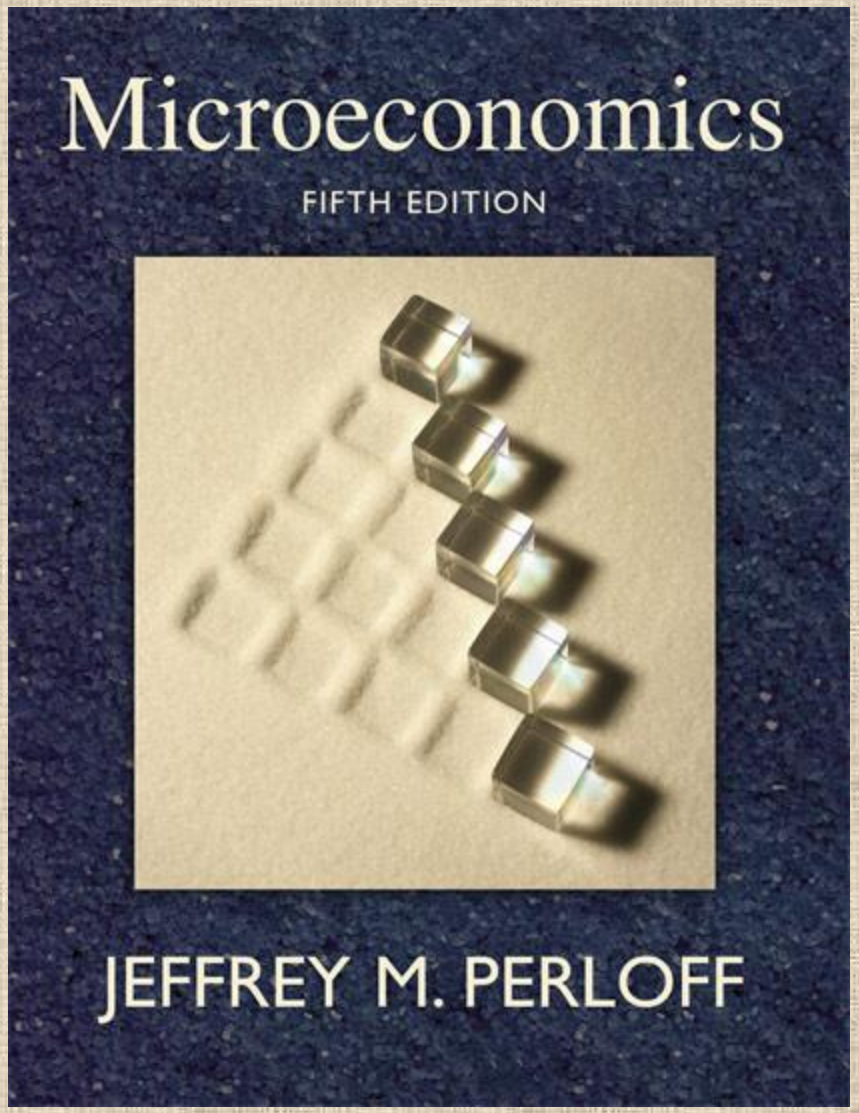


Chapter Eight

Competitive Firms and Markets

Topics

- **Competition.**
- **Profit Maximization.**
- **Competition in the Short Run.**
- **Competition in the Long Run.**
- **Zero Profit for Competitive Firms in the Long Run.**

Price Taking

- A market is *competitive* if each firm in the market is a *price taker*.
  - *price taker -* a firm that cannot significantly affect the market price for its output or the prices at which it buys its inputs.
  - the price taker firm faces a demand curve that is horizontal at the market price.

Why the Firm's Demand Curve Is Horizontal

- Consumers believe that all firms in the market sell *identical products*.
- Firms *freely enter and exit* the market.
- *Buyers and sellers know the prices* charged by firms.
- *Transaction costs are low*.

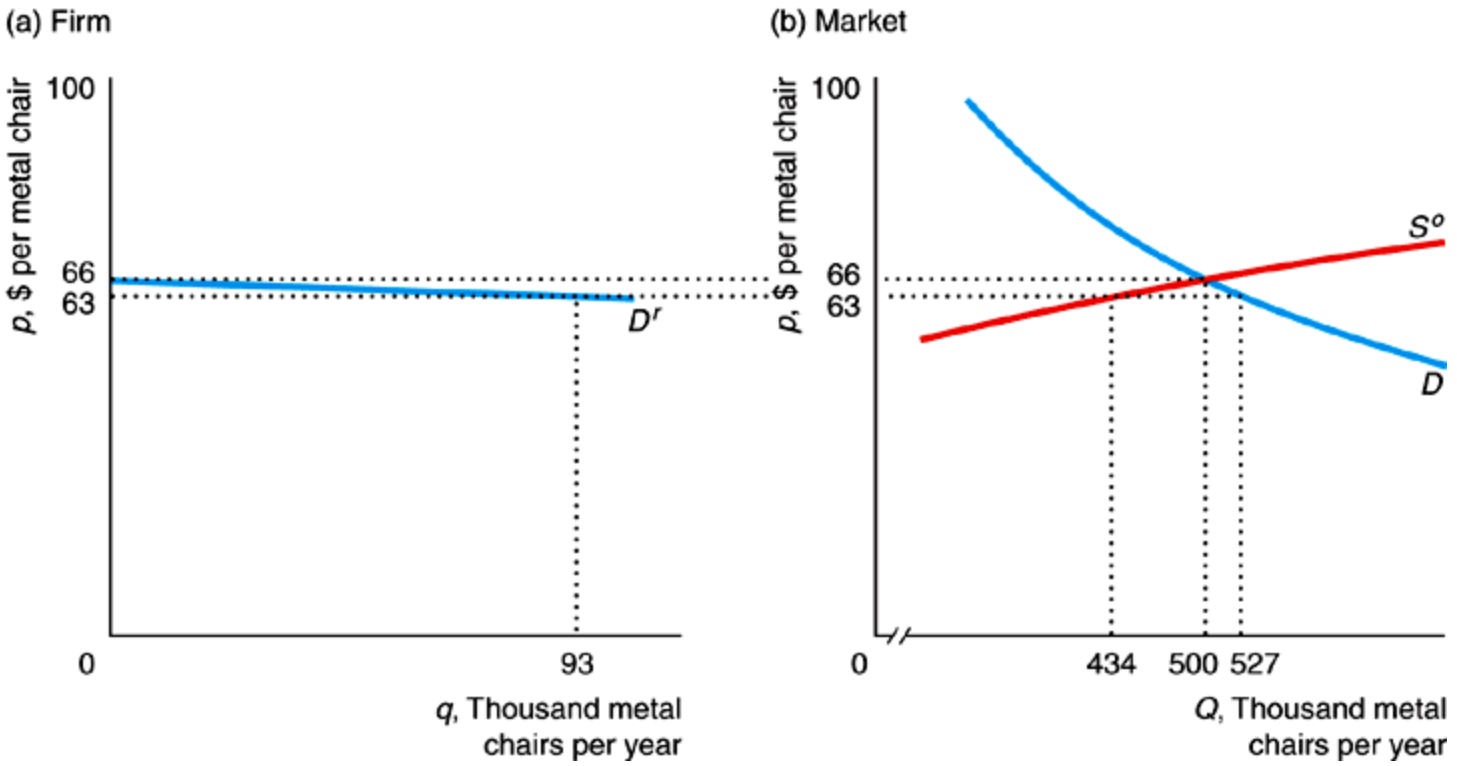
We call a market in which all these conditions hold a ***perfectly competitive market***.

Derivation of a Competitive Firm's Demand Curve

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

$$D'(p) = D(p) - S^o(p).$$

Figure 8.1 Residual Demand Curve



Profit Maximization

- **economic profit -** revenue minus *economic cost.*

$$\pi = R - C.$$

  - If profit is negative, $\pi < 0$, the firm makes a *loss*.
  - *economic cost* includes both explicit and implicit costs.

Two Steps to Maximizing Profit

- The firm's profit function is:

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

- To maximize its profit, any firm must answer two questions:
  - **Output decision -** If the firm produces, what output level, q^*, maximizes its profit or minimizes its loss?
  - **Shutdown decision -** Is it more profitable to produce q^* or to shut down and produce no output?

Output Rules.

- *Output Rule 1:* The firm sets its output where its profit is maximized.

- *Output Rule 2:* A firm sets its output where its marginal profit is zero.

MR = MC

- **marginal revenue (*MR*) -** the change in revenue a firm gets from selling one more unit of output: $MR = \Delta R / \Delta q$

- **marginal profit -** the change in profit a firm gets from selling one more unit of output.
  - The change in the firm's profit is:

$$\text{Marginal profit}(q) = MR(q) - MC(q).$$

MR = MC (cont).

- The change in the firm's profit is:

$$\text{Marginal profit}(q) = MR(q) - MC(q).$$

- *Output Rule 3:* A firm sets its output where its marginal revenue equals its marginal cost:

$$MR(q) = MC(q).$$

Shutdown Rule 1

- *Shutdown Rule 1*: The firm shuts down only if it can reduce its loss by doing so.
- Example: R = \$2,000, VC = \$1,000, and F = \$3,000.
  - This firm is making a short-run loss:

$$\pi = \$2{,}000 - \$1{,}000 - \$3{,}000 = -\$2{,}000.$$

  - But if it were to shutdown, the loss would be:

$$\pi = -\$3{,}000 = FC$$

Shutdown Rule 2

- *Shutdown Rule 2*: The firm shuts down only if its revenue is less than its avoidable cost.

Short-Run Output Decision.

- Because a competitive firm's marginal revenue equals the market price:

$$MR = p$$

a profit-maximizing competitive firm produces the amount of output at which its marginal cost equals the market price:

$$MC(q) = p.$$

Application Breaking Even on Christmas Trees

Fixed Costs	
Permit	$ 300
Security (guard patrol when the lot is closed to prevent theft)	360
Insurance	700
Electricity	1,000
Lot rental (undeveloped land across from a major shopping mall)	2,500
Miscellaneous (fences, lot cleanup, snow removal)	2,000
Total fixed costs:	$6,860
Variable Costs	
Labor (two full-time employees at $12 an hour for 50 hours a week, plus some part-time workers)	$ 5,500
Trees (1,500 trees bought from a Canadian tree farm at $11.50 each)	17,250
Shipping (1,500 trees at $2 each)	3,000
Total variable costs:	$25,750
Total accounting costs:	$32,610

