Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- We can study profit maximizing output for any firm, whether perfectly competitive or not
  - **Profit (π) = Total Revenue - Total Cost**
  - If q is output of the firm, then total revenue is price of the good times quantity
  - **Total Revenue (R) = Pq**

Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- Costs of production depends on output, *q*
  - Total Cost (*C*) = *C(q)*
- Profit for the firm, π, is difference between revenue and costs

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

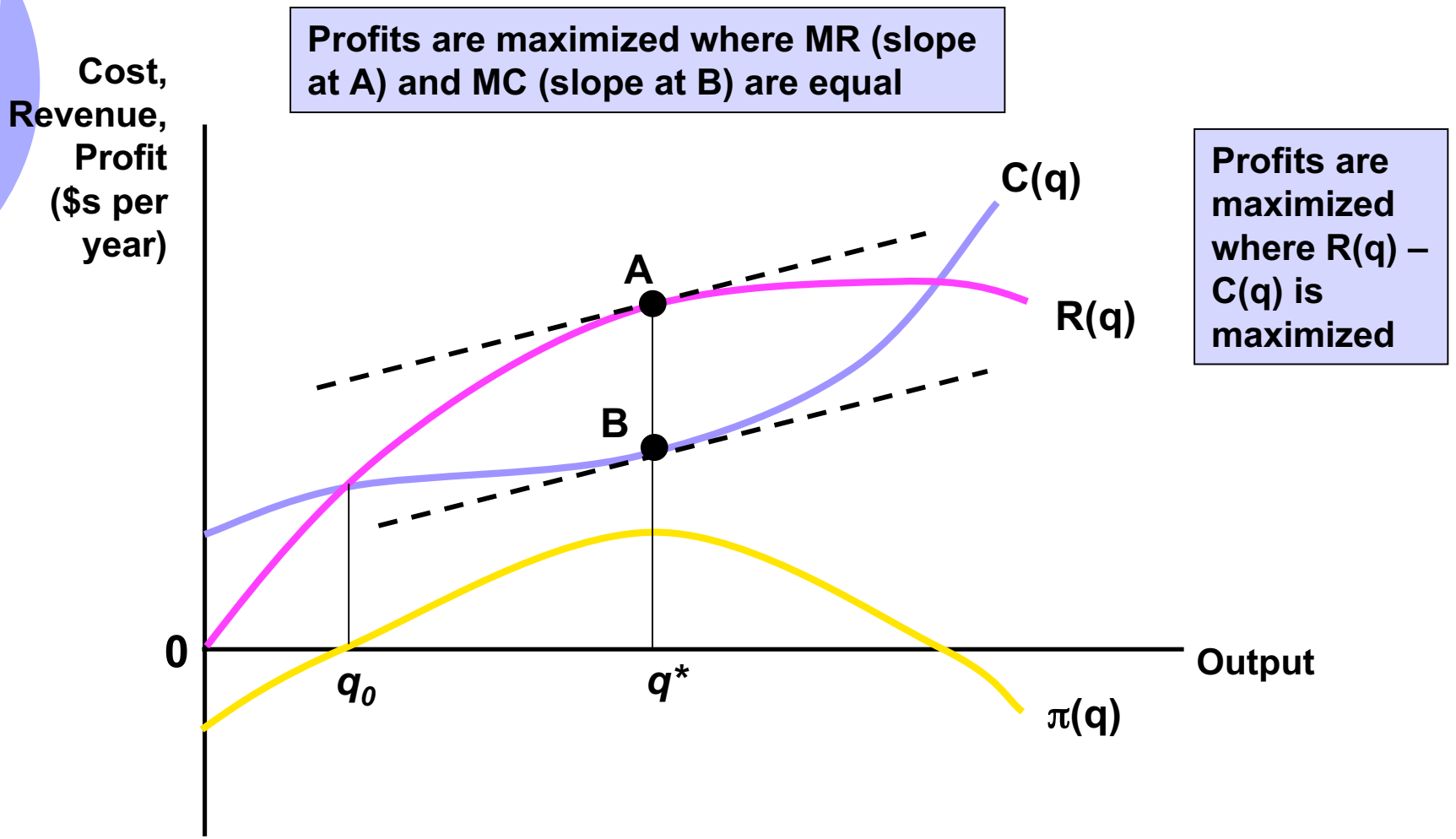
Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- Firm selects output to maximize the difference between revenue and cost
- We can graph the total revenue and total cost curves to show maximizing profits for the firm
- Distance between revenues and costs show profits

Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- *Revenue* is a curve, showing that a firm can only sell more if it lowers its price
- Slope of the revenue curve is the ***marginal revenue***
  - Change in revenue resulting from a one-unit increase in output
- Slope of the total cost curve is ***marginal cost***
  - Additional cost of producing an additional unit of output

Profit Maximization – Short Run pp. 262-8



Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- If the producer tries to raise price, sales are zero
- Profit is negative to begin with, since revenue is not large enough to cover fixed and variable costs
- As output rises, revenue rises faster than costs increasing profit
- Profit increases until it is maxed at q*
- Profit is maximized where MR = MC or where slopes of the R(q) and C(q) curves are equal

Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- Profit is maximized at the point at which an additional increment to output leaves profit unchanged

$$\pi = R - C$$

$$\frac{\Delta\pi}{\Delta q} = \frac{\Delta R}{\Delta q} - \frac{\Delta C}{\Delta q} = 0$$

$$MR - MC = 0$$

$$MR = MC$$

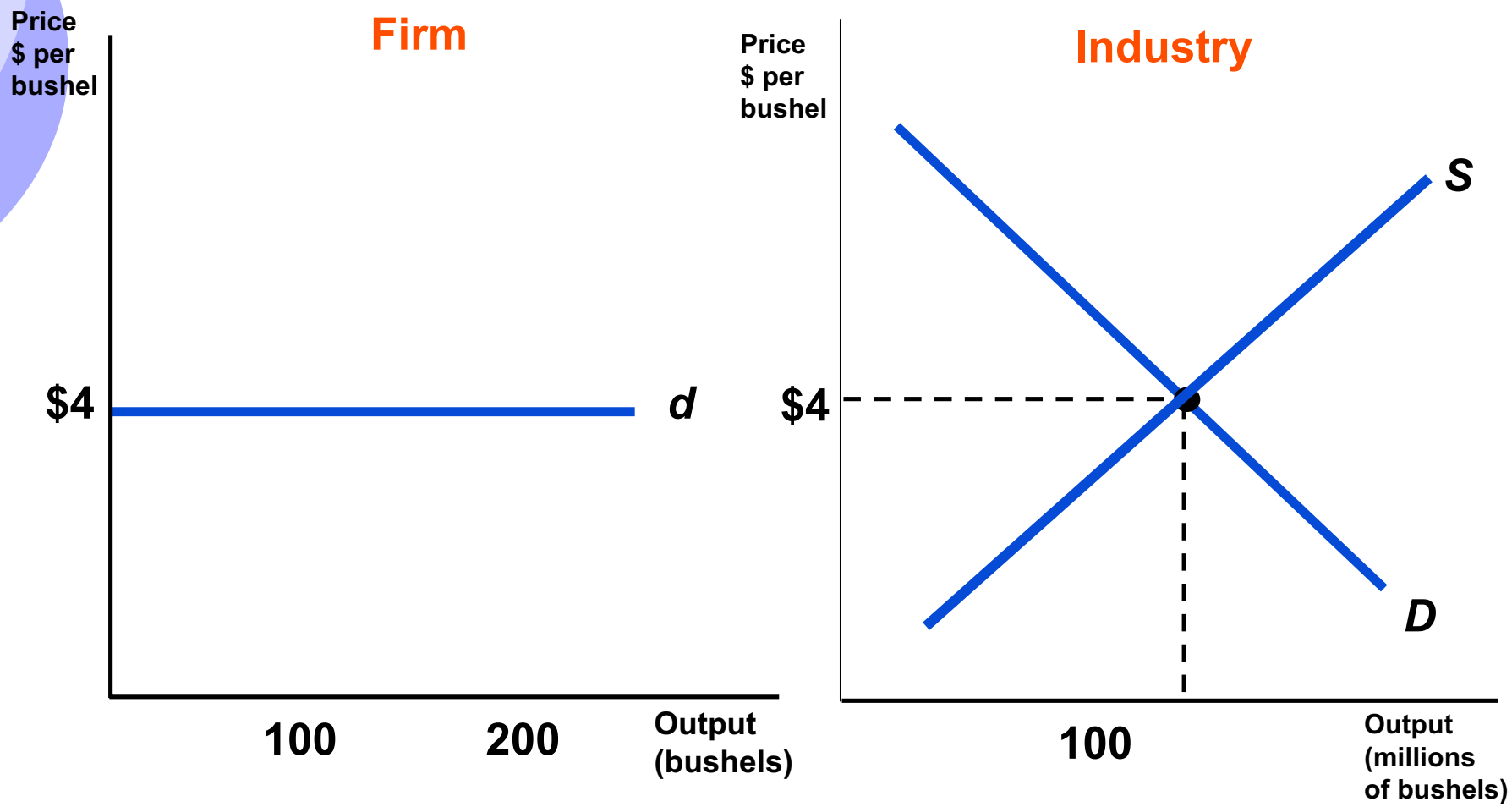
Marginal Revenue, Marginal Cost, and Profit Maximization pp. 262-8

- The Competitive Firm
  - Price taker – market price and output determined from total market demand and supply
  - Market output (Q) and firm output (q)
  - Market demand (D) and firm demand (d)

The Competitive Firm pp. 262-8

- Demand curve faced by an individual firm is a horizontal line
  - Each firm is so small that its sales have no effect on market price. As a result, each regards market price as given.
- Demand curve faced by whole market is downward sloping
  - Shows amount of goods *all consumers* will purchase at different prices

