical cost curves.
- However, some firms may be more efficient than others.

More efficient firms earn **Economic Rent**, or returns to specialized inputs above what firms paid for them.

In a perfectly competitive market consisting of firms with different long-run average cost curves:

- The long-run market price equals the minimum average total cost of the highest-cost firm in the industry.
- The highest-cost firm makes zero profit and zero producer surplus.

Producer Surplus, Economic Rents, and Economic Profits

8.5

Cost Differences and Economic Rent in Perfect Competition

Important distinction: Economic rent ≠ economic profit.

Economic rent is included in the *opportunity costs* associated with the use of an input.

- An excellent manager or a trade secret would likely be useful in other ventures as well.
- These "rents" often accrue to the more-productive-than-average inputs (e.g., salaries to the best managers).

Economic profit includes all opportunity costs.

Conclusion

8.6

Chapter 8 has analyzed the decisions facing firms in a perfectly competitive industry:

- Characterized by few barriers to entry, a large number of firms producing identical products, and firms that are price takers.
- Firms maximize profits by setting marginal cost equal to market price.

In the next chapters, we relax some of the assumptions of perfect competition to include product differentiation, barriers to entry, and other characteristics common to real-world markets.

figure it out

Assume that consumers view hair cuts as undifferentiated among producers, and that there are hundreds of barbers in a given market. The current market equilibrium price for a haircut is $15. Bob's Barbershop has a daily, short-run total cost given by

$$TC = 0.5Q^2$$

with marginal cost $MC = Q$

Answer the following questions:

a. How many haircuts should Bob prepare each day if his goal is to maximize profits?

b. How much will he earn in profit each day?

figure it out

a. Bob is assumed to be operating in a perfectly competitive market, so he will prepare returns up until the point that marginal revenue (price) is equal to marginal cost.

$$MR\,(=P) = MC \rightarrow 15 = Q \rightarrow Q = 15$$

b. To determine Bob's daily profit, plug the profit-maximizing quantity into the daily profit function.

$$\pi = TR - TC = P \times Q - \left(0.5Q^2\right)$$

$$= 15 \times 15 - \left(0.5(15)^2\right)$$

$$\pi = \$225 - \$112.5 \quad \text{per day}$$

figure it out

Additional figure it out

Assume that consumers view tax preparation services as undifferentiated among producers, and that there are hundreds of companies offering tax preparation in a given market. The current market equilibrium price is $120. Joe Audit's Tax Service has a daily, short-run total cost given by

$$TC = 100 + 4Q^2$$

with marginal cost $MC = 8Q$

Answer the following questions:

a. How many tax returns should Joe prepare each day if his goal is to maximize profits?

b. How much will he earn in profit each day?

figure it out

a. **Joe is assumed to be operating in a perfectly competitive market, so he will prepare returns up until the point that marginal revenue (price) is equal to marginal cost.**

$$MR = P = MC \rightarrow 120 = 8Q \rightarrow Q = 15$$

b. **To determine Joe's daily profit, plug the profit-maximizing quantity into the daily profit function.**

$$\begin{aligned}\pi &= TR - TC = P \times Q - \left(100 + 4Q^2\right) \\ &= 120 \times 15 - (100 + 4(15^2) \\ &= 1{,}800 - 1{,}000 = \$800\end{aligned}$$

figure it out

Cardboard boxes are produced in a perfectly competitive market. Each identical firm has a short-run total cost curve of

$$TC = 3Q^3 - 18Q^2 + 30Q + 50$$

where quantity is measured in thousands of boxes per week. The marginal cost of production is given by

$$MC = 9Q^2 - 36Q + 30$$

Calculate the price below which a firm in the market will not produce any output (the shut-down price).

figure it out

A firm will stop producing output in the short run when the price of output falls below the minimum average variable cost (*AVC*).

First, we must identify the equation for *AVC*. Variable cost (*VC*) is the portion of the total cost curve that varies with output

$$TC = 3Q^3 - 18Q^2 + 30Q + 50$$

And *AVC* is just variable cost divided by *Q*

$$AVC = \frac{3Q^3 - 18Q^2 + 30Q}{Q} \rightarrow AVC = 3Q^2 - 18Q + 30$$

To find the minimum point of *AVC*, remember that the marginal cost curve intersects the *AVC* curve at its minimum.

figure it out

To find the minimum point of *AVC*, remember that the marginal cost curve intersects the *AVC* curve at its minimum.

