LECTURE 11
PERFECT COMPETITION IN THE LONG RUN

Where are we?

- Firm's supply curve in the short run
  - Profit-maximizing *Q* in the short run as a function of market price
- Short-run market supply curve
- Short-run equilibrium
- Firm's supply curve in the long run
  - Profit-maximizing *Q* in the long run as a function of market price
- Long-run equilibrium
- Long-run market supply curve
- Economic Rent

Part 1

Long-Run Equilibrium

Long-Run Decisions

- Production
  - If the firm stays in the industry or if the potential entrant enters the industry, what is the optimal output level?
- Entry
  - Potential entrants decide whether to enter the market by starting new firms
- Exit
  - Existing firms decide whether to completely withdraw capacity

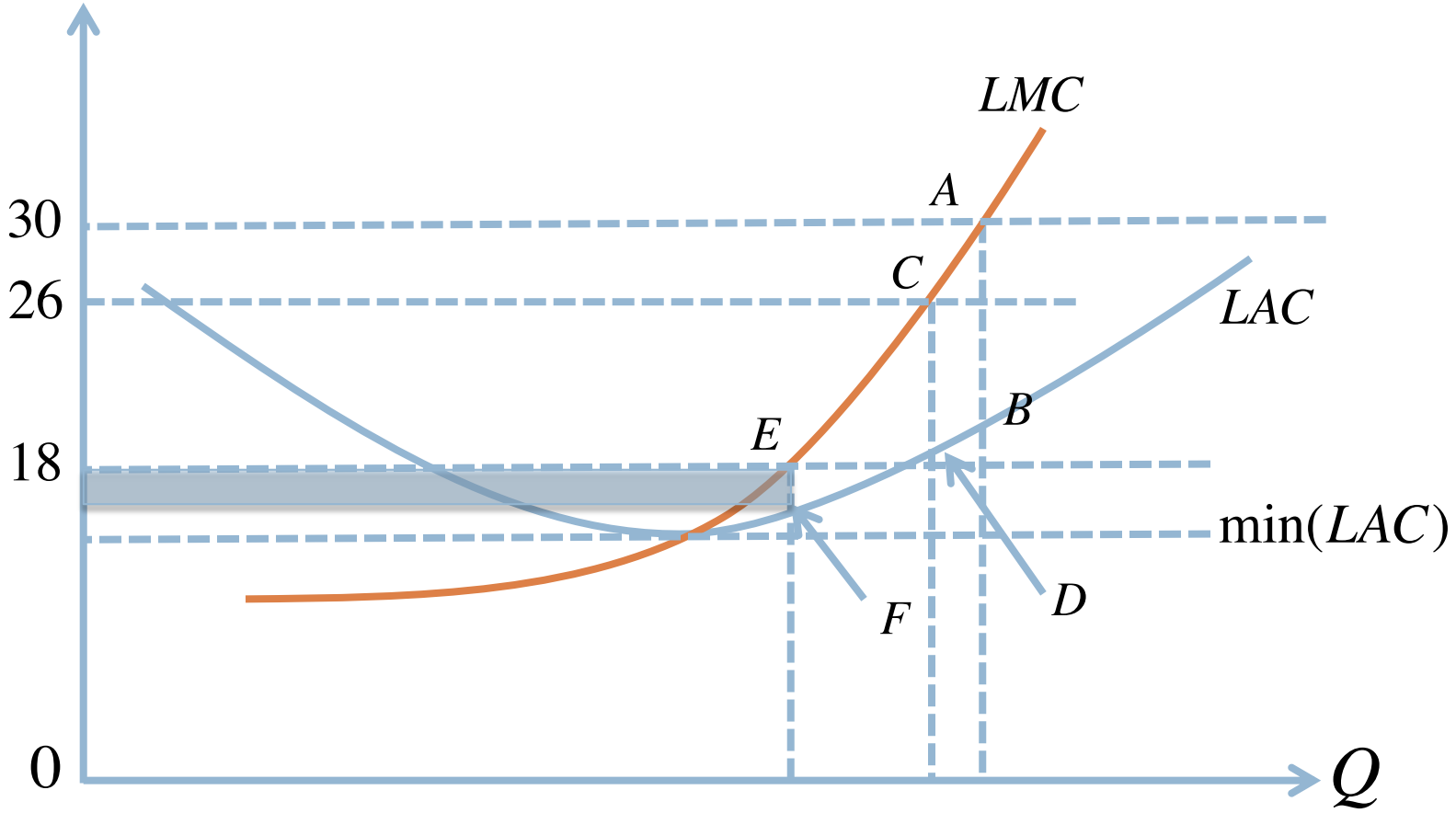
Profit-Maximizing Condition: Marginal Revenue Equals Long-Run Marginal Cost

- Long-run profit maximizing output choice is
  - $MR=P=LMC$
  - LMC is not downward sloping
- If $P>LMC$
  - Producing too little
  - Adjust both K and L to increase Q
- If $P<LMC$
  - Producing too much
  - Adjust both K and L to decrease Q

Individual Firm: Incentive for Entry

- If market price is such that
  - If enters, the firm can make positive profit
  - There is incentive for entry
- When are firms making positive profit?
  - When *TR>LTC*
  - Or equivalently when *P>LAC*
  - But can we say more?

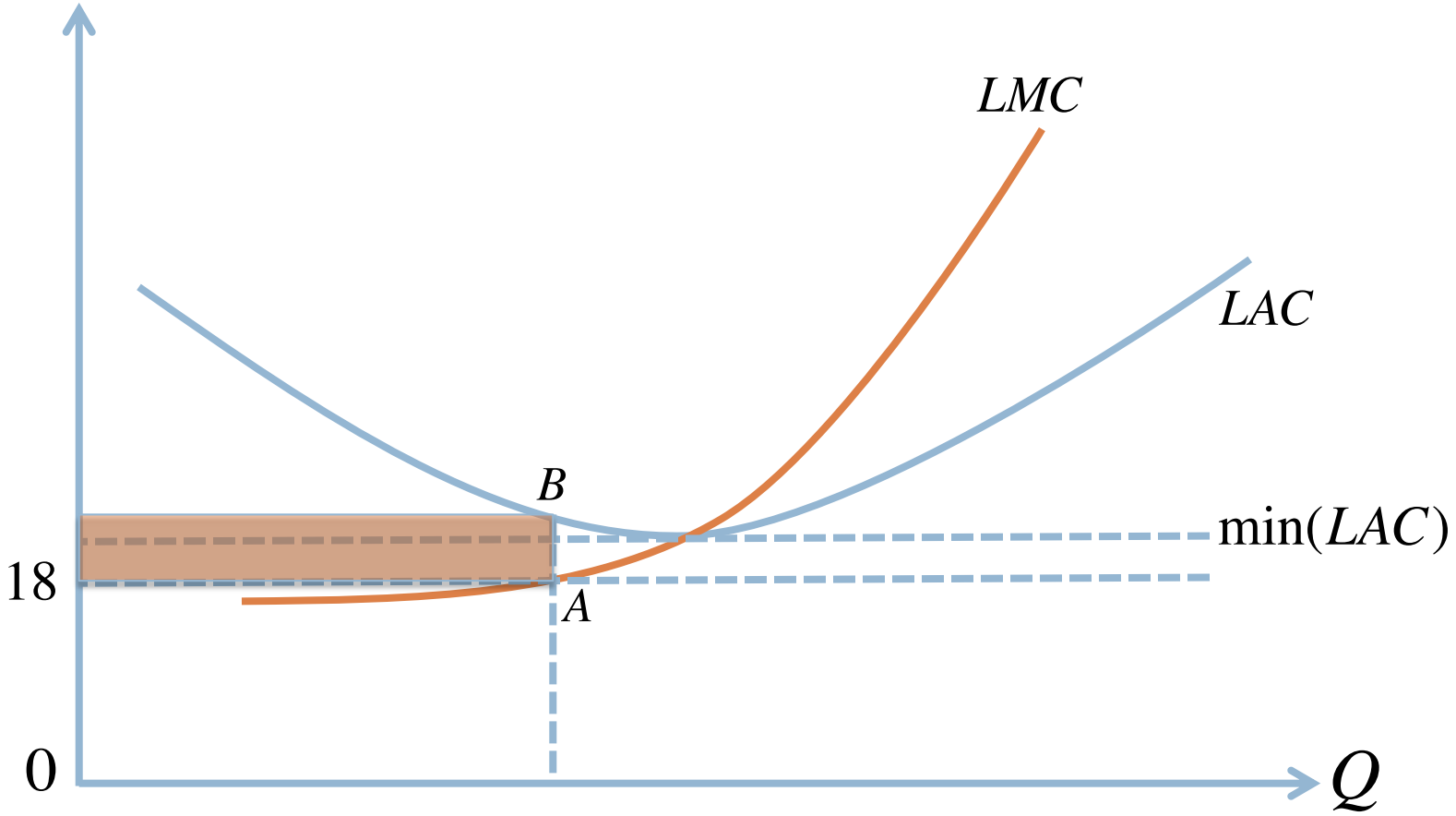
Incentive for Entry: *P*>min(*LAC*)