The Competitive Firm pp. 262-8

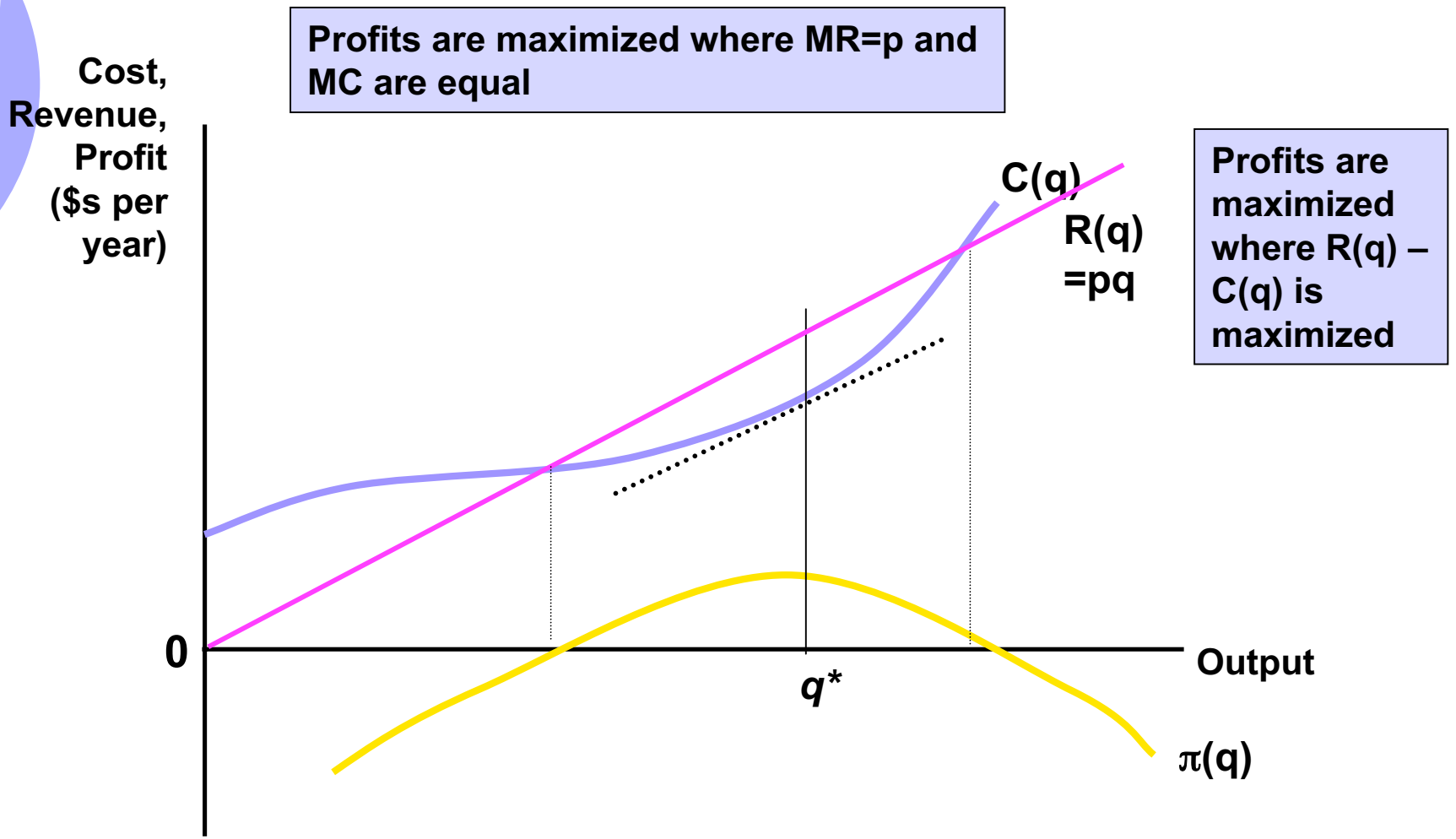


The Competitive Firm pp. 262-8

- The competitive firm's demand
  - Individual producer sells all units for $4 regardless of that producer's level of output
  - MR = P with the horizontal demand curve
  - For a perfectly competitive firm, profit maximizing output occurs when

$$MC(q) = MR = P = AR$$

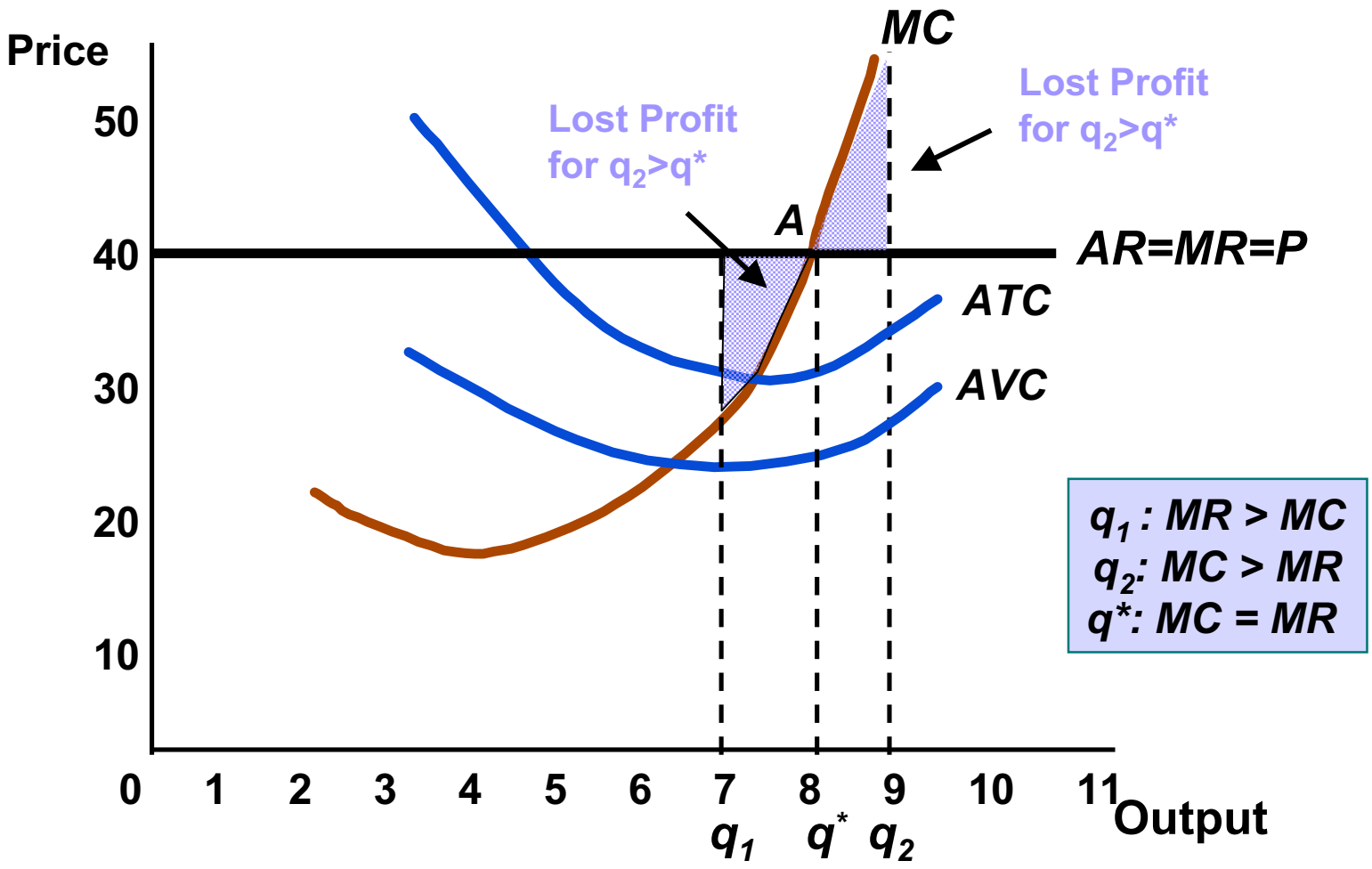
Profit Maximization – Short Run pp. 262-8



Choosing Output: Short Run pp. 268-73

- In the short run, capital is fixed and a firm must choose levels of *variable inputs* to maximize profits
- We can look at the graph of MR, MC, ATC and AVC to determine profits

