

LECTURE 6: Competitive Markets and Profit Maximization

- Perfectly Competitive Markets, Profit Maximization
- Marginal Revenue, Marginal Cost, and Profit
- Output in the Short-Run , Short-Run Supply Curve
- Short-Run Market Supply
- Choosing Output in the Long-Run
- The Industry's Long-Run Supply Curve

Perfectly Competitive Markets 완전경쟁시장

- The model of perfect competition can be used to study a variety of markets
- Basic assumptions of Perfectly Competitive Markets
 1. Price taking
 2. Product homogeneity
 3. Free entry and exit

Perfectly Competitive Markets

1. Price Taking 가격수용

- The individual firm sells a very small share of the total market output and, therefore, cannot influence market price.
- Each firm takes market price as given – price taker
- The individual consumer buys too small a share of industry output to have any impact on market price.

Perfectly Competitive Markets

2. Product Homogeneity

- ▣ The products of all firms are perfect substitutes.
- ▣ Product quality is relatively similar as well as other product characteristics
- ▣ Agricultural products, oil, copper, iron, lumber
- ▣ Heterogeneous products, such as brand names, can charge higher prices because they are perceived as better

Perfectly Competitive Markets

3. Free Entry and Exit

- When there are no special costs that make it difficult for a firm to enter (or exit) an industry
- Buyers can easily switch from one supplier to another.
- Suppliers can easily enter or exit a market.
 - Pharmaceutical companies not perfectly competitive because of the large costs of R&D required

When are Markets Competitive

- Few real products are *perfectly* competitive
- Many markets are, however, highly competitive
 - ▣ They face relatively low entry and exit costs
 - ▣ Highly elastic demand curves
- No rule of thumb to determine whether a market is close to perfectly competitive
 - ▣ Depends on how they behave in situations

Profit Maximization

- Do firms maximize profits?
 - ▣ Managers in firms may be concerned with other objectives
 - Revenue maximization
 - Revenue growth
 - Dividend maximization
 - Short-run profit maximization (due to bonus or promotion incentive)
 - Could be at expense of long run profits

Profit Maximization

- Implications of non-profit objective
 - ▣ Over the long-run investors would not support the company
 - ▣ Without profits, survival unlikely in competitive industries
- Managers have constrained freedom to pursue goals other than long-run profit maximization

Marginal Revenue, Marginal Cost, and Profit Maximization

- 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

- Costs of production depends on output
 - ▣ 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

- 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

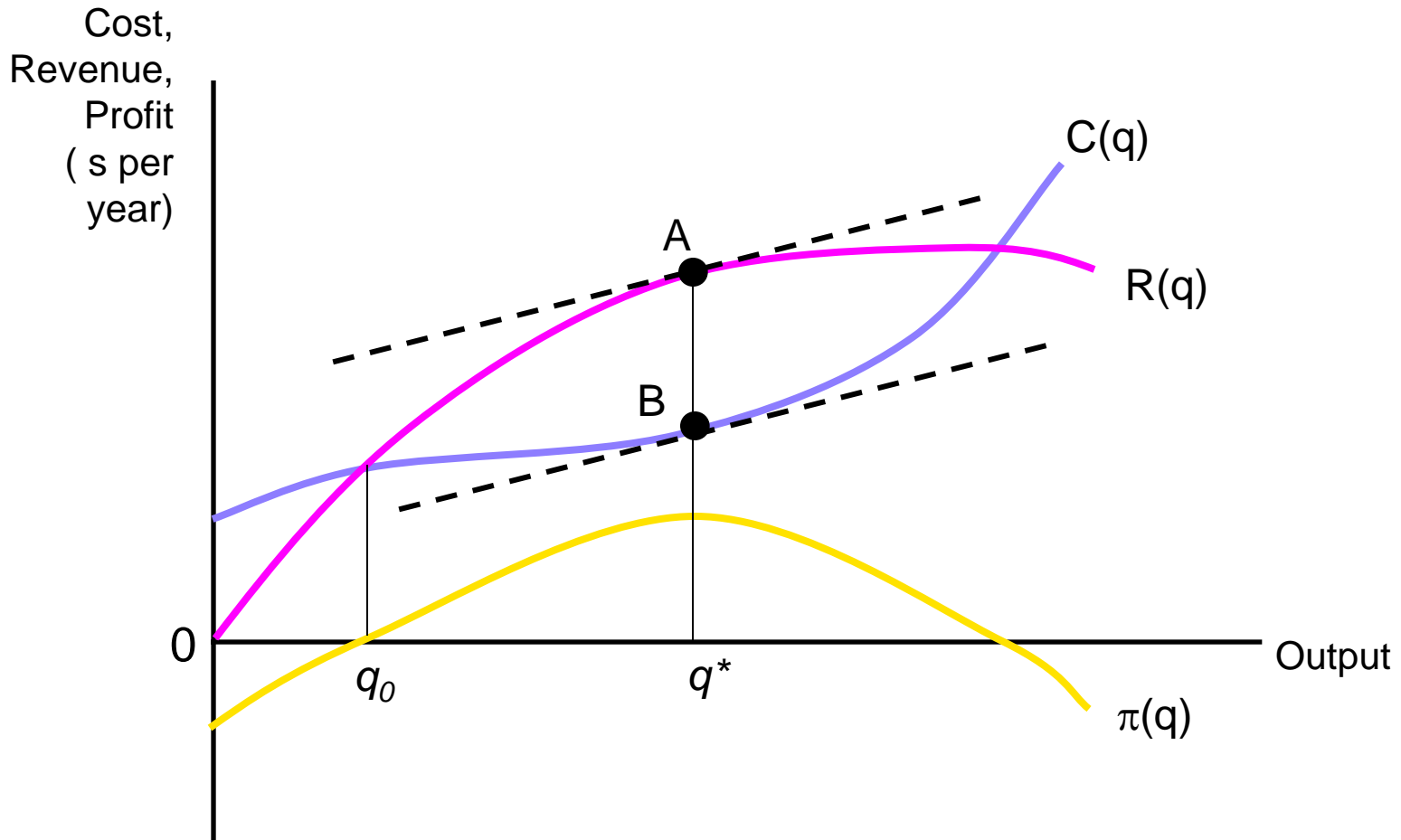
Marginal Revenue, Marginal Cost, and Profit Maximization

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

Marginal Revenue, Marginal Cost, and Profit Maximization

- 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

Profit Maximization – Short Run



Marginal Revenue, Marginal Cost, and Profit Maximization

- 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

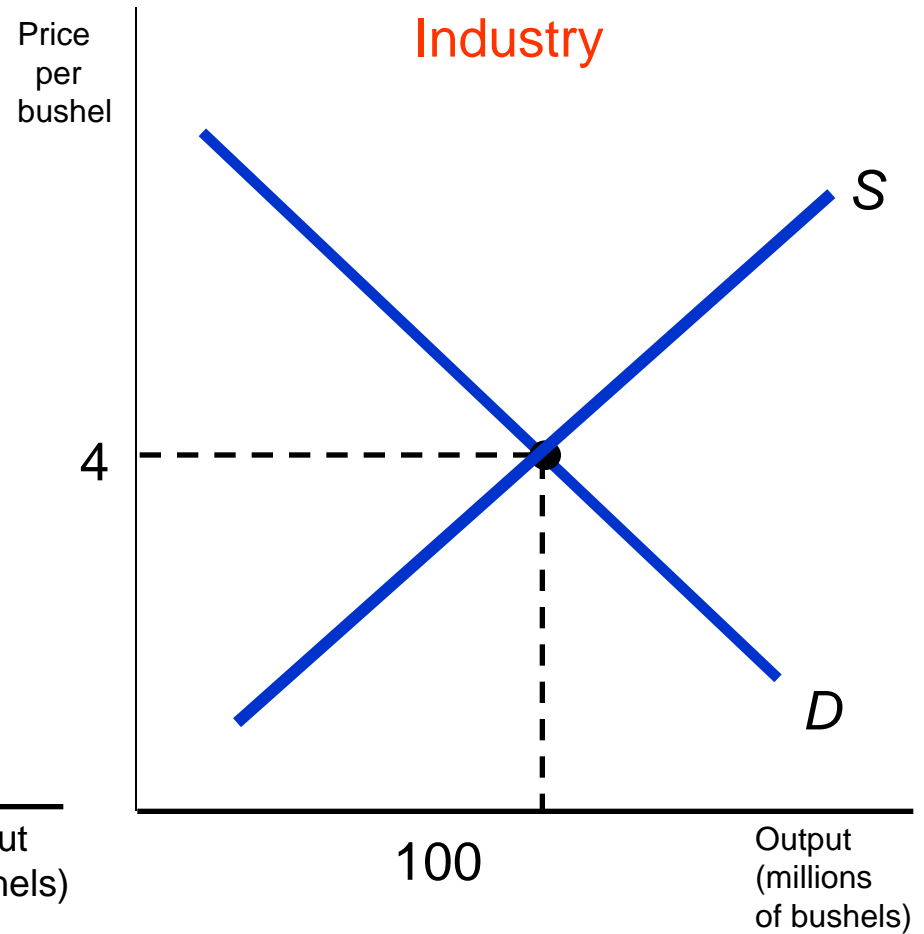
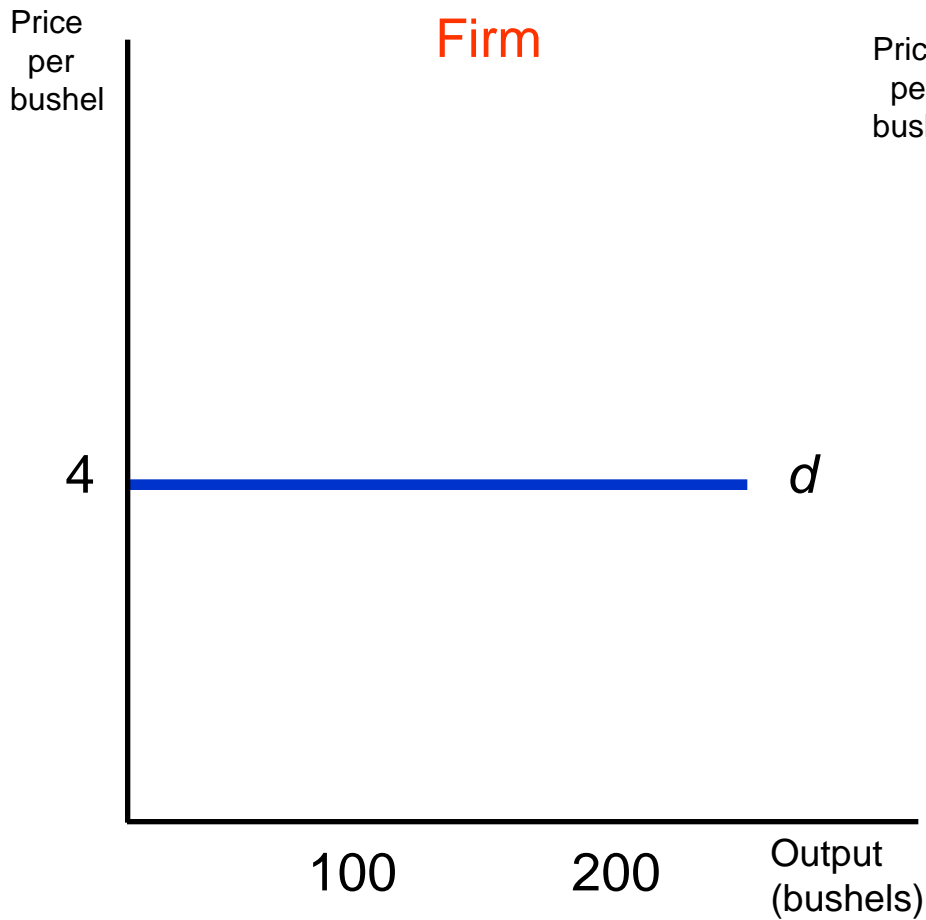
□ The Competitive Firm

- 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

- Demand curve faced by an individual firm is a horizontal line
 - ▣ Firm's sales have no effect on market price
- Demand curve faced by whole market is downward sloping
 - ▣ Shows amount of good *all consumers* will purchase at different prices

The Competitive Firm



The Competitive Firm

- The competitive firm's demand
 - Individual producer sells all units for P 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

