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Chapter 2
Demand and Supply

Chapter Summary and Learning Objectives

2.1 Describe the factors that affect the demand for goods and services.

After introducing the law of demand, as explained by the substitution and income effects, we provide demand curves and demand functions. We then discuss the main factors that will increase or decrease demand, and show how these factors can be incorporated into a demand function and shown by a shift of the demand curve.

2.2 Describe the factors that affect the supply of goods and services.

Our exploration of supply parallels what students learned about demand: law of supply, factors that shift supply, and exploration of supply curves and supply functions.

2.3 Determine the market equilibrium price and quantity using the demand and supply model.

The equilibrium price and quantity are determined both graphically (using demand and supply curves) and numerically (using demand and supply functions).

2.4 Explain why perfectly competitive markets are socially optimal.

We introduce the concept of total surplus, or the benefits from market transactions that move goods from firms who can produce it cheaply to consumers who value it highly. Concepts like the efficient level of output, over- or underproduction and the resulting deadweight loss, are explored.

2.5 Use the demand and supply model to predict how changes in the market affect the price and quantity of a good or service.

We propose a simple, four-step procedure to showing how a market is affected by a change in supply or demand. We then go through specific examples of changes in demand, supply, and finally both changing simultaneously.

2.6 Explain the effects of price ceilings and price floors.

Having established how competitive markets will reach equilibrium, we turn to government intervention that prevents that equilibrium. We explain the common consequences of such interventions, using rent control and the minimum wage as our examples.

2.7 Apply the demand and supply model to make better managerial decisions.

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Chapter Outline

Introduction

A. Summary: Understanding how markets are determined by supply, demand, and government intervention will help you become a better manager.
B. Key Terms:
   i. **Market**: Any arrangement that allows buyers and sellers to transact their business.

2.1 Demand

Learning Objective 2.1: Describe the factors that affect the demand for goods.

A. Summary: The law of demand says that when the price of a good or service falls, consumers will increase the amount they wish to purchase. This is explained by the substitution effect and the income effect. We can express this negative relationship between price (P) and quantity demanded (Q^d) graphically, forming a downward-sloping demand curve; or numerically, as a demand equation, where price enters negatively. The main factors that will shift the demand for a good or service discussed are: income, prices of substitutes and complements, consumer preferences and advertising, financial market conditions, expected future price, and the number of consumers in the relevant market. Changes in demand result in either a shift of the demand curve or a change in the demand function.
B. Key Terms:
   i. **Substitution effect**: When the price of a good or service changes, its price compared to the prices of other substitute goods or services changes.
   ii. **Income effect**: When the price of a good or service changes, buyers' purchasing power changes.
   iii. **Demand curve**: A curve that shows the relationship between the price of a good or service and the quantity demanded.
   iv. **Normal good or service**: A good or service for which an increase in income increases demand and a decrease in income decreases demand.
   v. **Inferior good or service**: A good or service for which an increase in income decreases demand and a decrease in income increases demand.
   vi. **Substitutes**: Alternative goods and services; a consumer buys one *or* the other.
   vii. **Complements**: Separate goods and services purchased for use together; a consumer buys one *and* the other.
C. **Teaching Tip**: The distinction between "demand" and "quantity demanded" is often confused in the business world. Emphasize the distinction, that demand refers to the entire demand curve or demand function, while quantity demanded refers to the actual amount demanded at one specific price. If students adhere to this strict definition, it makes discussion of "changes in demand" vs. "changes in quantity demanded (resulting from a change in the price the firm charges)" less confusing.

2.2 Supply

Learning Objective 2.2: Describe the factors that affect the supply of goods and services.

A. Summary: If we make the assumption that firms will provide more of goods that are more profitable and less of goods that are less profitable, the result is the law of supply: higher prices cause firms to increase the quantity supplied. This positive relationship can be shown by an upward-sloping supply curve, or by a supply function where price enters positively. The main factors that affect supply are: cost of production, substitutes and complements in production, technology, the state of nature, expected future price,

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and the number of suppliers. A change in supply shifts the supply curve and changes the supply function. Increases in supply result in more output supplied at every price, increasing the function and shifting the supply curve to the right. Decreases in supply do the opposite, resulting in less output produced at every price, and shifting the supply curve to the left.

B. Key Terms:
   i. **Supply curve**: A curve illustrating the relationship between the price of a good or service and the quantity supplied.
   ii. **Substitutes in production**: Products that are alternatives in production; a firm can produce one *or* the other.
   iii. **Complements in production**: Products that are produced simultaneously; a firm produces one *and* the other.

C. **Teaching Tip**: Increases and decrease in supply always seem to trip up some students, who are used to thinking of increase as a shift up and decrease as a shift down. Remind students that if they think of left/right as decrease/increase, they will never shift their supply curve the wrong way.

2.3 Market Equilibrium

Learning Objective 2.3: Determine the market equilibrium price and quantity using the demand and supply model.

A. Summary: Demand and supply interact in a competitive market to obtain an equilibrium price. If the price is not equal to the equilibrium price, it will change so that it does. If the price is too high, there will be a surplus, which will cause prices to fall due to a rise in inventories; if the price is too low, there will be a shortage, which will cause prices to rise due to a fall in inventories. Mathematically, if provided supply and demand functions, setting them equal and solving for *P* will yield the equilibrium price, which can then be plugged back into either equation to obtain the equilibrium quantity.