A Competitive Firm pp. 268-73

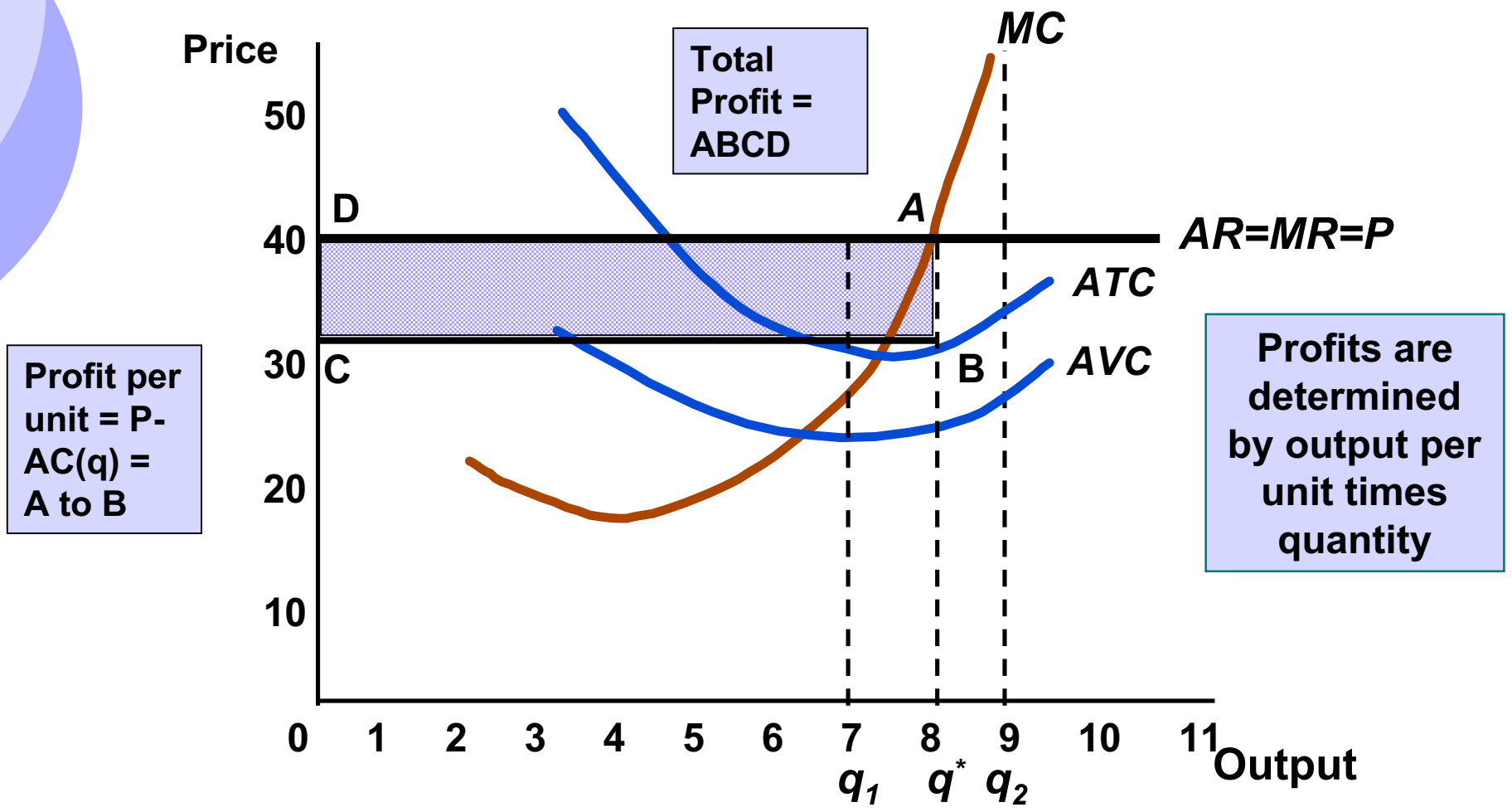


Choosing Output: Short Run pp. 268-73

- The point where MR = MC, the profit maximizing output is chosen
  - MR = MC at quantity, q*, of 8
  - At a quantity less than 8, MR > MC, so more profit can be gained by increasing output
  - At a quantity greater than 8, MC > MR, increasing output will decrease profits

  See also Fig. 8-8 on p. 275 of the text for an example of actual MC curve.

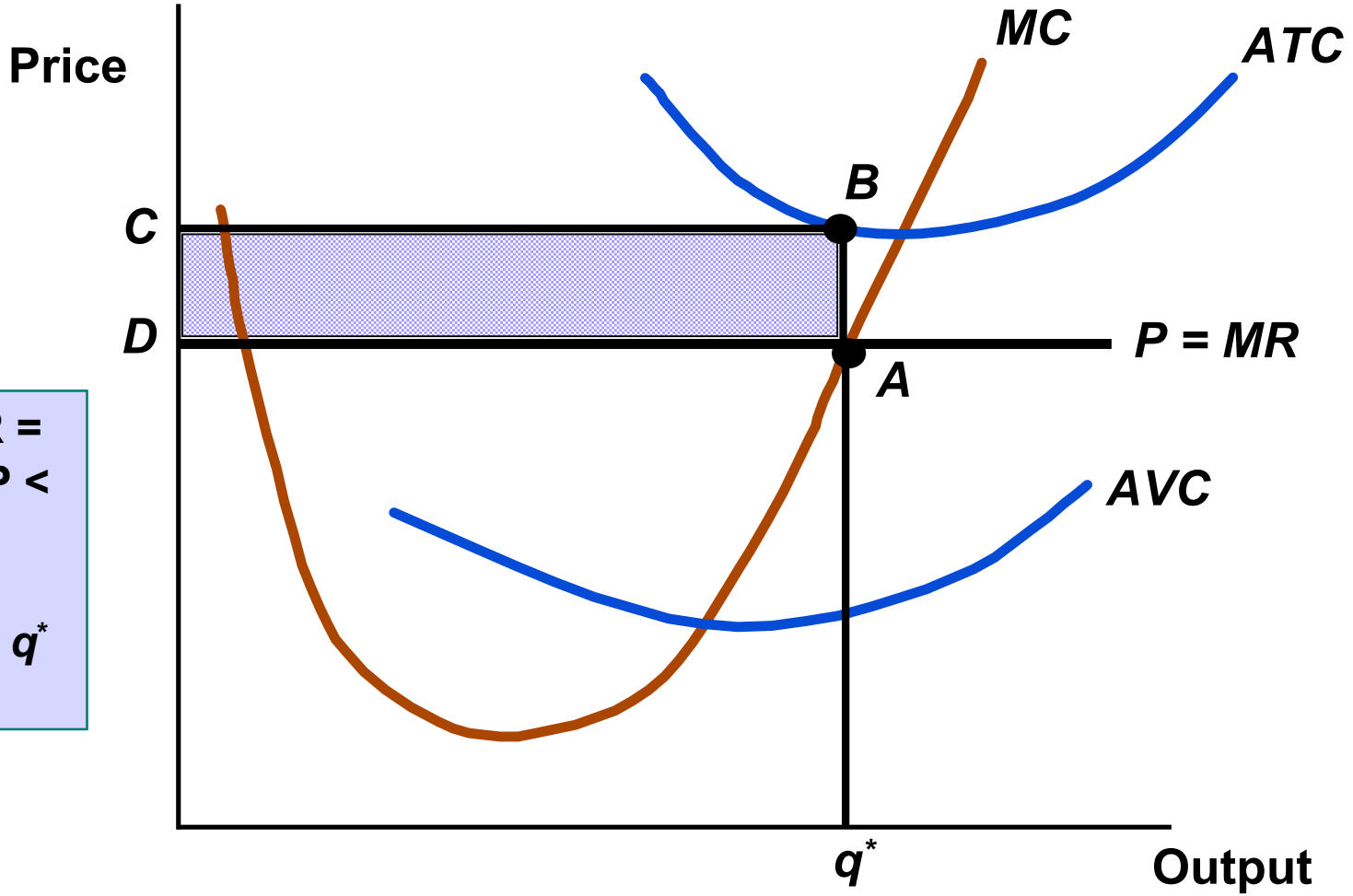
A Competitive Firm – Positive Profits pp. 268-73



The Competitive Firm pp. 268-73

- A firm does not have to make profits
- It is possible a firm will incur losses if the P < AC for the profit maximizing quantity
  - Still measured by profit per unit times quantity
  - Profit per unit is negative (P – AC < 0)