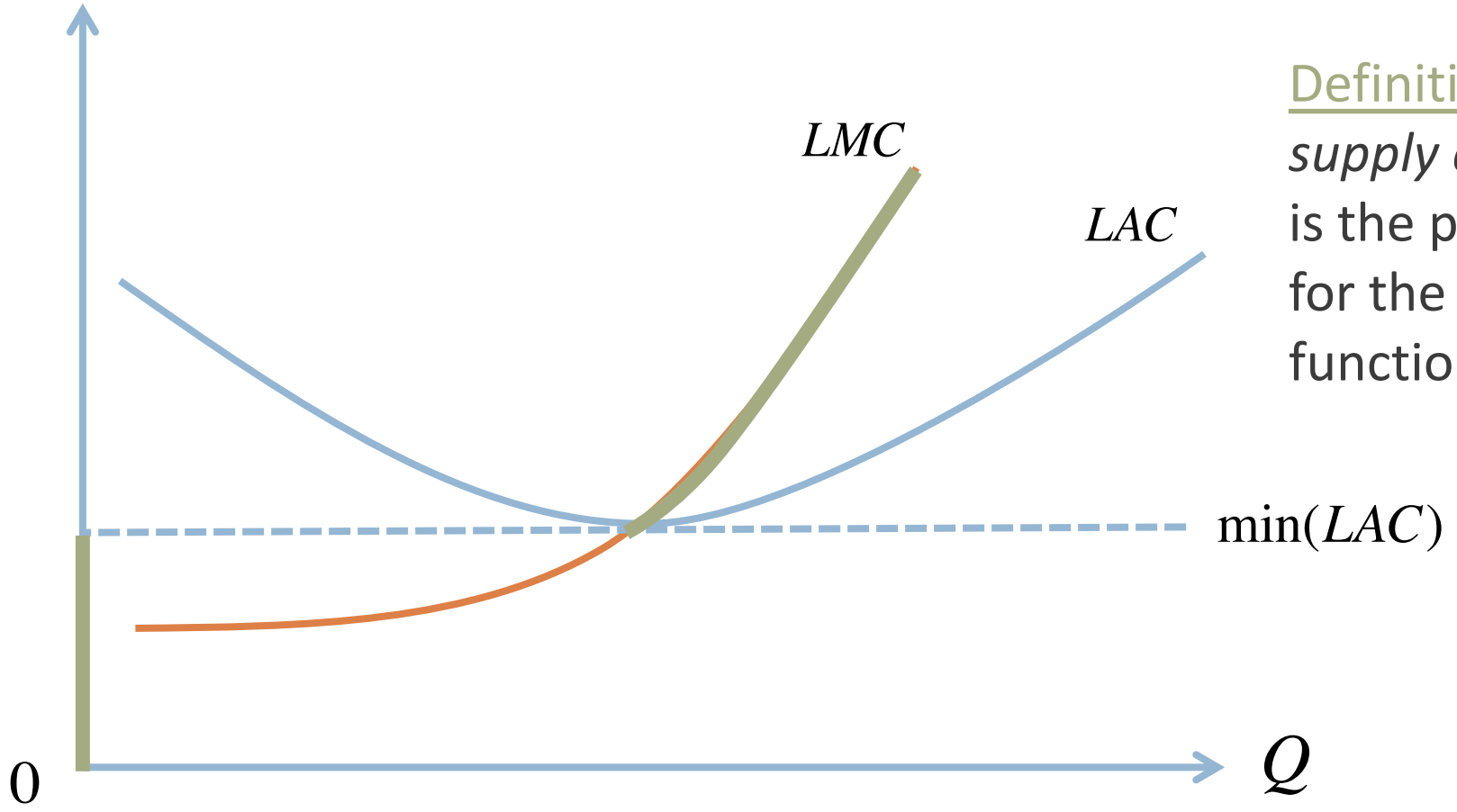
Individual Firm: Incentive for Exit

- If market price is such that
  - Existing firms are making negative profit
  - There is incentive for exit
- When are existing firms making negative profit?

Incentive for Exit: $P<\min(LAC)$



Individual Firm's Long-Run Supply Curve



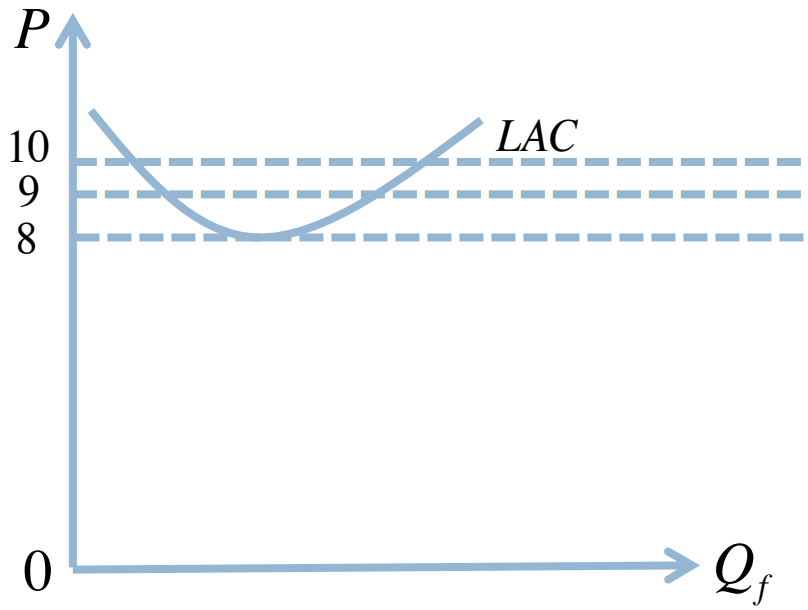
Definition 11.1 The *long-run supply curve for an individual firm* is the profit-maximizing quantity for the firm in the long run as a function of the market price