Figure 8.2 Maximizing Profit

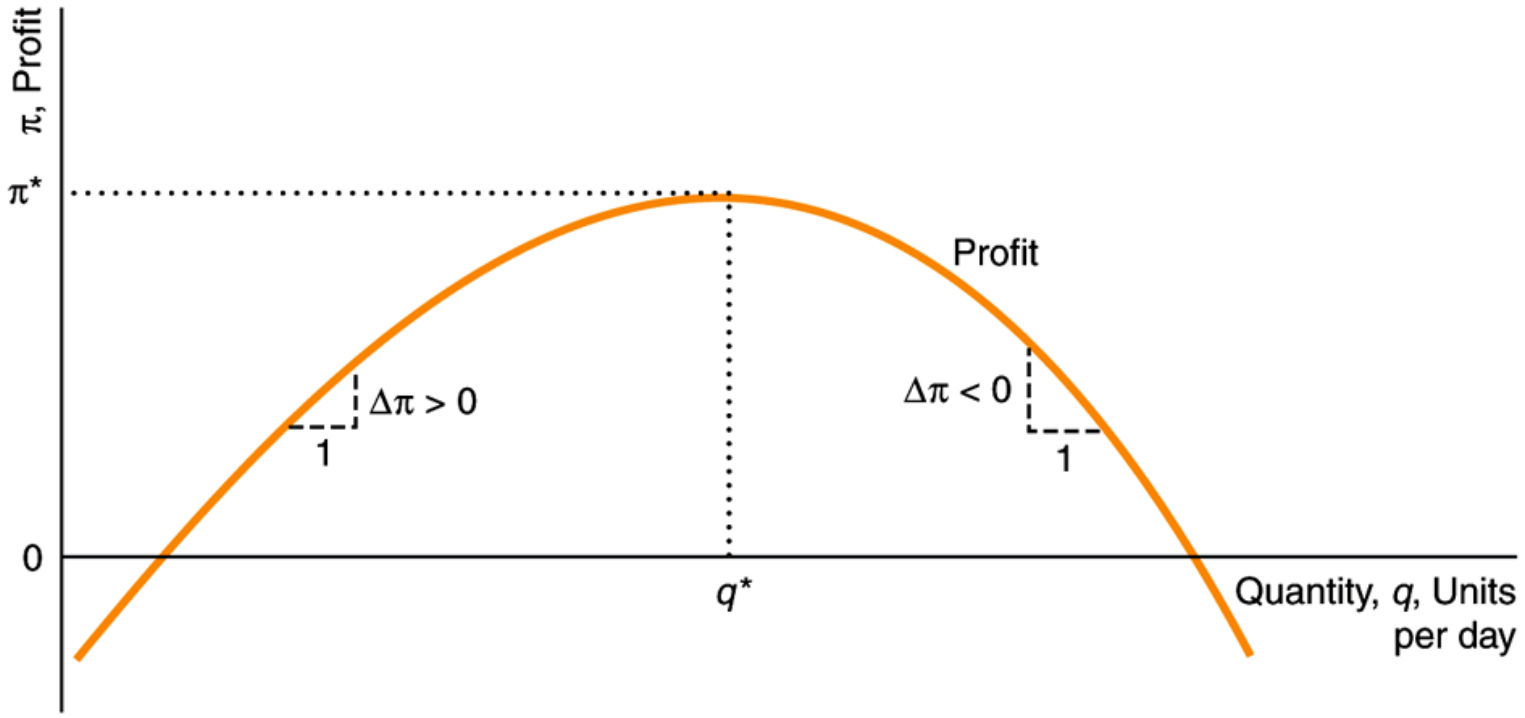


Figure 8.3 How a Competitive Firm Maximizes Profit

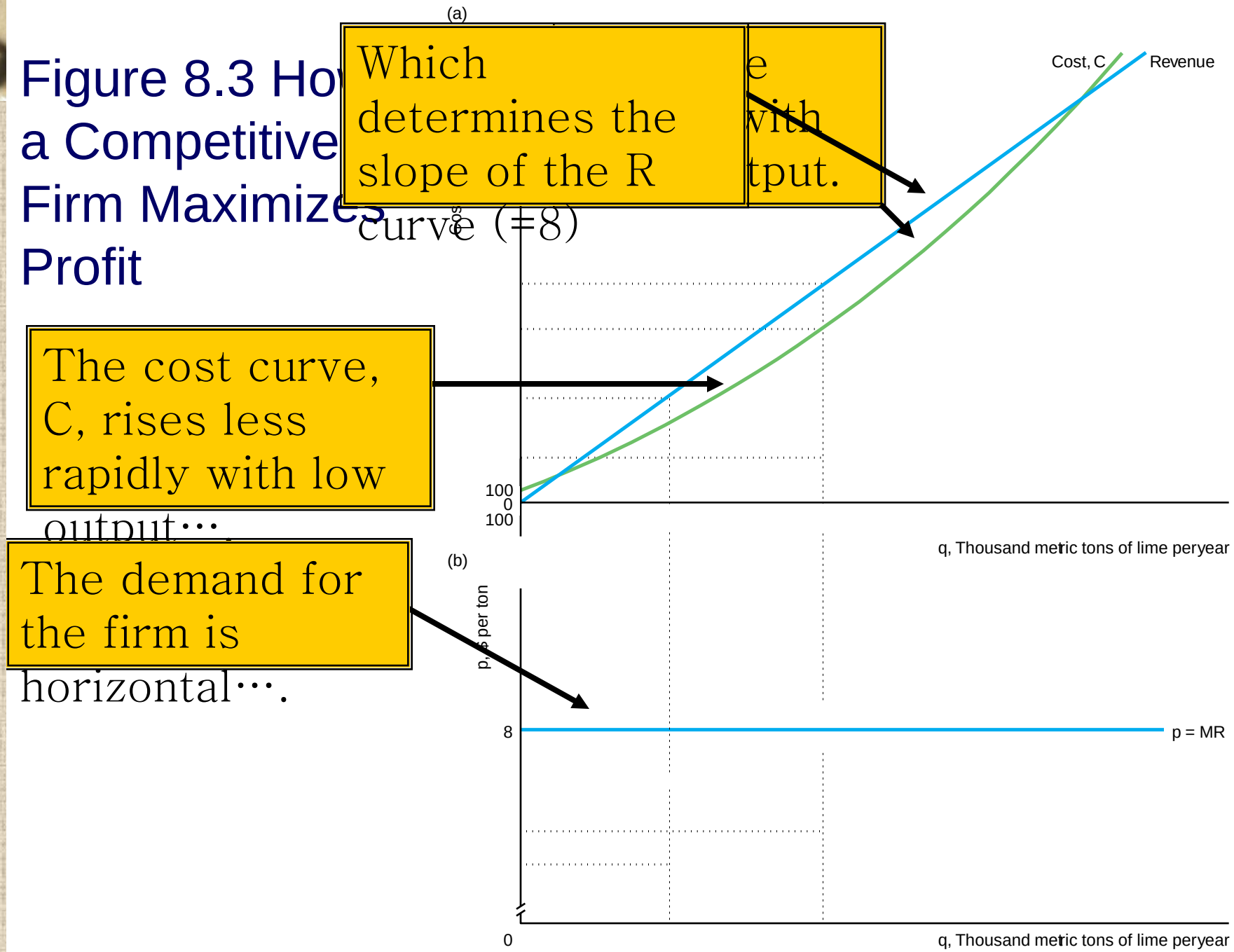


Figure 8.3 How a Competitive Firm Maximizes Profit

Firm maximizes profit by producing q = 284 …

Which also the point at which $MC = p$ …

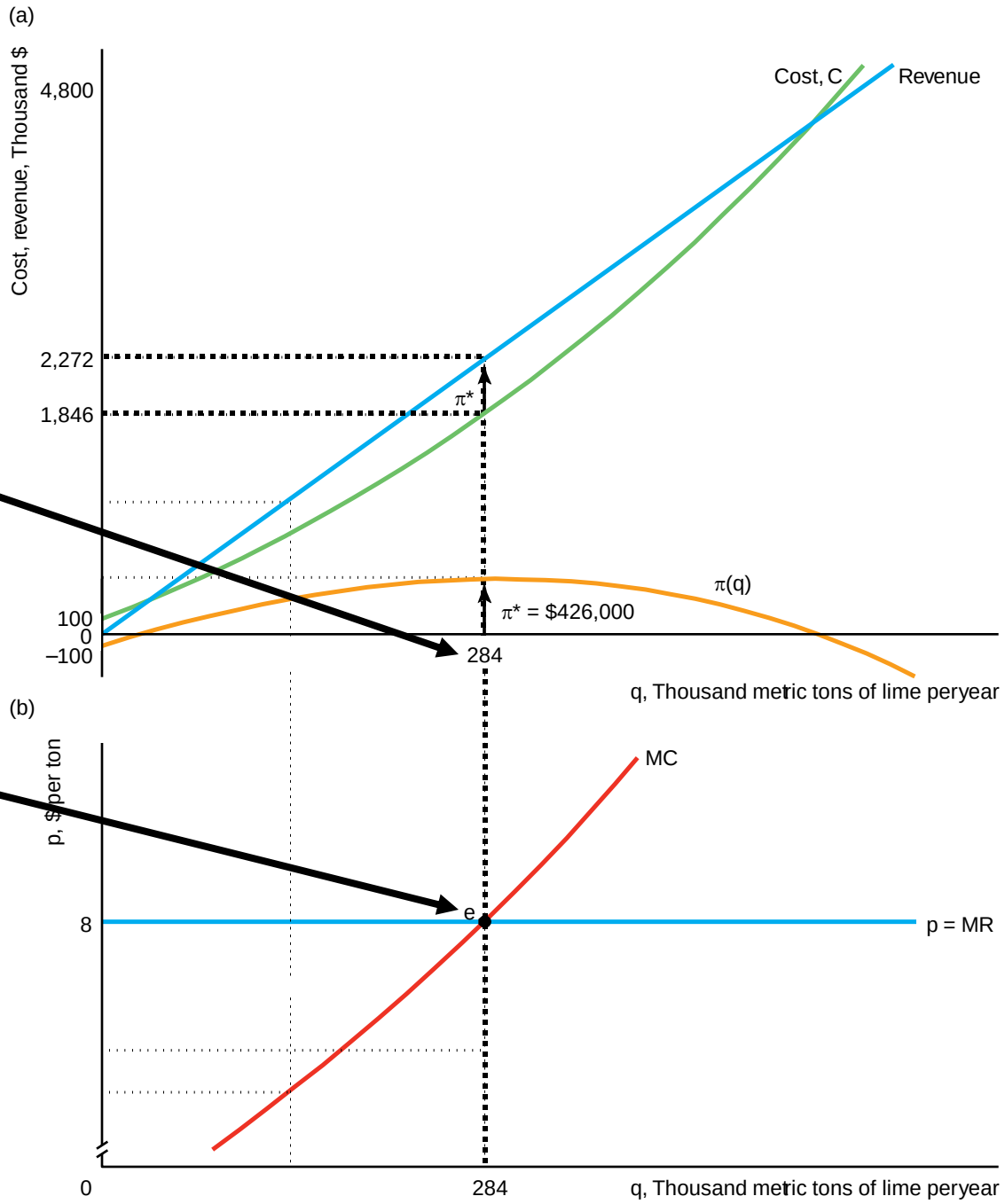


Figure 8.3 How a Competitive Firm Maximizes Profit

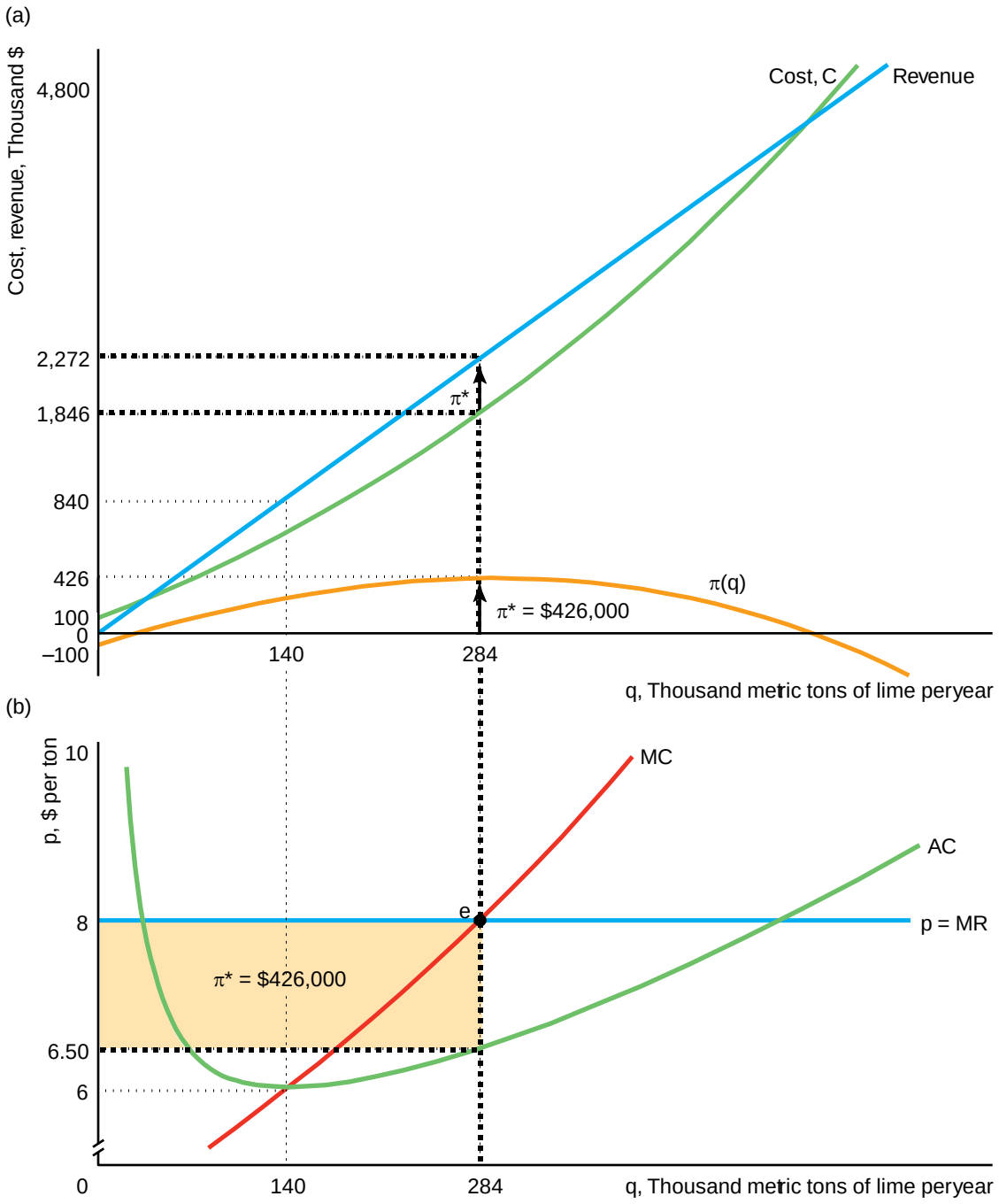
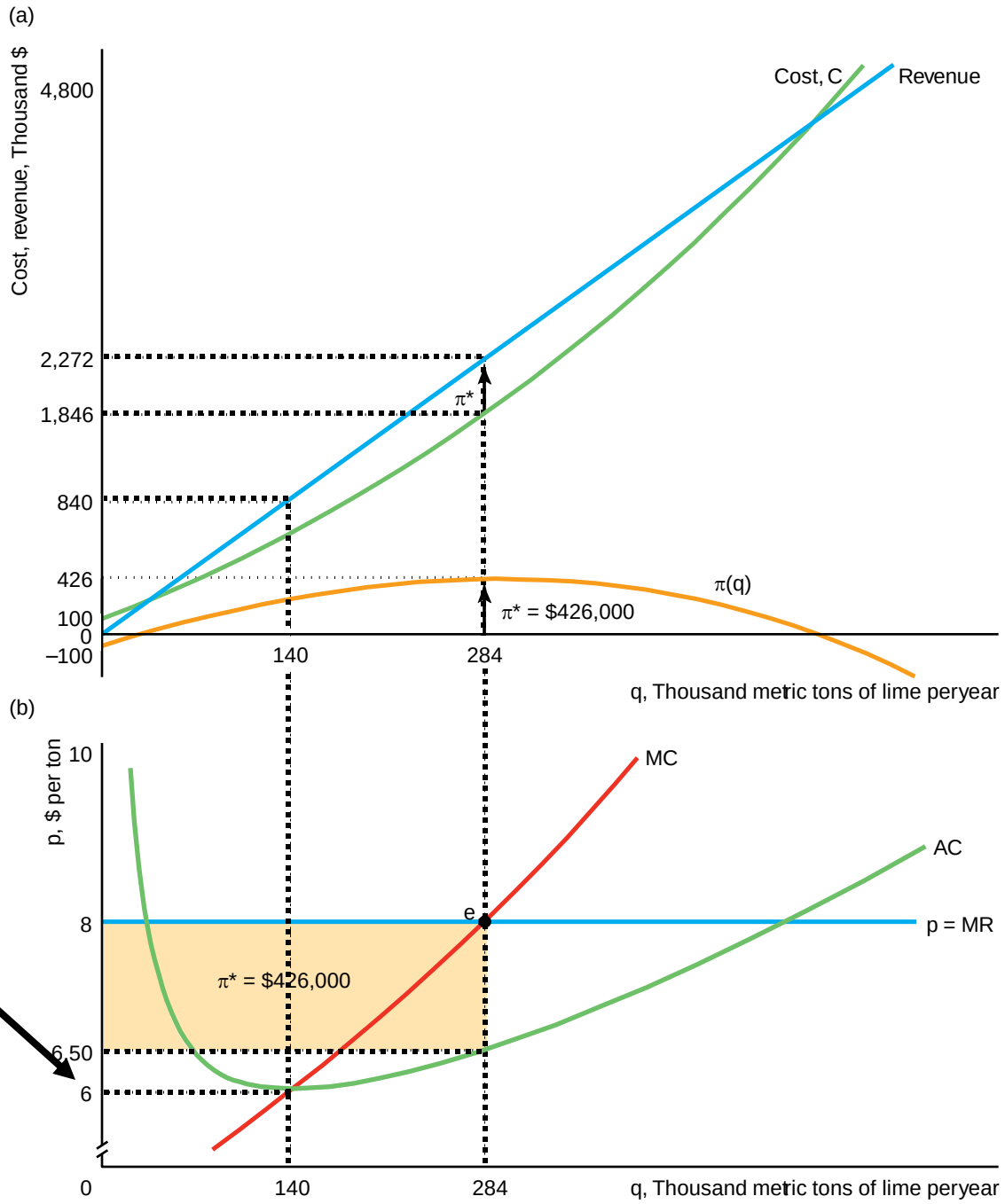


Figure 8.3 How a Competitive Firm Maximizes Profit

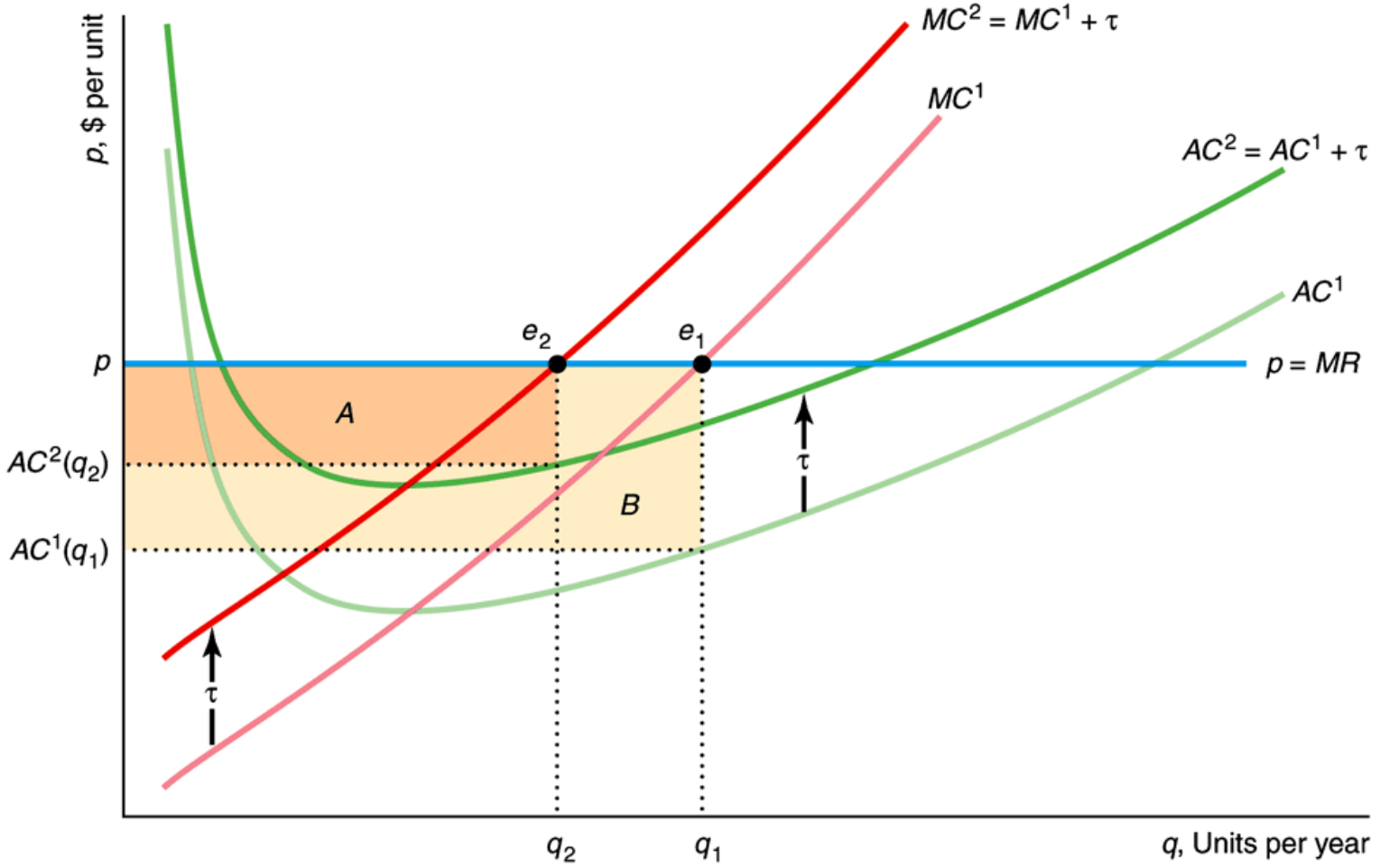