A Competitive Firm – Losses pp. 268-73



At q^*: MR = MC and P < ATC
Losses = (P- AC) x q^* or ABCD

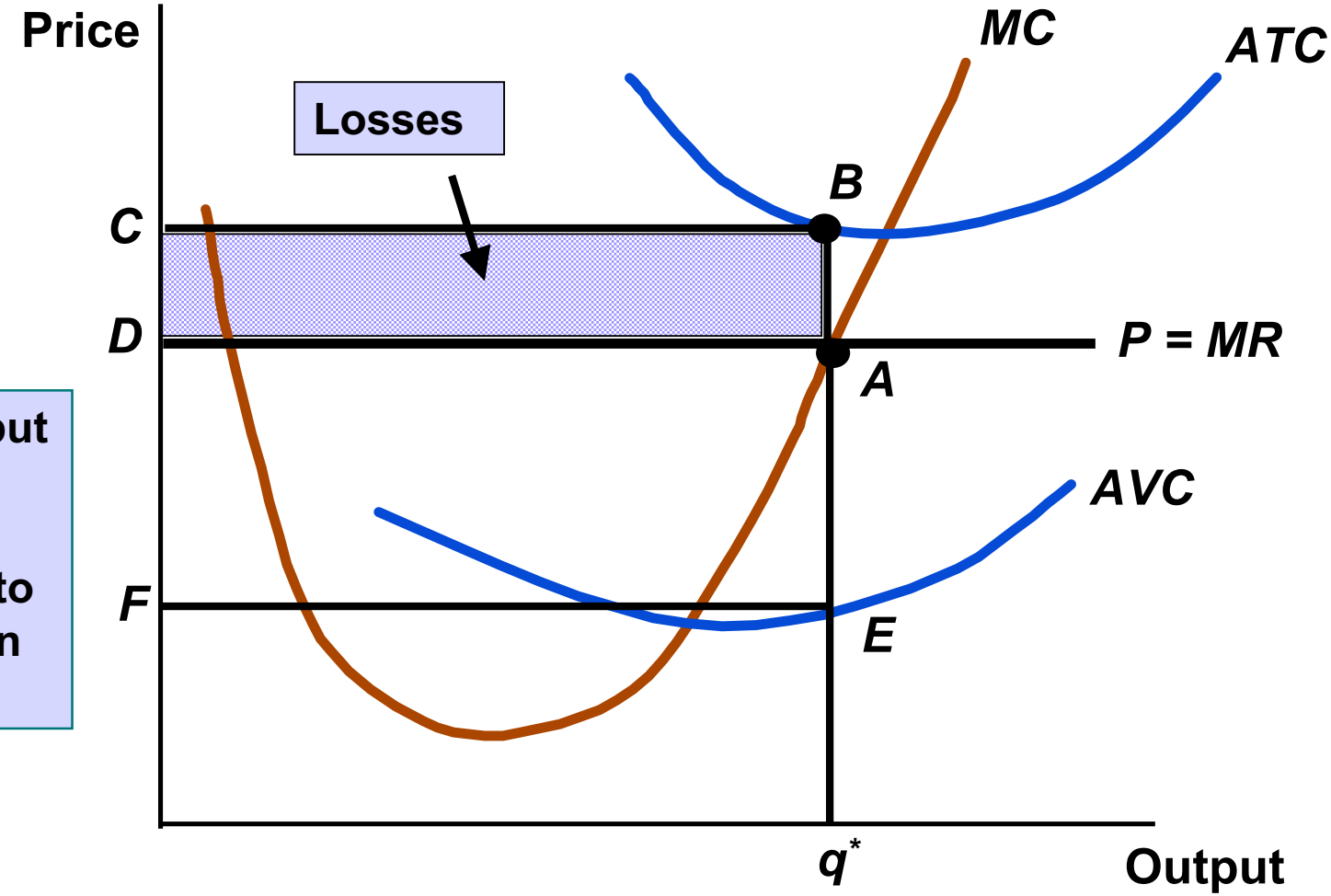
Short Run Production pp. 268-73

- Why would a firm produce at a loss? ***Leave as your exercise!***
  - Might think price will increase in near future
  - Shutting down and starting up could be costly
- Firm has two choices in short run
  - Continue producing
  - Shut down temporarily
  - Will compare profitability of both choices

Short Run Production pp. 268-73

- When should the firm shut down?
  - If AVC < P < ATC, the firm should continue producing in the short run
    - Can cover all of its variable costs and some of its fixed costs
  - If P< AVC< ATC, the firm should shut down
    - Cannot cover its variable costs or any of its fixed costs

A Competitive Firm – Losses pp. 268-73

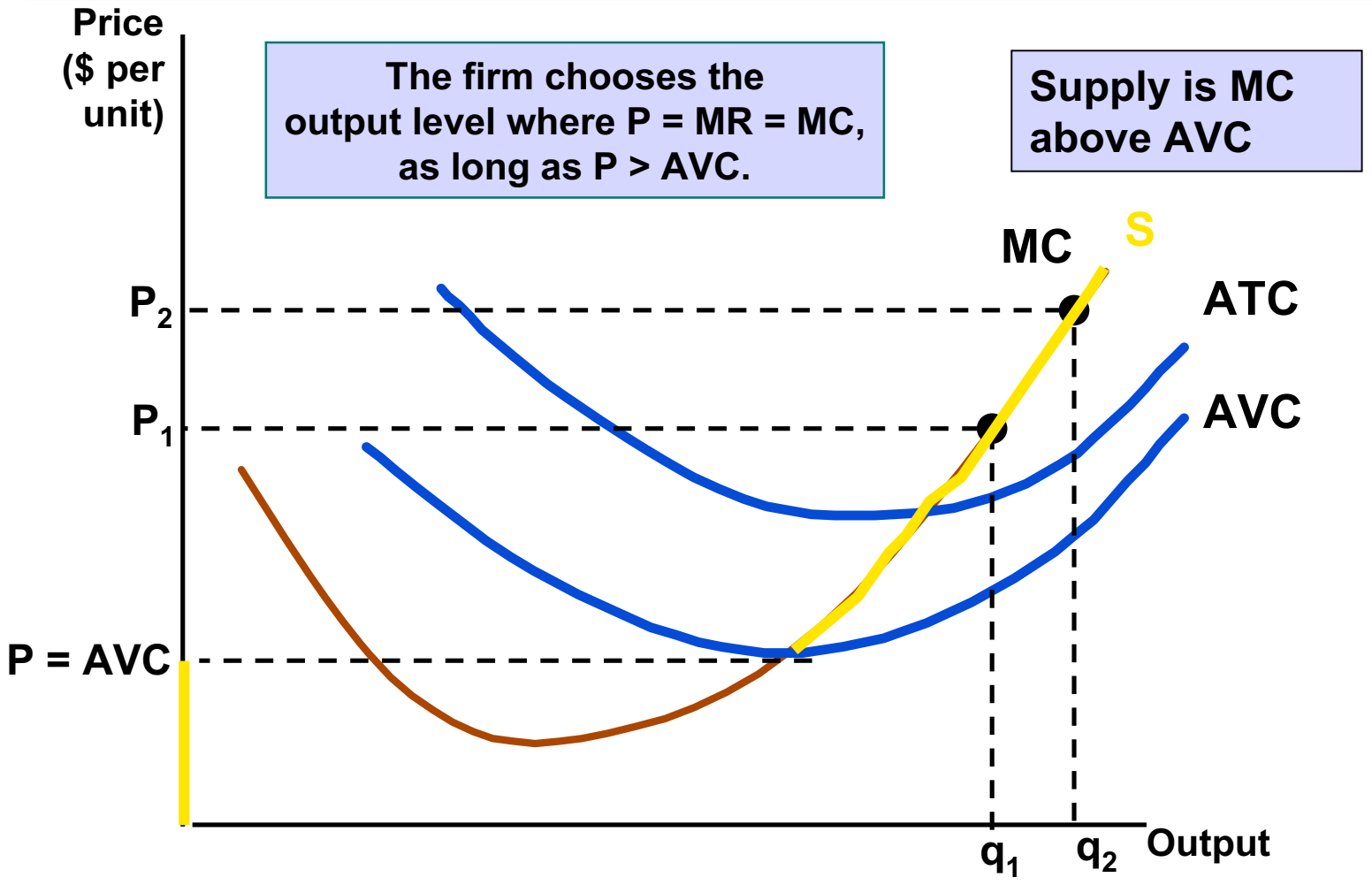


P < ATC but
➢AVC so firm will continue to produce in short run

Competitive Firm – Short Run Supply pp. 273-6

- Supply curve tells how much output will be produced at different prices
- Competitive firms determine quantity to produce where P = MC
  - Firm shuts down when P < AVC
- Competitive firms' supply curve is portion of the marginal cost curve above the AVC curve

A Competitive Firm's Short-Run Supply Curve pp. 273-6



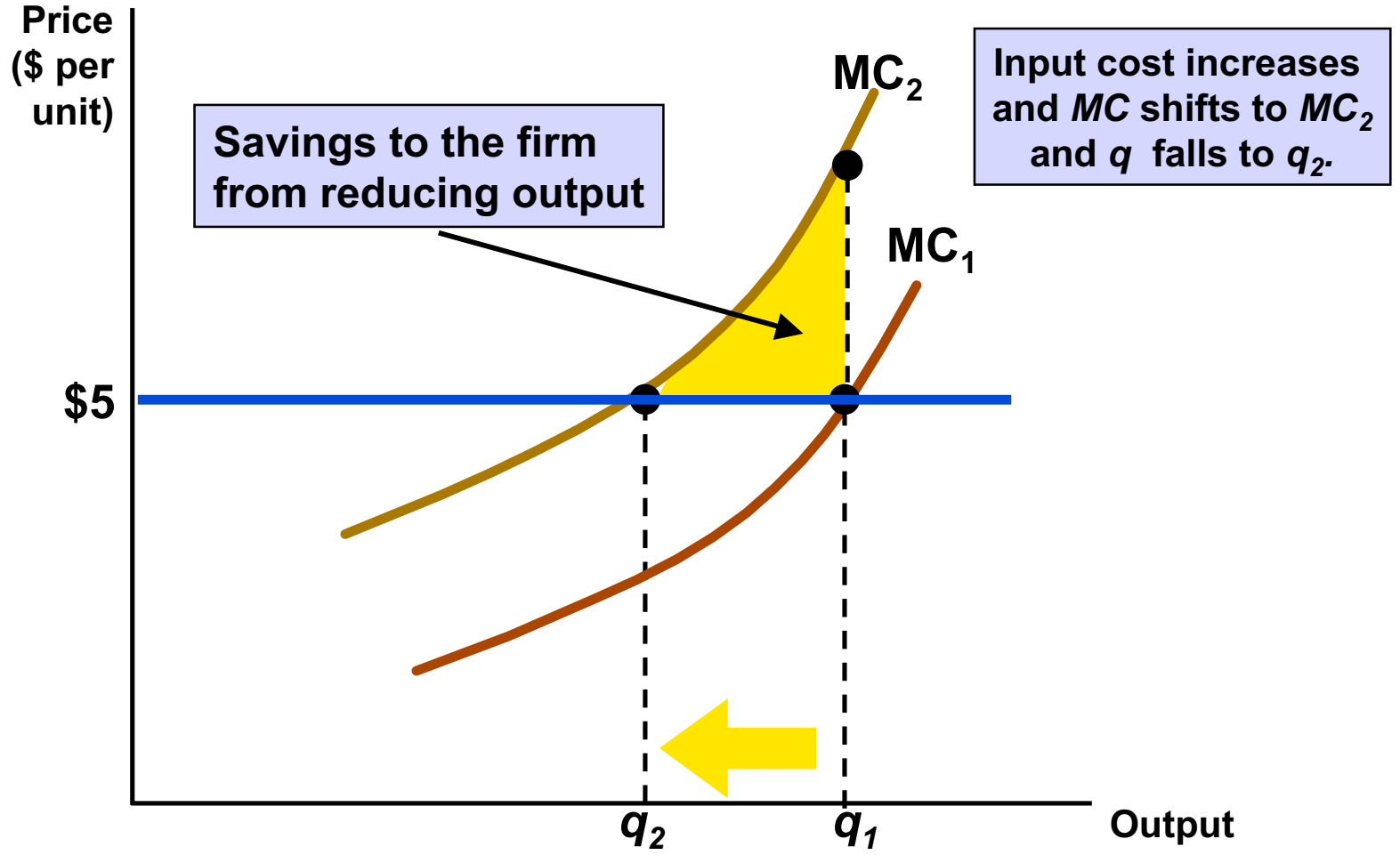
A Competitive Firm's Short-Run Supply Curve pp. 273-6