First: Find the quantity that minimizes the *AVC* curve by setting *AVC* = *MC*.

$$AVC_{\min} \rightarrow 3Q^2 - 18Q + 30 = 9Q^2 - 36Q + 30$$

$$18Q = 6Q^2$$

$$Q_{\min AVC} = 3$$

Second: Plug in this *Q* the A*VC* (or *MC* curve) curve to solve for the price that the firm should not produce below.

$$AVC_{\min} = 3Q^2 - 18Q + 30 \rightarrow 3(3^2) - 18(3) + 30$$

$$P = \$3$$

The firm should stop production and shutdown when the market price falls below $3.00.

figure it out

Additional figure it out

Cardboard boxes are produced in a perfectly competitive market. Each identical firm has a short-run total cost curve of

$$TC = 6Q^3 - 36Q^2 + 60Q + 50$$

where quantity is measured in thousands of boxes per week. The marginal cost of production is given by

$$MC = 18Q^2 - 72Q + 60$$

Calculate the price below which a firm in the market will not produce any output (the shut-down price).

figure it out

A firm will stop producing output in the short run when the price of output falls below the minimum average variable cost (*AVC*).

First, we must identify the equation for *AVC*. Variable cost (*VC*) is the portion of the total cost curve that varies with output.

$$TC = 6Q^3 - 36Q^2 + 60Q + 50$$

And *AVC* is just variable cost divided by *Q*.

$$AVC = \frac{6Q^3 - 36Q^2 + 60Q}{Q} \rightarrow AVC = 6Q^2 - 36Q + 60$$

To find the minimum point of *AVC*, remember that the marginal cost curve intersects the *AVC* curve at its minimum.

figure it out

To find the minimum point of *AVC*, remember that the marginal cost curve intersects the *AVC* curve at its minimum.

First: Find the quantity that minimizes the *AVC* curve by setting *AVC* = *MC*

$$AVC_{\min} \rightarrow 6Q^2 - 36Q + 60 = 18Q^2 - 72Q + 60$$

$$36Q = 12Q^2$$

$$Q_{\min AVC} = 3$$

Second: Plug in this *Q* to the *AVC* curve (or *MC* curve) to solve for the price that the firm should not produce below.

$$AVC_{\min} = 6Q^2 - 36Q + 60 \rightarrow 6(3^2) - 36(3) + 60$$

$$P = \$6$$

The firm should stop production and shutdown when the market price falls below $6.00.

figure it out

Assume that the industry for pickles is perfectly competitive. There are 150 producers. 100 of the firms are "high-cost," with short-run supply curves $Q_{hc} = 4P$, while the others are "low-cost," with short-run supply curves $Q_{lc} = 6P$. Quantities are measured in jars and prices in dollars.

Answer the following questions:

a. Derive the short-run industry supply curve for tortillas.

b. Assume the market demand curve for tortillas is given by $Q^d = 6{,}000 - 300P$. Find the market equilibrium price *and* quantity.

c. At this price, how many pickles are produced by the high- and low-cost firms, respectively?

d. Determine total industry surplus at the equilibrium.

figure it out

a. The short-run industry supply curve is found by summing the firms' supply curves:

$$Q^S = Q_{hc} + Q_{lc} = (\#Firms_{hc} \times Q_{hc}) + (\#Firms_{lc} \times Q_{lc})$$