B. Key Terms:
   i. **Equilibrium price**: The price at which the quantity demanded equals the quantity supplied.
   ii. **Equilibrium quantity**. The quantity bought and sold at the equilibrium price.
   iii. **Equilibrium**: A situation in which no automatic forces lead to change; once at the equilibrium, the situation will persist until some factor changes.

C. **Teaching Tip**: Managers should be concerned about knowing the equilibrium price and being able to predict changes. Pricing too high means consumers will not buy as much output, which means lost revenues. Pricing too low means earning less profit on each unit than you could. Thus, charging the equilibrium price is an important aspect of being a manager.

2.4 Competition and Society

Learning Objective 2.4: Explain why perfectly competitive markets are socially optimal.

A. Summary: Any society has limited resources, so it is crucial that these resources are used to obtain the greatest overall benefit. Total surplus is maximized when marginal benefit equals marginal cost, or where the demand and supply curves intersect. Producing more or less than this level of output results in less total surplus, i.e. deadweight loss. We can divide this total surplus into consumer surplus and producer surplus.

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B. Key Terms:
   i. **Efficient quantity**: The quantity of output that yields the largest total surplus of marginal benefit over marginal cost for society.
   ii. **Deadweight loss**: The loss in total surplus from producing less or more than the efficient quantity.
   iii. **Consumer surplus**: The difference between the maximum price consumers are willing and able to pay for each unit of a product and the price actually paid, summed over the quantity of units purchased.
   iv. **Producer surplus**: The difference between the actual price producers receive for each unit and the minimum price they are willing to accept to produce that unit, summed over the quantity of units produced.

C. **Teaching Tip**: Why should managers care about consumer surplus? Later in the course, when you consider alternate pricing strategies, you may be able to design a pricing system that allows you to extract some of this consumer surplus as profit for your firm.

2.5 Changes in Market Equilibrium

Learning Objective 2.5: Use the demand and supply model to predict how changes in the market affect the price and quantity of a good or service.

A. Summary: We establish a simple four-step procedure for students to use when analyzing a shift in demand or supply. Draw a demand and supply figure to show the initial equilibrium, determine which curve (demand or supply) is affected, determine whether the change shifts the curve left or right, and finally add the new curve to the diagram to determine the new equilibrium. Changes in demand result in price and quantity moving in the same direction, while changes in supply result in price and quantity moving in opposite directions. When both demand and supply are affected (usually by two different factors changing simultaneously), you will be able to determine whether one of the variables (P or Q) increases or decreases, but the other can either increase or decrease depending on whether demand shifted more or less than supply.

B. **Teaching Tip**: Inventories are important! How can you run a store with thousands of products and have any idea what price to charge, how much to order, or whether you should raise or lower prices? Pay attention to your inventories and how they change. If suddenly the demand for a good increases and more customers want to buy it, your inventory of that good will fall. First the shelves will be bare, then you will run out of stock in the back of the store. That should serve as a signal to you that something has changed in the market, and you probably want to do two things: order more of the product, and raise the price you charge to reflect the increase in demand. If you do not order more and have bare shelves, you are missing out on potential profit. Note that you do not have to know *why* your customers are demanding more of the product – you just have to be observant enough to see the change in inventories and respond accordingly.

2.6 Price Controls

Learning Objective 2.6: Explain the effects of price ceilings and price floors.

A. Summary: Governments can force non-equilibrium prices on a market through the use of price ceilings (like rent control) and price floors (like minimum wages). Price ceilings force the price down, causing an increase in quantity demanded but a decrease in quantity supplied. The resulting shortage often results in increased search times and black markets. Price floors, on the other hand, force the price up. This leads to a

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decrease in quantity demanded and an increase in quantity supplied, particularly if the government agrees to purchase any output supplied at this price. If the government does not purchase what is supplied, as in the case of the minimum wage (where the government does not guarantee employment at this wage), the decrease in quantity demanded will make some suppliers worse off.

B. Key Terms:
   i. **Price ceiling**: A government regulation that sets the maximum legal price.
   ii. **Price floor**: A government regulation that sets the minimum legal price.
   iii. **Search**: The activity of finding a seller who has the product available for sale.
   iv. **Black market**: A market in which buyers and sellers illegally purchase and sell goods or services at unlawful prices.
   v. **Minimum wage**: The lowest legal wage rate an employer can pay a worker.

C. **Teaching Tip**: Show the deadweight loss from price ceilings and price floors, as these are not specifically covered in the chapter. Also, be sure students understand the difference between a price floor where the government purchases any surplus output (making all firms better off) and a price floor where no such purchases are made; in the latter case, at some point the quantity in the market converges to the level of output demanded, as firms will not continue to produce more output than consumers are willing to purchase. Thus, some suppliers will be worse off due to the decrease in sales. Whether total profit increases or decreases depends on the price elasticity of demand, which will be covered in the next chapter.

2.7 Using the Demand and Supply Model

Learning Objective 2.7: Apply the demand and supply model to make better managerial decisions.