- *Supply is upward sloping* due to diminishing returns
- Higher price compensates the firm for the higher cost of additional output and increases total profit because it applies to all units

A Competitive Firm's Short-Run Supply Curve pp. 273-6

- Over time, prices of product and inputs can change
- How does the firm's output change in response to a change in the price of an input?
  - We can show an increase in marginal costs and the change in the firm's output decisions

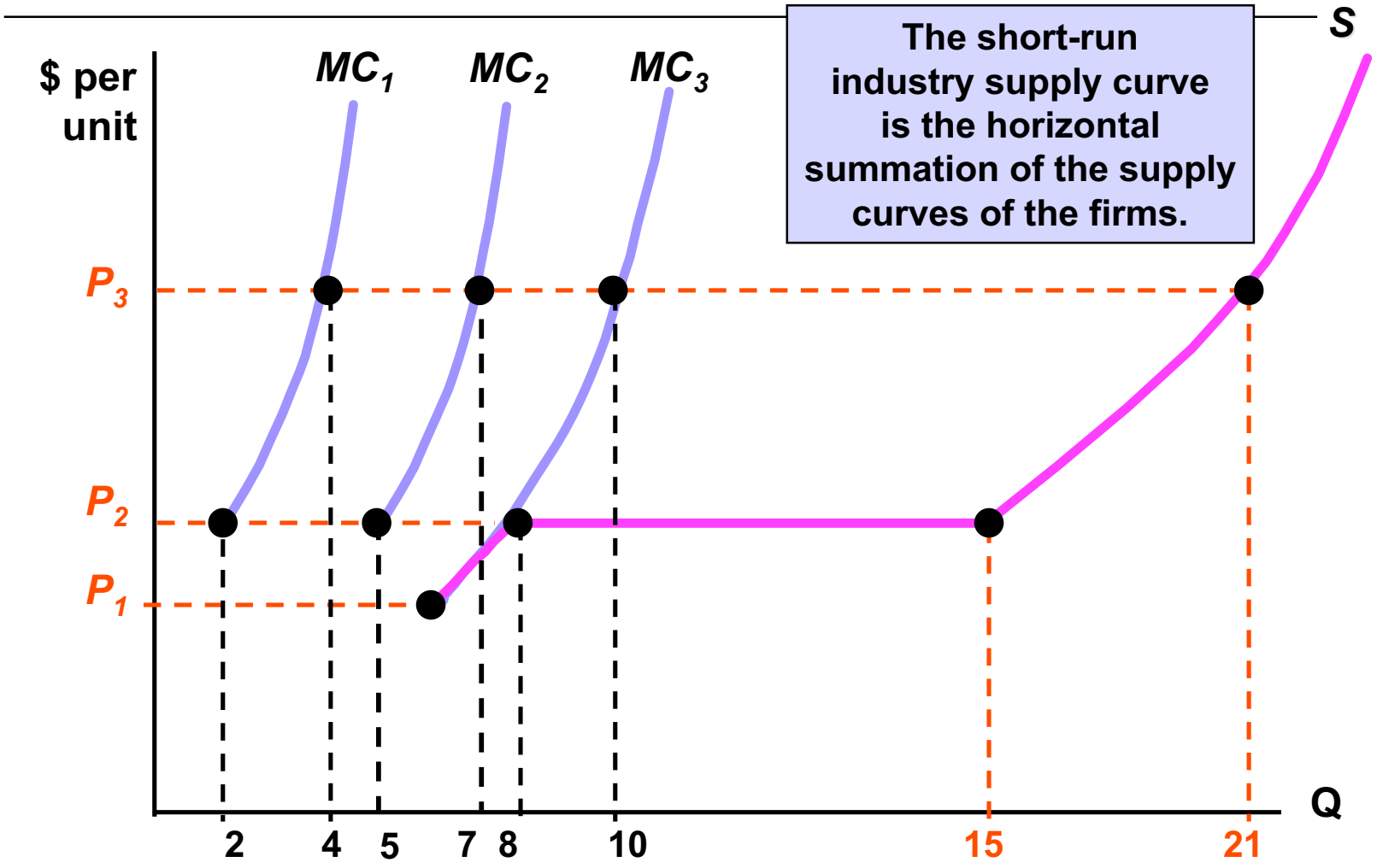
The Response of a Firm to a Change in Input Price pp. 273-6



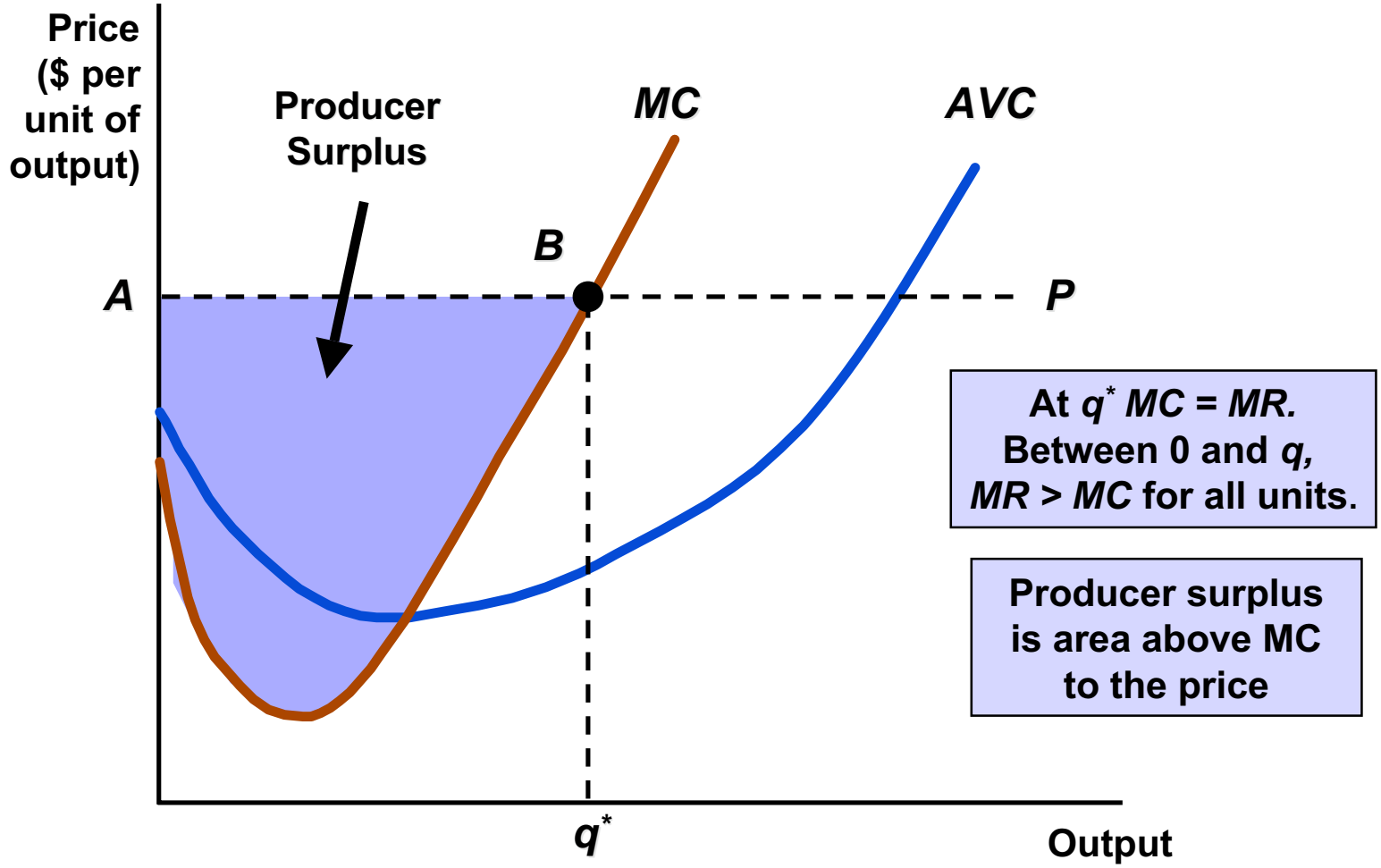
Short-Run Market Supply Curve pp. 276-81

- Shows the amount of product the whole market will produce at given prices
- Is the sum of all the individual producers in the market
- We can show graphically how we can sum the supply curves of individual producers