What if the market price fell below $6?

Solved Problem 8.1

- If a specific tax of τ is collected from only one competitive firm, how should that firm change its output level to maximize its profit, and how does its maximum profit change?

Solved Problem 8.1



Short-Run Shutdown Decision.

- The firm can gain by shutting down only if its revenue is less than its short-run variable cost:

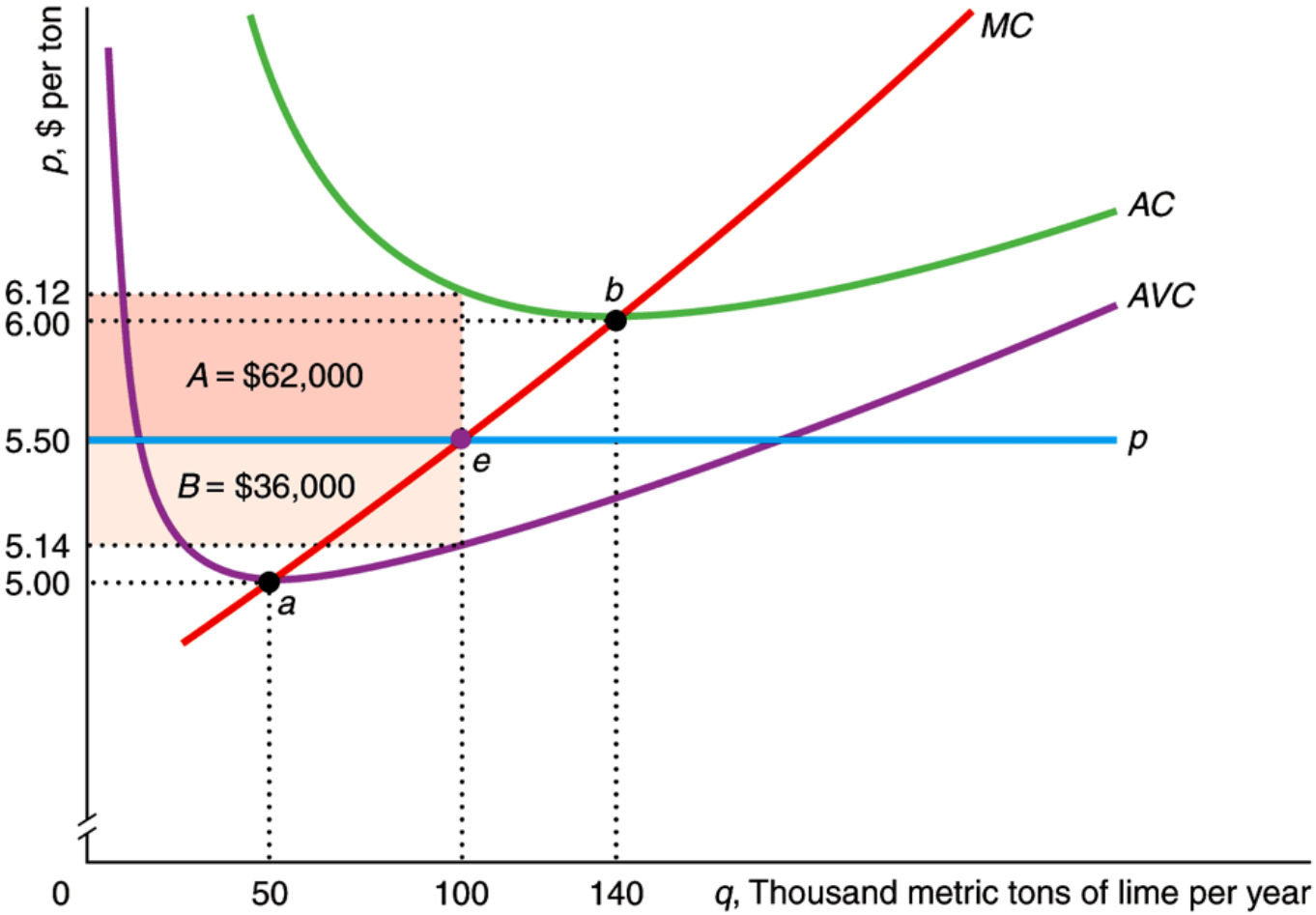
$$pq < VC$$

  - In average terms:

$$p < AVC(q).$$

A competitive firm shuts down if the market price is less than the minimum of its short-run average variable cost curve.