Market: Entry, Supply Curve, and Price

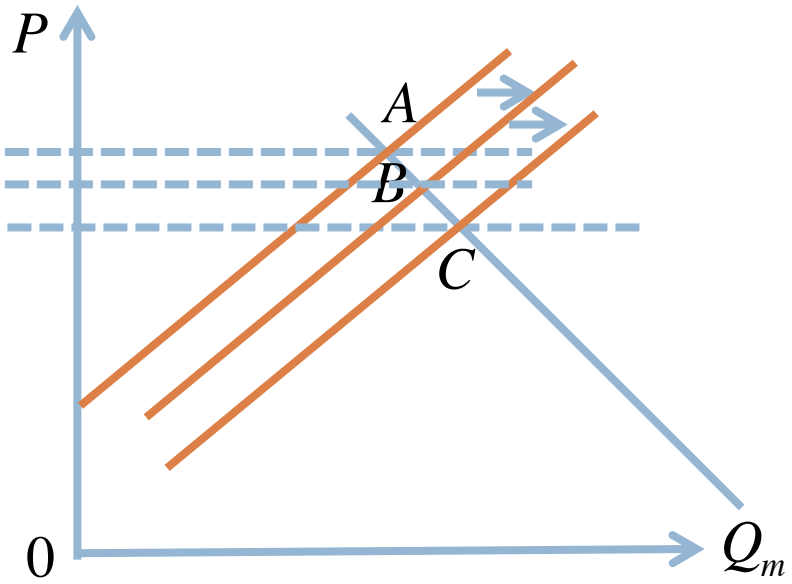
- Assume all firms are identical
- What happens when new firms start to enter the market?
- More firms in the market
- Short-run market supply curve will shift to the right
- Market price will

Entry stops when *P*=min(*LAC*)

Typical Firm's Cost and Supply



Market Supply and Demand

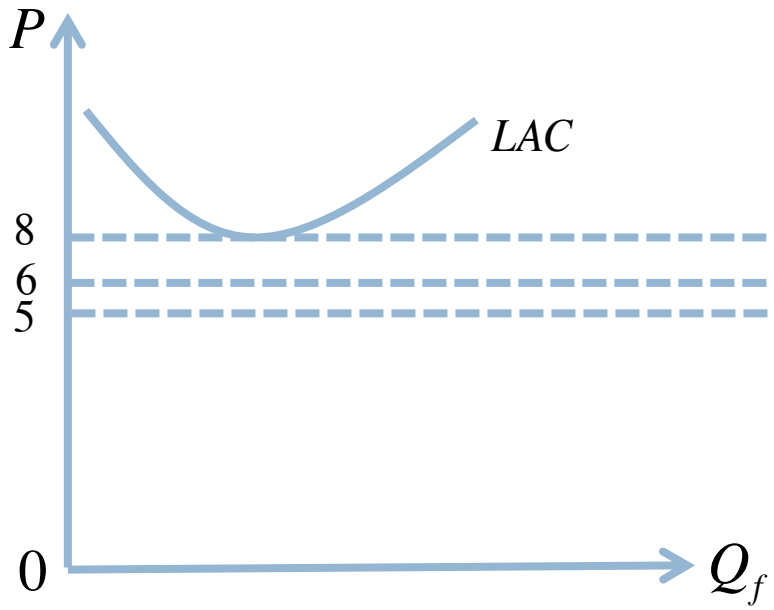


Market: Exit, Supply Curve, and Price

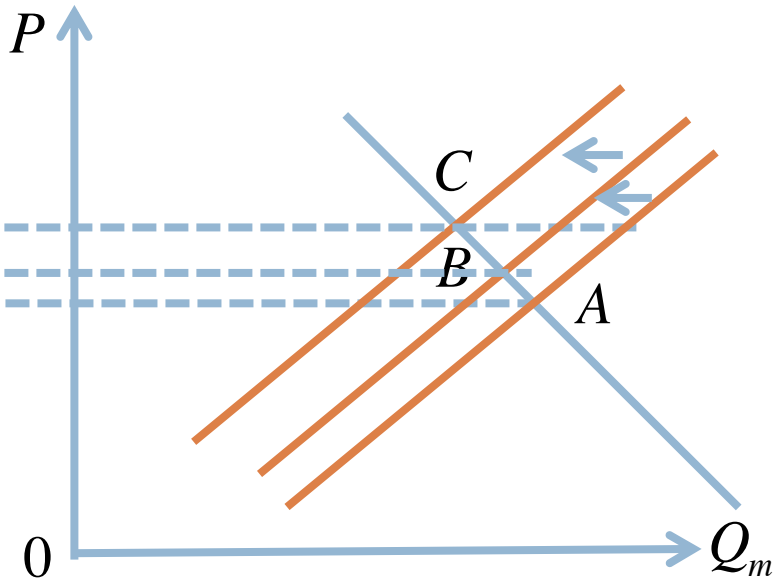
- What happens when existing firms start to exit the market?
- Fewer firms in the market
- Short-run market supply curve will shift to the left
- Market price will

Exit stops when *P*=min(*LAC*)