$$Q^S = 100 \times 4P + 50 \times 6P = 700P$$

b. The market equilibrium occurs where $Q^S = Q^D$

$$Q^S = Q^D \rightarrow 700P = 6{,}000 - 300P$$

$$1{,}000P = 6{,}000 \rightarrow P = \$6$$

$$P = \$6 \rightarrow Q_S = 700(6) = 4{,}200 \ jars$$

$$\rightarrow Q_D = 6{,}000 - 300(6) = 4{,}200 \ jars$$

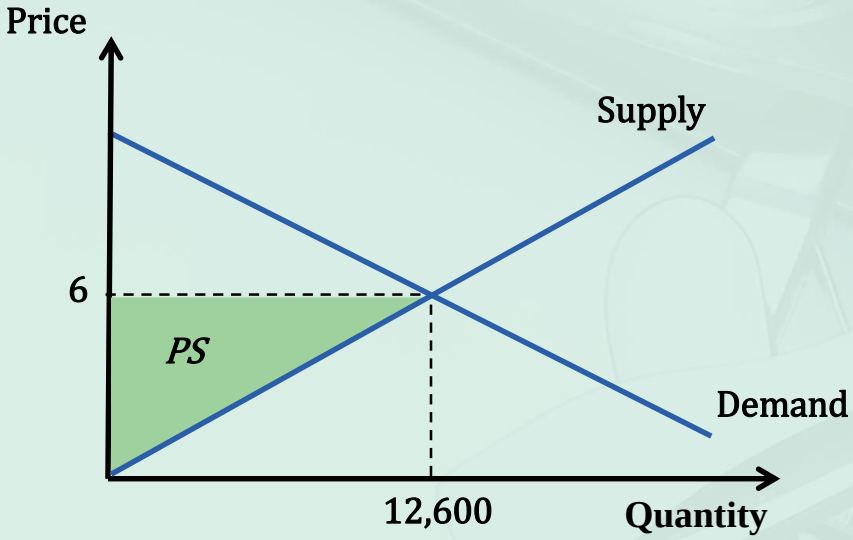
figure it out

c. To determine how many jars of pickles are produced by the high- and low-cost firms, respectively, plug P = \$6 into each type of producers' supply curve.

$$Q_{hc} = 4P = 24 \text{ jars}$$

$$Q_{lc} = 6P = 36 \text{ jars}$$

d. Producer surplus (PS) is the area between the price line and the industry supply curve.



$$PS = \frac{1}{2} \times Q_E \times P_E$$

$$= \frac{1}{2} \times 4{,}200 \times \$6$$

$$= \$12{,}600$$

figure it out

Additional figure it out

Assume that the industry for flour tortillas in Denver is perfectly competitive. There are 200 firms. 75 of the firms are "high-cost," with short-run supply curves $Q_{hc} = 5P$, while the others are "low-cost," with short-run supply curves $Q_{lc} = 8P$. Quantities are measured in tortillas and prices in dollars.

Answer the following questions:

a. Derive the short-run industry supply curve for tortillas.

b. Assume the market demand curve for tortillas is given by $Q^D = 10{,}000 - 625P$. Find the market equilibrium price *and* quantity.

c. At this price, how many dozens of tortillas are produced by the high- and low-cost firms, respectively?

d. Determine total industry surplus at the equilibrium.

figure it out

a. The short-run industry supply curve is found by summing the firms' supply curves:

$$Q^S = Q_{hc} + Q_{lc} = (\#Firms_{hc} \times Q_{hc}) + (\#Firms_{lc} \times Q_{lc})$$

$$= 75 \times 5P + 125 \times 8P = 1,375P$$

b. The market equilibrium occurs where $Q^S = Q^D$

$$Q^S = Q^D \rightarrow 1375P = 10,000 - 625P$$

$$2,000P = 10,000 \rightarrow P = \$5$$

$$P = \$5 \rightarrow Q_S = 1,375(5) = 6,875 \text{ tortillas}$$

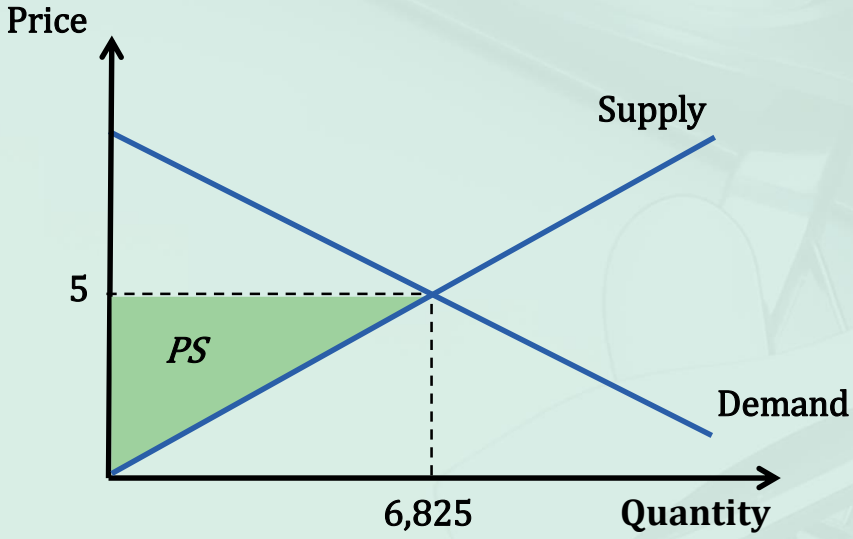
$$\rightarrow Q_D = 10,000 - 625(5) = 6,875 \text{ tortillas}$$