The Short-Run Shutdown Decision



Solved Problem 8.2

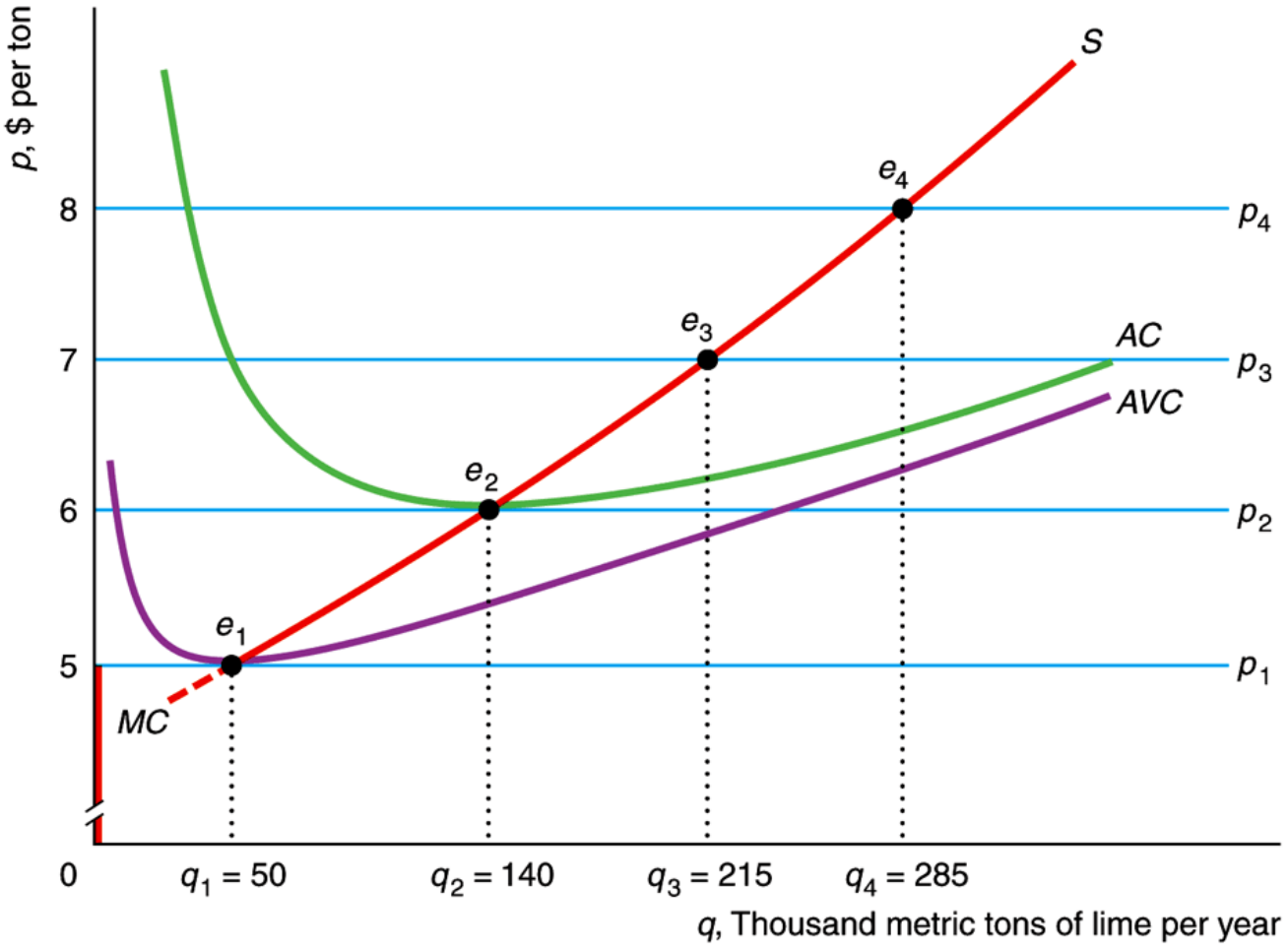
- A competitive firm's bookkeeper, upon reviewing the firm's books, finds that the firm spent twice as much on its plant, a fixed cost, as the firm's manager had previously thought. Should the manager change the output level because of this new information? How does this new information affect profit?

Short-Run Firm Supply Curve

- If the price falls below the firm's minimum average variable cost the firm shuts down.
  - Thus:

the competitive firm's short-run supply curve is its marginal cost curve above its minimum average variable cost.

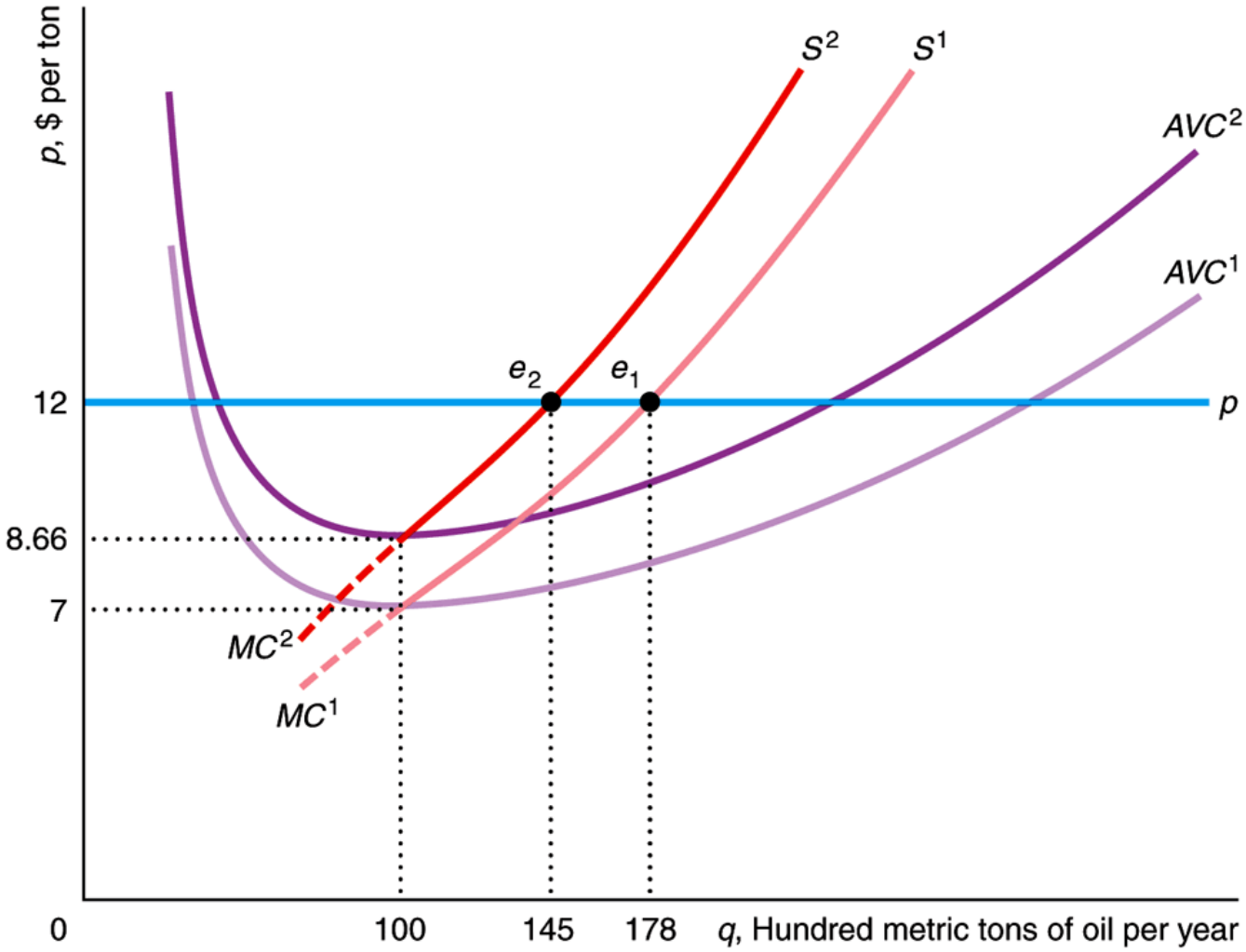
Figure 8.5 How the Profit-Maximizing Quantity Varies with Price



Factor Prices and the Short-Run Firm Supply Curve

- An increase in factor prices causes the production costs of a firm to rise, shifting the firm's supply curve to the left.

Figure 8.6 Effect of an Increase in the Cost of Materials on the Vegetable Oil Supply Curve



Short-Run Market Supply Curve

- In the short run, the maximum number of firms in a market, n, is fixed.

- If all the firms in a competitive market are identical, each firm's supply curve is identical, so the market supply at any price is n times the supply of an individual firm.

Short-Run Market Supply with Identical Firms.

- As the number of firms grows very large, the market supply curve approaches a horizontal line at the minimum point of the AVC curve.

- Thus,

the more identical firms producing at a given price, the flatter (more elastic) the short-run market supply curve at that price