A. Summary: Managers should be familiar with the demand and supply model for a variety of reasons. First, you need to be able to predict your costs, so anticipating when costs of inputs may rise due to changes in the market for those inputs is a useful skill. Second, you need to be able to predict the price in your market. If you observe changes in factors that are likely to shift demand in the market for a good you produce, anticipating this can increase profits or decrease losses. If you expect demand to fall, you should take steps to slow production, including buying fewer inputs. Knowing that the equilibrium price will fall may also encourage you to shift production to other, more profitable goods.

B. **Teaching Tip**: Highlight the importance of anticipating changes. Being reactive, or slow to react, means you'll run out of product when demand is high and have to employ massive discounts to eliminate excess inventories when demand falls. Staying on top of things by monitoring inventories, monitoring events in your industry, and paying attention to input markets, can help reduce these kinds of mistakes.

Extra Example:

Federal ethanol mandates require billions of gallons of ethanol be produced, purchased, and mixed into gasoline as part of an effort to reduce fossil fuel use and increase energy independence in the U.S. Suppose these ethanol mandates are removed from the market.

A. What would you expect to happen to the equilibrium price and quantity in the market for ethanol?

B. What would you expect to happen to the equilibrium price and quantity in the market for corn, which is the predominant source of ethanol production in the U.S.?

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C. If you are a corn producer, what steps might you take as a result of the removal of the ethanol mandates?
D. Consider C&H, the Nation's Largest Sugar Manufacturer. Sugar competes directly with high fructose corn syrup, a product made from corn. What steps might C&H take as a result of the removal of the ethanol mandates?

Solution to Extra Example:

A. Ethanol mandates that the government purchase ethanol, which is viewed as an increase in the demand for ethanol. If these mandates are removed, the demand for ethanol would decrease, resulting in decrease in both the equilibrium price and quantity of ethanol.
B. With less ethanol being produced, there will be a decrease in the demand for corn. Thus, the equilibrium price and quantity of corn would also decrease.
C. As a result of the decrease in demand for corn, I would decrease or slow production. This may mean not planting corn on some of the more costly acres of land (those that require more fertilization and/or water), and perhaps shifting production to other products that can be grown on the same land.
D. With corn being less expensive, the costs of producing corn syrup will fall. This should increase the supply of corn syrup and therefore decrease the price of corn syrup. C&H should expect that purchases of sweeteners will now be more likely to purchase corn syrup, which will result in a decrease in the demand for sugar. C&H may want to consider scaling back production and/or lowering prices to remain competitive with the price of corn syrup.

Discussion Question

In the chapter, there are a variety of main factors provided that will shift demand. Provide at least two additional factors, one that will shift supply and one that will shift demand. You may have to specify a particular product, as these might not apply to *all* products the way we assume income and prices of related goods do.

Answer:

There are many here and probably no "bad" answers. In some markets, like electricity and ice cream, temperature would clearly play a role in demand, as electricity use is greatest when temperatures are very high and very low, and demand for ice cream is highest when temperatures are high. The legality of a product also has an important effect on demand, as buying an illegal product includes an additional "price" in the form of a probability of being arrested for a crime. We would expect the price of marijuana to be higher in states where it is legal, as suppliers in states where it is illegal have to decrease the price to compensate consumers for the risk they take in purchasing it illegally. Word-of-mouth may be related to consumer preferences, but it can arguably be seen as different, especially when recommendations are coming from people who are known (perhaps through social media) or respected/trusted (verified purchasers with a track record for well-crafted reviews).

Understanding all the factors that affect the consumers in the market in which you operate is crucial to being an effective manager. While the factors addressed in this chapter are common across most goods, any specific product has additional factors that are likely to have at least some significant effect on demand. Learning what these are and anticipating how they change is part of being a good manager.

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Answer Key
Here are the solutions to the questions and problems that appear at the end of the chapter.

2.1 Demand

1.1 The law of demand is that, all other things remaining the same, the quantity demanded decreases as price increases, and vice versa. A movement along the demand curve illustrates the law of demand. Recall that the law of demand holds with "all other things remaining the same", so the factors that could shift the curve do not change. Taken together, this describes movement along the demand curve, rather than a shift of the curve.

1.2 The description of iceberg lettuce as an inferior good is incorrect in economic terms. In economic terms, an inferior good is not necessarily a low-quality good. Rather, it is a good for which demand decreases as consumer income increases.

1.3 Requiring additional information makes it more difficult for consumers to obtain a car loan. This is a "bad financial market condition", which decreases the demand for automobiles and shifts the demand curve to the left.

1.4 a. The demand for jeans decreases so the demand curve shifts to the left.

b. There will be a downward movement along the demand curve for jeans, resulting in an increase in the quantity demanded.

c. The demand for jeans increases so the demand curve shifts to the right.

d. The demand for jeans decreases so the demand curve shifts to the left.

1.5 a. Q^d = 30 million – (2 million × \$5) = 20 million.

b. Q^d = 30 million – (2 million × \$6) = 18 million. The \$1 price increase will decrease the quantity of stuffed animals demanded by 2 million.

2.2 SUPPLY

2.1 Cost is what the supplier pays to produce the product. Price is how much the supplier receives for selling the product. If the cost of production increases, the supply decreases, and the supply curve *shifts* to the left. If the price of the good increases, there is an upward *movement along* the supply curve.