figure it out

c. To determine how many tortillas are produced by the high- and low-cost firms, respectively, plug P = \$5 into each type of producers' supply curve.

$$Q_{hc} = 5P = 25 \text{ tortillas}$$
$$Q_{lc} = 8P = 40 \text{ tortillas}$$

d. Producer surplus (PS) is the area between the price line and the industry supply curve.



$$PS = \frac{1}{2} \times Q_E \times P_E$$
$$= \frac{1}{2} \times 6{,}875 \times \$5$$
$$= \$17{,}187.50$$

figure it out

Suppose the market for cantaloupes is currently in long-run equilibrium at a price of $3 per melon. A listeria outbreak in cantaloupe crops leads to a sharp decline in the demand for cantaloupe.

Answer the following questions:

a. In the short run, what will happen to the price of cantaloupes? Explain using a diagram.

b. In the short run, how will firms respond to the change in price described in part (a)? What will happen to firms' profits? Explain using the same diagram.

c. Given the situation described in (b), what can we expect to happen to the number of cantaloupe producers in the long run?

d. What will the long run price of cantaloupes be?

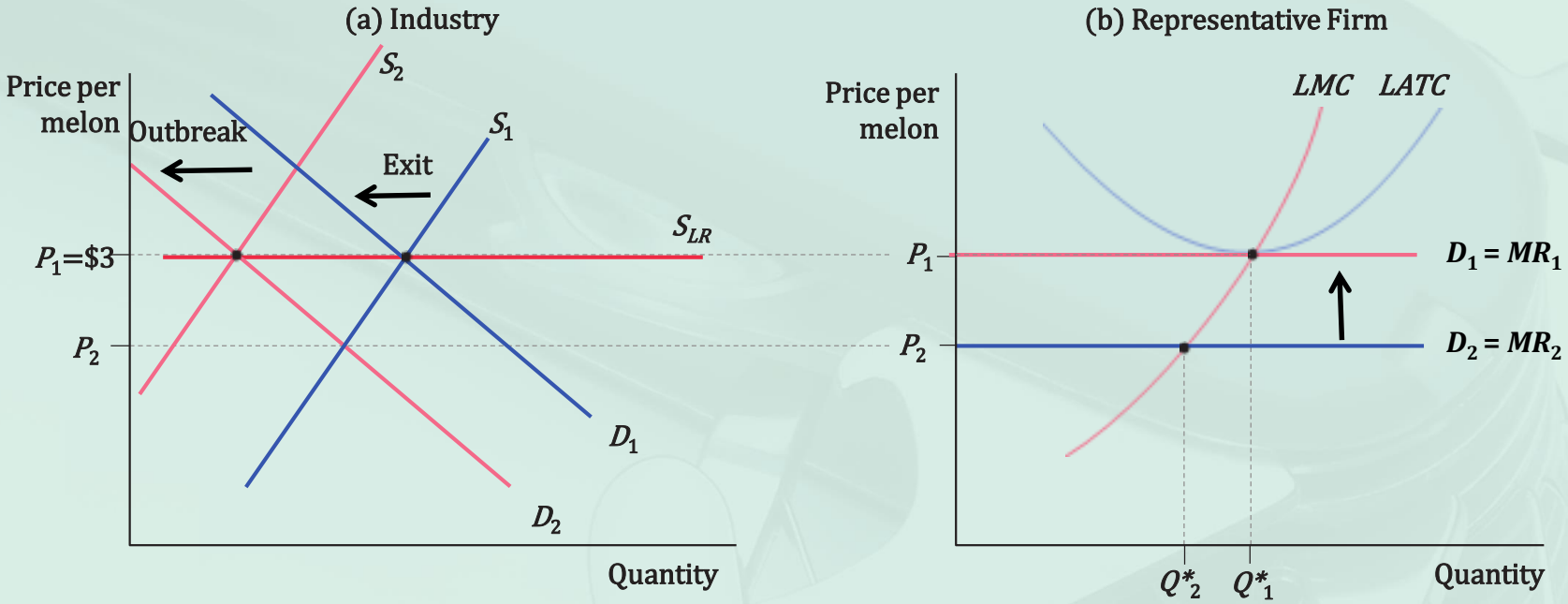
figure it out