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

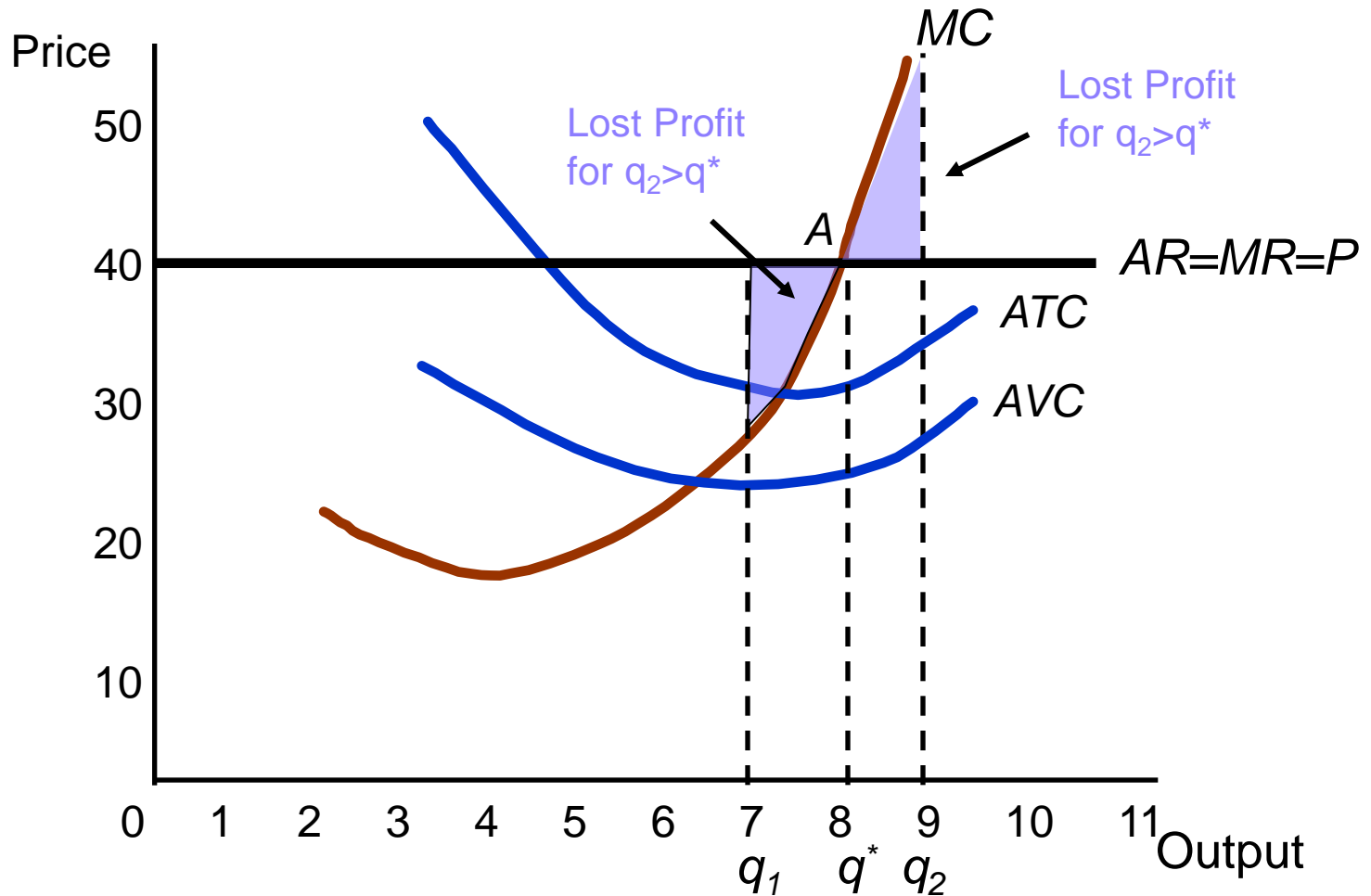
Choosing Output: Short Run

- We will combine revenue and costs with demand to determine profit maximizing output decisions.
- In the short run, capital is fixed and 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

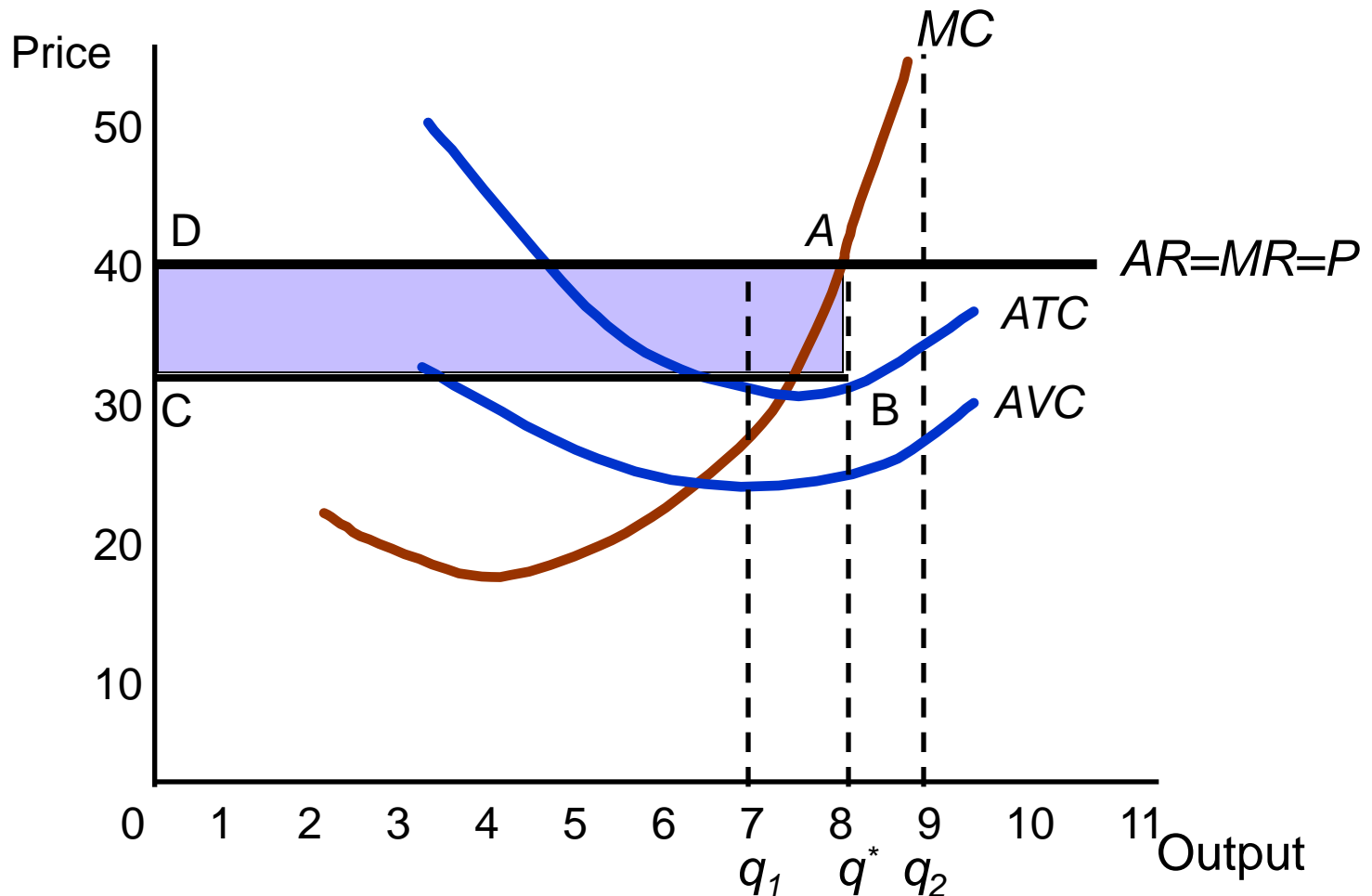
Choosing Output: Short Run

- 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

A Competitive Firm



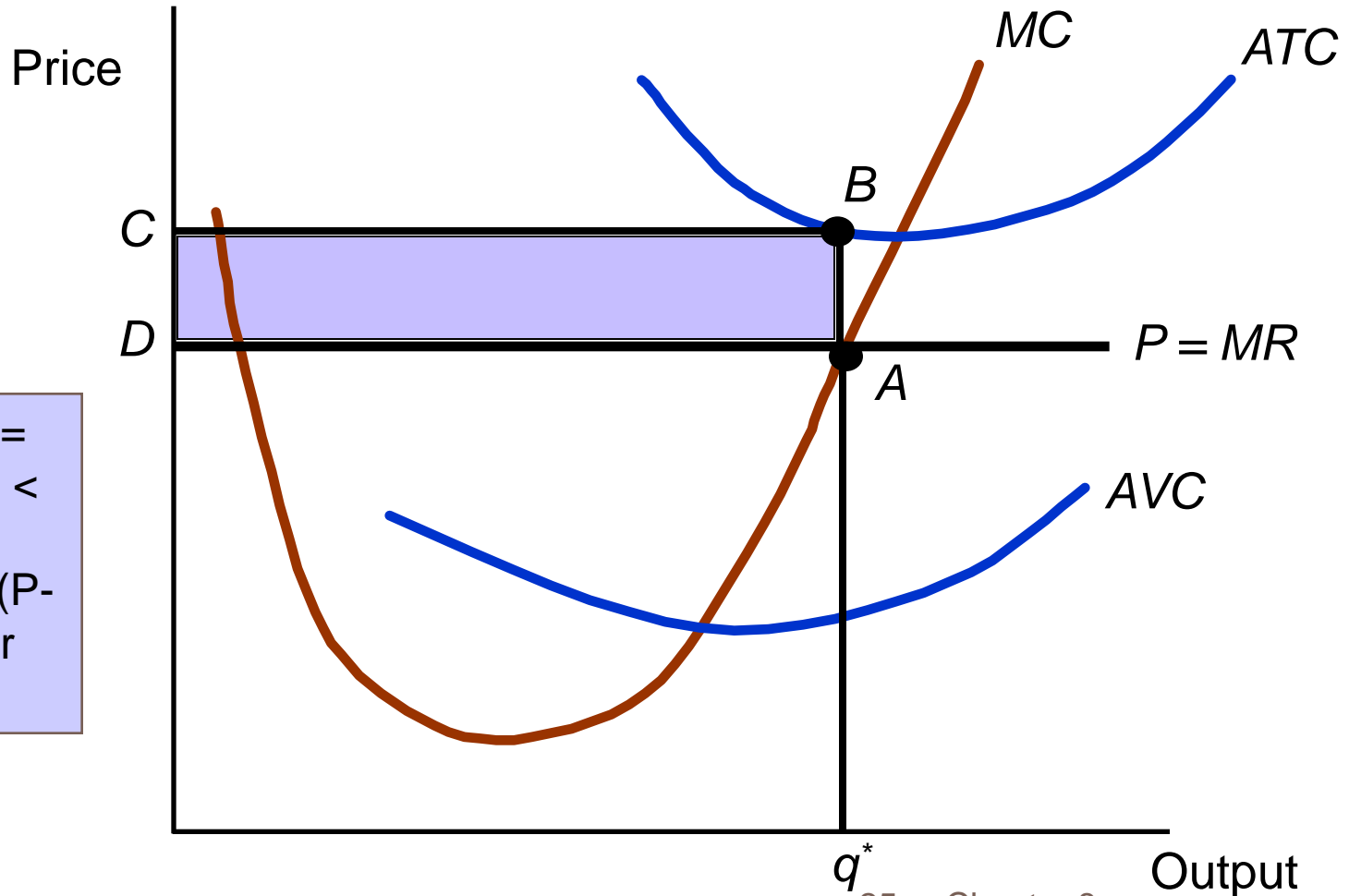
A Competitive Firm – Positive Profits



The Competitive Firm

- A firm does not have to make profits
- $Pq - TC = Pq - FC - VC > -FC$ or
 - ▣ $Pq - VC > 0$
- Continue to produce, at loss, if
 - ▣ $-FC < Pq - TC < 0$ or $Pq - VC > 0$ ($P > AVC$)
- 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



At q^* : $MR = MC$ and $P < ATC$
Losses = $(P - ATC) \times q^*$ or ABCD

Choosing Output in the Short Run

- Summary of Production Decisions
 - Profit is maximized when $MC = MR$
 - If $P > ATC$ the firm is making profits.
 - If $P < ATC$ the firm is making losses