Typical Firm's Cost and Supply



Market Supply and Demand



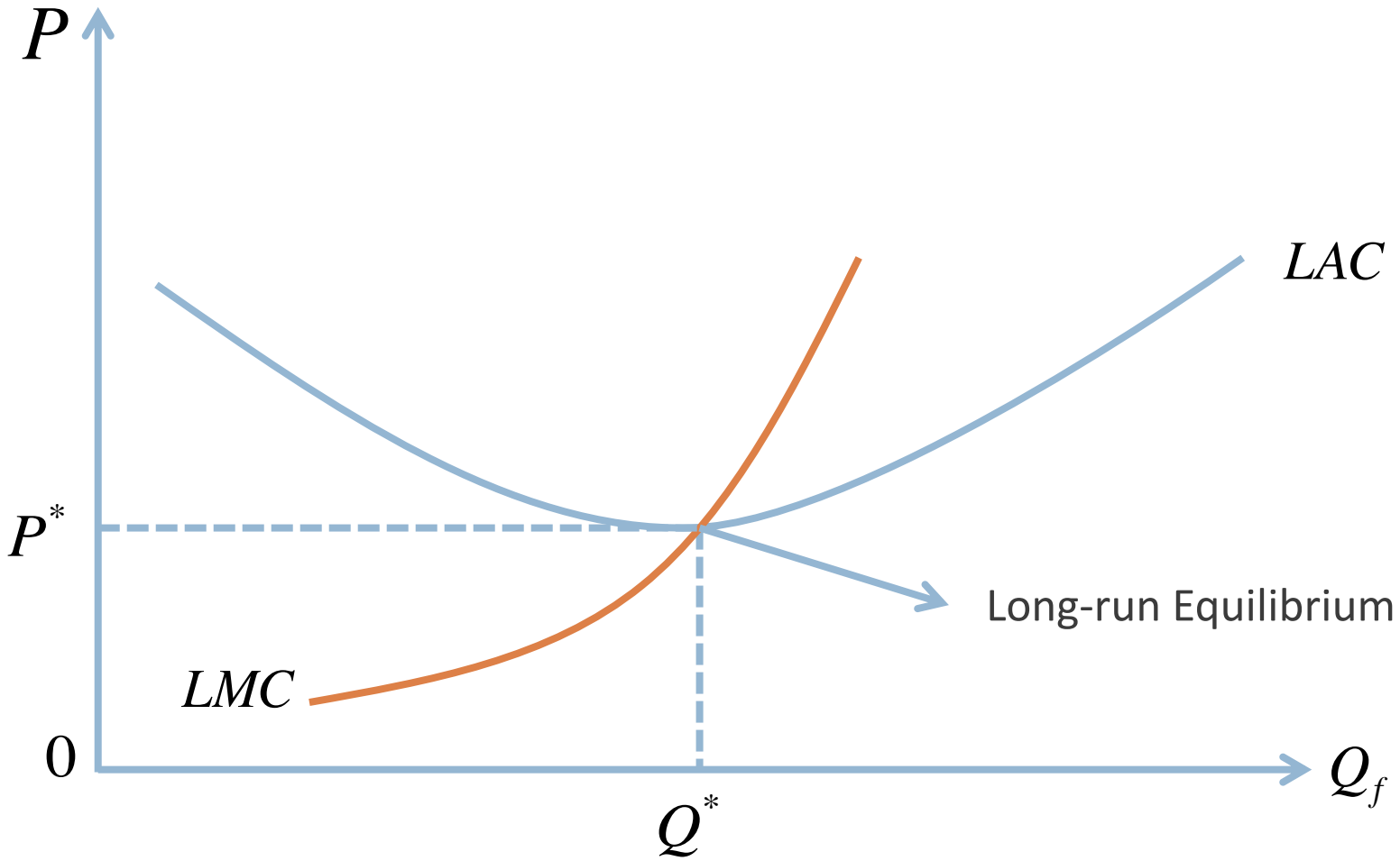
Long-Run Equilibrium

- Definition 11.2 At the *long-run equilibrium* in a competitive market
  - No existing firm has an incentive to exit the market
  - No potential entrant has an incentive to enter the market
  - Total quantity demanded equals total quantity supplied
  - Each firm produces at the profit-maximizing output level given the equilibrium price
  - Each consumer buys the utility-maximizing quantity given the equilibrium price

Implication of Long-Run Equilibrium

- No incentive to enter
  - $P<=\min(LAC)$
- No incentive to exit
  - $P>=\min(LAC)$
- Long-run equilibrium price
  - $P^*=\min(LAC)$
- Long-run equilibrium output for each firm
  - $P^*=LMC(Q^*)=\min(LAC)=LAC(Q^*)$
- Long-run equilibrium profit for each firm
  - $[P^*-LAC(Q^*)]Q^*=0$!