Figure 8.7 Short-Run Market Supply with Five Identical Lime Firms

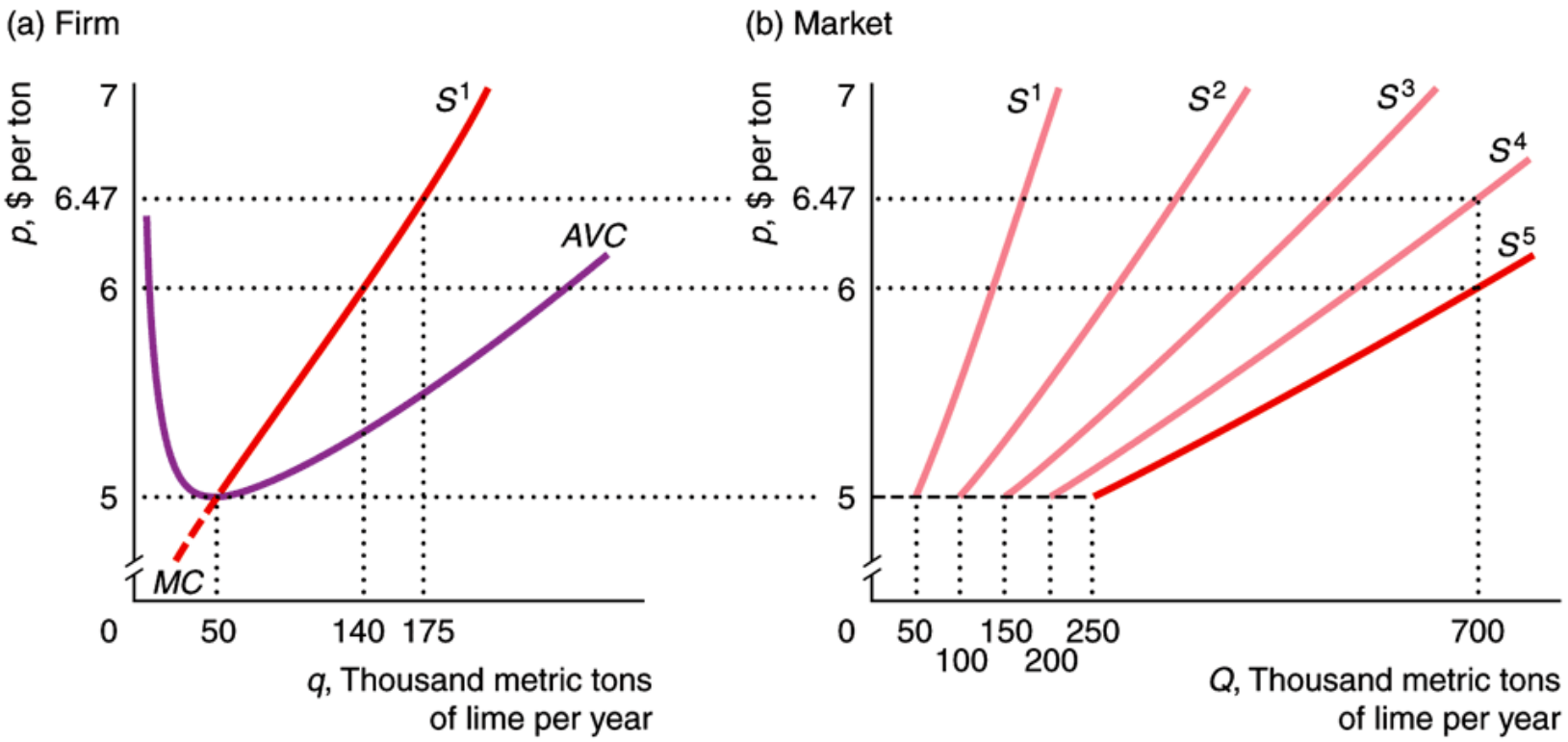


Figure 8.8 Short-Run Market Supply with Two Different Lime Firms

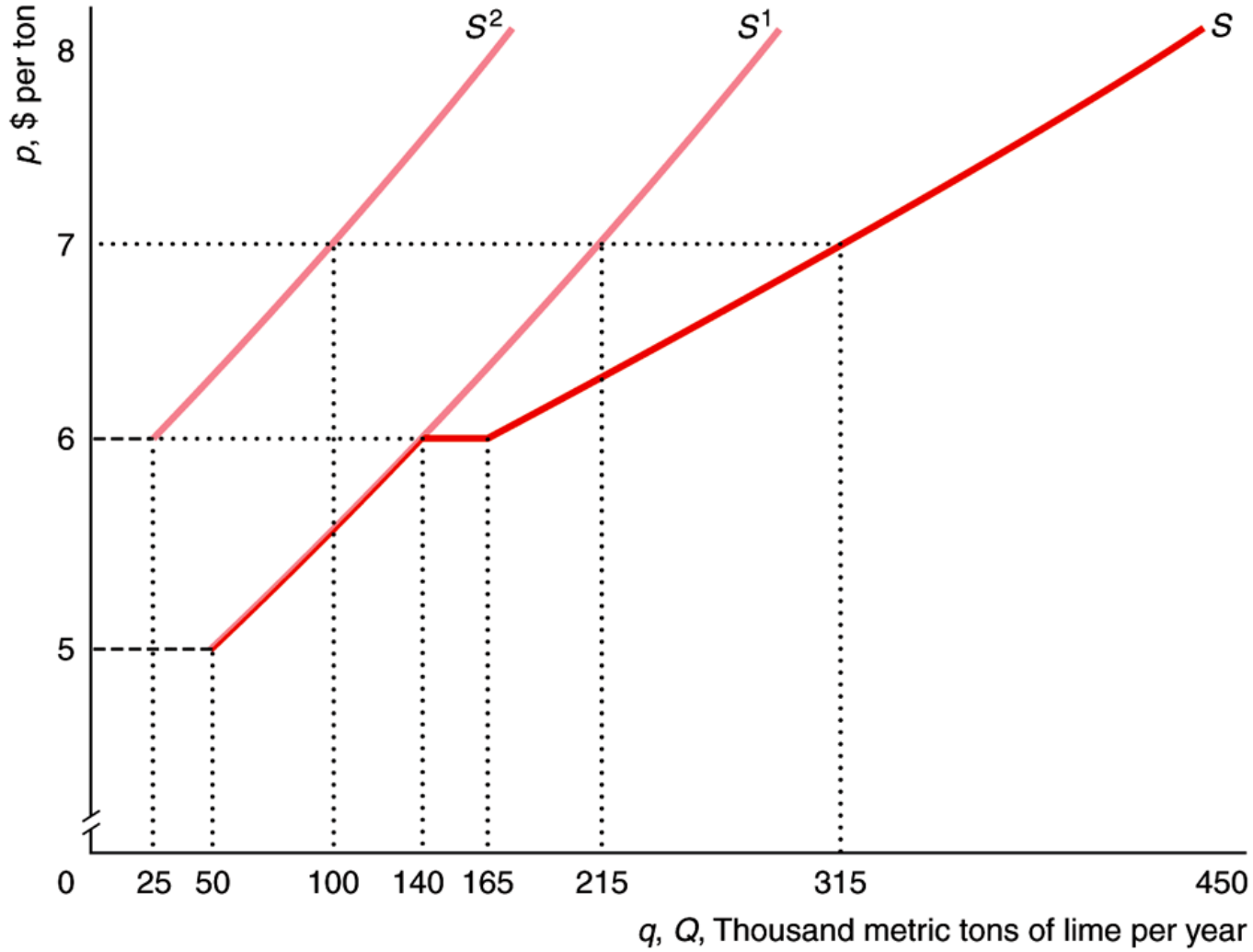
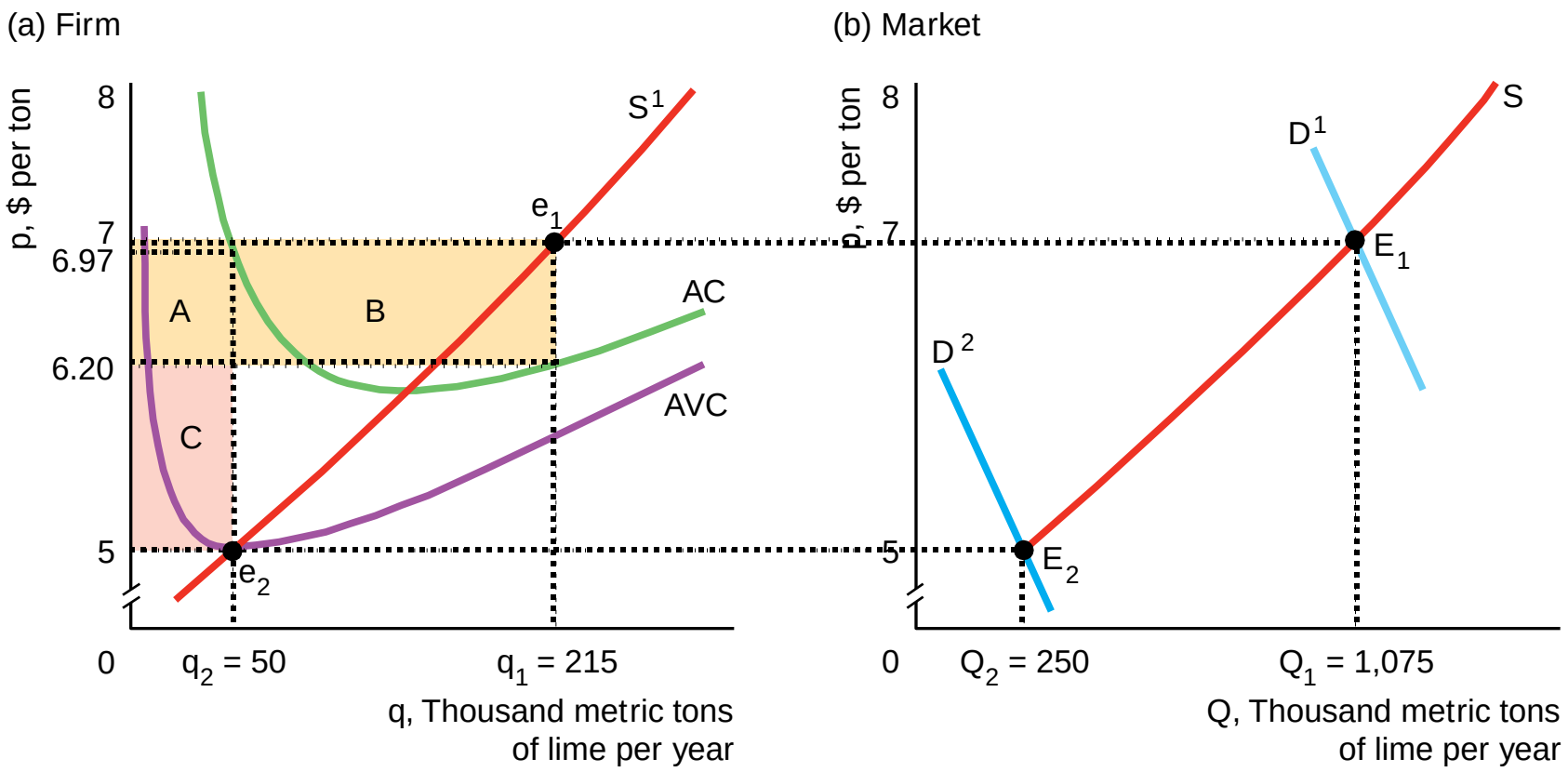


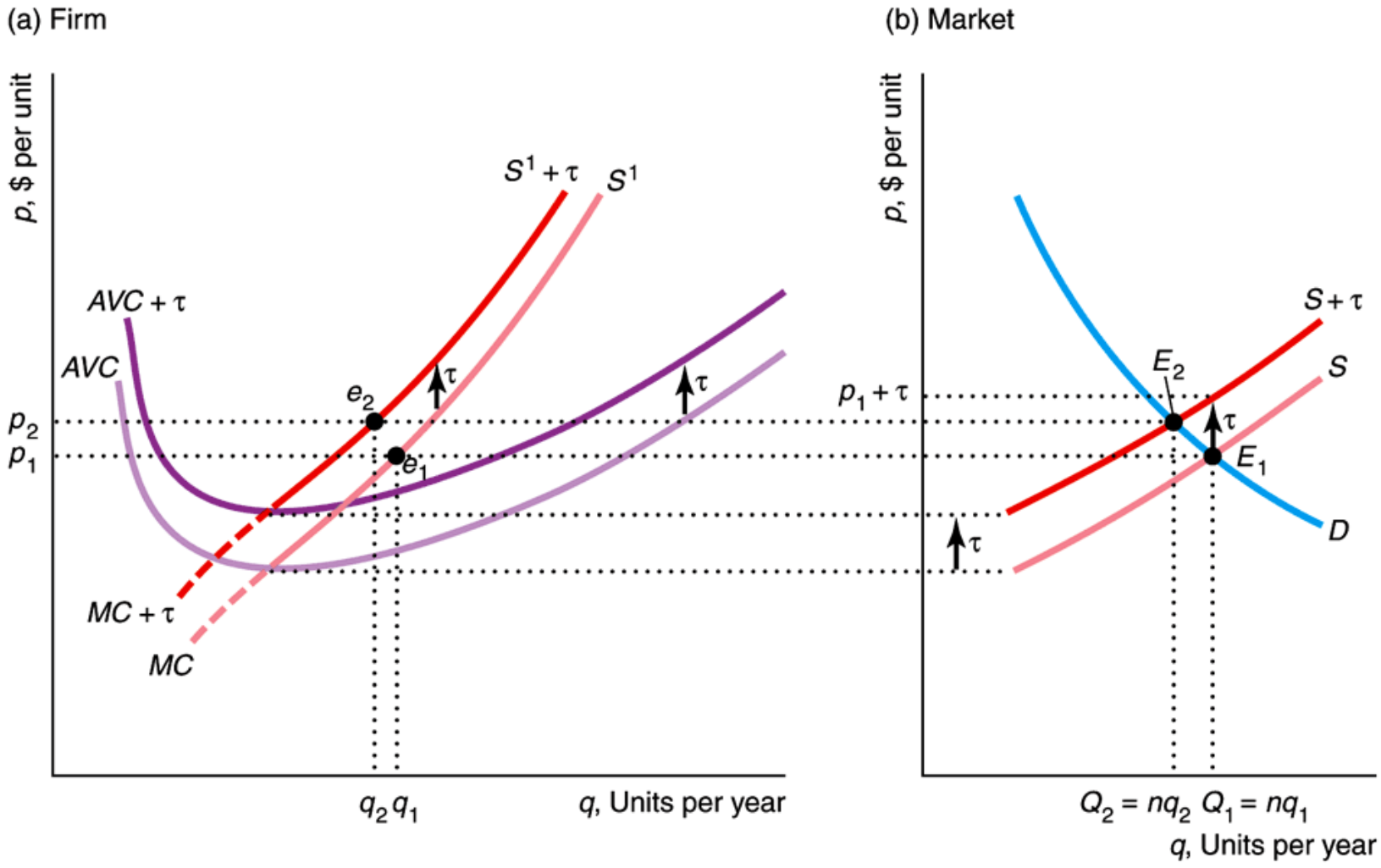
Figure 8.9 Short-Run Competitive Equilibrium in the Lime Market



Solved Problem 8.3

- What is the effect on the short-run equilibrium of a specific tax of τ per unit that is collected from all n firms in a market? What is the incidence of the tax?

Solved Problem 8.3



Long-Run Output Decision.

- The firm chooses the quantity that maximizes its profit using the same rules as in the short run.
  - The firm picks the quantity that maximizes long-run profit, the difference between revenue and long-run cost.