Industry Supply in the Short Run pp. 276-81



Producer Surplus for a Firm pp. 276-81



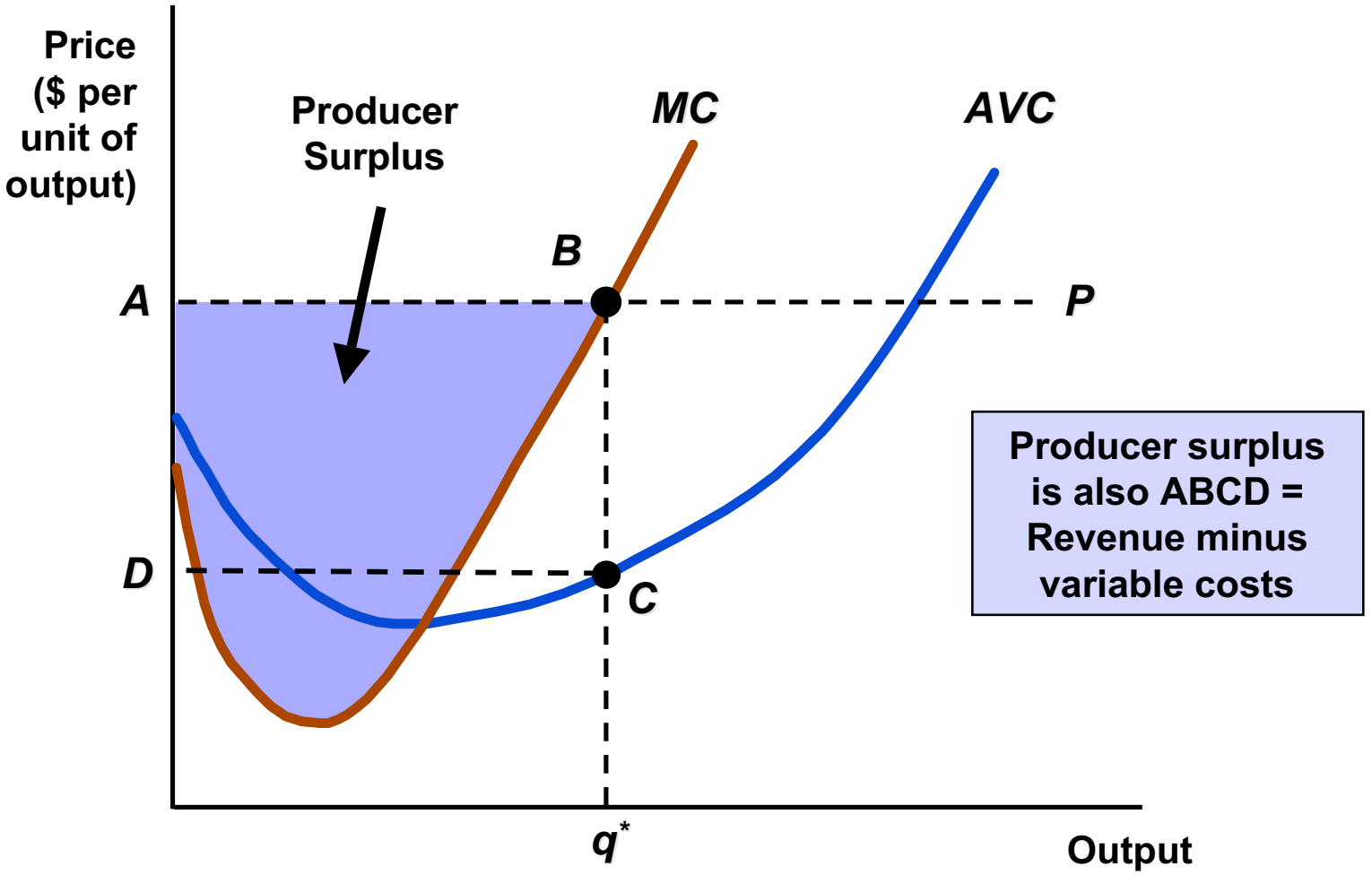
Producer Surplus in the Short Run pp. 276-81

- Price is greater than MC on all but the last unit of output
- Therefore, surplus is earned on all but the last unit
- The **producer surplus** is the sum over all units produced of the difference between the market price of the good and the marginal cost of production (**It indicates a firm's gains from trade.**)
- Area above supply curve to the market price

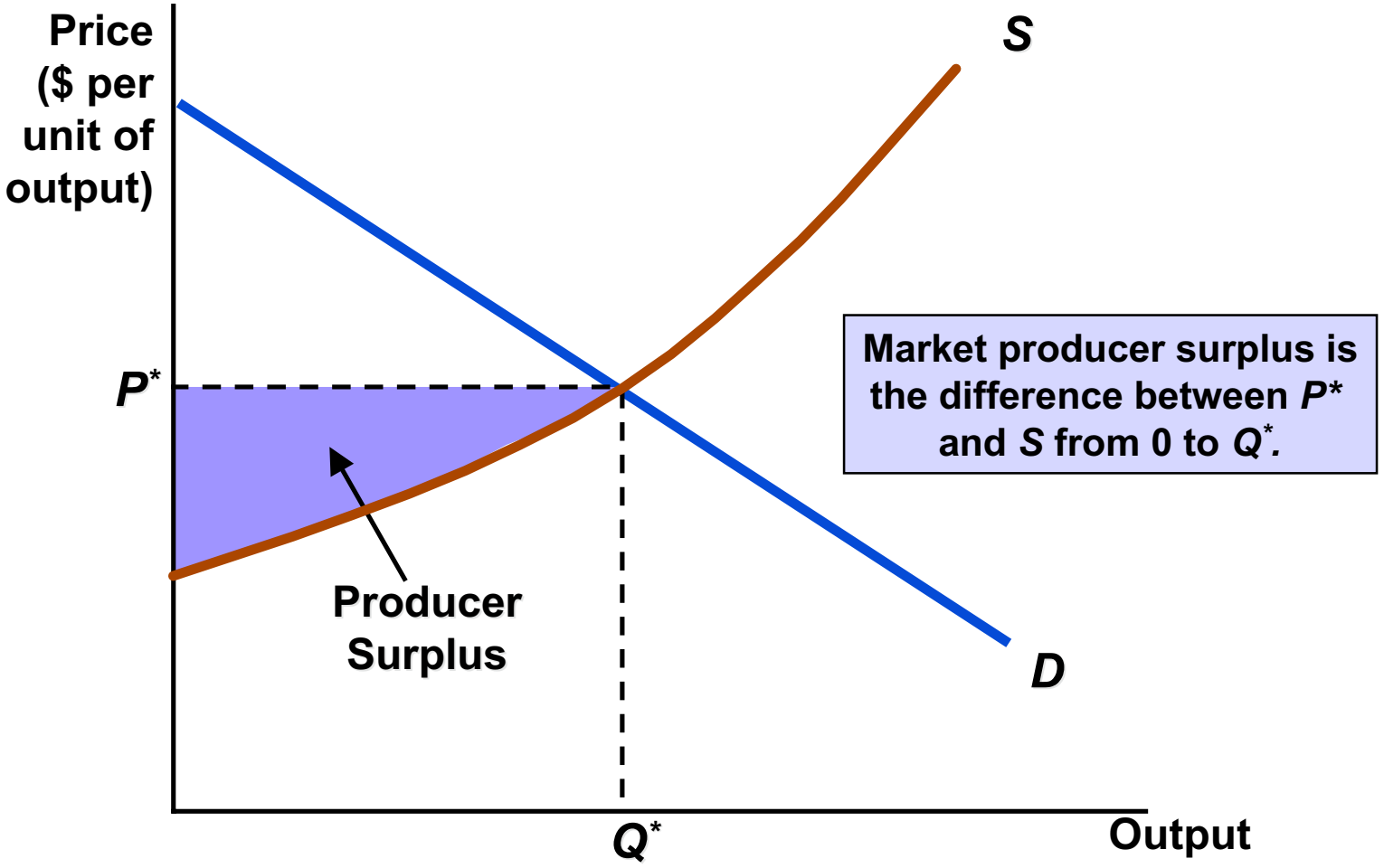
The Short-Run Market Supply Curve pp. 276-81

- Sum of MC from 0 to q*, it is the sum of the total variable cost of producing q*
- Producer Surplus can be defined as the difference between the firm's revenue and its total variable cost
- We can show this graphically by the rectangle ABCD
  - Revenue (0ABq*) minus variable cost (0DCq*)

Producer Surplus for a Firm pp. 276-81



Producer Surplus for a Market pp. 276-81



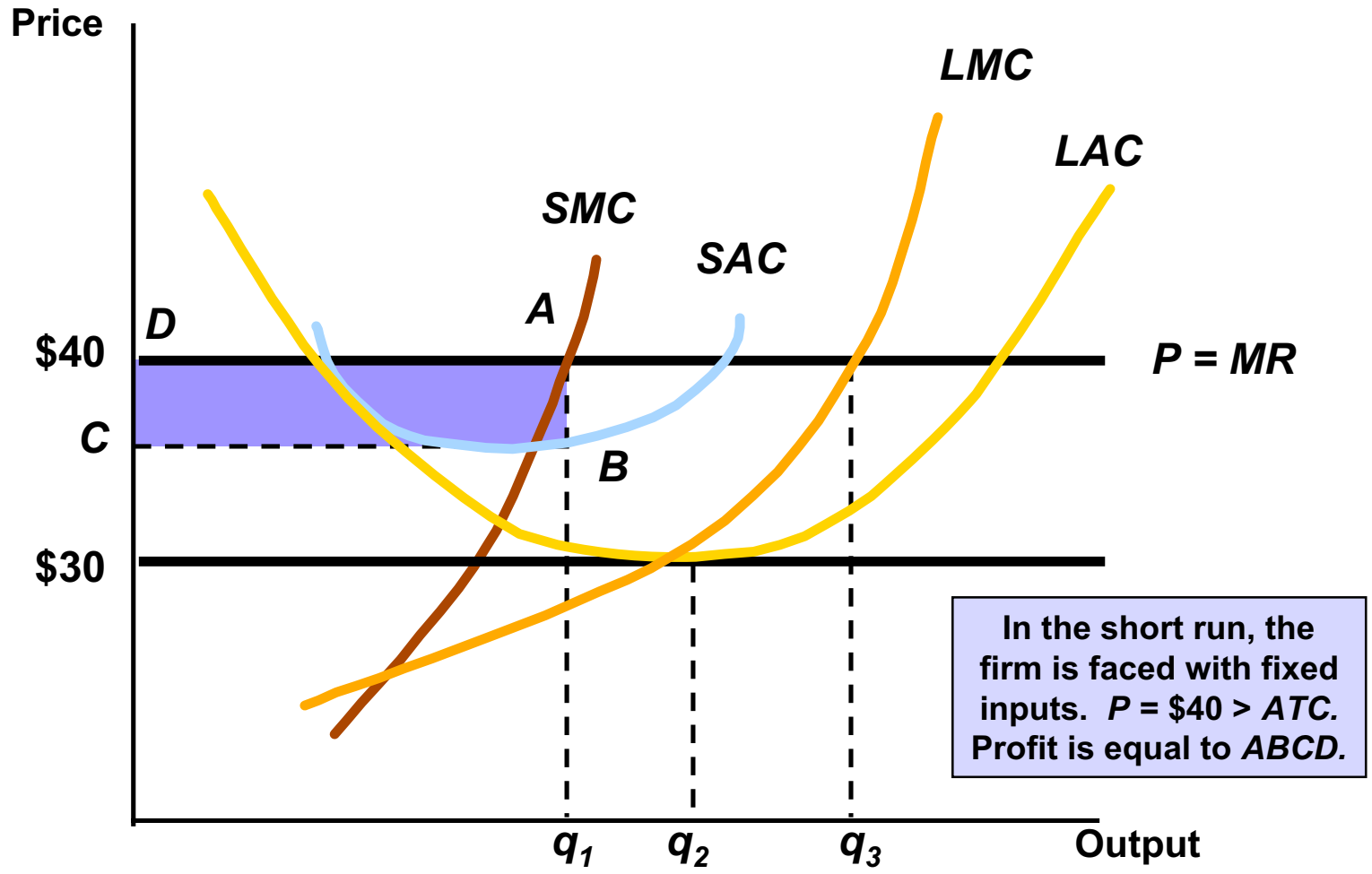
Choosing Output in the Long Run pp. 281-7