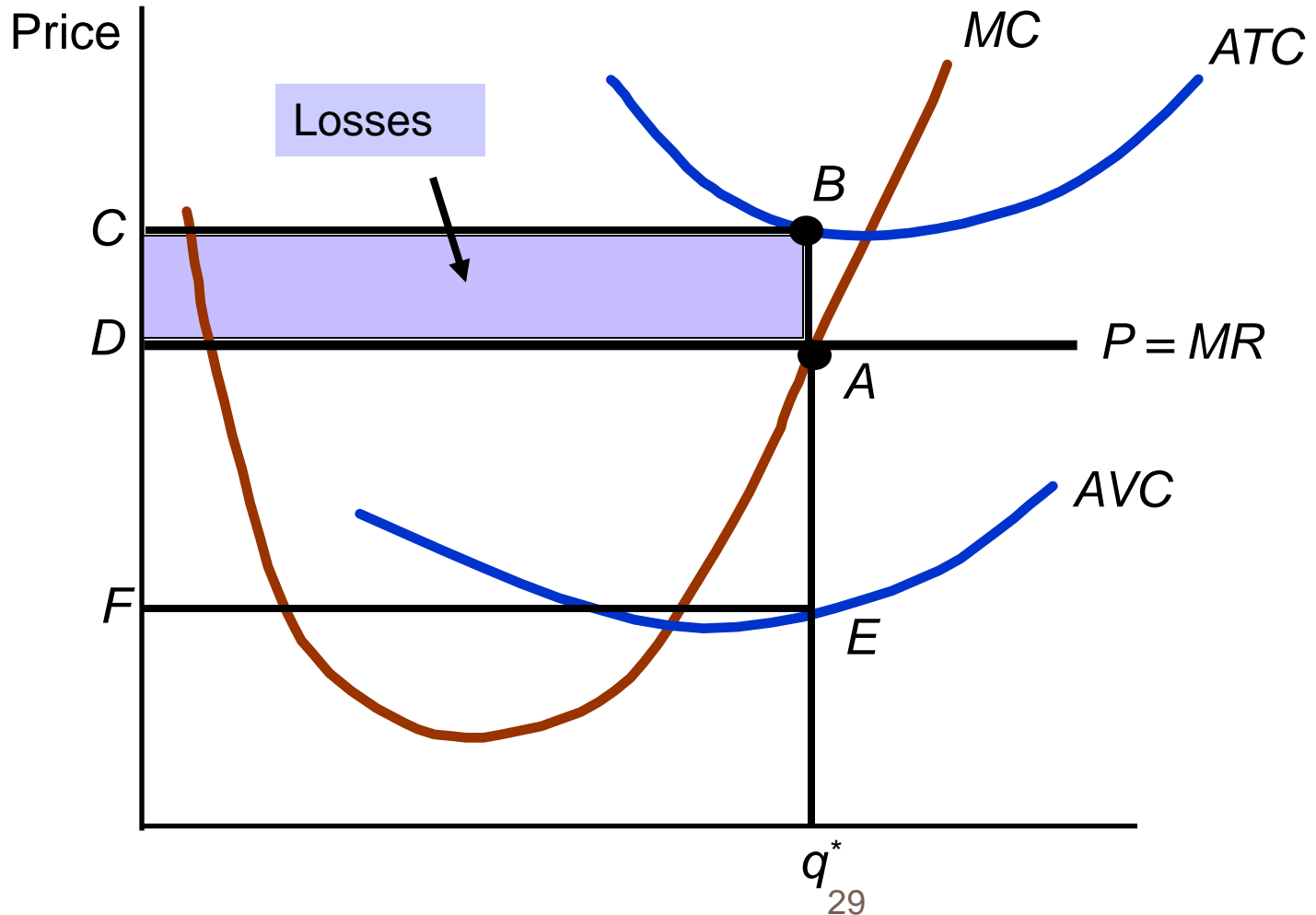
Short Run Production

- Why would firm produce at a loss?
 - 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

- When should the firm shut down?
 - ▣ If $AVC < P < ATC$ the firm should continue producing in the short run
 - Can cover some of its variable costs and all of its fixed costs
 - ▣ If $AVC > P < ATC$ the firm should shut-down.
 - Can not cover even its fixed costs

A Competitive Firm – Losses



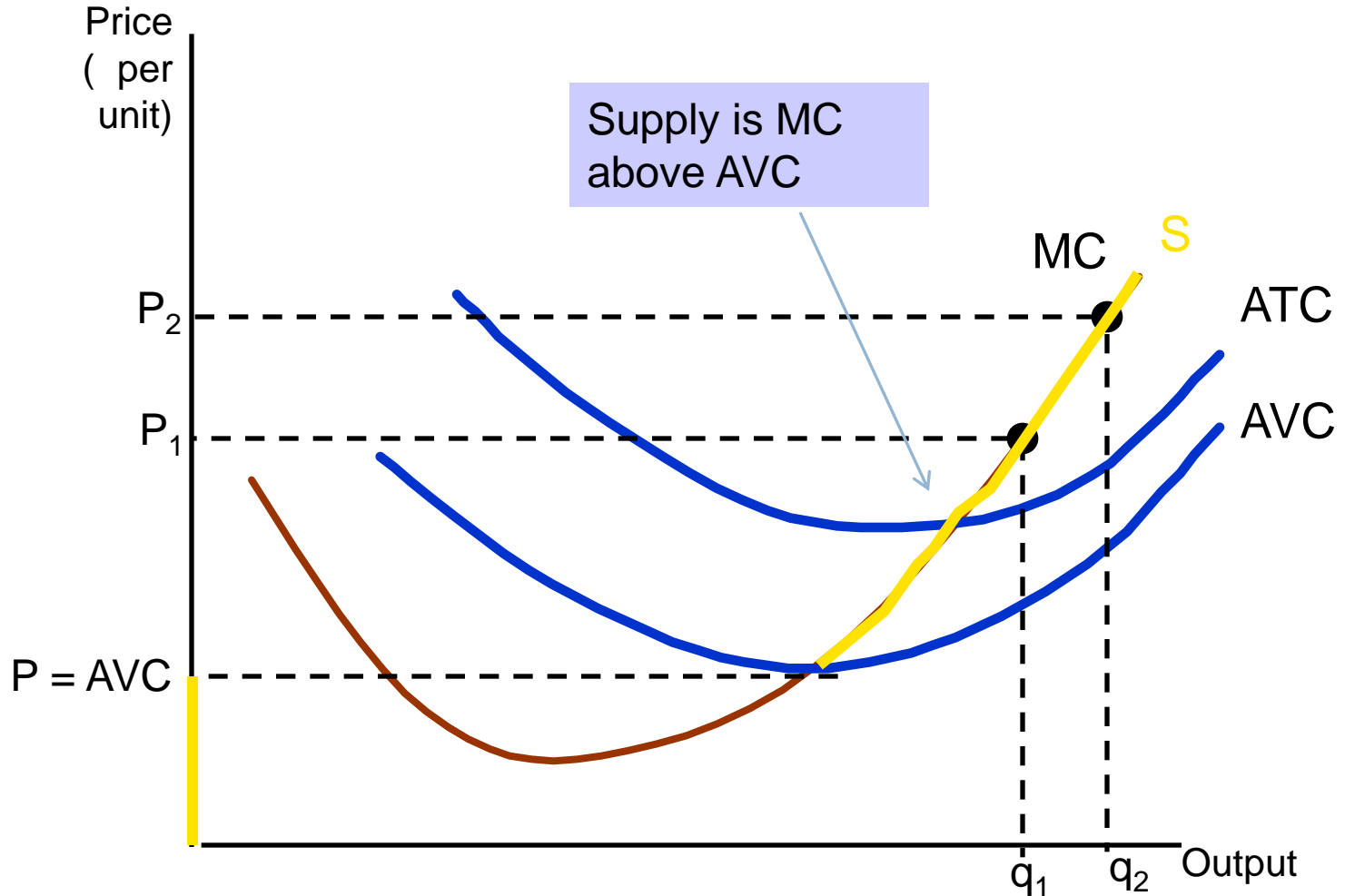
Some Cost Considerations for Managers

- Three guidelines for estimating marginal cost:
 1. Average variable cost should not be used as a substitute for marginal cost.
 2. A single item on a firm's accounting ledger may have two components, only one of which involved marginal cost
 3. All opportunity costs should be included in determining marginal cost

Competitive Firm – Short Run Supply

- 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



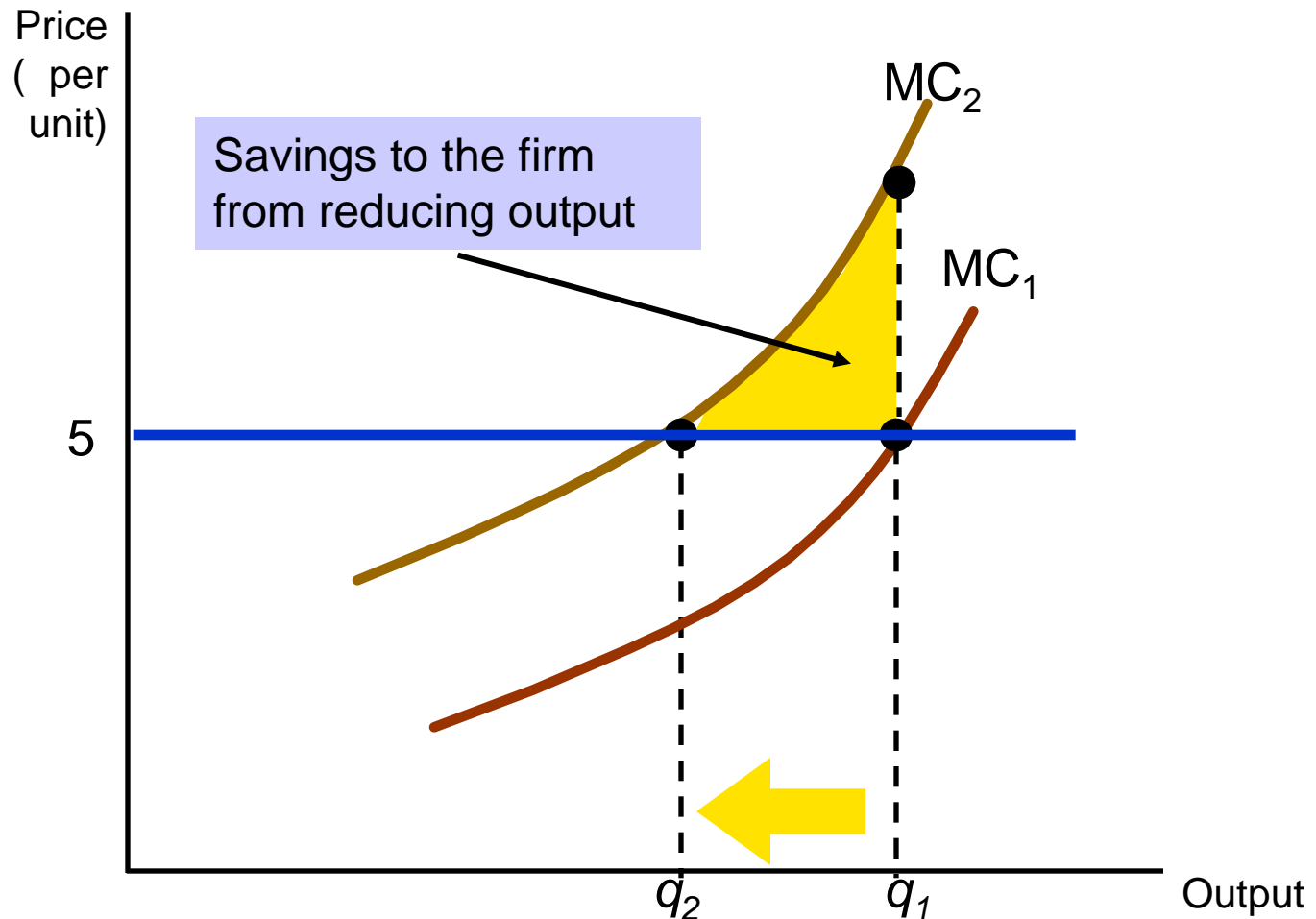
A Competitive Firm's Short-Run Supply Curve

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

A Competitive Firm's Short-Run Supply Curve

- 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 firms output decisions

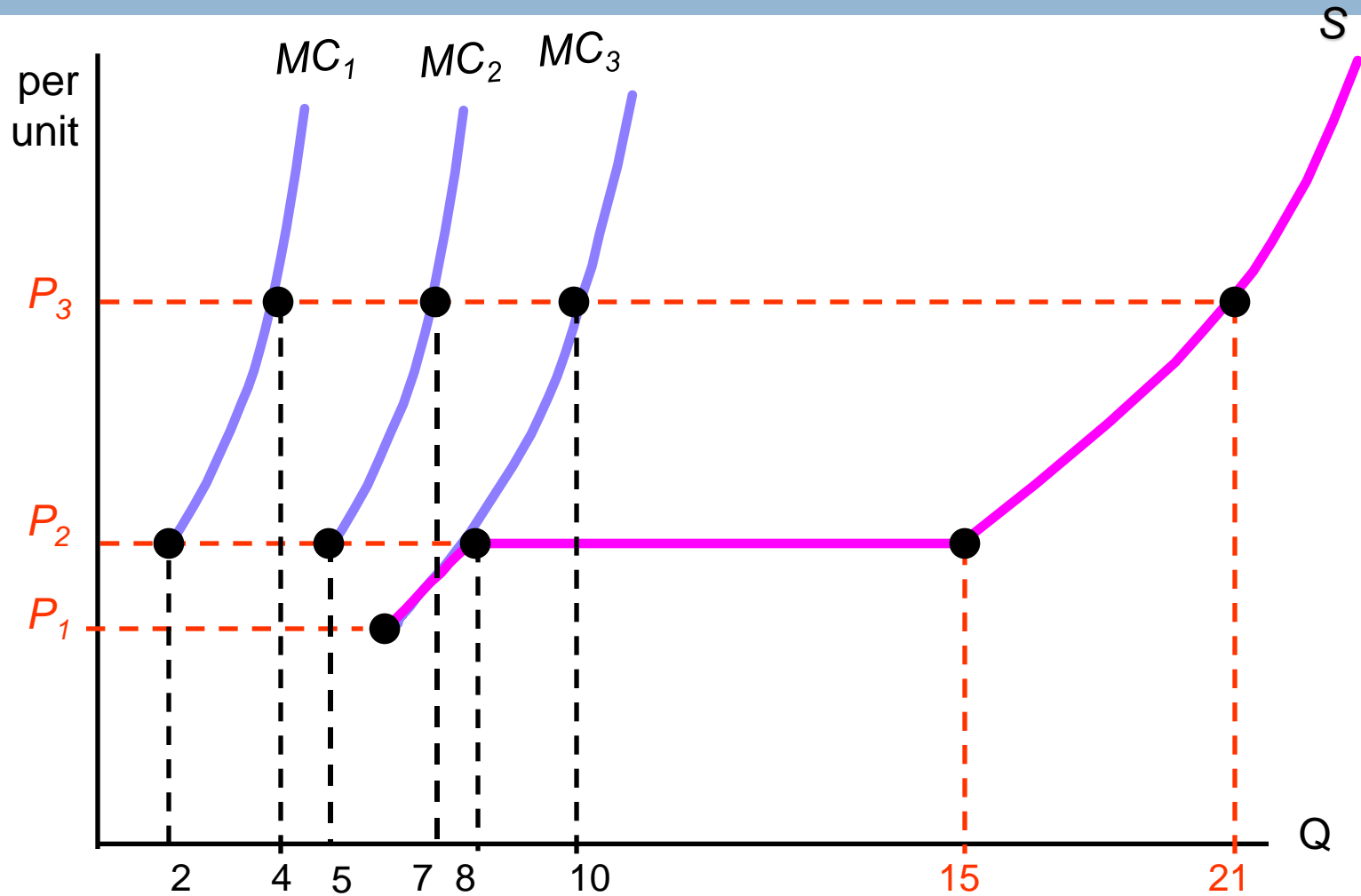
The Response of a Firm to a Change in Input Price