a. This new information leads to a decrease in demand in the short run. Which will result in an decrease in price.

b. This will decrease the price of cantaloupes, and existing firms will produce less because they are now making negative economic profits (losses).

figure it out

c. In the long-run, a number of producers will have losses (at P_2, Q^*_2) so some will exit the market.



d. In the long run the price of cantaloupes will rise back to the initial equilibrium of $3 per melon as the reduction in supply will drive price back to $3 where there are no more losses.

figure it out

Additional figure it out

Suppose the market for the pain reliever, aspirin ,is currently in long-run equilibrium at a price of $3 per bottle. New scientific research is released that links aspirin with a reduced risk of heart disease.

Answer the following questions:

a. In the short run, what will happen to the price of aspirin? Explain using a diagram.

b. In the short run, how will firms respond to the change in price described in part (a)? What will happen to firms' profits? Explain using the same diagram.

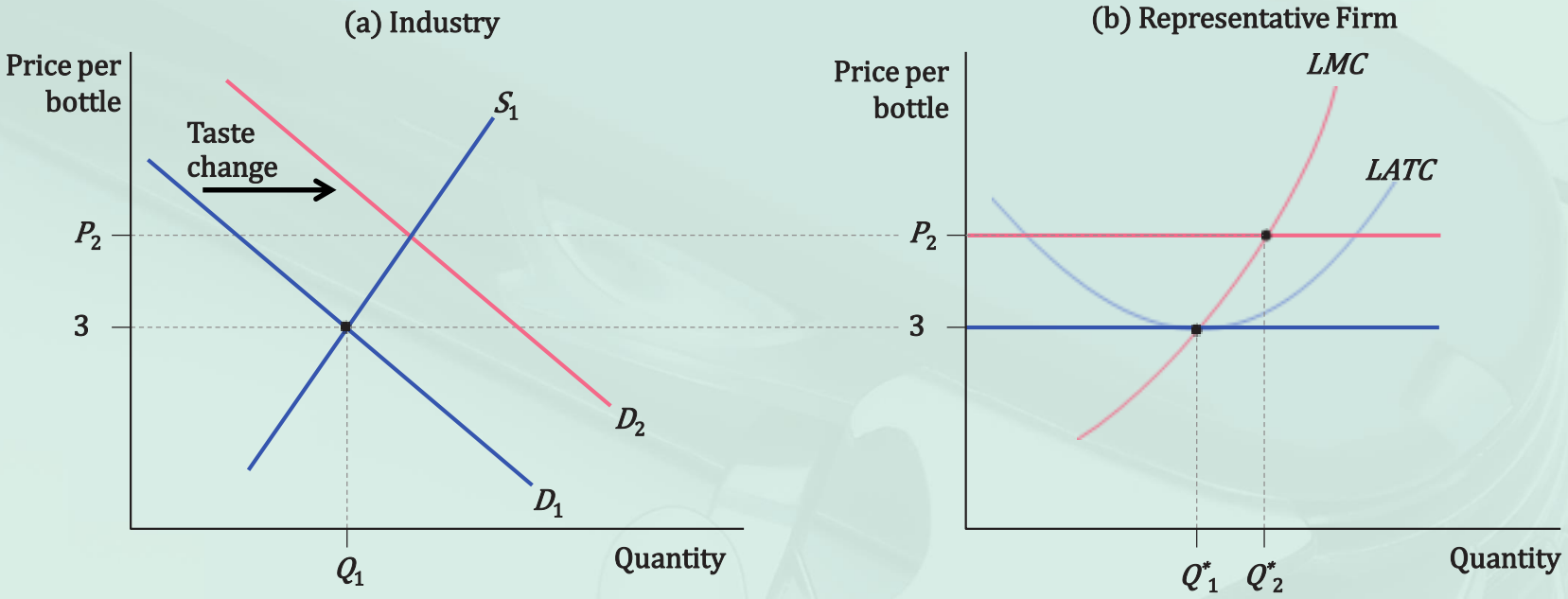
c. Given the situation described in (b), what can we expect to happen to the number of aspirin producers in the long run?