- *In short run, one or more inputs are fixed*
  - Depending on the time, it may limit the flexibility of the firm
- *In the long run, a firm can alter all its inputs, including the size of the plant*
- We assume free entry and free exit
  - No legal restrictions or extra costs

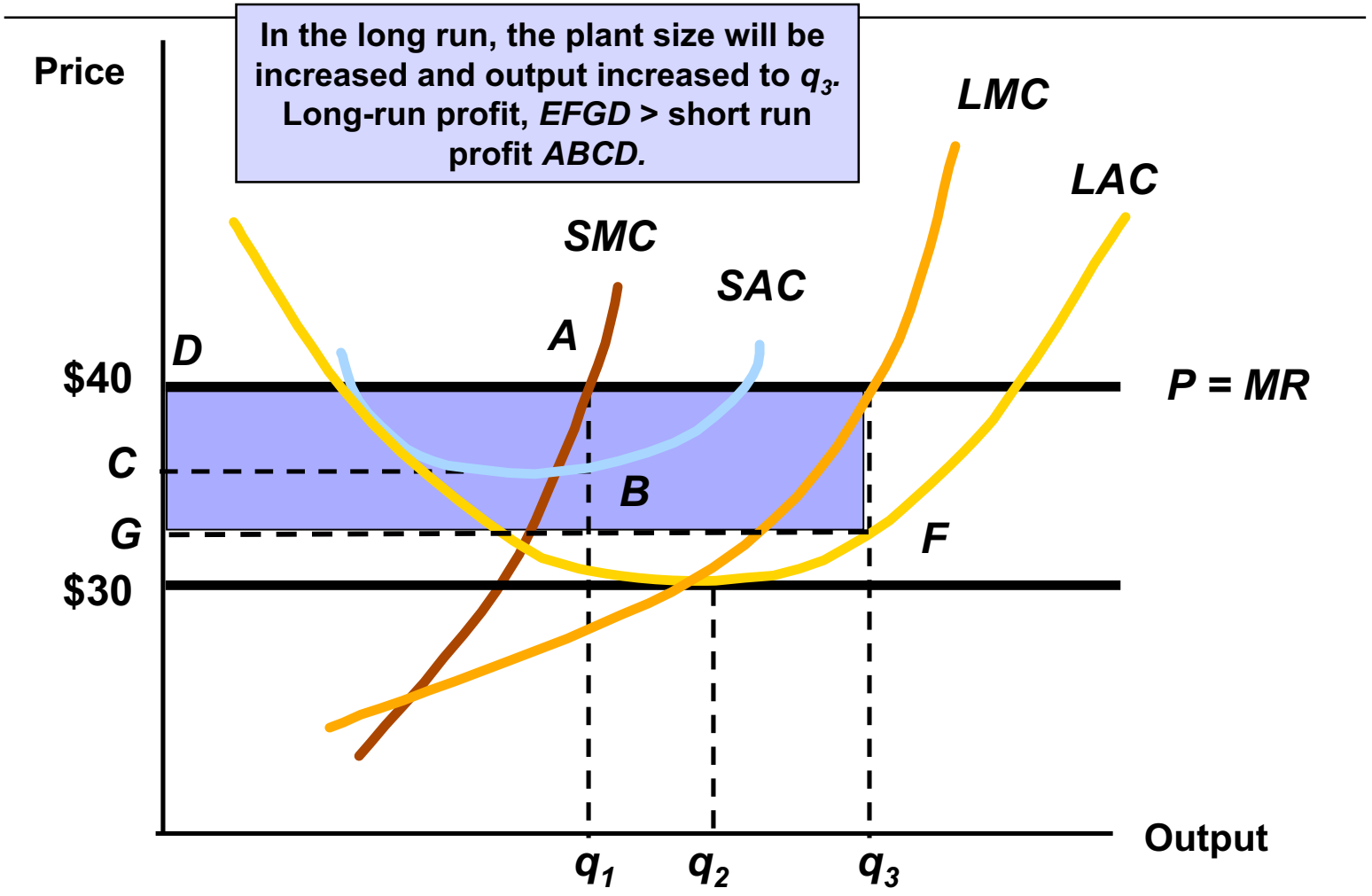
Choosing Output in the Long Run pp. 281-7

- In the short run, a firm faces a horizontal demand curve
  - Take market price as given
- The short-run average cost curve (SAC) and short-run marginal cost curve (SMC) are low enough for firm to make positive profits (ABCD)
- The long-run average cost curve (LRAC)
  - Economies of scale to q_2
  - Diseconomies of scale after q_2

Output Choice in the Long Run pp. 281-7



Output Choice in the Long Run pp. 281-7



Long-Run Competitive Equilibrium pp. 281-7

- For *long run equilibrium*, firms must have no desire to enter or leave the industry
- We can relate economic profit to the incentive to enter and exit the market

Long-Run Competitive Equilibrium pp. 281-7

- Firm uses labor (L) and capital (K) with purchased capital
- Accounting Profit and Economic Profit
  - Accounting profit: π = R - wL
  - Economic profit: π = R = wL - rK
    - wl = labor cost
    - rk = opportunity cost of capital

Long-Run Competitive Equilibrium pp. 281-7

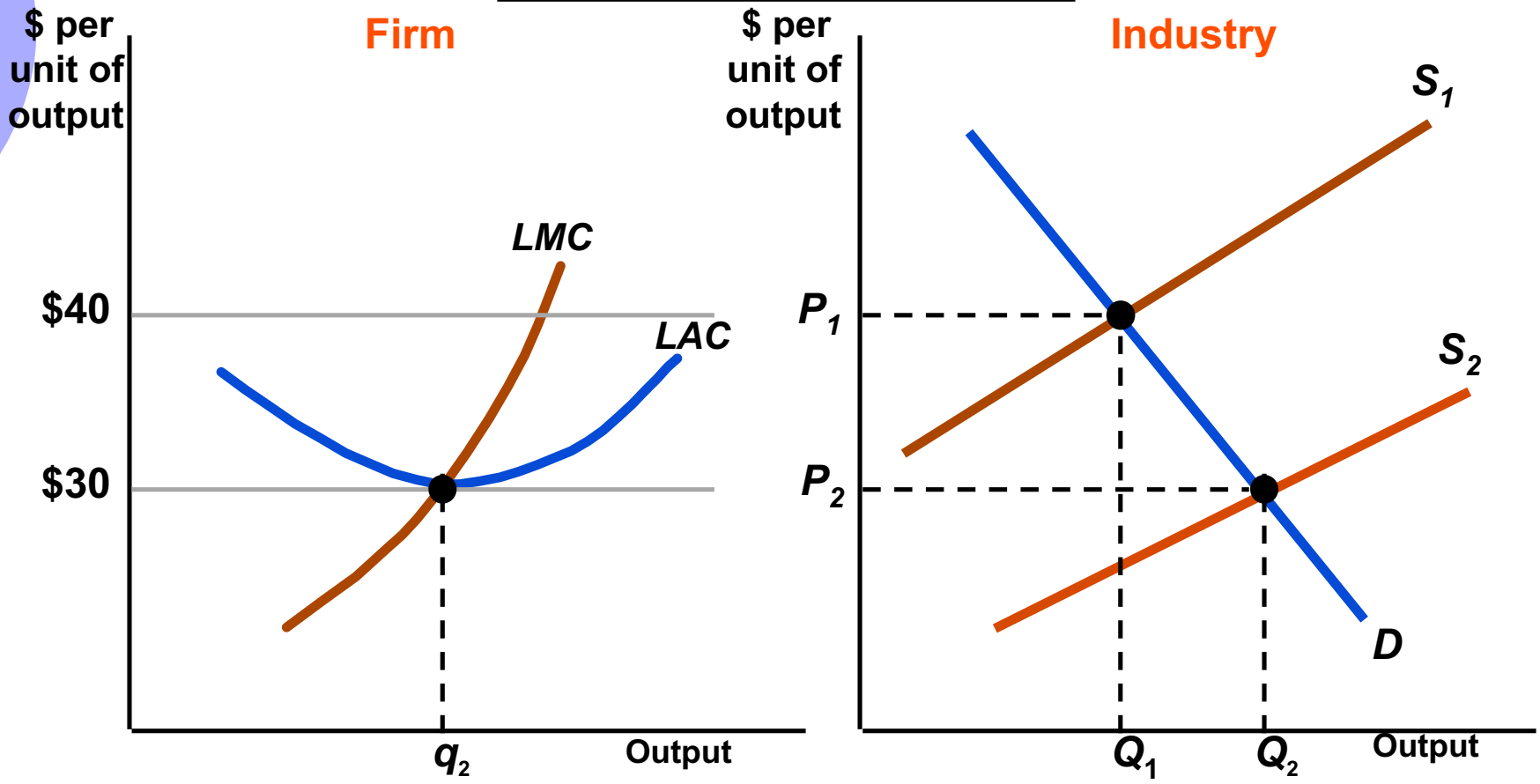
- Zero-Profit
  - A firm is earning a normal return on its investment
  - Doing as well as it could by investing its money elsewhere
  - Normal return is firm's opportunity cost of using money to buy capital instead of investing elsewhere
  - Competitive market long run equilibrium