Short-Run Market Supply Curve

- 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



The Short-Run Market Supply Curve

- As price rises, firms expand their production
- Increased production leads to increased demand for inputs and could cause increases in input prices
- Increases in input prices cause MC curve to rise
- This lowers each firm's output choice
- Causes industry supply to be less responsive to change in price than would be otherwise

Elasticity of Market Supply

- Elasticity of Market Supply
 - ▣ Measures the sensitivity of industry output to market price
 - ▣ The percentage change in quantity supplied, Q , in response to 1-percent change in price

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

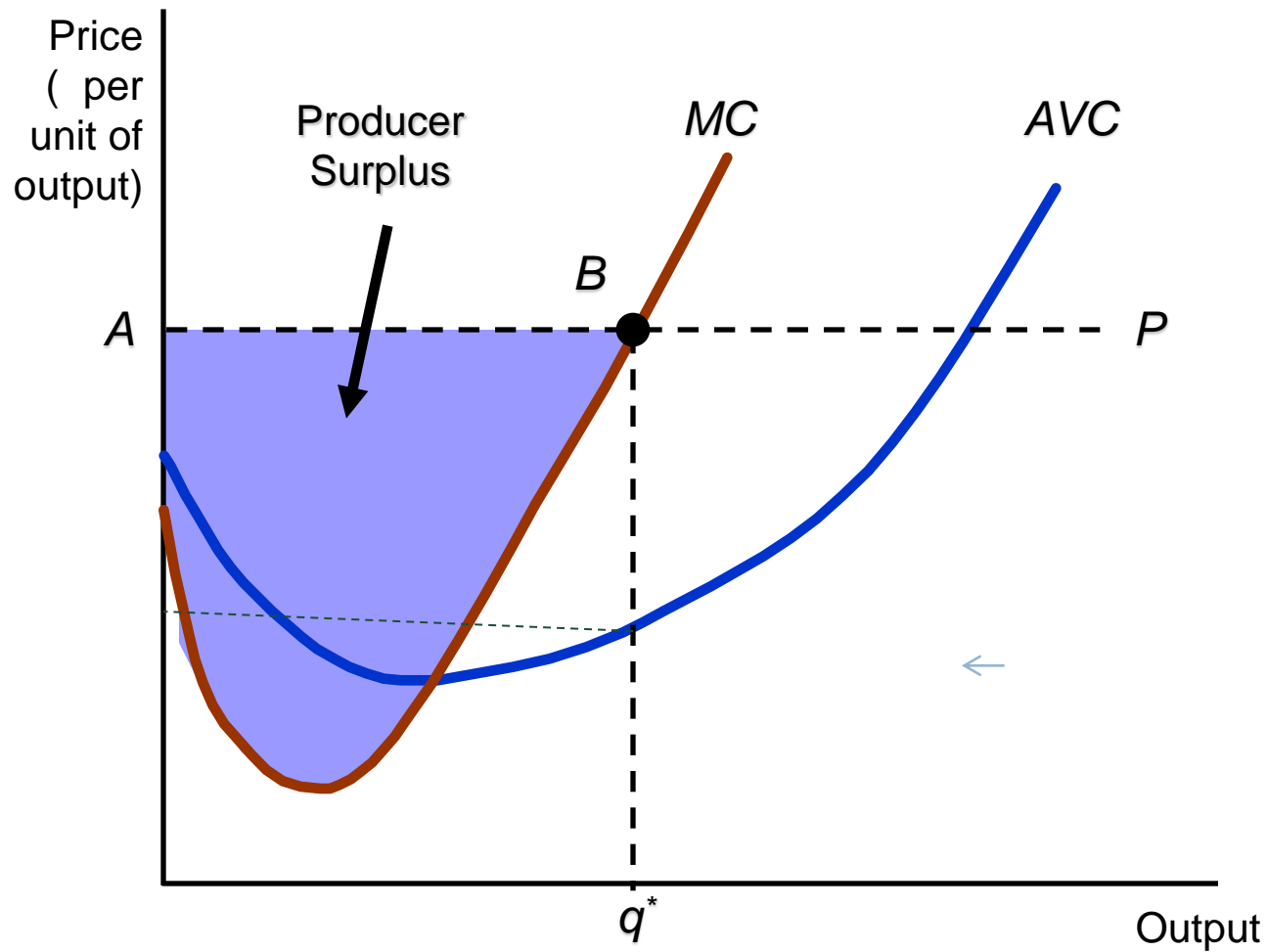
Elasticity of Market Supply

- When MC increase rapidly in response to increases in output, elasticity is low
- When MC increase slowly, supply is relatively elastic
- **Perfectly inelastic** short-run supply arises when the industry's plant and equipment are so fully utilized that new plants must be built to achieve greater output.
- **Perfectly elastic** short-run supply arises when marginal costs are constant.

Producer Surplus in the Short Run

- 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.
- Area above supply to the market price

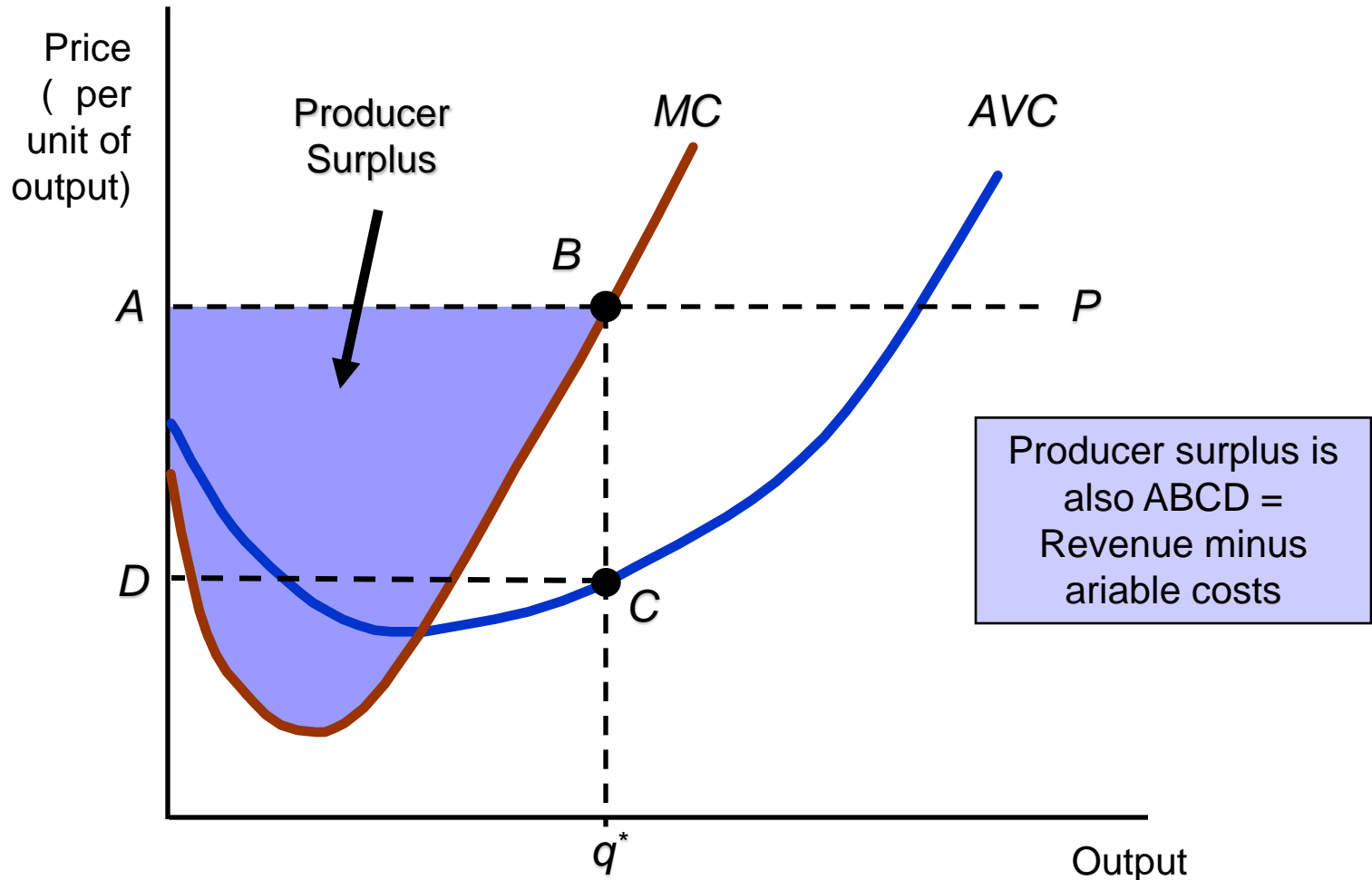
Producer Surplus for a Firm



The Short-Run Market Supply Curve

- 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 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



Producer Surplus versus Profit

- Profit is revenue minus total cost (not just variable cost)
- When fixed cost is positive, producer surplus is greater than profit

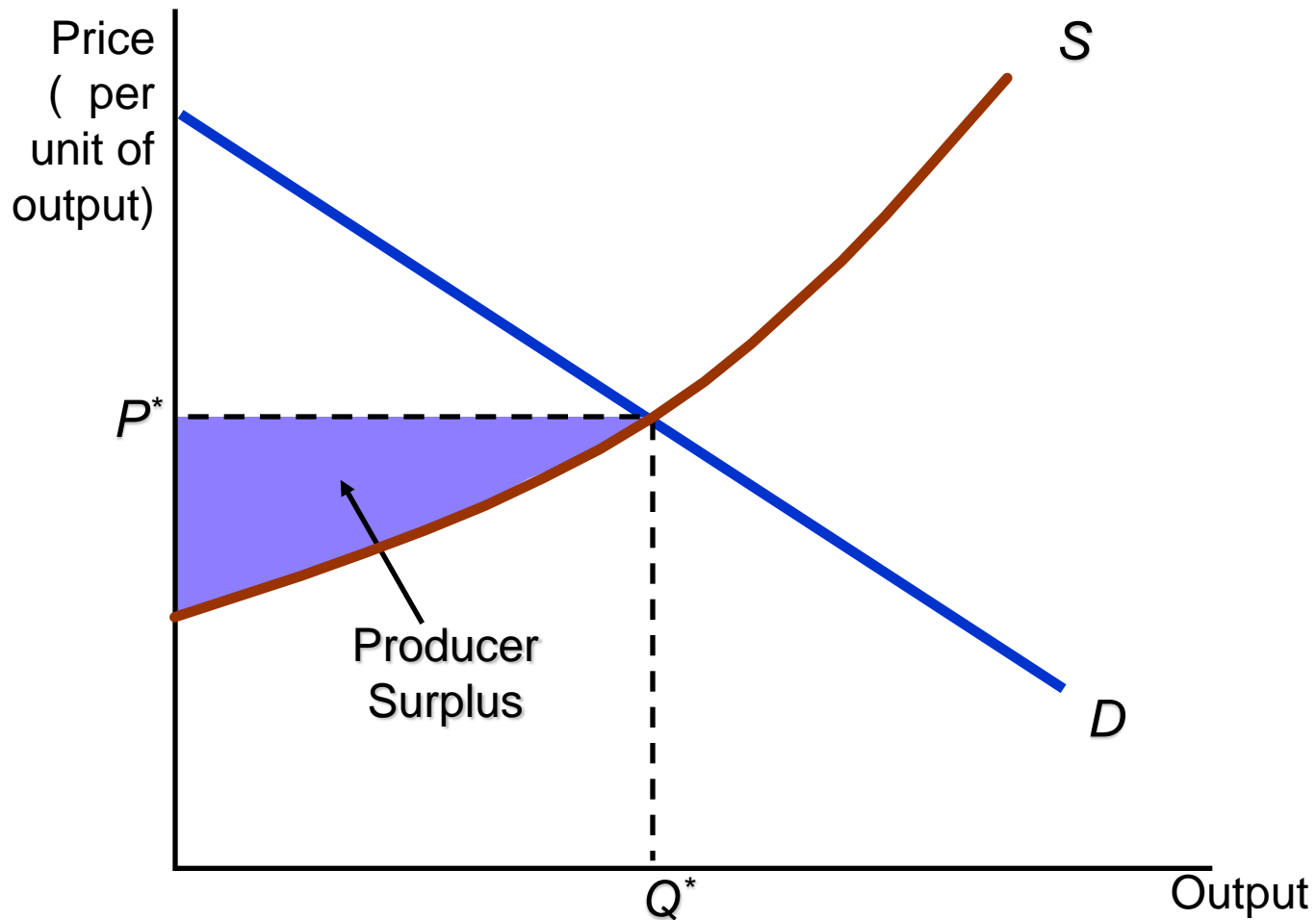
$$\text{Producer Surplus} = \text{PS} = R - \text{VC}$$