2.2 An increase in the price of cheese is an increase in the cost of producing pizza. This change decreases the supply of pizza and shifts the supply curve to the left.

2.3 a. They are substitutes in production because the factory can produce either the Camry or the Camry Hybrid – but not both.

b. Toyota will respond to the increase in the price of the Camry Hybrid by producing more. The supply curve for the Camry will shift to the left as production switches to the Camry Hybrid model.

2.4 a. The supply of jeans decreases so the supply curve shifts to the left.

b. The supply of jeans increases so the supply curve shifts to the right.

c. There will be an upward movement along the supply curve, resulting in an increase in the quantity supplied.

d. The supply of jeans increases so the supply curve shifts to the right.

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2.3 MARKET EQUILIBRIUM

3.1 At any price above the equilibrium price, there is a surplus of the product ($Q^d < Q^s$), and the price will fall. At any price below the equilibrium price, there is a shortage of product ($Q^d > Q^s$), and the price will rise. The equilibrium price is the only price at which the quantity supplied is equal to the quantity demanded, so that the price does not change.

3.2 If the price is less than the equilibrium price, there will be a shortage of the product. Whenever the product is offered for sale, it rapidly sells out. Managers find it hard to keep the product in inventory, so they respond by raising the price. As the price rises, the quantity demanded decreases and the quantity supplied increases, both of which help reduce the amount of the shortage. The price continues to rise until it reaches the equilibrium price, at which point the shortage is eliminated and the price stops rising.

3.3 a. The NFL will hire 30 punters. This is the equilibrium quantity shown in the figure, determined by the point where the supply curve and demand curve intersect.

b. The punters will receive a $4 million salary. This is the equilibrium salary shown in the figure, determined by the point where the supply curve and demand curve intersect.

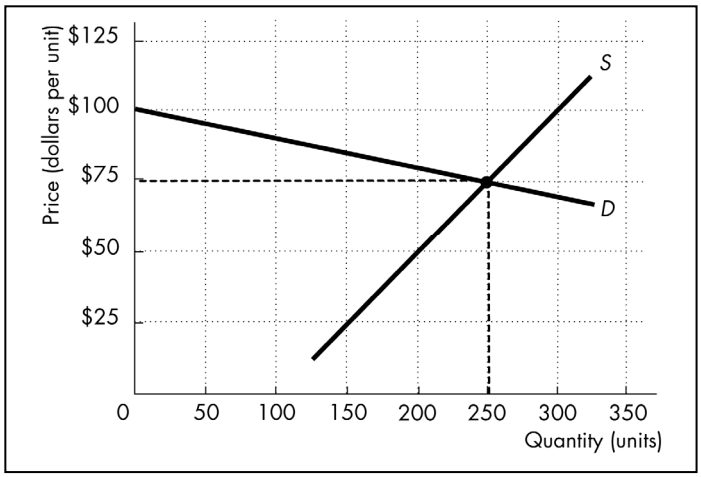
3.4 In equilibrium, the quantity supplied is equal to the quantity demanded ($Q^s = Q^d$). Substituting the equations for Q^s and Q^d gives $100 + 2P = 1{,}000 - 10P$. Solving this equation for price gives

$$100 + 2P = 1{,}000 - 10P$$
$$12P = 900$$
$$P = 75$$

Substitute this equilibrium price of $75 into either the demand or the supply function to get the equilibrium quantity. Using the supply function gives

$$Q = 100 + (2 \times 75) = 250$$

The figure shows the demand and supply curves that reflect the demand and supply functions in the problem. In the figure, the equilibrium price is $75, and the equilibrium quantity is 250, exactly as calculated using the algebraic functions.



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2.4 COMPETITION AND SOCIETY

4.1 a. The market demand curve shows the maximum price consumers will pay for each particular unit. The maximum price equals the consumer's marginal benefit from that unit of the product. Because the consumer is the member of society who benefits from the product, the consumer's marginal benefit is also society's marginal social benefit from the product.

b. The market supply curve shows the minimum price suppliers will accept to produce and sell each particular unit of the product. The minimum price equals the firm's marginal cost of producing that particular unit. Because the firm is the part of society that pays the cost of producing the product, the firm's marginal cost is also society's marginal social cost of the product.

c. The total surplus is the difference between the total benefit and the total cost. Equivalently, it is the sum of consumer and producer surplus, so it equals the area between the demand curve and the supply curve up to the efficient quantity – that is, the equilibrium quantity.

4.2 By producing the efficient quantity, competitive markets maximize social gains. When a competitive market produces the equilibrium quantity, each of the units up to the equilibrium quantity has a marginal social benefit that exceeds its marginal social cost. Consequently, producing and consuming each of these units results in a gain for society or, phrased differently, results in increasing society's surplus of benefit over cost. By producing the equilibrium quantity, all of the units for which the marginal social benefit exceeds the marginal social cost are produced and consumed so a competitive market maximizes the social gains or, again phrased differently, maximizes society's total surplus of benefit over cost.