Long-Run Competitive Equilibrium pp. 281-7

- Entry and Exit
  - The long-run response to short-run profits is to increase output and profits
  - Profits will attract other producers
  - More producers increase industry supply, which lowers the market price
  - This continues until there are no more profits to be gained in the market – zero economic profits

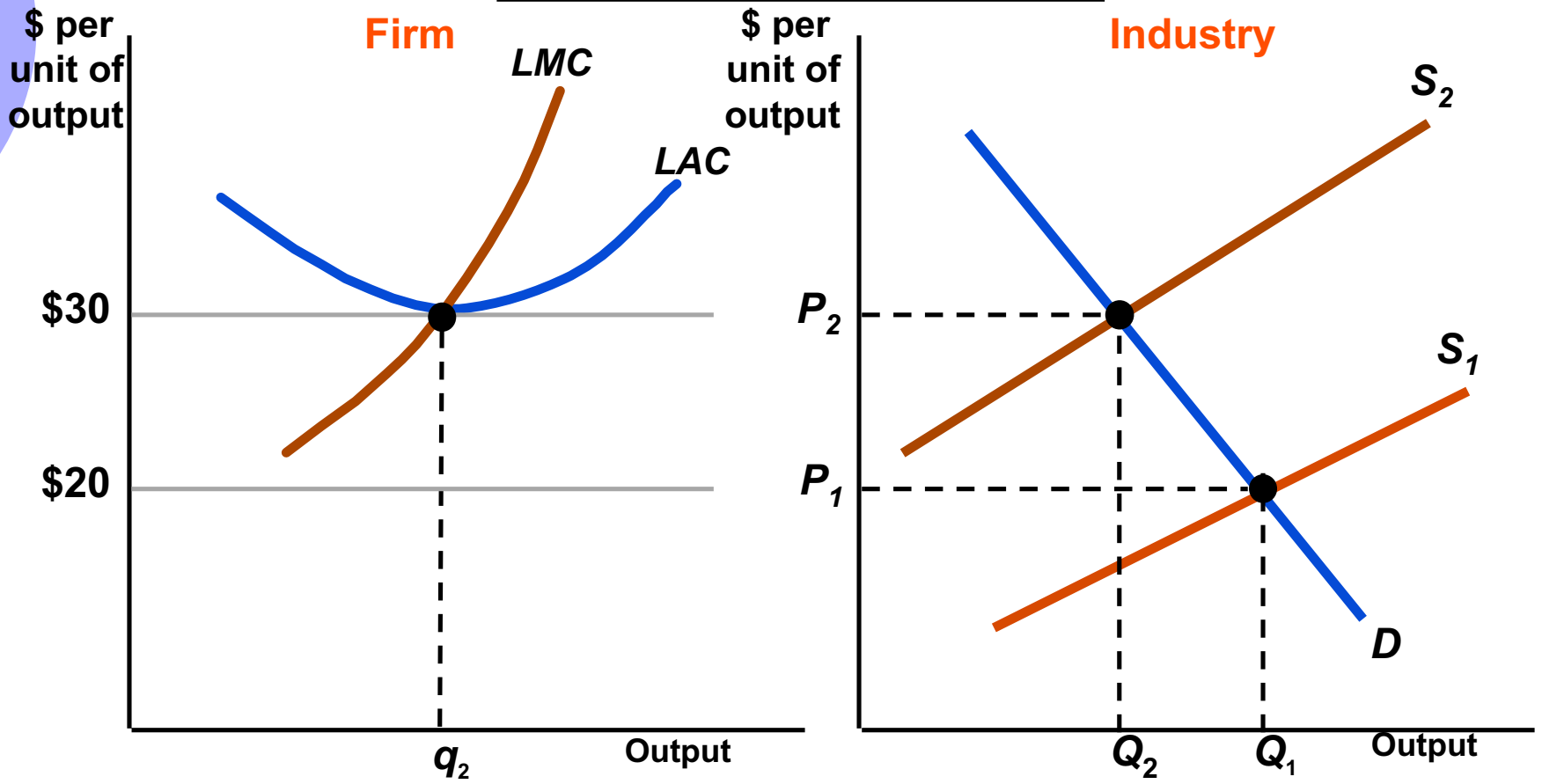
Long-Run Competitive Equilibrium – Profits pp. 281-7

- Profit attracts firms: New entrants
- Supply increases until profit = 0



Long-Run Competitive Equilibrium – Losses pp. 281-7

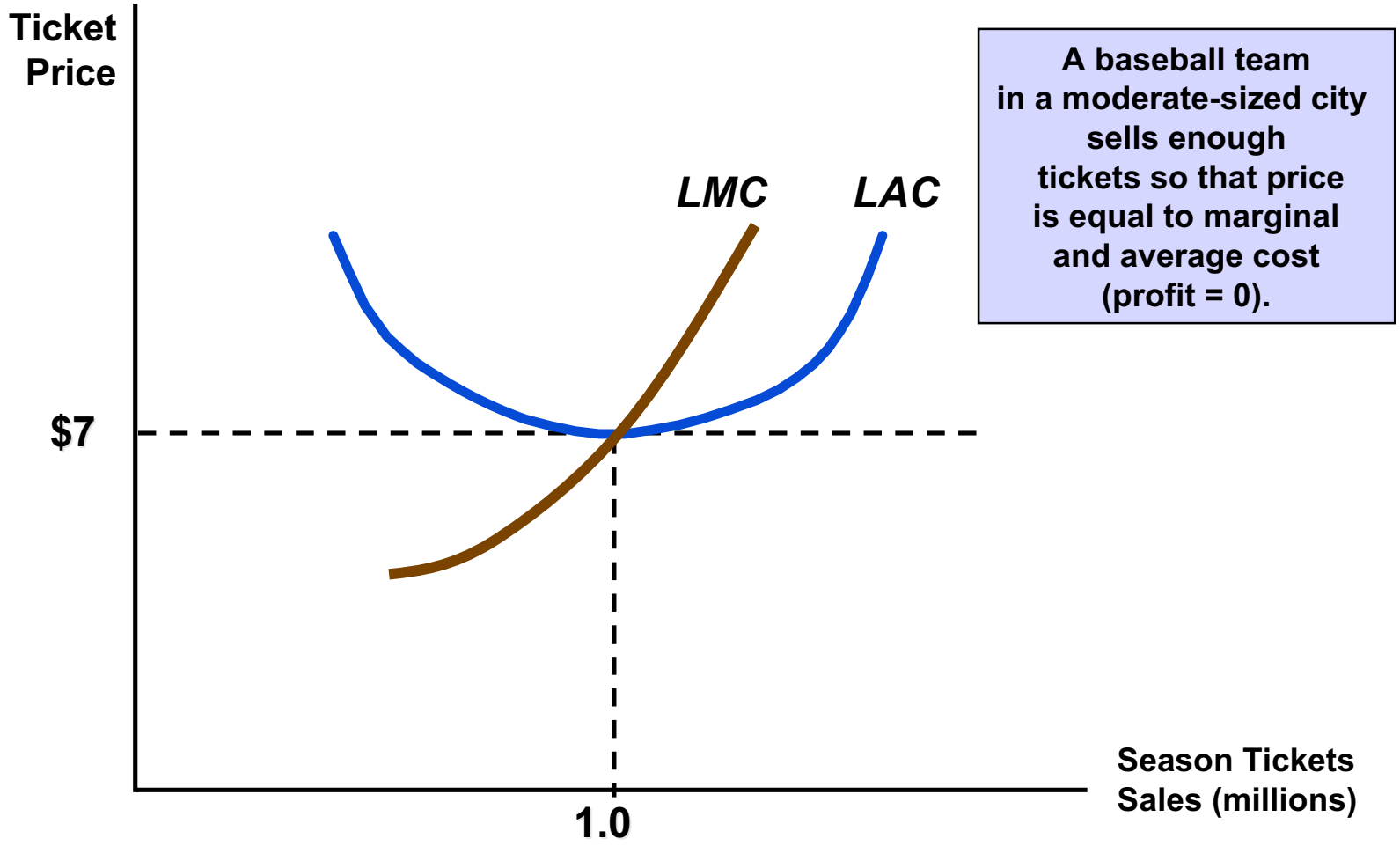
•Losses causeexisting firms to leave
•Supply decreases until profit = 0



Long-Run Competitive Equilibrium pp. 281-7

1. All firms in industry are maximizing profits
   - p = MC
2. No firm has incentive to enter or exit industry
   - Earning zero economic profits
3. Market is in equilibrium
   - $Q_D = Q_S$

Firms Earn Zero Profit in Long-Run Equilibrium pp. 281-7



A baseball team in a moderate-sized city sells enough tickets so that price is equal to marginal and average cost (profit = 0).