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

Producer Surplus versus Profit

- Costs of production determine magnitude of producer surplus
 - ▣ Higher costs firms have less producer surplus
 - ▣ Lower cost firms have more producer surplus
 - ▣ Adding up surplus for all producers in the market given total market producer surplus
 - ▣ Area below market price and above supply curve

Producer Surplus for a Market



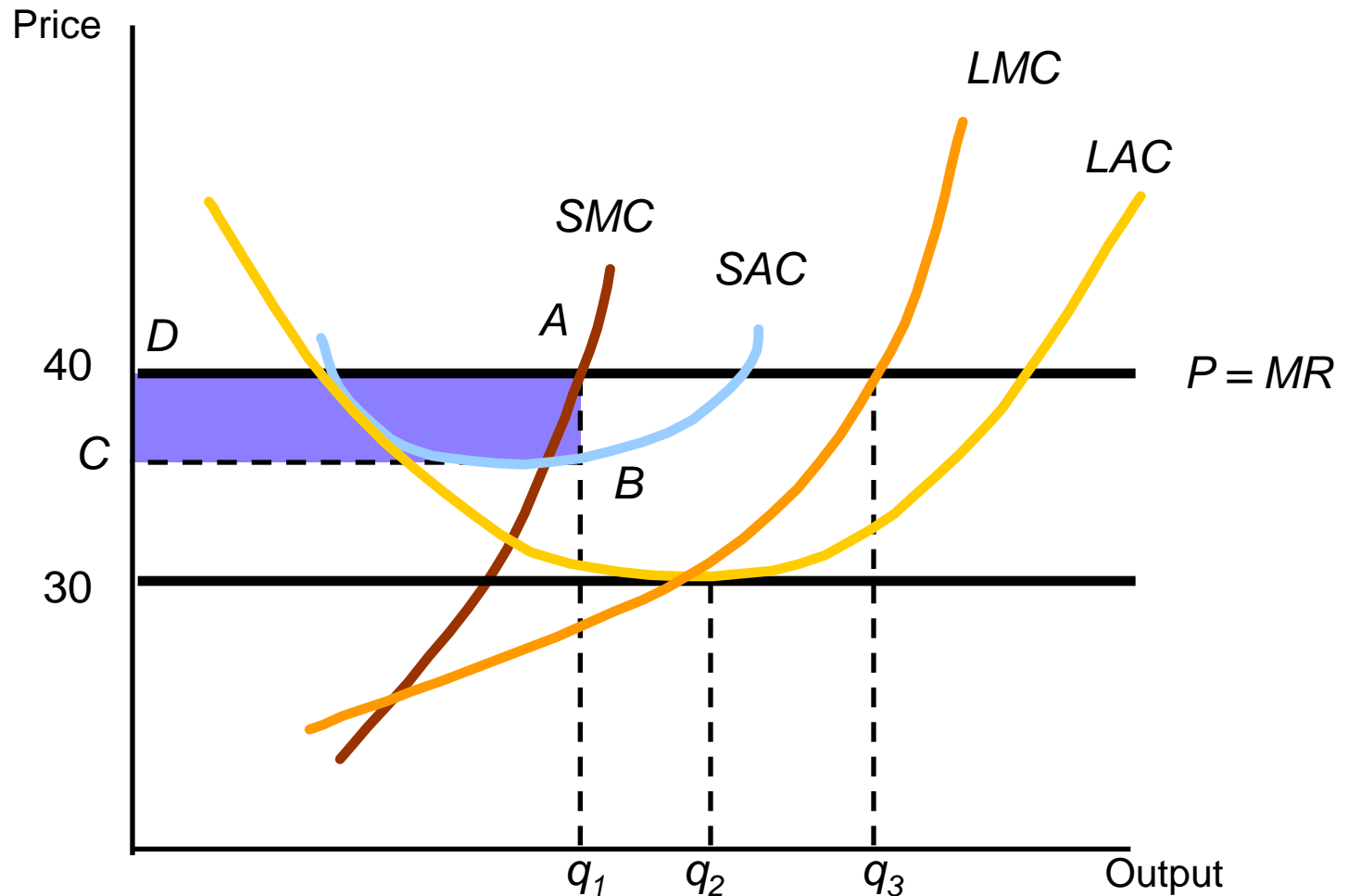
Choosing Output in the Long Run

- 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

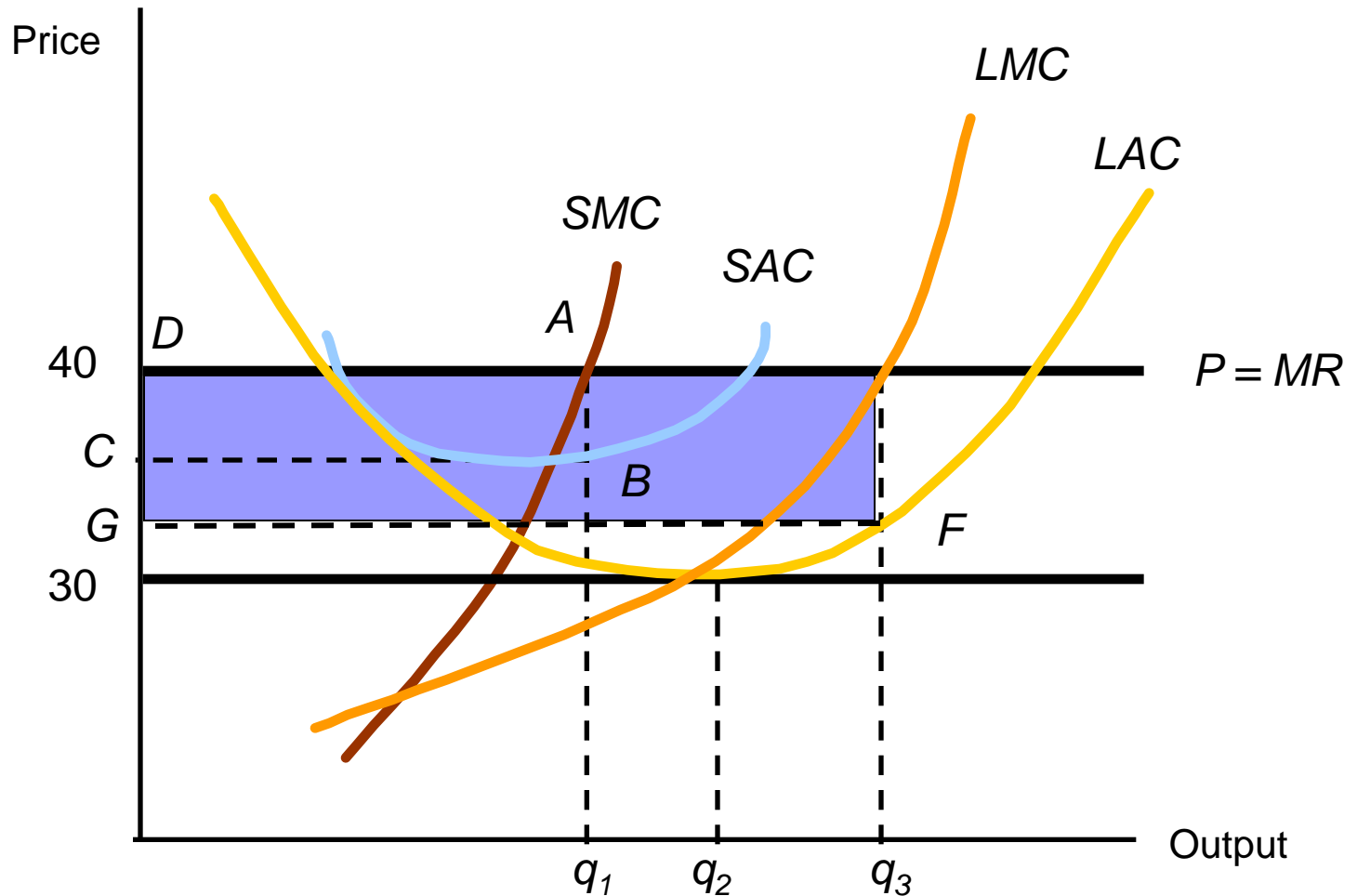
Choosing Output in the Long Run

- 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



Output Choice in the Long Run



Long-Run Competitive Equilibrium

- 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
- Need to relate accounting profit to economic profit

Long-run Competitive Equilibrium

- Accounting profit
 - ▣ Difference between firm's revenues and direct costs
- Economic profit
 - ▣ Difference between firm's revenues and direct and indirect costs
 - ▣ Takes into account opportunity costs

Long-run Competitive Equilibrium

- Firm uses labor (L) and capital (K) with purchased capital
- Accounting Profit & Economic Profit
 - ▣ Accounting profit: $\pi = R - wL$
 - ▣ Economic profit: $\pi = R - wL - rK$
 - wL = labor cost
 - rK = opportunity cost of capital

Long-run Competitive Equilibrium

□ 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

□ Zero Economic Profits

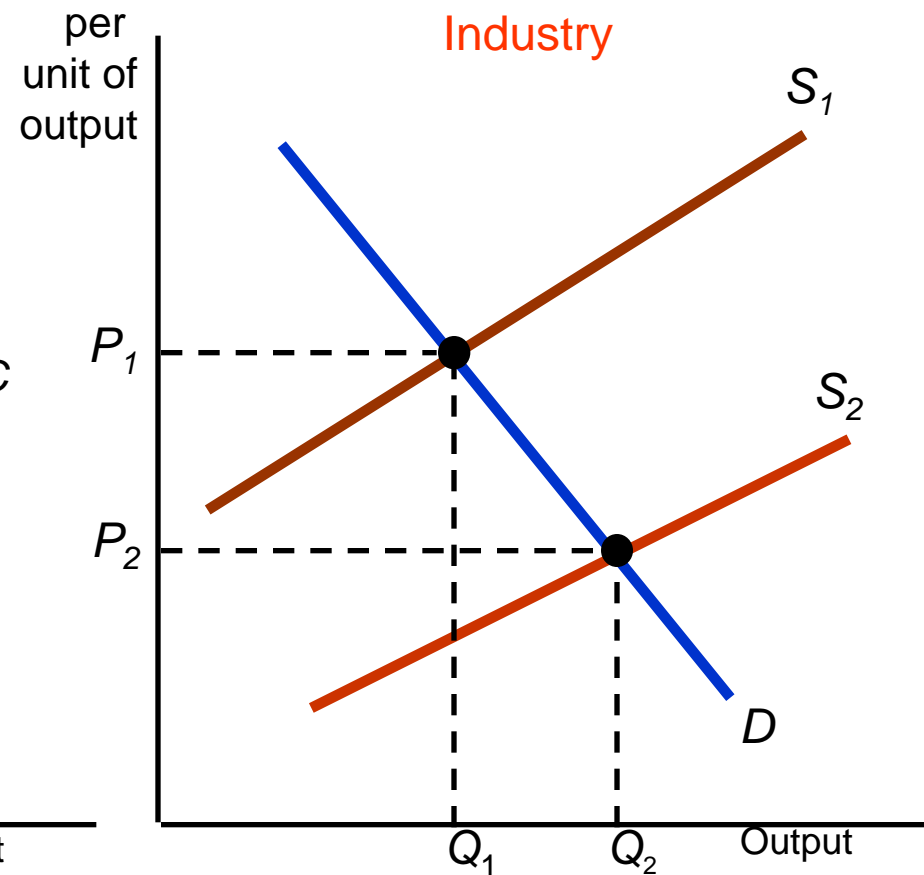
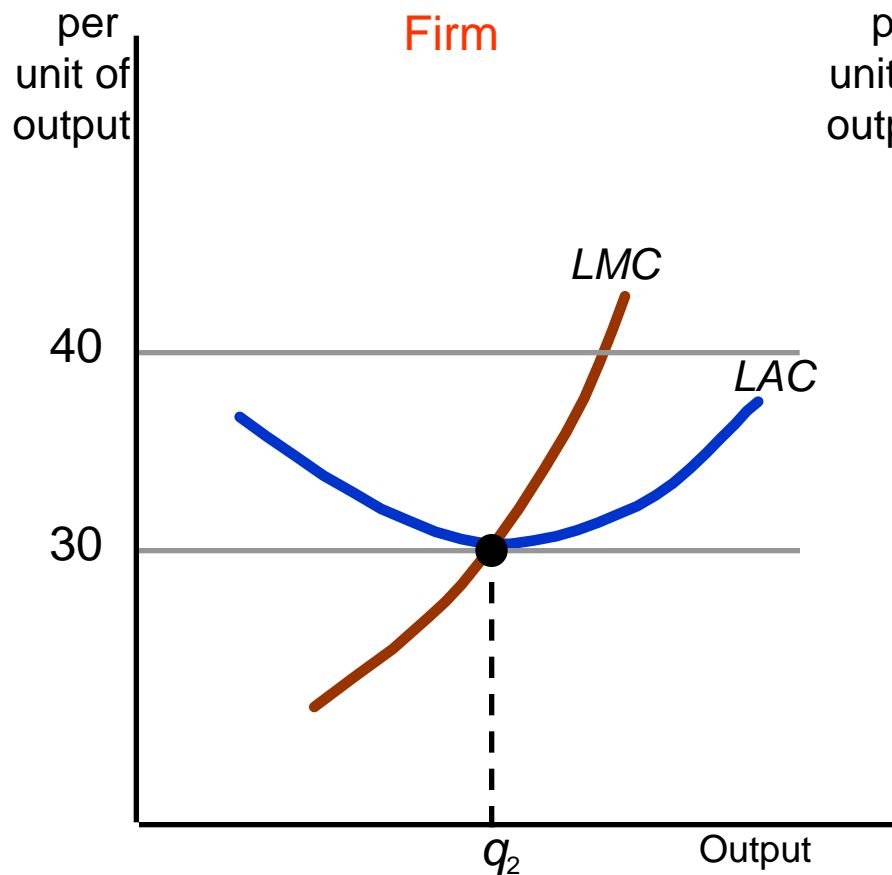
- If $R > wL + rk$, economic profits are positive
- If $R = wL + rk$, zero economic profits, but the firm is earning a normal rate of return; indicating the industry is competitive
- If $R < wL + rk$, consider going out of business