4.3 For each of the units that is less than the equilibrium quantity, there is a consumer willing to pay more than the marginal cost of producing the unit, which means that for every one of these units, the marginal social benefit exceeds the marginal social cost. Total surplus would be higher if all these units were produced and consumed – that is, if all the units up to the equilibrium quantity were produced and consumed.

For each of the units that exceeds the equilibrium quantity, the marginal cost of the unit exceeds the maximum price a consumer is willing to pay for the unit, which means that for every one of these units, the marginal social cost exceeds the marginal social benefit. Total surplus would be higher if none of these units was produced and consumed – that is, if none of the units beyond the equilibrium quantity was produced and consumed.

2.5 CHANGES IN MARKET EQUILIBRIUM

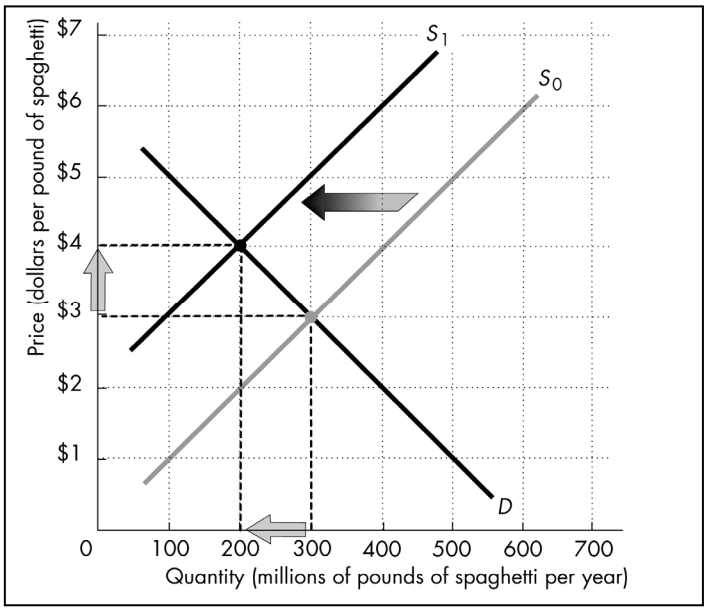
5.1 The supply curve for airline travel shifts to the left because the price of jet fuel is a cost for airlines. The demand curve is unaffected because the supplier's cost is not one of the factors that shifts the demand curve.

5.2 If more people favor wearing jeans, the demand curve for jeans shifts to the right. The supply curve does not shift. If the number of jean producers decreases, the supply curve for jeans shifts to the left. The demand curve does not shift.

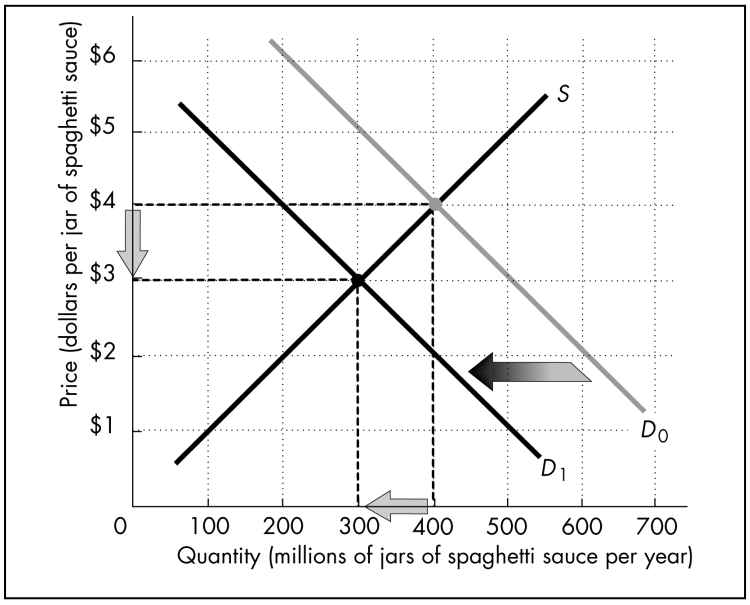
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5.3 a. The drought reduces the supply of durum wheat and thereby raises its price. Because durum wheat is an input used in producing high-quality spaghetti, the higher price increases the cost of producing high-quality spaghetti. The increase in cost decreases the supply of high-quality spaghetti and shifts the supply curve to the left. This shift decreases the equilibrium quantity and raises the equilibrium price, as shown in the figure.