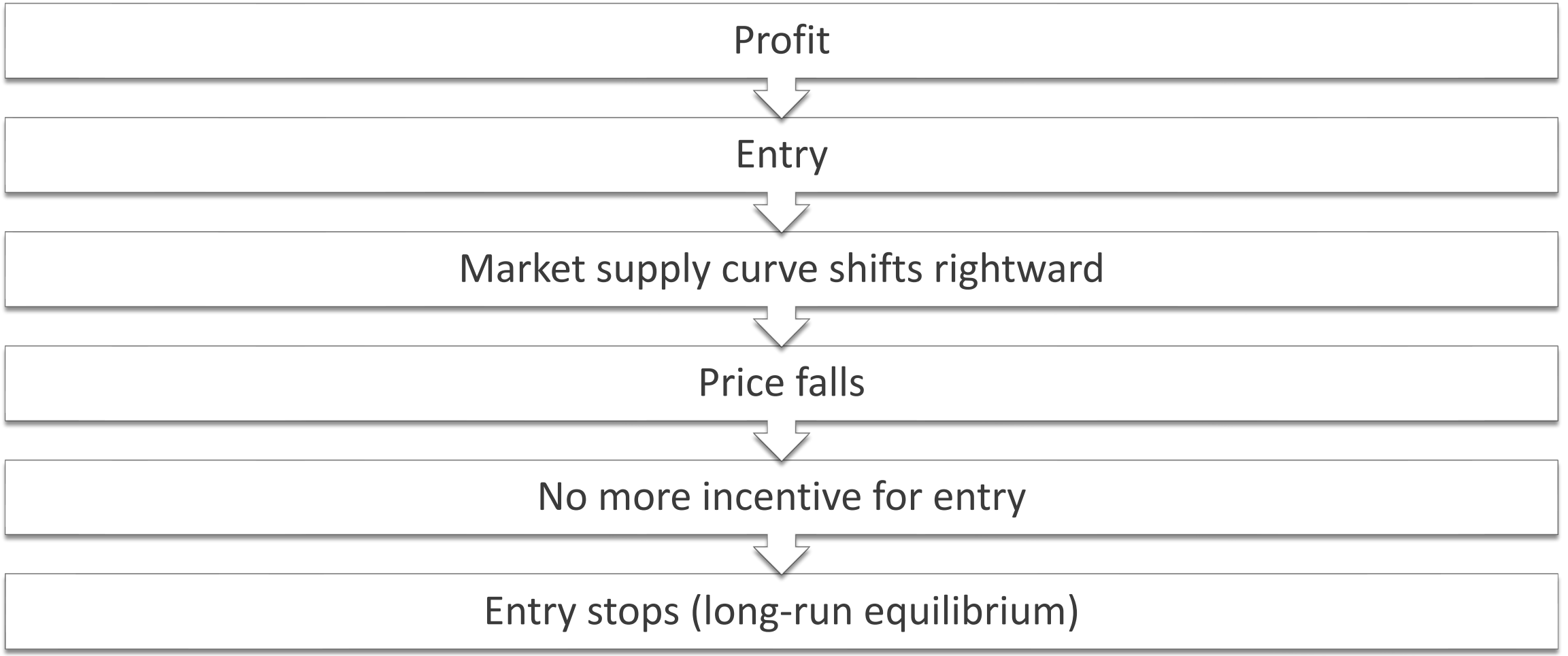
Long-run Equilibrium in Graph



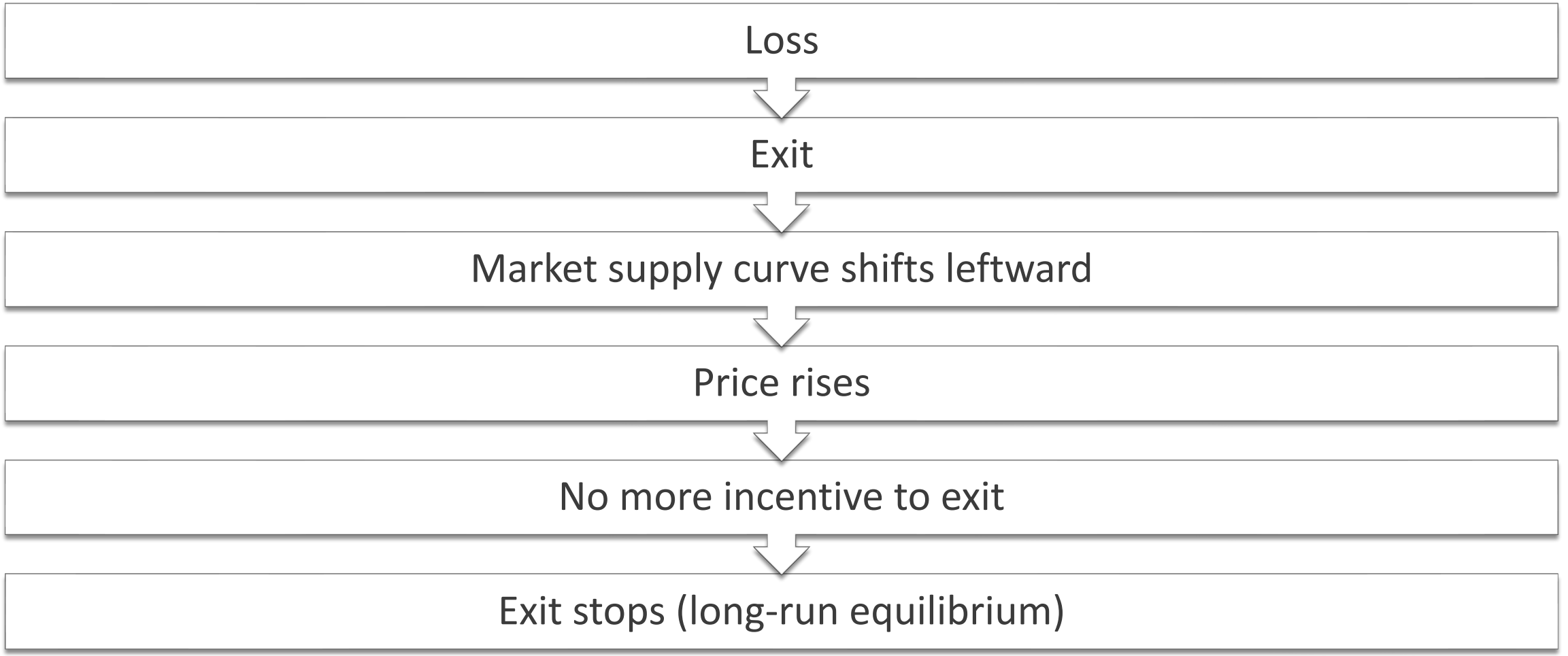
Number of Firms in Equilibrium

- Number of firms is not fixed in the long run
  - Entry and exit are possible
- Number of firms in the long-run equilibrium can be determined
  - Suppose the long-run equilibrium price is 10
  - Given this price, each firm produces 5 units
  - Given this price, the total quantity demanded in the market is 80
  - There are 80/5=16 firms in the long-run equilibrium

Long-Run Dynamic: Entry



Long-Run Dynamic: Exit



Economic Profit: An Example

- Suppose you own and run a small software development firm
- Last year your total revenue=$400,000
- Your incurred a cost of $250,000 for
  - wages paid to workers, supplies, rents, utilities, and etc.
- The amount of money you made is
  - $400,000-$250,00=$150,000

Economic Profit: An Example Cont'

- Your best alternative is to work for Google for $150,000 per year
- Your total economic cost is
  - $250,000+$150,000=$400,000
- Your economic profit is
  - $400,000-$400,000=$0
- By operating your own firm, you are making the same amount of money as you could have made had you worked for Google

How to interpret economic profit?

- Zero economic profit
  - All resources (entrepreneur's time, assets, capital) are getting a return equivalent to the best returns they could get elsewhere
- Positive economic profit
  - The business is delivering returns above and beyond the returns from the best alternative
- Negative economic profit
  - The resources could be used somewhere else to generate higher returns

What does long-run equilibrium tell us?

- In long-run equilibrium all firms earn zero profit
- Free entry and exit eventually drives profit down to 0
  - Economic profit will not last in perfectly competitive market
- But market is not always in long-run equilibrium!
  - Positive profit is possible if the market is not in a long-run equilibrium

Part 2

Long-Run Market Supply Curve

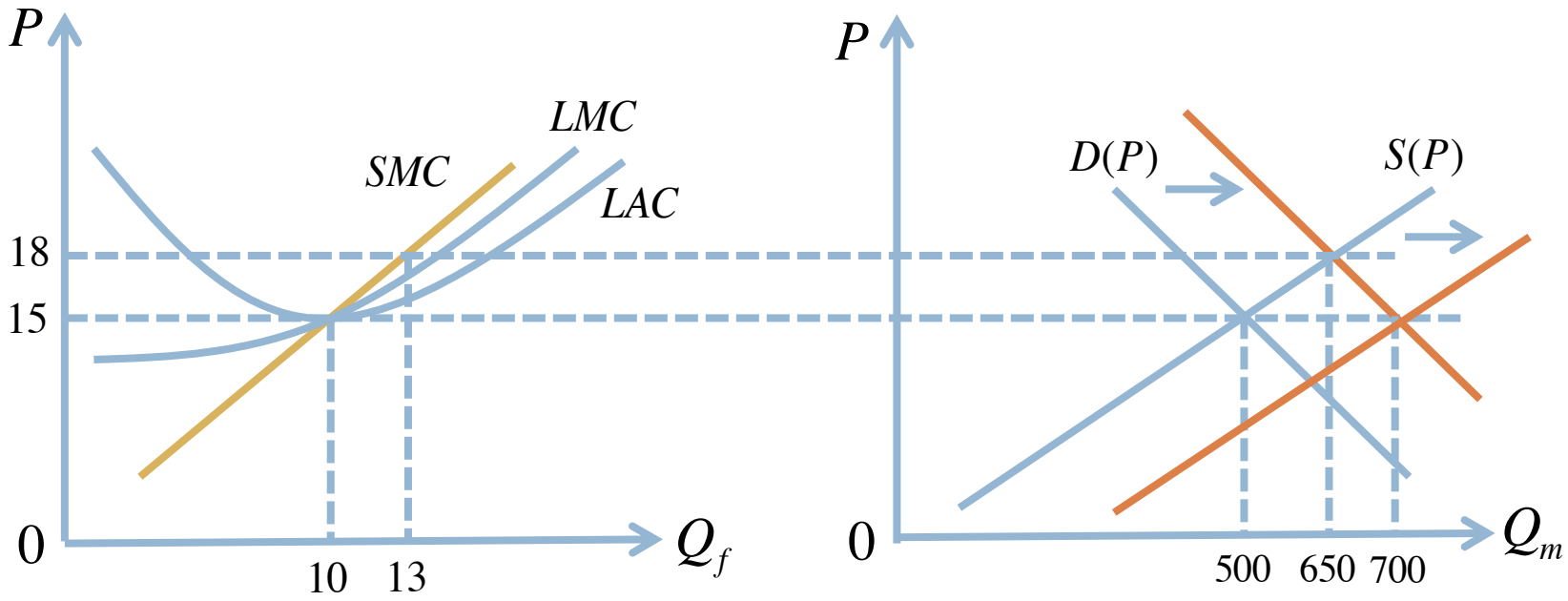
Input Prices in the Long Run

- Definition 11.3 *Constant-cost industry*
  - Changes in industry output does not affect input prices in the long run
- Definition 11.4 *Increasing-cost industry*
  - Increase in industry output causes the prices of inputs to rise in the long run
  - Decrease in industry output causes the prices of inputs to drop in the long run
- Definition 11.5 *Decreasing-cost industry*
  - Increase in industry output causes the prices of inputs to drop in the long run
  - Decrease in industry output causes the prices of inputs to rise in the long run

Constant-Cost Industry: What happens when demand increases?

Typical Firm's Cost and Supply

Market Equilibrium with 50 identical firms at the initial equilibrium



Equilibrium price increases in the short run but goes back to the same level in the long run