Long-run Competitive Equilibrium

□ Entry and Exit

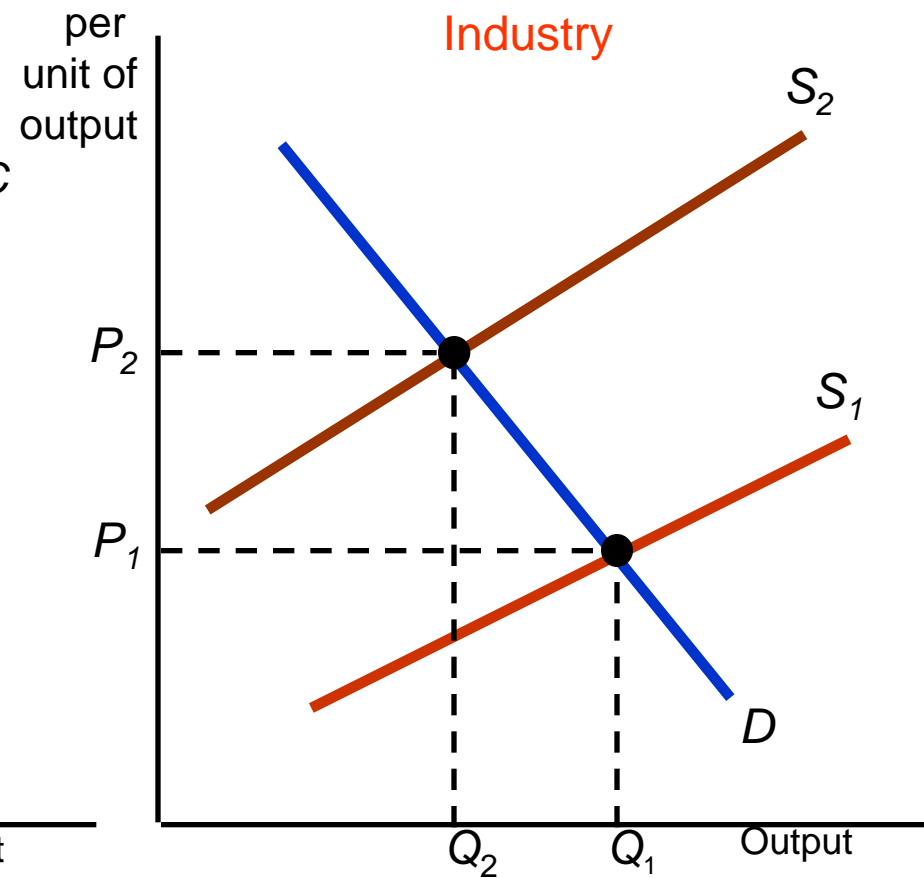
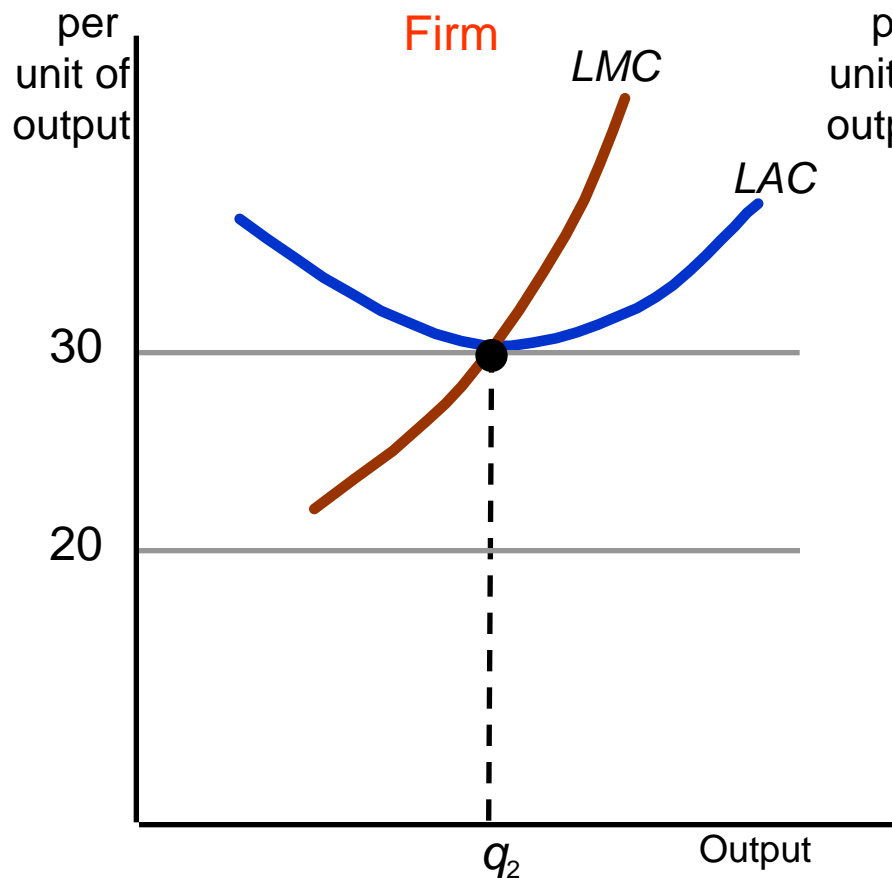
- The long-run response to short-run profits is to increase output and profits.
- Profits will attract other producers.
- More producers increase industry supply which lowers the market price.
- This continues until there are no more profits to be gained in the market – zero economic profits

Long-Run Competitive Equilibrium – Profits



Long-Run Competitive Equilibrium – Losses

- Losses cause firms to leave
- Supply decreases until profit = 0



Long-Run Competitive Equilibrium

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

Choosing Output in the Long Run

□ Economic Rent

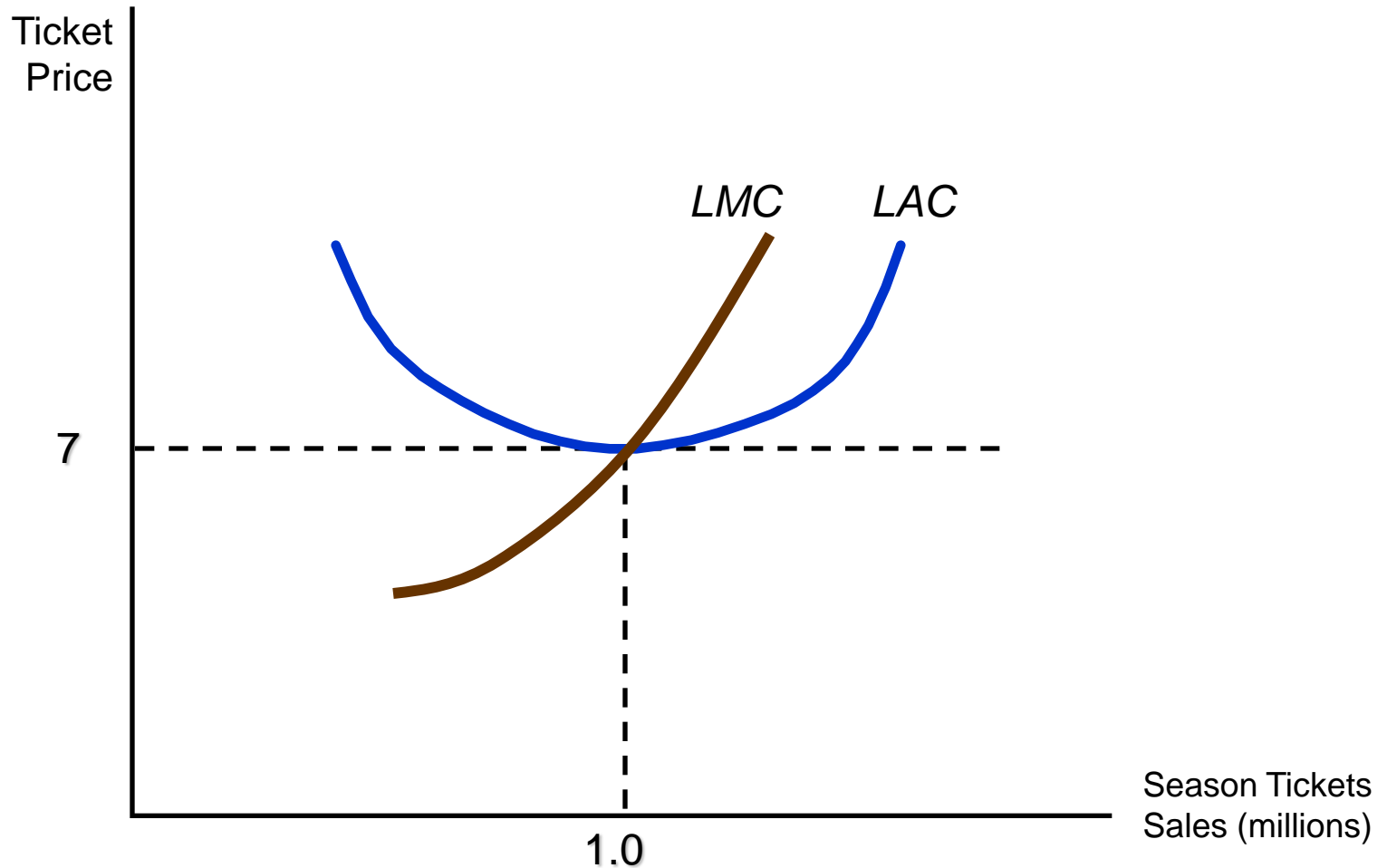
- The difference between what firms are willing to pay for an input less the minimum amount necessary to obtain it.
- When some have accounting profits are larger than others, still earn zero economic profits because of the willingness of other firms to use the factors of production that are in limited supply

Choosing Output in the Long Run

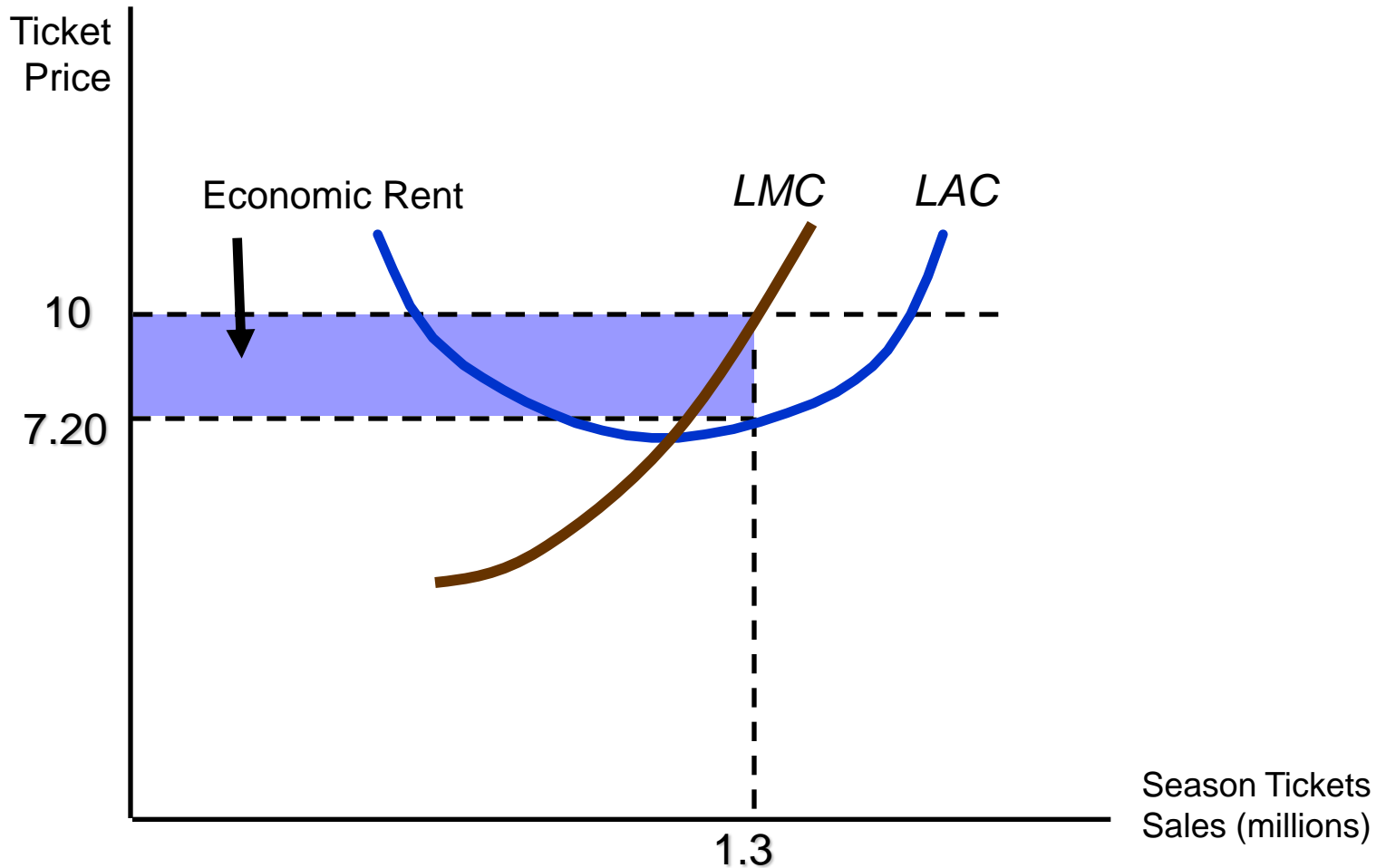
□ An Example

- Two firms A & B that both own their land
- A is located on a river which lowers A's shipping cost by 10,000 compared to B.
- The demand for A's river location will increase the price of A's land to $10,000 = \text{economic rent}$
- Although economic rent has increased, economic profit has become zero