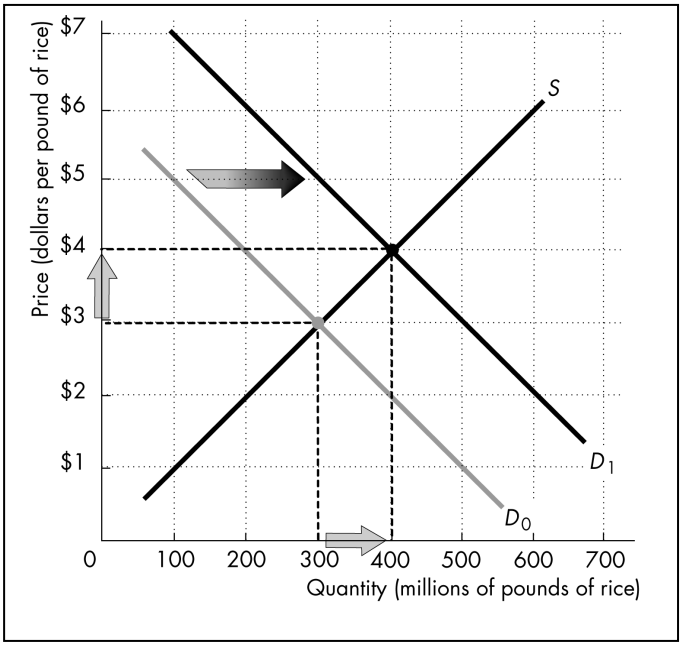
b. Spaghetti sauce and high-quality spaghetti are complements. Because the drought increases the equilibrium price of high-quality spaghetti, the demand for spaghetti sauce decreases. As the figure shows, the demand curve for spaghetti sauce shifts leftward, causing both the equilibrium quantity and the equilibrium price of spaghetti sauce to fall.



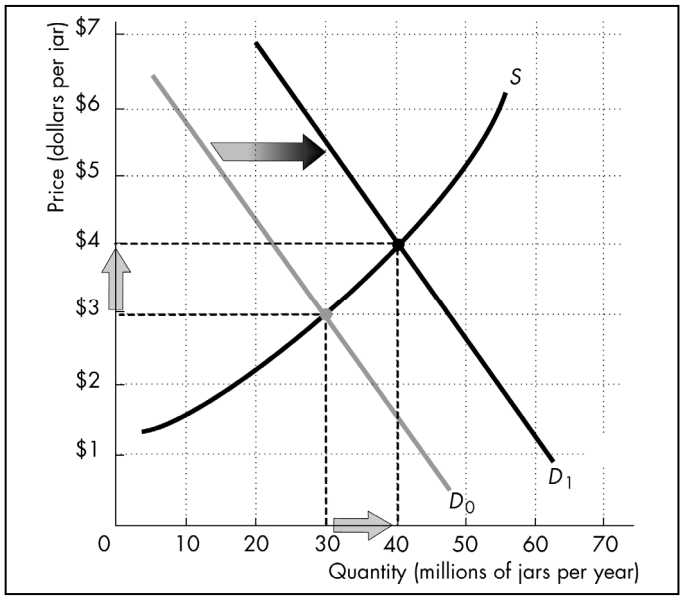
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c. The drought increases the equilibrium price of pasta, so consumers increase their demand for rice, the substitute good. As the figure shows, the demand curve for rice shifts rightward, causing both the equilibrium quantity and the equilibrium price of rice to rise.



5.4 A bountiful peanut harvest lowers the price of peanuts. Because peanuts are an input used to produce peanut butter, the lower price reduces the cost of producing peanut butter. The fall in cost increases the supply of peanut butter, resulting in a lower price for peanut butter. The fall in the price of the complement good, peanut butter, increases the demand for jelly, so the demand curve for jelly shifts to the right. The figure shows that the result is a higher equilibrium price and equilibrium quantity of jelly.



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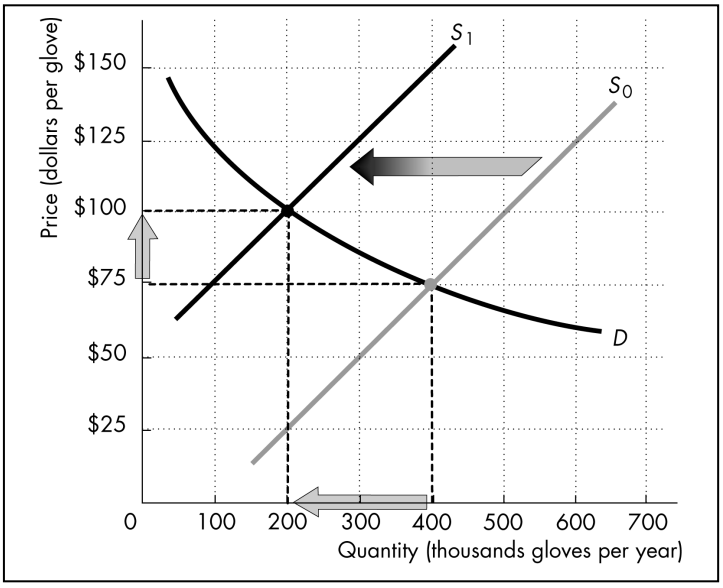
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5.5 a. Before the change, the equilibrium price was $750 per television, and the equilibrium quantity was 60 million televisions per year. After the change, the equilibrium price is $500 per television, and the equilibrium quantity is 80 million televisions per year.

b. There are many examples that could cause this change: Production costs drop, more suppliers enter the market, technological improvement are made, the price of a substitute in production falls, the price of a complement in production rises, or there is a good state of nature.

c. There are many correct answers to this question depending on what example was used in part b. All of the answers, however, should focus on the effect the change has on LG's profit. For example, a drop in cost or an advance in technology will lead LG to produce more televisions because the profit from producing televisions increases. But an increase in the number of suppliers likely will lead LG to produce fewer televisions because the price for a television has fallen and nothing else that affects LG has changed.