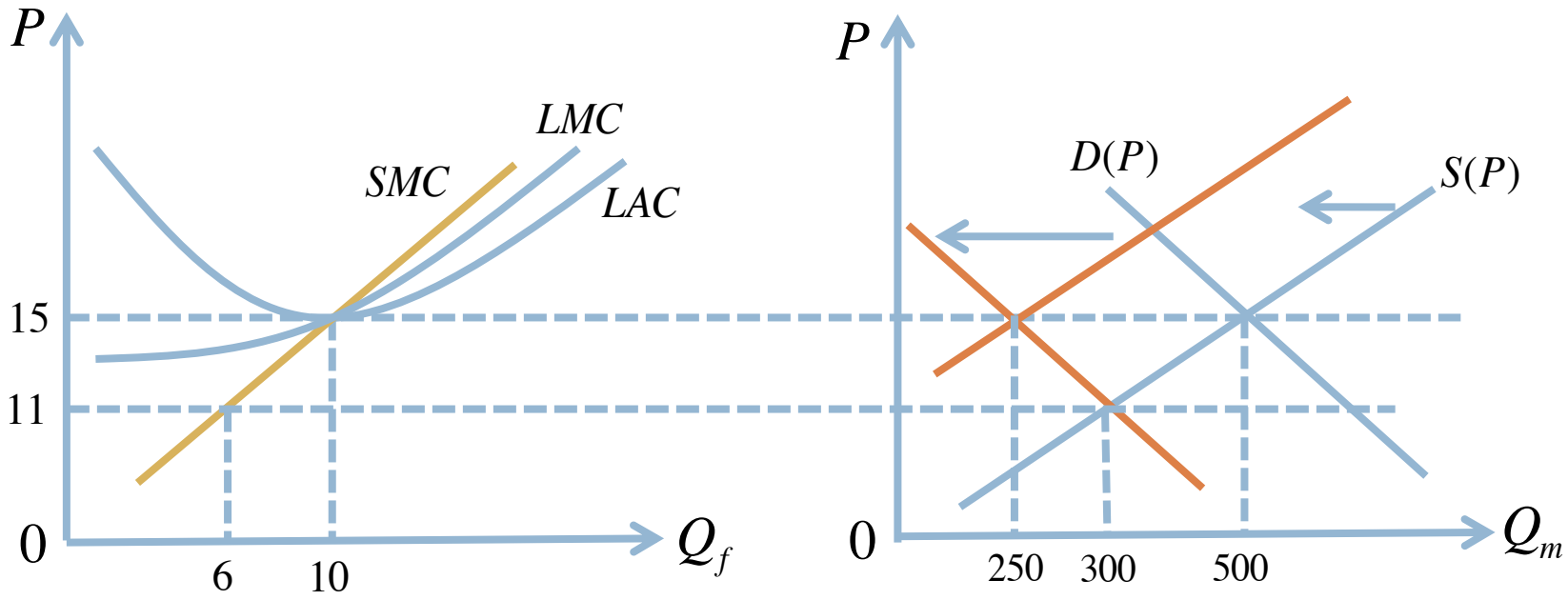
Constant-Cost Industry: Price and Quantity Dynamics after Permanent Increase in Demand

	Before demand increase	After demand increase	
	Long-run equilibrium	Short-run equilibrium	Long-run equilibrium
Price	15	18	15
Total quantity	500	650	700
Each firm's output	10	13	10
Number of firms	50	50	70

Constant-Cost Industry: What happens when demand decreases?

Typical Firm's Cost and Supply

Market Equilibrium with 50 identical firms at the initial equilibrium



Equilibrium price decreases in the short run but goes back to the same level in the long run

Constant-Cost Industry: Price and Quantity Dynamics after Permanent Decrease in Demand

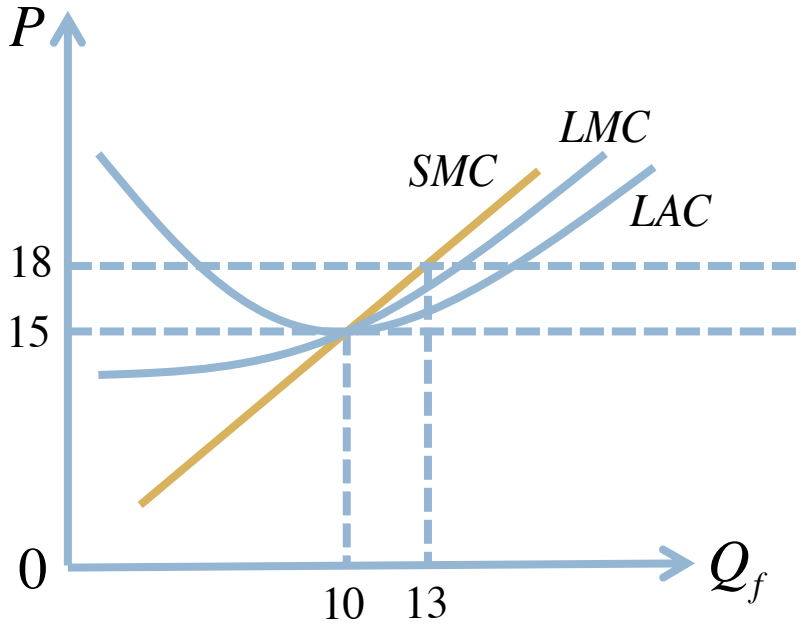
	Before demand decrease	After demand decrease	
	Long-run equilibrium	Short-run equilibrium	Long-run equilibrium
Price	15	11	15
Total quantity	500	300	250
Each firm's output	10	6	10
Number of firms	50	50	25

What is the long-run market supply curve?

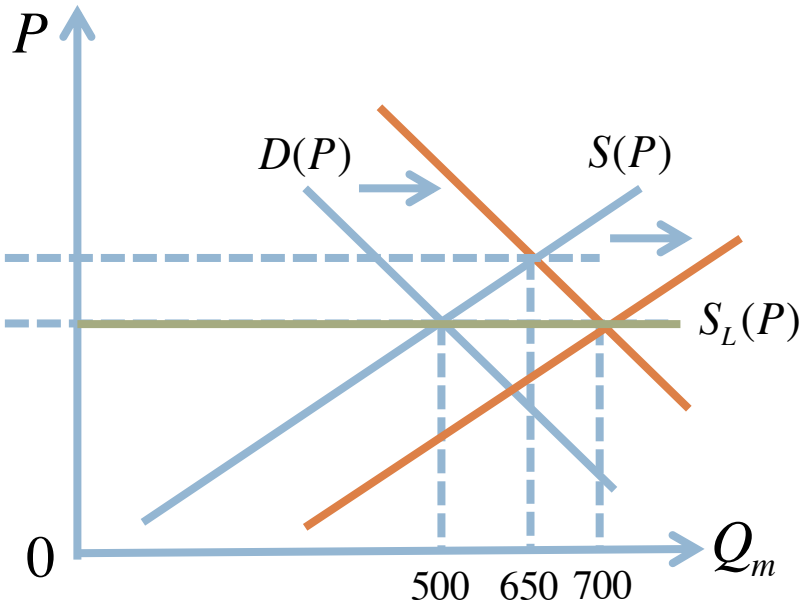
- How to get long-run market supply curve?
  - Set of firms in the market is not fixed in the long run
  - Number of firms only stabilizes in long-run equilibrium
- Long-run market supply curve describes the relationship between price and total quantity in long-run equilibrium
- Definition 11.6 *Long-run market supply curve*
  - Total quantity supplied in long-run equilibrium as a function of long-run equilibrium price