Firms Earn Zero Profit in Long-Run Equilibrium



Firms Earn Zero Profit in Long-Run Equilibrium



Firms Earn Zero Profit in Long-Run Equilibrium

- With a fixed input such as a unique location, the difference between the cost of production ($LAC = 7$) and price (10) is the value or opportunity cost of the input (location) and represents the economic rent from the input.

Firms Earn Zero Profit in Long-Run Equilibrium

- If the opportunity cost of the input (rent) is not taken into consideration it may appear that economic profits exist in the long-run.

The Industry's Long-Run Supply Curve

- The shape of the long-run supply curve depends on the extent to which changes in industry output affect the prices the firms must pay for inputs.

The Industry's Long-Run Supply Curve

- Assume
 - ▣ All firms have access to the available production technology
 - ▣ Output is increased by using more inputs, not by invention
 - ▣ The market for inputs does not change with expansions and contractions of the industry.

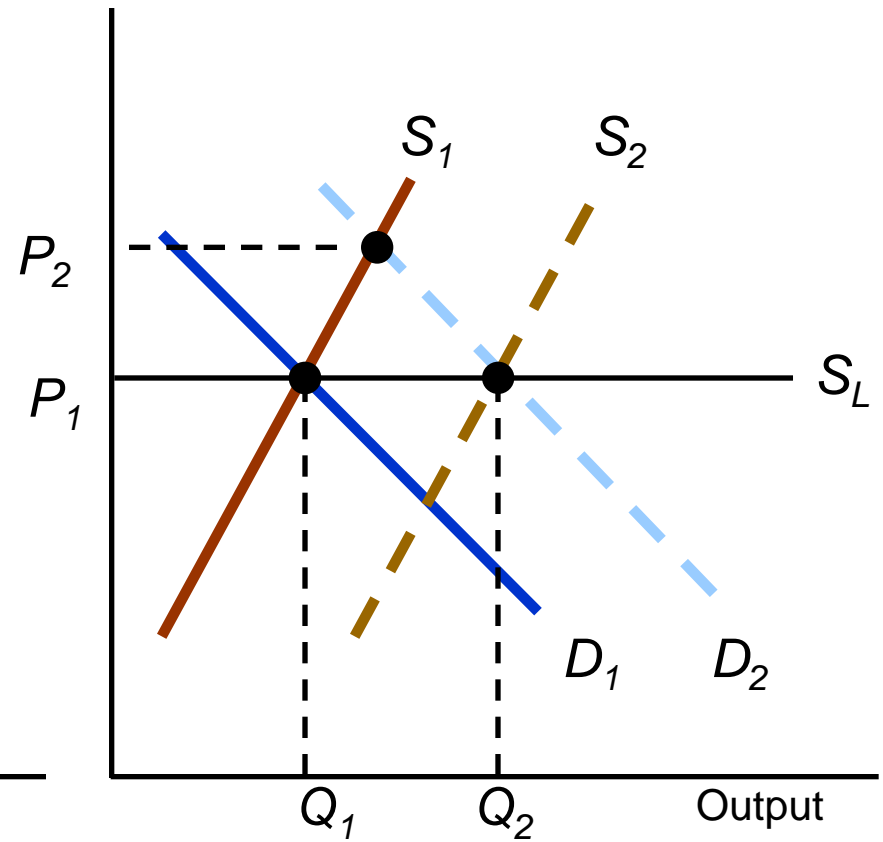
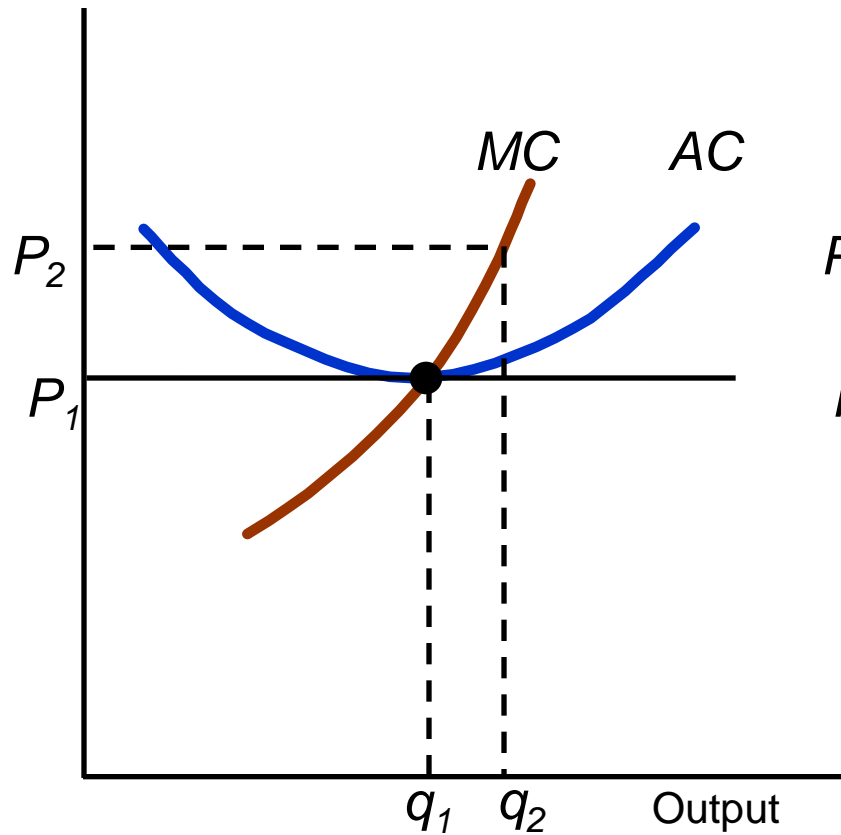
The Industry's Long-Run Supply Curve

- To analyze long-run industry supply, will need to distinguish between three different types of industries
 1. Constant-Cost
 2. Increasing-Cost
 3. Decreasing-Cost

Constant-Cost Industry

- Industry whose long-run supply curve is horizontal
- Assume a firm is initially in equilibrium
 - ▣ Demand increases causing price to increase
 - ▣ Individual firms increase supply
 - ▣ Causes firms to earn positive profits in short-run
 - ▣ Supply increases causing market price to decrease
 - ▣ Long run equilibrium – zero economic profits

Constant-Cost Industry



Long-Run Supply in a Constant-Cost Industry

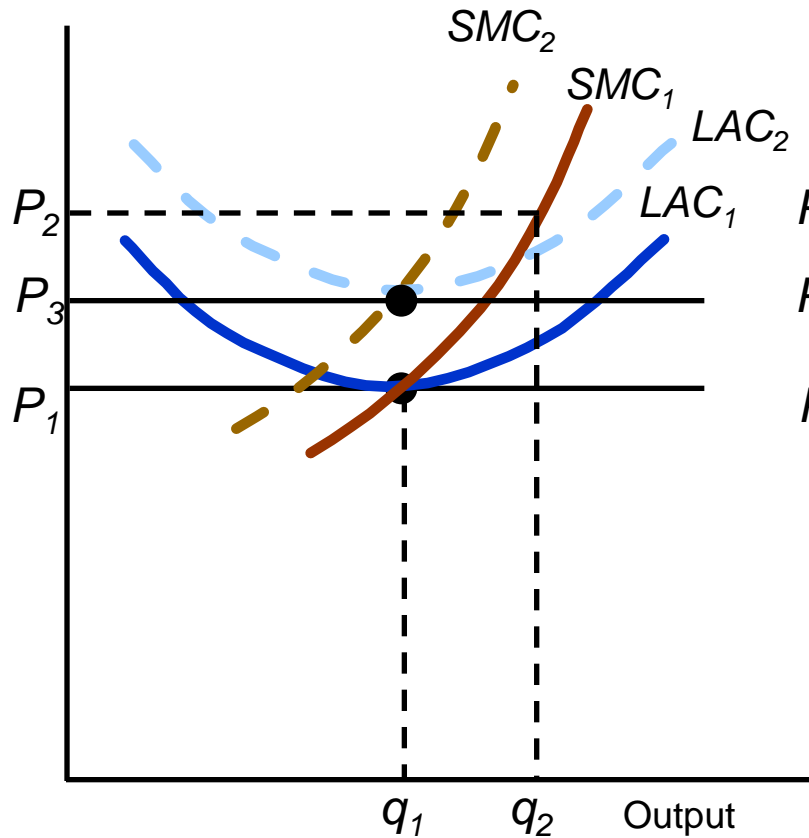
- Price of inputs does not change
 - ▣ Firms cost curves do not change
- In a constant-cost industry, long-run supply is a horizontal line at a price that is equal to the minimum average cost of production.

Increasing-Cost Industry

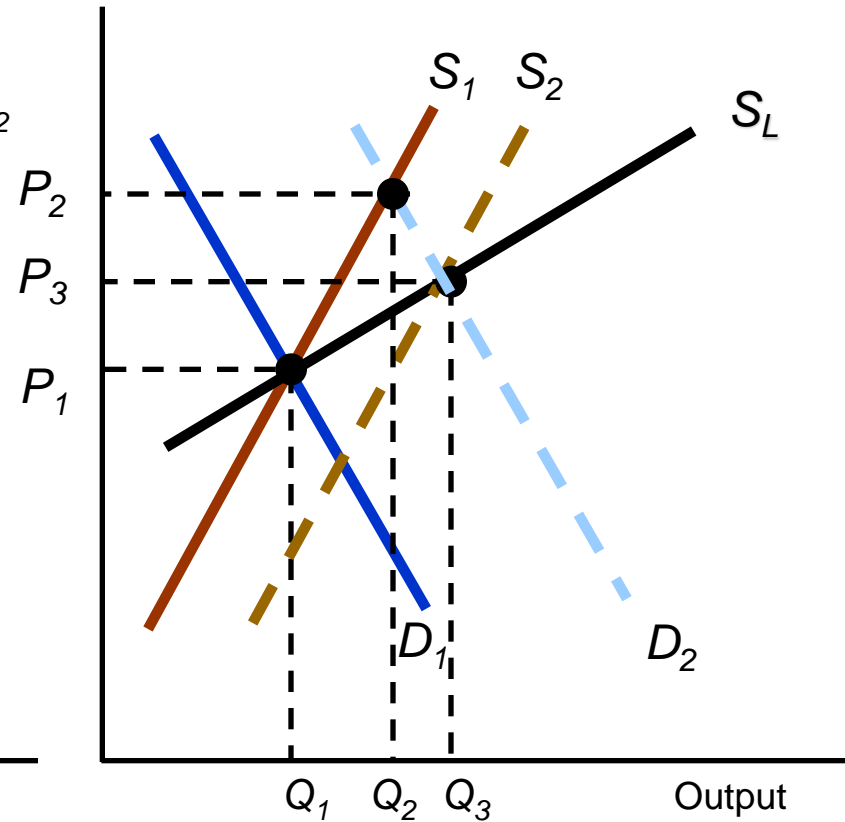
- Prices of some or all inputs rises as production is expanded when demand of inputs increases
- When demand increases causing prices to increase and production to increase
 - ▣ Firms enter the market increasing demand for inputs
 - ▣ Costs increase causing an upward shift in supply curves
 - ▣ Market supply increases but not as much

Long-run Supply in an Increasing-Cost Industry

Due to the increase in input prices, long-run equilibrium occurs at a higher price.