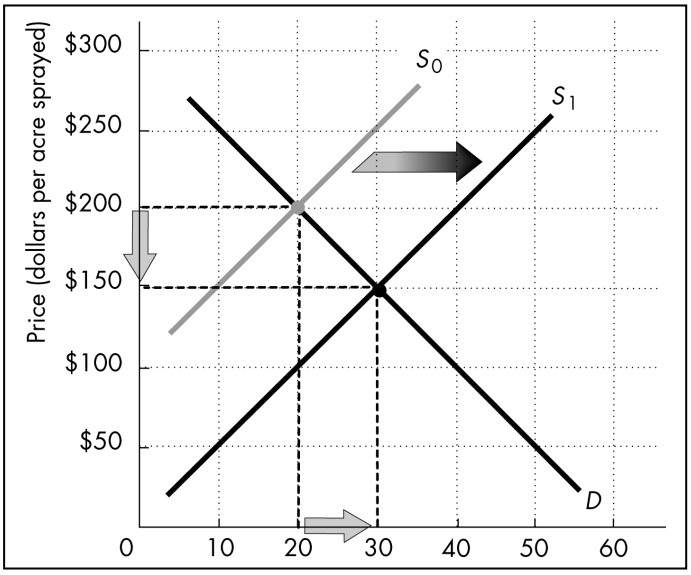
5.6 Because mad cow disease decreases the demand for beef, the equilibrium price and quantity of beef fall. Cowhide and beef are complements in production, so the supply of cowhide decreases and the supply curve of cowhide shifts to the left. This change increases the equilibrium price and decreases the equilibrium quantity of cowhide. Cowhide is used to produce baseball gloves, so the increase in price is an increase in cost for producers of baseball gloves. The increase in cost decreases the supply of baseball gloves, and the supply curve for baseball gloves shifts to the left. Therefore, as the figure illustrates, the equilibrium price of a baseball glove rises, and the equilibrium quantity of baseball gloves falls.



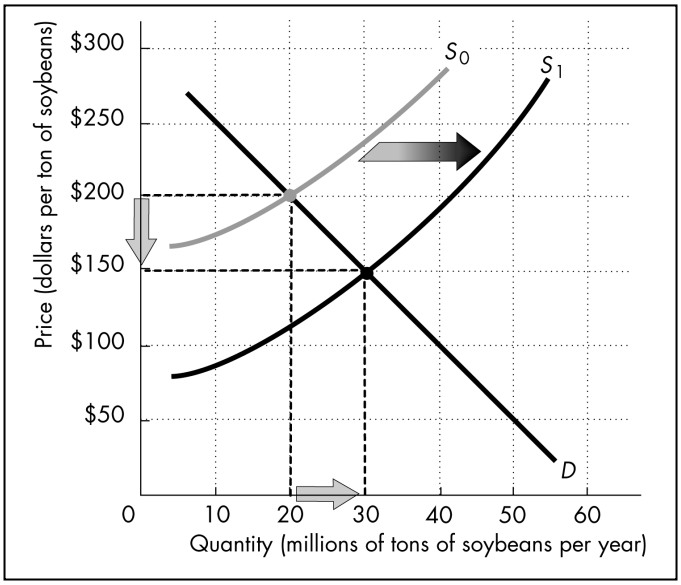
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5.7 a. Removal of these regulations reduces the cost of crop dusting. The supply of crop dusting increases, and the supply curve of crop dusting shifts to the right. The figure shows that the equilibrium price of crop dusting falls and the equilibrium quantity increases.



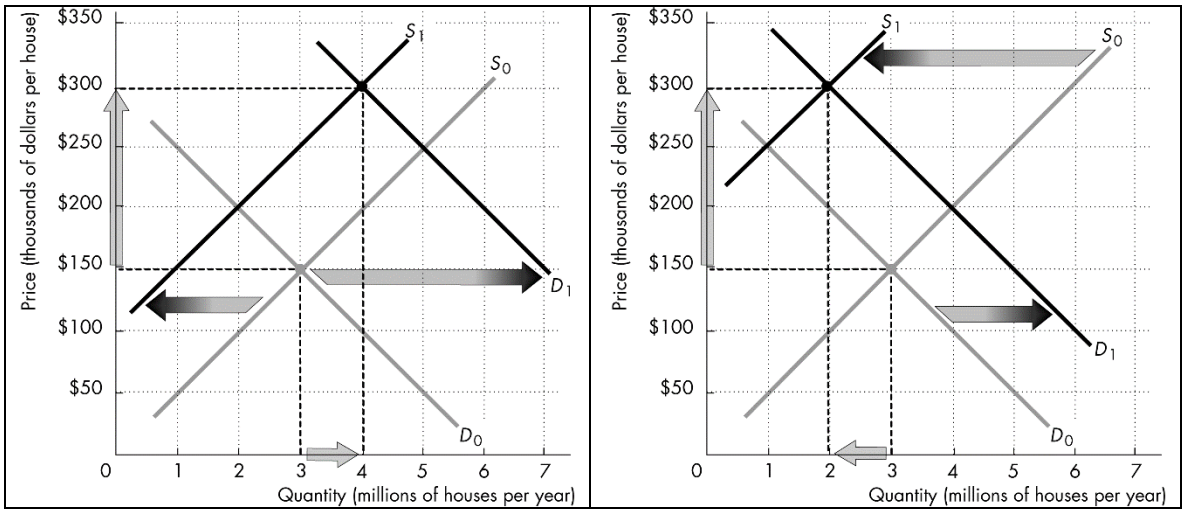
b. The new lower price of crop dusting reduces the cost of producing soybeans. The supply of soybeans increases, and the supply curve of soybeans shifts to the right. As the figure shows, the equilibrium of soybeans price falls, and the equilibrium quantity increases.