d. What will the long-run price of aspirin be?

figure it out

Additional figure it out

a. This new information will lead to an increase in demand in the short run, which will result in an increase in price

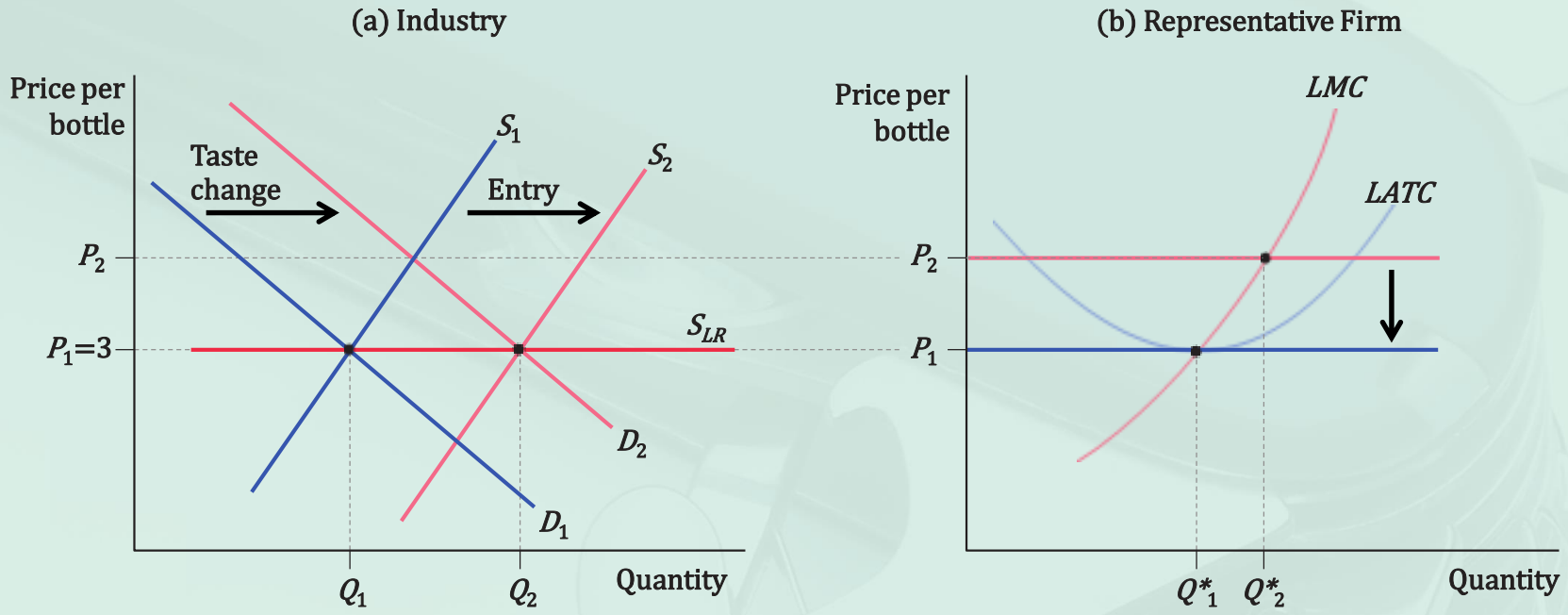


b. This will increase the price of aspirin, and existing firms will produce more because they are now making profits.

figure it out

Additional figure it out

c. In the long-run, the number of producers will rise because firms see profits and enter the market.



d. In the long run the price of aspirin will fall back down to initial equilibrium of $3 per bottle as more firms enter the market seeking profit.