Long Run Supply is upward Sloping



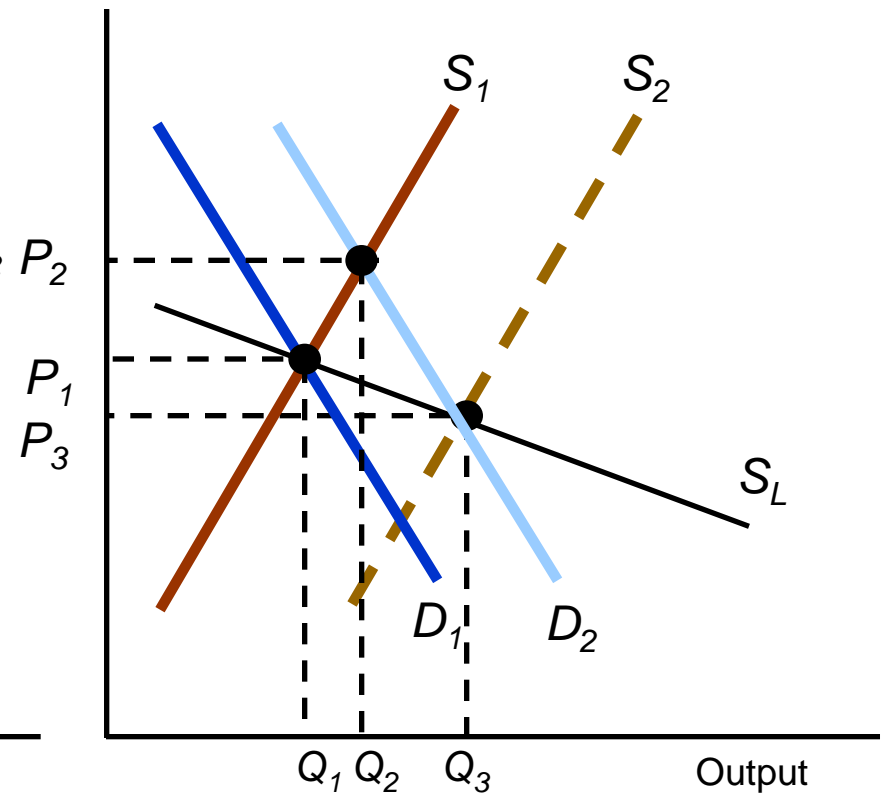
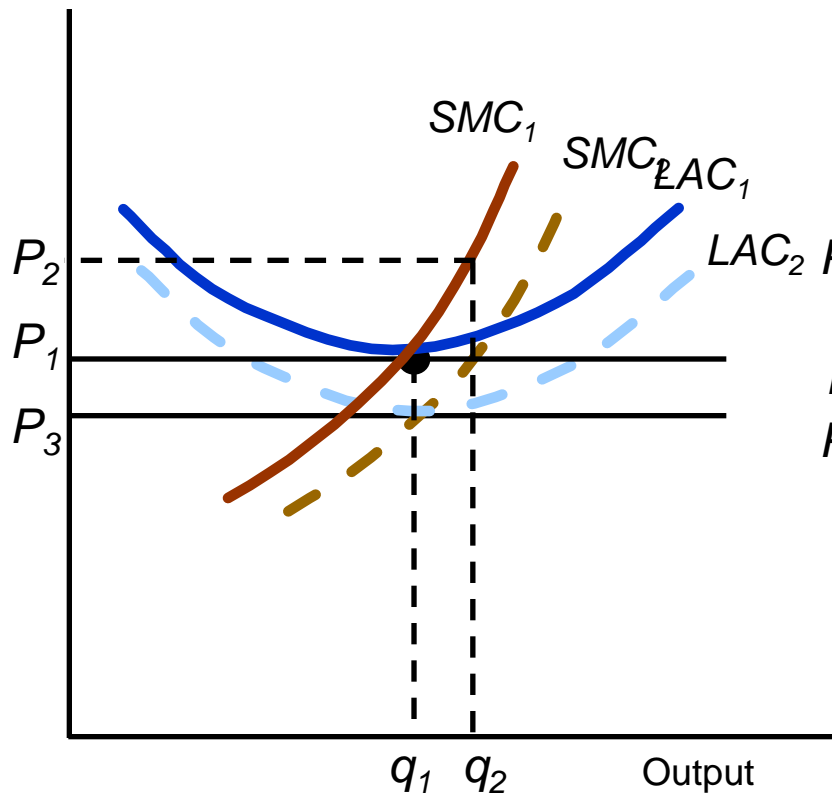
Long-Run Supply in a Increasing-Cost Industry

- In an increasing-cost industry, long-run supply curve is upward sloping.
- More output is produced, but only at the higher price needed to compete for the increased input costs

Decreasing-Cost Industry

- Industry whose long-run supply curve is downward sloping
- Increase in demand causes production to increase
 - ▣ Increase in size allows firm to take advantage of size to get inputs cheaper
 - ▣ Increased production may lead to better efficiencies or quantity discounts
 - ▣ Costs shift down and market price falls

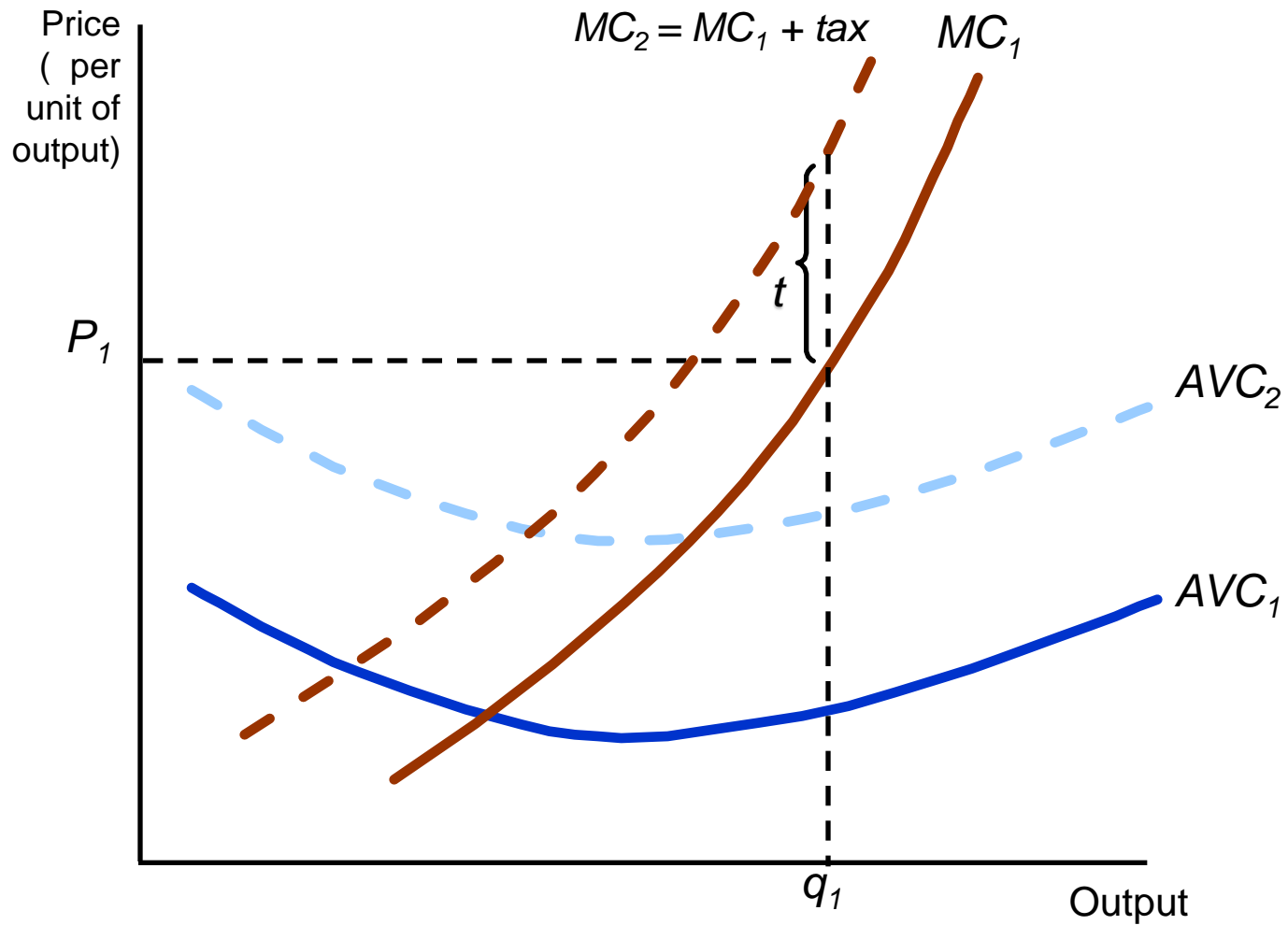
Long-run Supply in a Decreasing-Cost Industry



The Industry's Long-Run Supply Curve

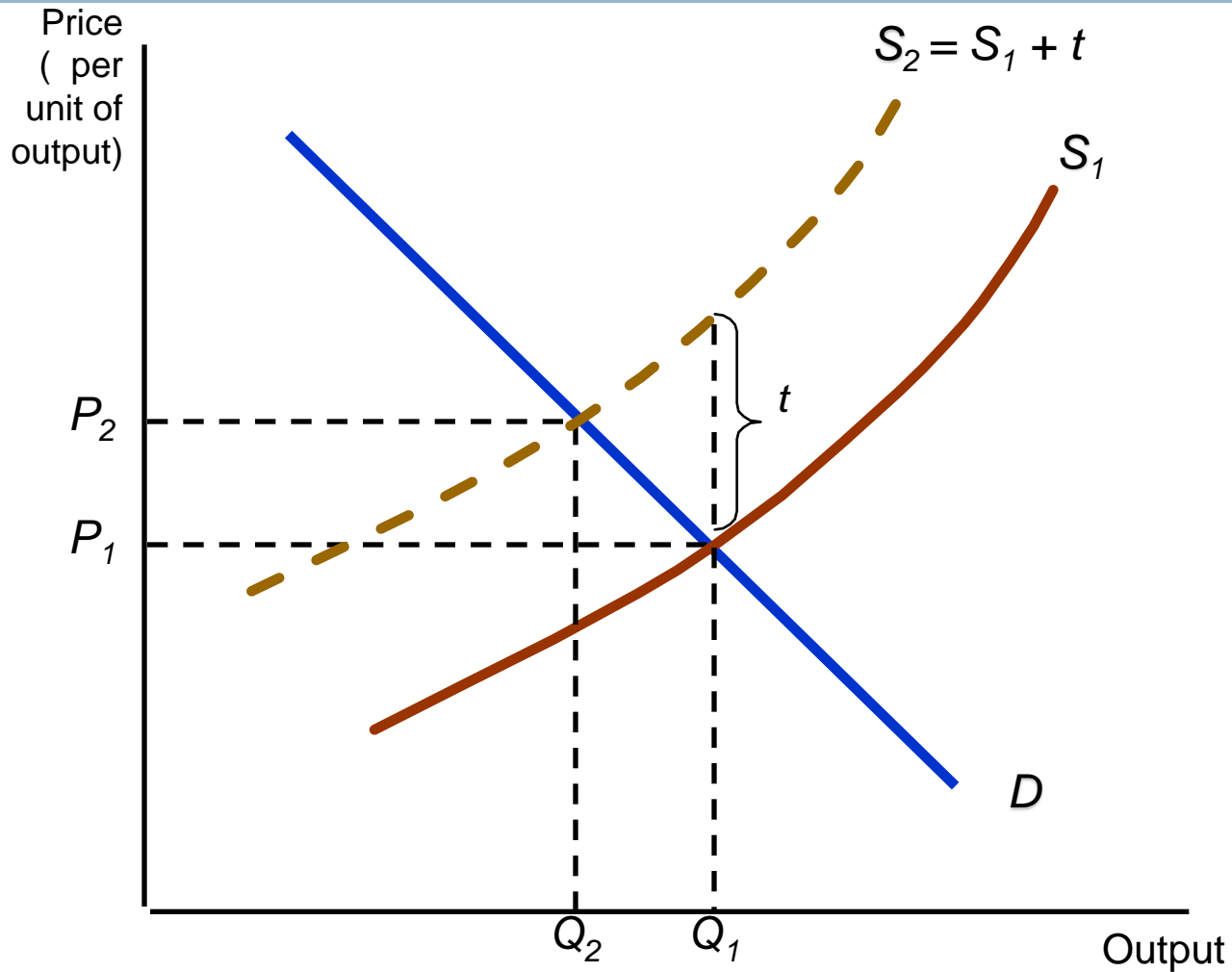
- The Effects of a Tax
 - ▣ In an earlier chapter we studied how firms respond to taxes on an input.
 - ▣ Now, we will consider how a firm responds to a tax on its output.

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



Effect of an Output

Tax on Industry Output



Long-Run Elasticity of Supply

1. Constant-cost industry
 - ▣ Long-run supply is horizontal
 - ▣ Small increase in price will induce an extremely large output increase
 - ▣ Long-run supply elasticity is infinitely large
 - ▣ Inputs would be readily available

Long-Run Elasticity of Supply

2. Increasing-cost industry

- ▣ Long-run supply is upward-sloping and elasticity is positive
- ▣ The slope (elasticity) will depend on the rate of increase in input cost
- ▣ Long-run elasticity will generally be greater than short-run elasticity of supply