Long-Run Market Supply Curve in a Constant-Cost Industry

Typical Firm's Cost and Supply

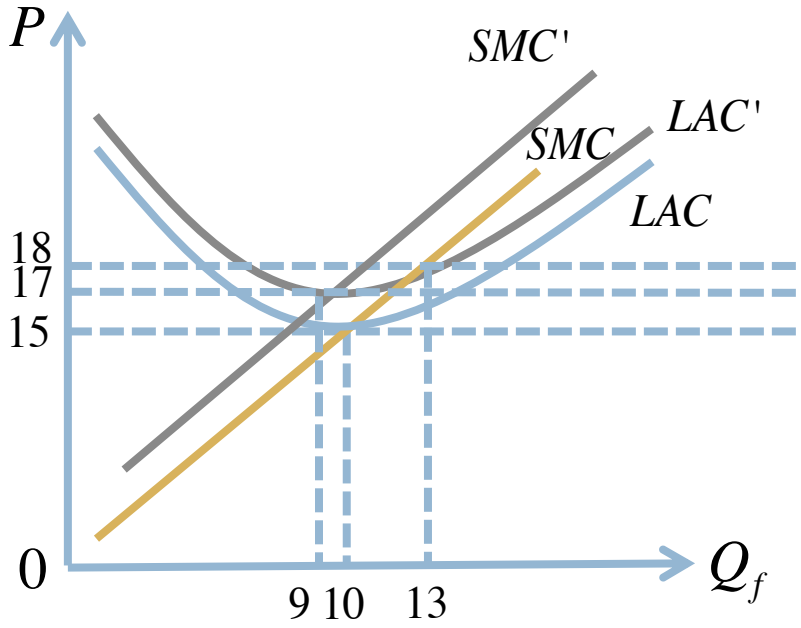


Market Equilibrium with 50 identical firms at the initial equilibrium

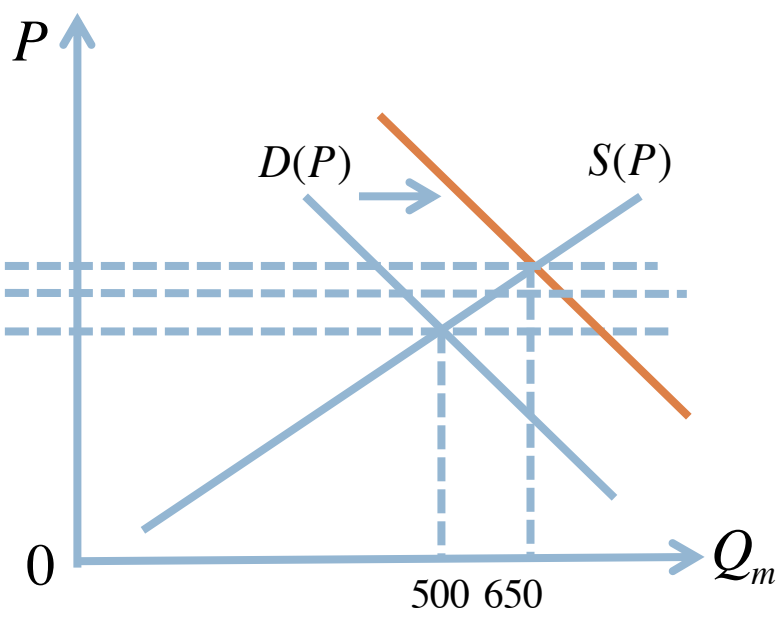


Long-Run Market Supply Curve in an Increasing-Cost Industry

Typical Firm's Cost and Supply

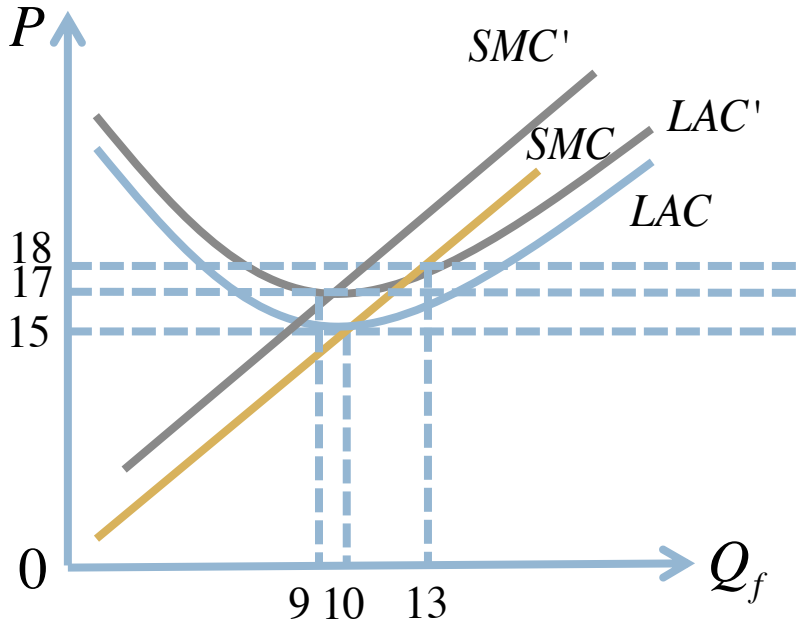


Market Equilibrium with 50 identical firms at the initial equilibrium

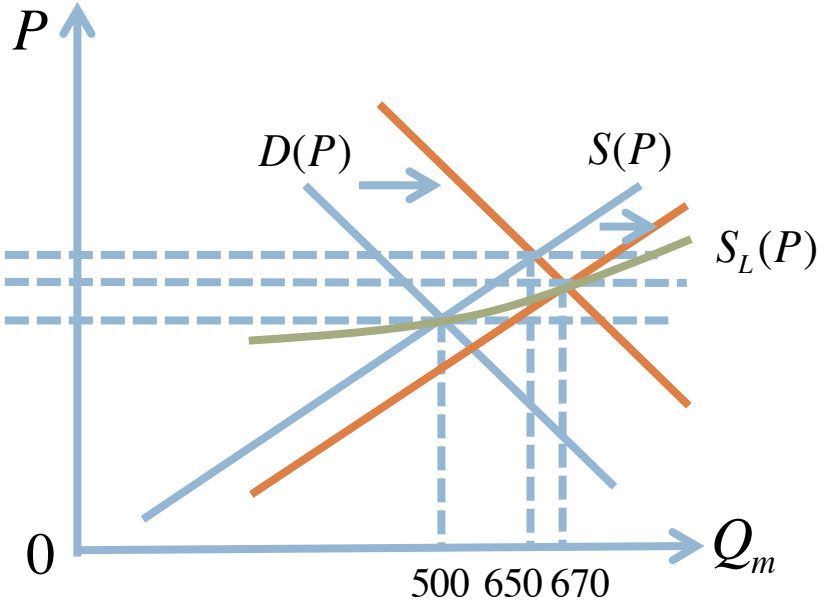


Long-Run Market Supply Curve in an Increasing-Cost Industry Cont'