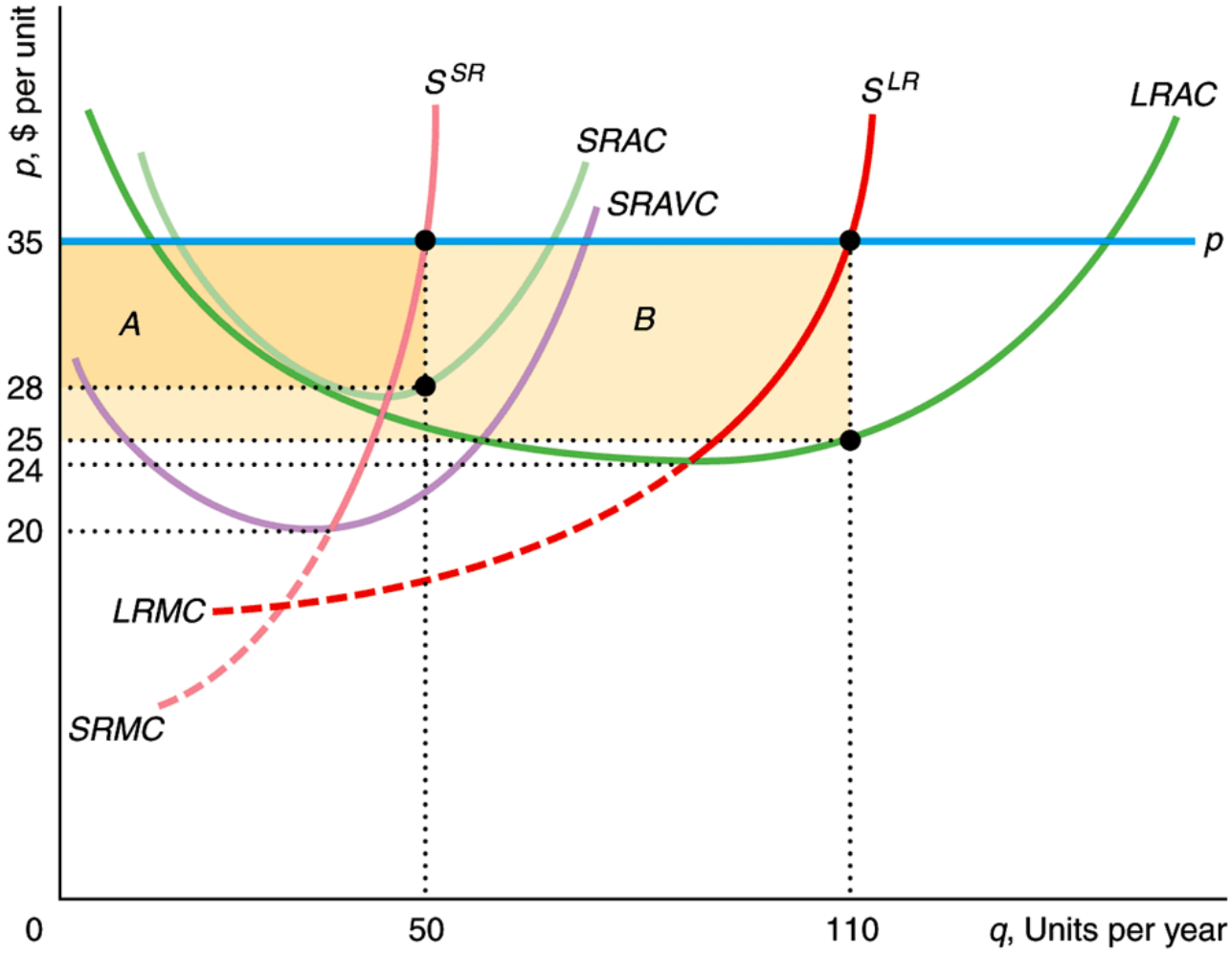
Long-Run Shutdown Decision.

- In the long run, the firm shuts down if it would make an economic loss by operating.

Long-Run Firm Supply Curve

- A firm's long-run supply curve is its long-run marginal cost curve above the minimum of its long-run average cost curve.
  - The firm is free to choose its capital in the long run, so the firm's long-run supply curve may differ substantially from its short-run supply curve.

Figure 8.10 The Short-Run and Long-Run Supply Curves



Long-Run Market Supply Curve

- The competitive market supply curve is the horizontal sum of the supply curves of the individual firms in both the short run and the long run.
  - But, in the long run, firms can enter or leave the market.

    Thus, before we can obtain the long-run market supply curve, we need to determine how many firms are in the market at each possible market price.

Role of Entry and Exit.

- In a market with free entry and exit:
  - A firm enters the market if it can make a long-run profit, $\pi > 0$.
  - A firm exits the market to avoid a long-run loss, $\pi < 0$.
  - If firms in a market are making zero long-run profit, they stay in the market.

Table 8.1 Average Annual Entry and Exit Rates in Selected U.S. Industries, 1989–1996

Industry	Entry Rate, %	Exit Rate, %
Total economy	10	8
Agriculture, hunting, forestry, and fishing	11	8
Construction	11	9
Services	10	8
Mining and quarrying	8	9
Total manufacturing	8	7
Textile products, leather, and footwear	12	12
Wood products	10	9
Paper products, printing, and publishing	8	8
Food products, beverages, and tobacco	8	7
Chemical, rubber, plastics, and fuel products	8	6
Electricity, gas, and water supply	4	3

Source: Calculations based on data from the OECD Firm-Level Data Project, **www.oecd.org**, as of 2005.

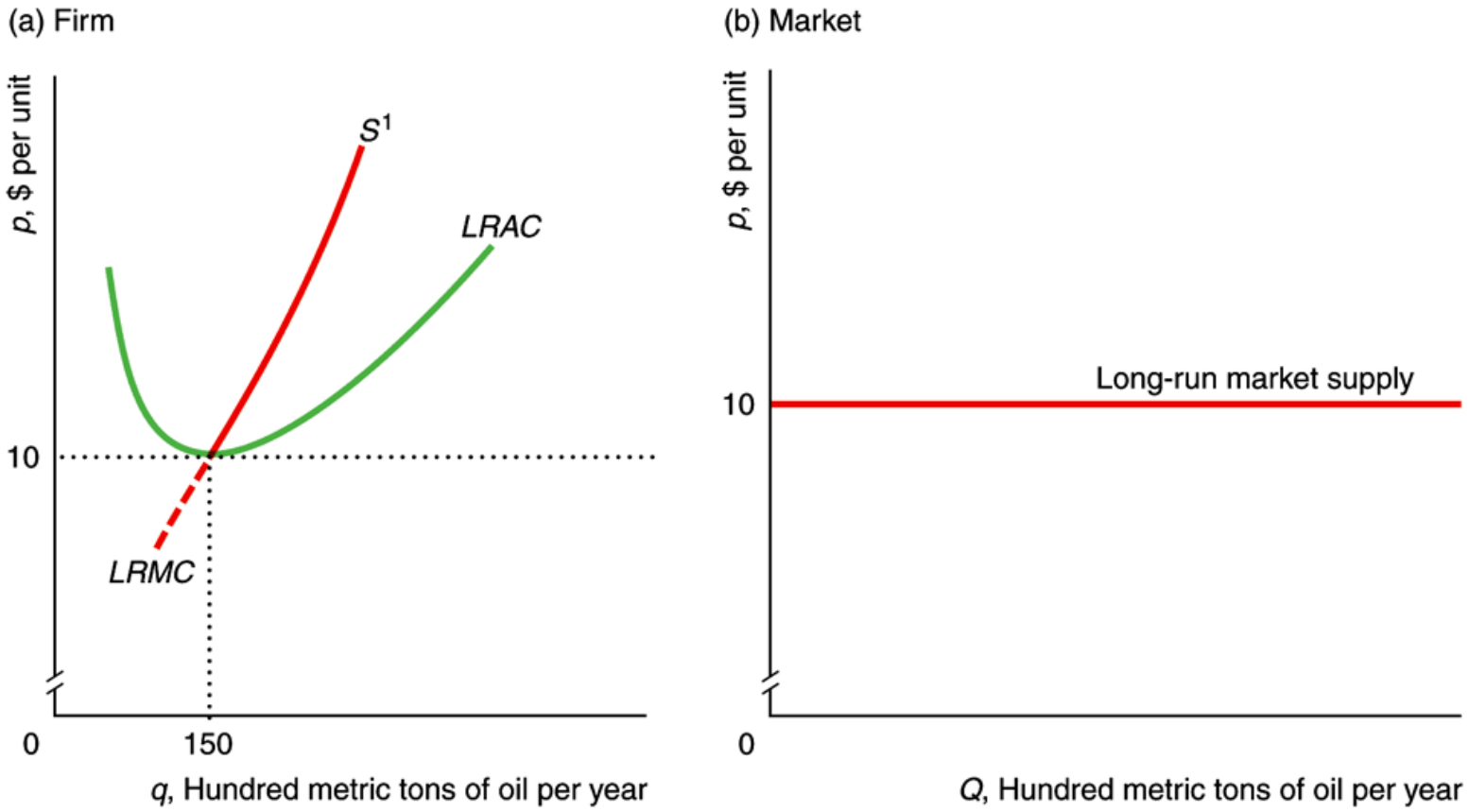
Long-Run Market Supply with Identical Firms and Free Entry.

- The *long-run market supply curve is flat* at the minimum long-run average cost *if firms can freely enter and exit* the market, an unlimited number of *firms have identical costs*, and *input prices are constant*.

Long-Run Market Supply When Entry Is Limited.

- If the number of firms in a market is limited in the long run, the market supply curve slopes upward.

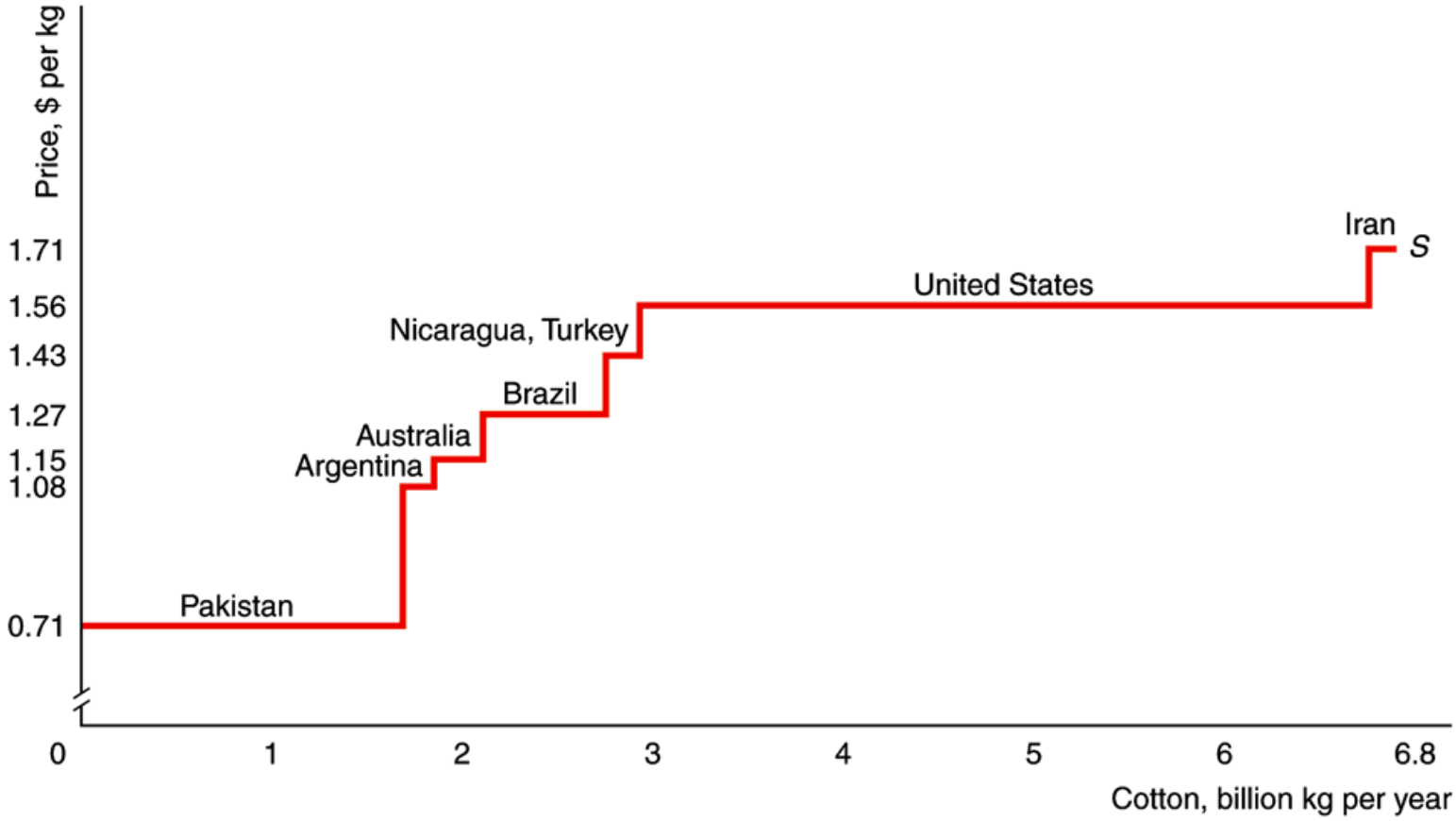
Figure 8.11 Long-Run Firm and Market Supply with Identical Vegetable Oil Firms



Long-Run Market Supply When Firms Differ.