Typical Firm's Cost and Supply

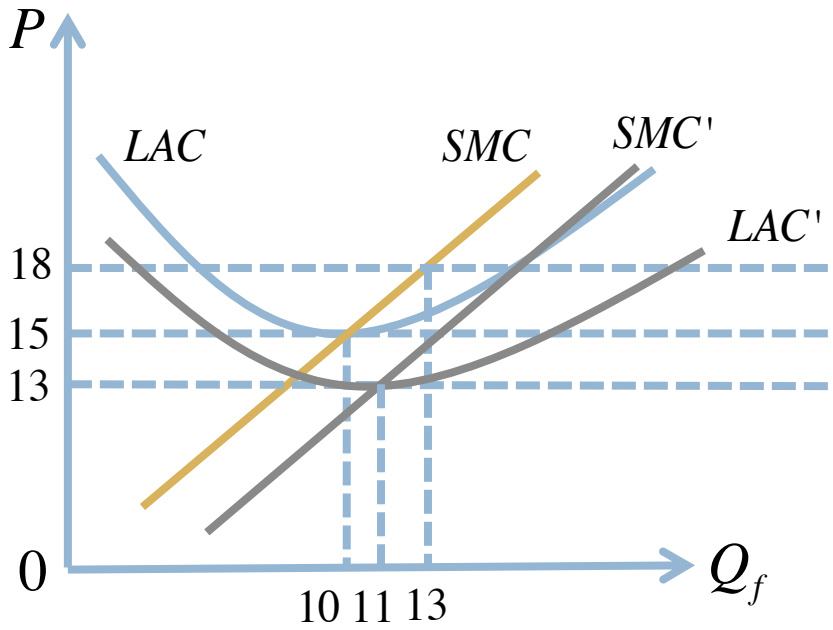


Market Equilibrium with 50 identical firms at the initial equilibrium

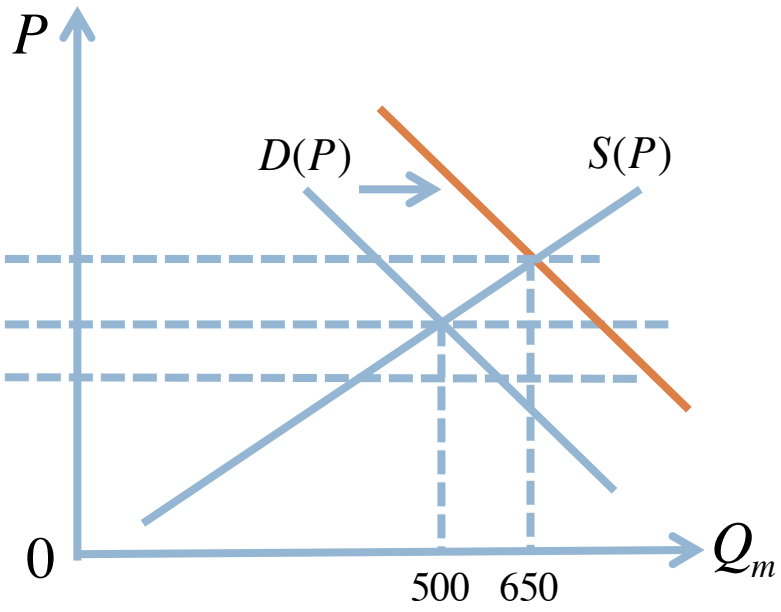


Long-Run Market Supply Curve in a Decreasing-Cost Industry

Typical Firm's Cost and Supply

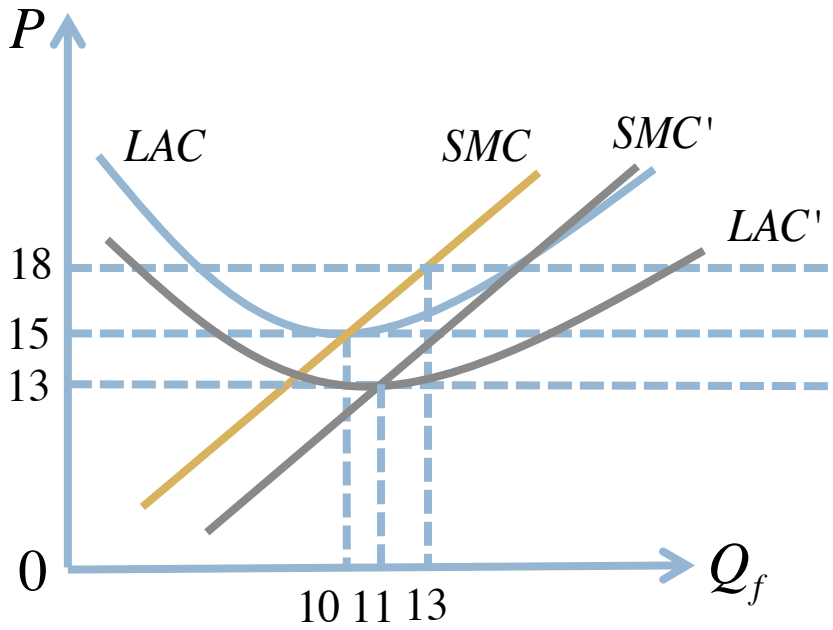


Market Equilibrium with 50 identical firms at the initial equilibrium

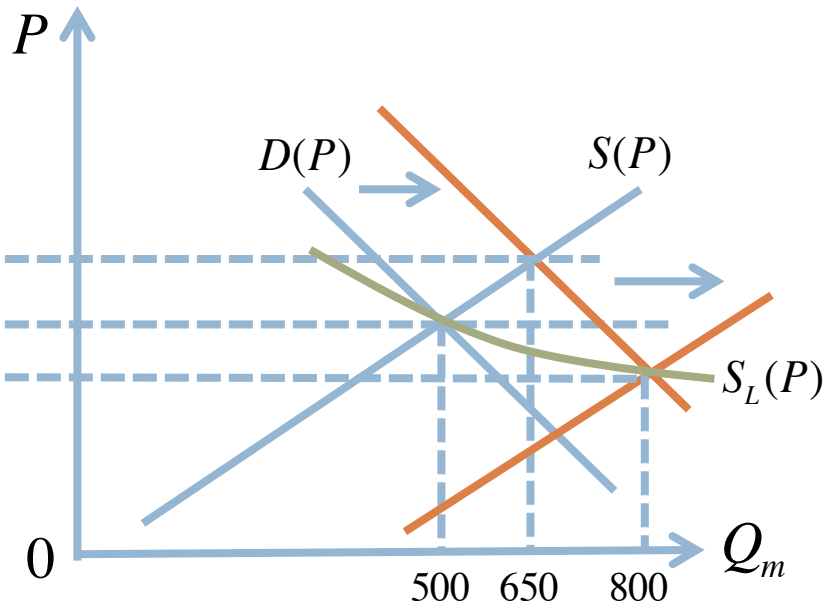


Long-Run Market Supply Curve in a Decreasing-Cost Industry Cont'

Typical Firm's Cost and Supply



Market Equilibrium with 50 identical firms at the initial equilibrium



Types of Industry and Long-Run Market Supply Curve

- Constant-cost industry
  - An industry in which long-run market supply curve is
- Increasing-cost industry
  - An industry in which long-run market supply curve is
- Decreasing-cost industry
  - An industry in which long-run market supply curve is

Part 3

Economic Rent

Definition of Economics Rent

- So far we have assumed that all firms have equal access to resources
  - Firms have identical costs
- What if some firms use superior inputs that are not available to other firms?
  - E.g., star chefs, managerial talent, control of higher quality land, better veins of ore
- Definition 11.7 These superior inputs could generate *economic rent*
  - Economic rent = maximum amount firm is willing to pay for the input – *reservation value* of the input

Example: Economic Rent

- There are two types of managers
  - Great managers
  - Average managers
- Suppose there is only 1 great manager but infinitely many average managers
- Suppose the *reservation wage* for any manager is $70000
- Assuming every manager is paid the reservation wage, the firm that hires the great manager can operate at lower costs
  - The firm with the great manager has lower min(*LAC*)

Example: Economic Rent Cont'

- The long-run equilibrium price is the min(*LAC*) of the firms that hire the average managers
  - Assuming both types of firms are in the market
  - At this price, no potential entrants want to enter, no existing firms want to exit
- The firm with the great manager earns positive profit!
  - Because of lower cost
- Suppose the profit for the firm that hires the great manager is $20000
- What is the economic rent?

Example: Economic Rent Cont'

- The maximum amount the firm is willing to pay for the great manager
  - $70000+$20000=$90000
  - If the firm pays more than $90000, they will be better off not hiring the great manager
- The reservation value of the great manager
  - The reservation wage of $70000
- Economic rent is $90000-$70000=$20000
- What is the difference between economic rent and profit?

Example: Economic Rent Cont'

- Suppose firms need to compete with each other to hire the great manager
- Wage of the great manager can be bid up to $90000
  - The $20000 is now part of the wage to the great manager
  - The firm with the great manager still earns a profit of 0
  - But the economic rent is still $20000
- In general, economic rent is split between the firm and the great manager
  - The amount that goes to the firm becomes the firm's profit
  - The amount that goes to the great manager becomes the manager's wage