- Firms with relatively low minimum long-run average costs are willing to enter the market at lower prices than others, resulting in an upward-sloping long-run market supply curve.

Application Upward-Sloping Long-Run Supply Curve for Cotton



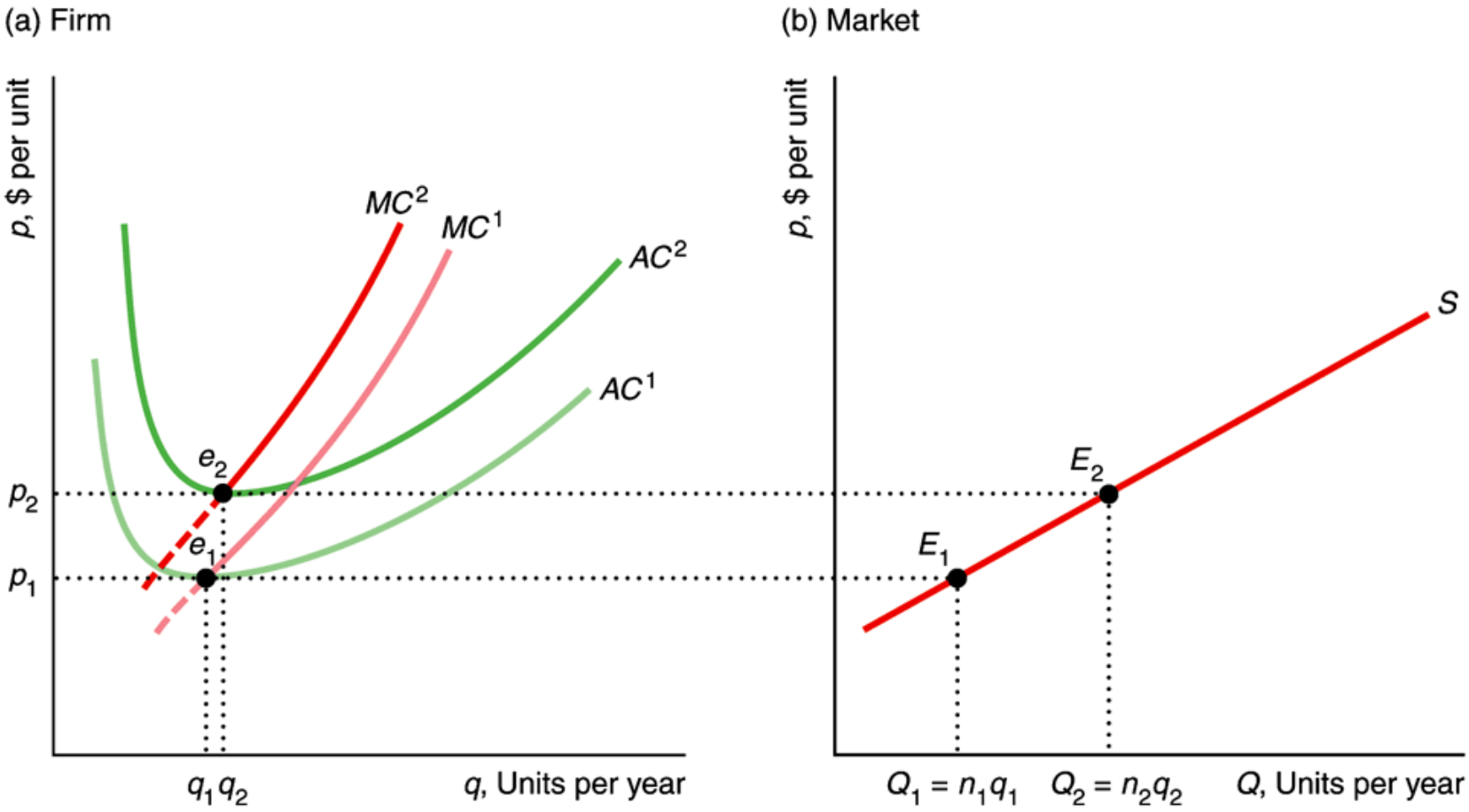
Long-Run Market Supply When Input Prices Vary with Output.

- A third reason why market supply curves may slope is nonconstant input prices.
  - In markets in which factor prices rise or fall when output increases, the long-run supply curve slopes even if firms have identical costs and can freely enter and exit.

Increasing and Constant-Cost Markets.

- **increasing-cost market** - a market in which input prices rise with output.
- **constant-cost market** – a market in which input prices remain constant as output increases.
- the long-run supply curve is upward sloping in an increasing-cost market and flat in a constant-cost market.

Figure 8.12 Long-Run Market Supply in an Increasing-Cost Market

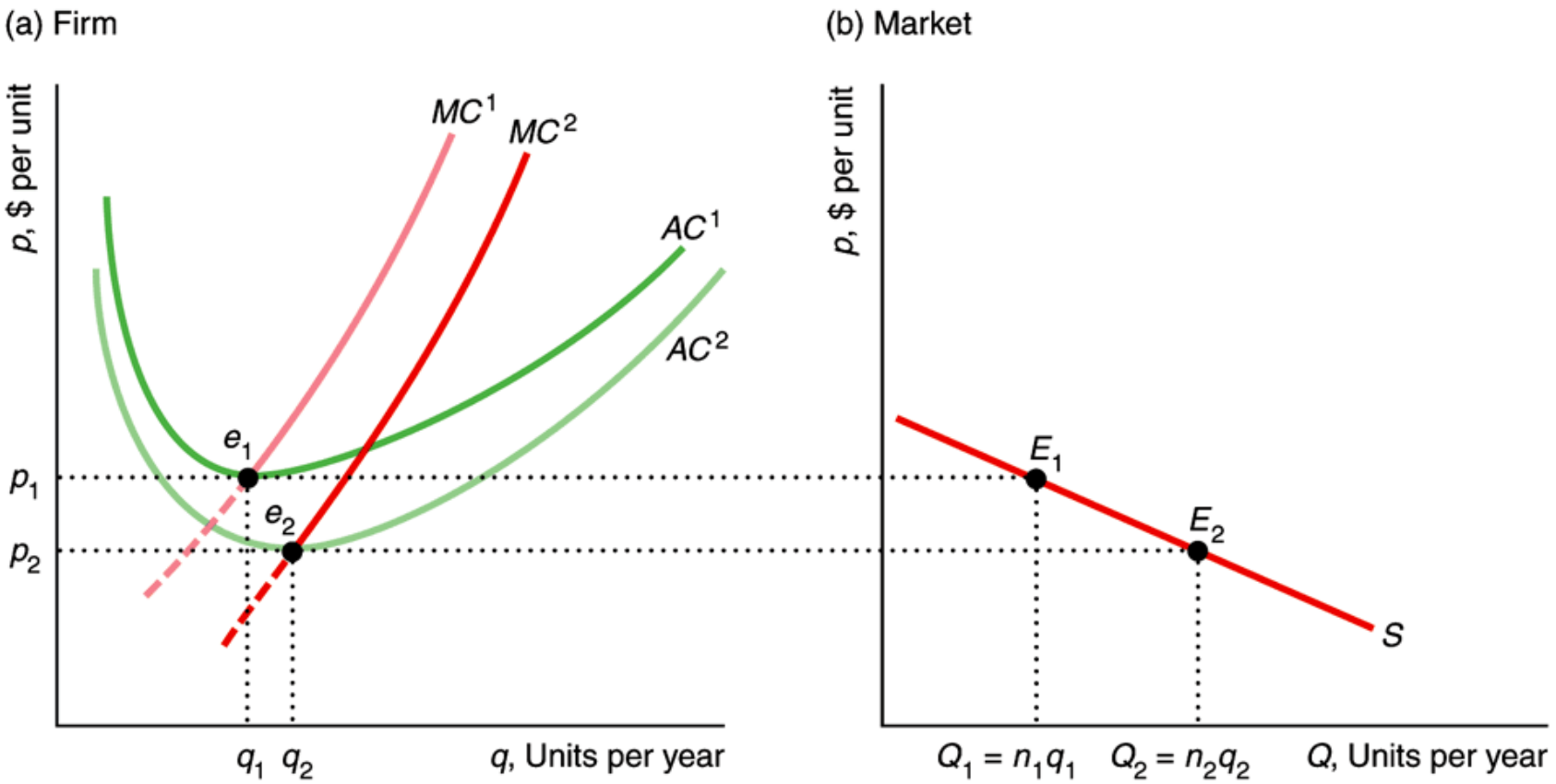


Decreasing-cost markets

- decreasing-cost markets - a market in which as market output rises, at least some factor prices fall.
  - As a result,

in a decreasing-cost market, the long-run market supply curve is downward sloping.

Figure 8.13 Long-Run Market Supply in a Decreasing-Cost Market

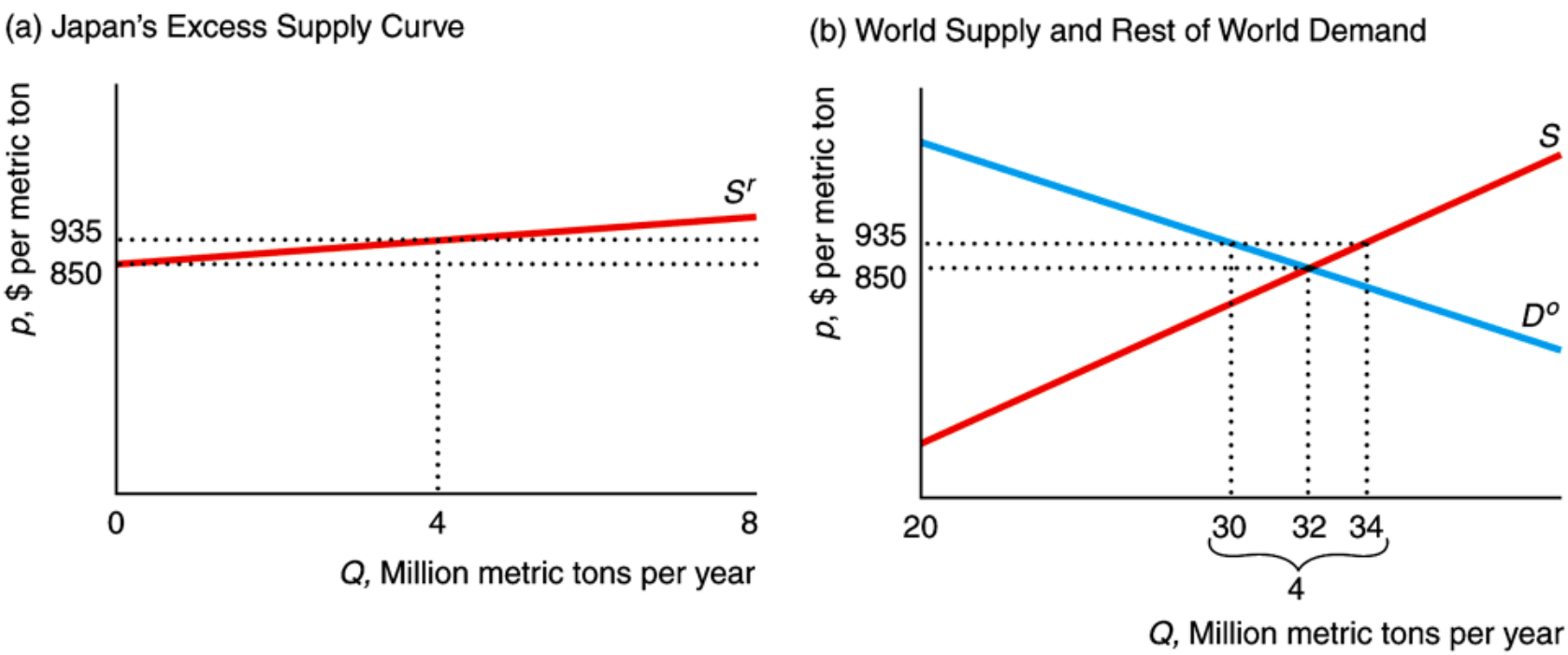


Long-Run Market Supply Curve with Trade.

- **residual supply curve -** the quantity that the market supplies that is not consumed by other demanders at any given price:

$$S'(p) = S(p) - D^o(p).$$

Figure 8.14 Excess or Residual Supply Curve



Solved Problem 8.4

- In the short run, what happens to the competitive market price of gasoline if the demand curve in a state shifts to the right as more people move to the state or start driving gashogging SUVs? In your answer, distinguish between areas in which regular gasoline is sold and jurisdictions that require special blends.

Solved Problem 8.4

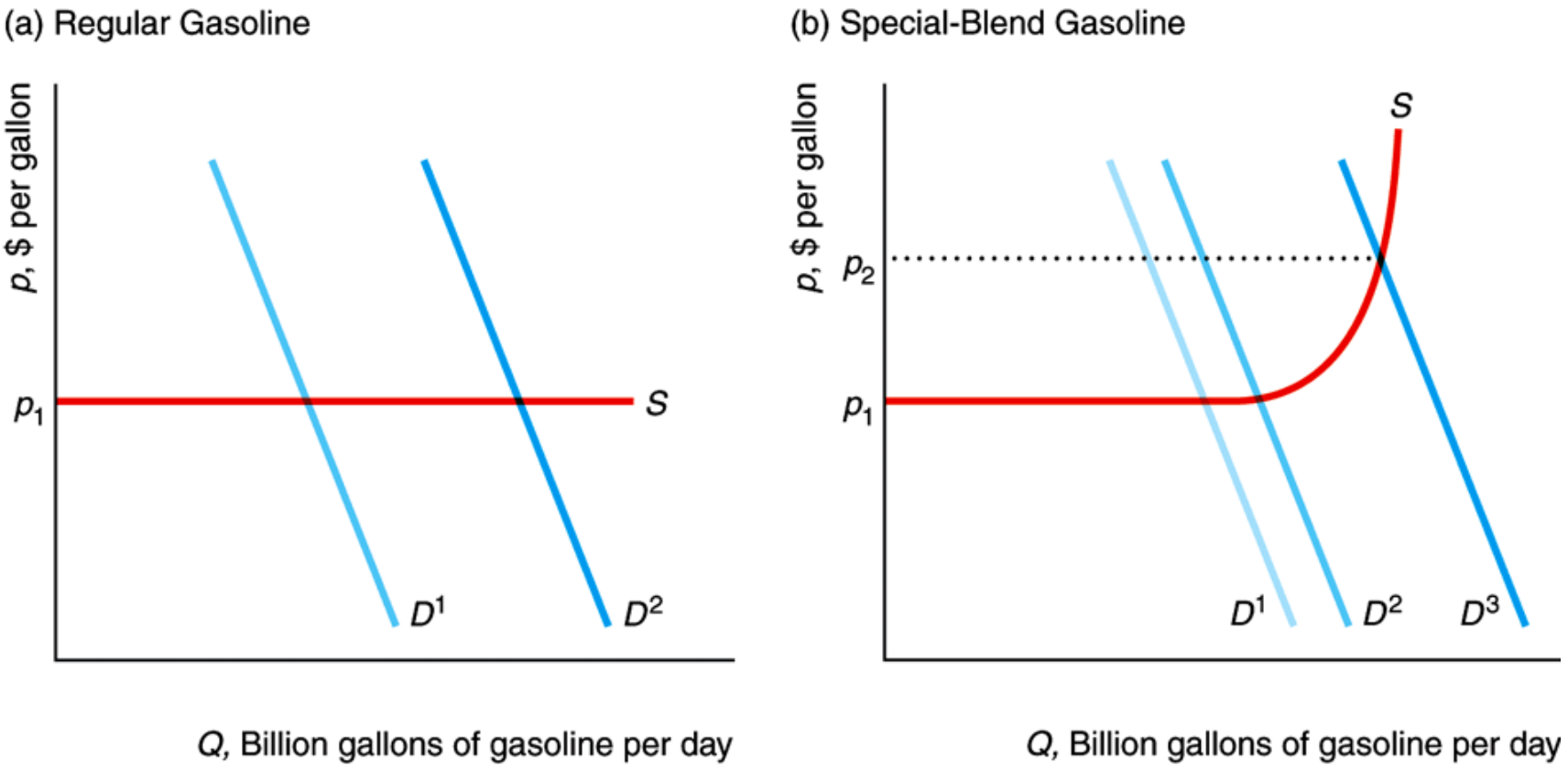
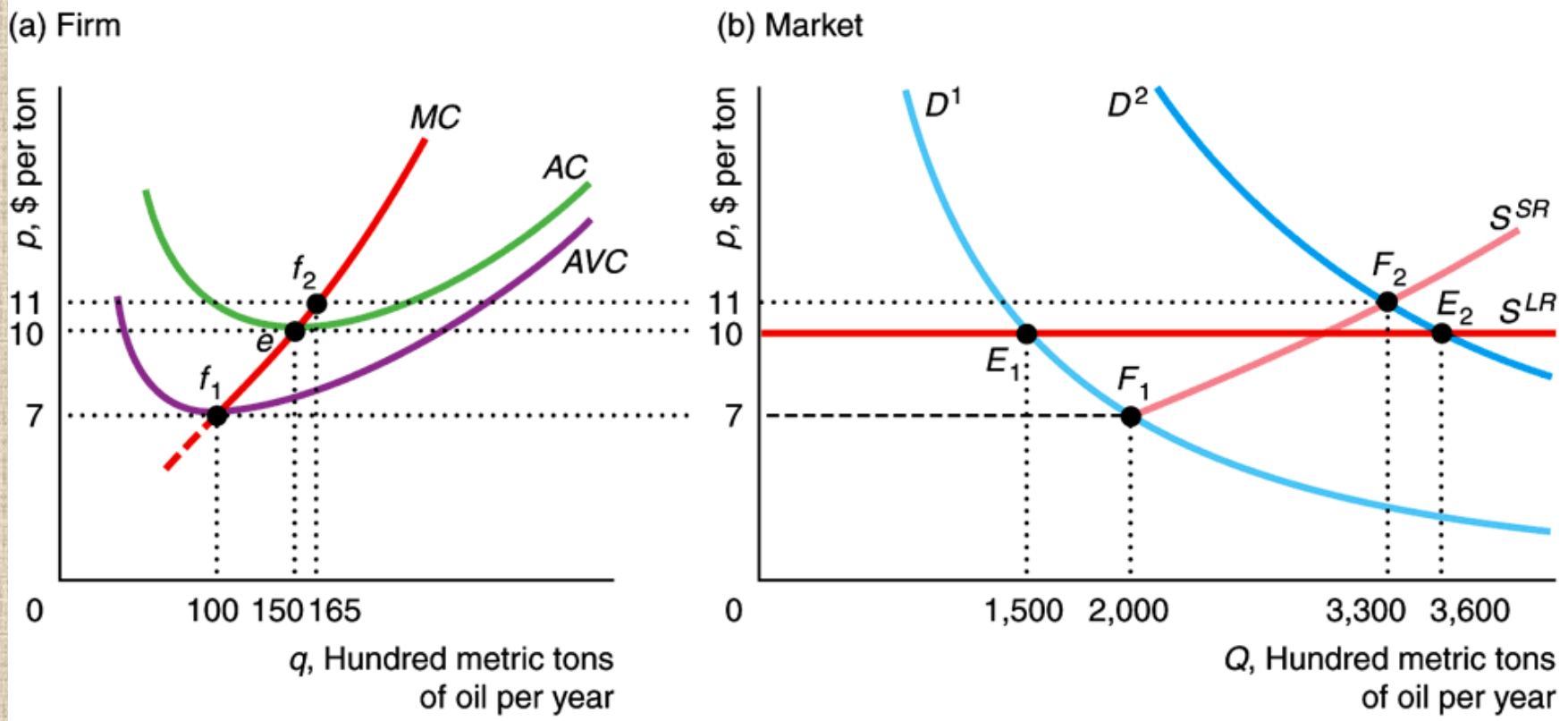


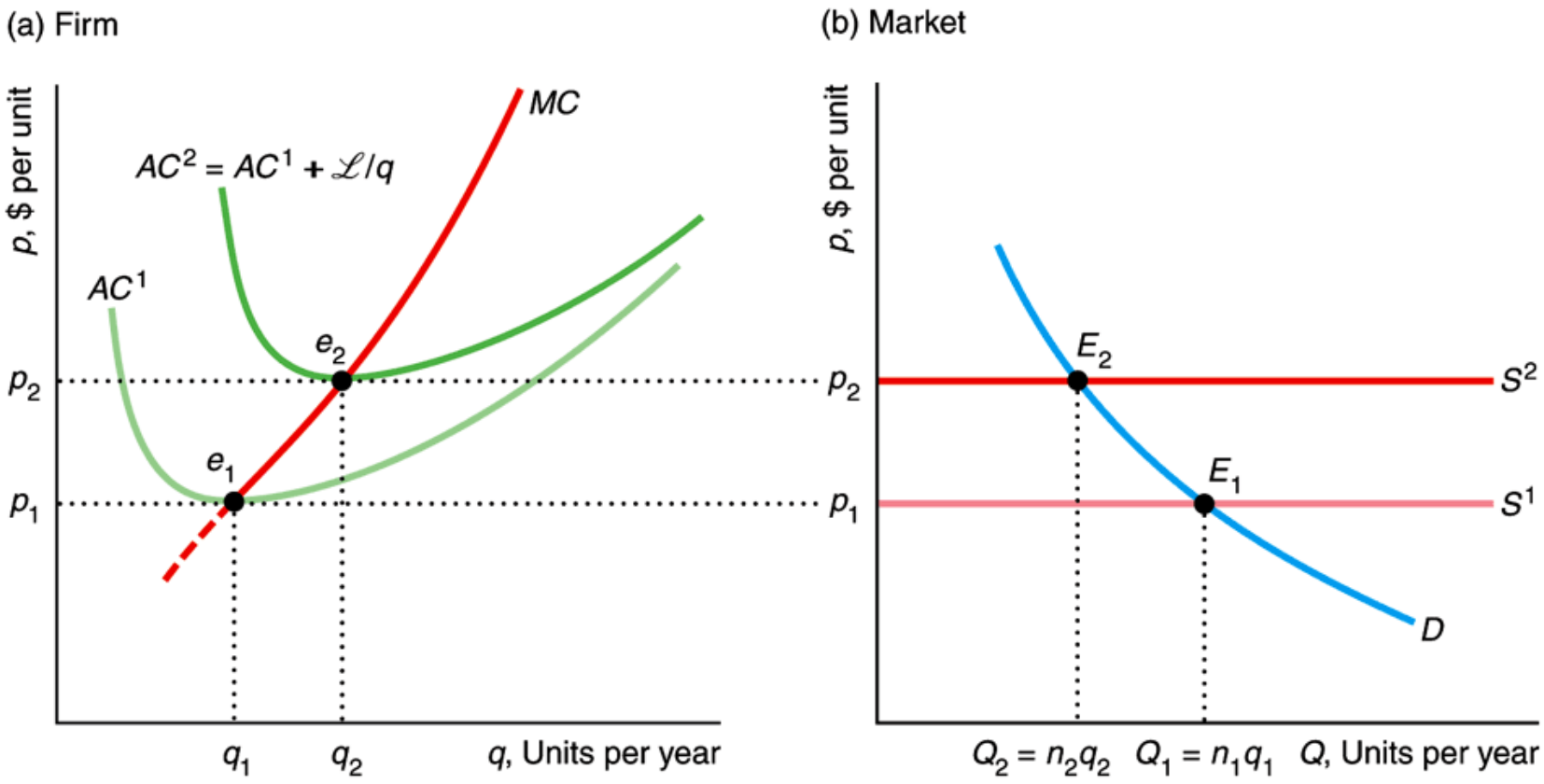
Figure 8.15 The Short-Run and Long-Run Equilibria for Vegetable Oil



Solved Problem 8.5

- If the government starts collecting a lump-sum franchise tax of each year from each identical firm in a competitive market with free entry and exit, how do the long-run market and firm equilibria change?

Solved Problem 8.5



Zero Long-Run Profit with Free Entry

- One implication of the shutdown rule is that the firm is willing to operate in the long run even if it is making zero profit.
  - But how can this be?
  - Because opportunity cost includes the value of the next best investment, at a zero long-run economic profit, the firm is earning the normal business profit that the firm could earn by investing elsewhere in the economy.

Zero Long-Run Profit When Entry Is Limited

- **Rent -** a payment to the owner of an input beyond the minimum necessary for the factor to be supplied

Figure 8.16 Rent