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5.8 The increase in income increases the demand for new homes, and the demand curve shifts to the right. The higher price of plywood increases the cost of building new homes, so the supply decreases and the supply curve shifts to the left. These changes are illustrated in the figures. In the first figure, the increase in demand exceeds the decrease in supply; in the second figure, the sizes of the shifts are reversed. The figures show that the equilibrium price unambiguously rises, to \$300,000 per house in both figures. But the effect on the equilibrium quantity is ambiguous. In the first figure, the quantity increases to 4 million houses, but in the second figure, the quantity decreases to 2 million homes.



5.9 a. If INCOME is \$50,000, the demand function is

$$Q^d = 300 - 100P + (0.01 \times \$50{,}000)$$

$$Q^d = 800 - 100P$$

COST is \$5, so the supply function is

$$Q^s = 200 + 150P - (30 \times \$5)$$

$$Q^s = 50 + 150P$$

In equilibrium, the quantity supplied is equal to the quantity demanded ($Q^s = Q^d$). Use the supply and demand functions, and solve for the equilibrium price:

$$50 + 150P = 800 - 100P$$

$$250P = 750$$

$$P = \frac{750}{250} = 3$$

Substitute the equilibrium price into either the demand or the supply function to determine the equilibrium quantity. Using the supply function gives

$$Q = 50 + (150 \times 3) = 500$$

b. COST stays the same, so the supply function does not change. The new demand function is

$$Q^d = 300 - 100P + (0.01 \times \$40{,}000)$$

$$Q^d = 700 - 100P$$

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Solve for the equilibrium price and quantity similarly to part a: For the equilibrium price, equate the supply function (still unchanged) with the new demand function, and solve for the price:

$$50 + 150P = 700 - 100P$$

$$250P = 650$$

$$P = \frac{650}{250} = 2.6$$

Then substitute the equilibrium price into either the demand or the supply function to calculate the equilibrium quantity. Using the supply function gives

$$Q = 50 + (150 \times 2.6) = 440$$

c. INCOME is once again \$50,000, so the demand function is the same as in part a. COST has increased to \$10, so the new supply function is

$$Q^s = 200 + 150P - (30 \times \$10)$$

$$Q^s = -100 + 150P$$

Now solve for the equilibrium price and quantity in the same way as before: First, equate the new supply function with the demand function, and solve for the equilibrium price:

$$-100 + 150P = 800 - 100P$$

$$250P = 900$$

$$P = \frac{900}{250} = 3.6$$

Second, substitute the equilibrium price into either the demand or the supply function to determine the equilibrium quantity. Using the supply function gives

$$Q = -100 + (150 \times 3.6) = 440$$

d. Now the demand function is the same as in part b, and the supply function is the same as in part c. Equating these two yields

$$-100 + 150P = 700 - 100P$$

$$250P = 800$$

$$P = \frac{800}{250} = 3.2$$

Substitute the equilibrium price into either the demand or the supply function to calculate the equilibrium quantity. Using the supply function gives

$$Q = -100 + (150 \times 3.2) = 380$$

5.10 a. The higher minimum wage increases firms' costs. Consequently the supply decreases and the supply curve shifts to the left. The equilibrium price rises and the equilibrium quantity decreases.

b. Consumer surplus will decrease. The price rises, which decreases the consumer surplus. Additionally, consumers respond to the higher price by decreasing the quantity they demand, so they consume less of the product, which also decreases the consumer surplus. Diagrammatically, the size of the consumer surplus triangle before the increase in cost is larger than the size after the increase in cost.

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2.6 PRICE CONTROLS

6.1 A price ceiling above the equilibrium price is a maximum price that is above what anyone is paying. This price ceiling has no effect because no one is paying a price above the ceiling in the first place. The price remains equal to the equilibrium price, so nothing changes.

6.2 The minimum wage affects lower-skilled labor more than any other group. Teenagers are generally lower skilled, in part because they have the least work experience. Consequently, they are the age group with the highest proportion of workers earning minimum wage. An increase in the minimum wage causes firms to decrease the quantity of lower-skilled labor they demand. Because teenagers have the least work experience and so are generally the least skilled, they experience the majority of the layoffs and have the hardest time finding new jobs.

6.3 The quantity of labor hours supplied increases as new workers enter the market and existing workers increase the quantity of labor hours they are willing to supply. The quantity of labor hours demanded decreases because it is now more expensive to employ workers. These changes create a surplus of labor hours in the market for minimum-wage labor. Due to the increased labor cost, Taco Bell will lay off some workers and pay the remaining workers the new higher minimum wage.

2.7 MANAGERIAL APPLICATION: USING THE DEMAND AND SUPPLY MODEL

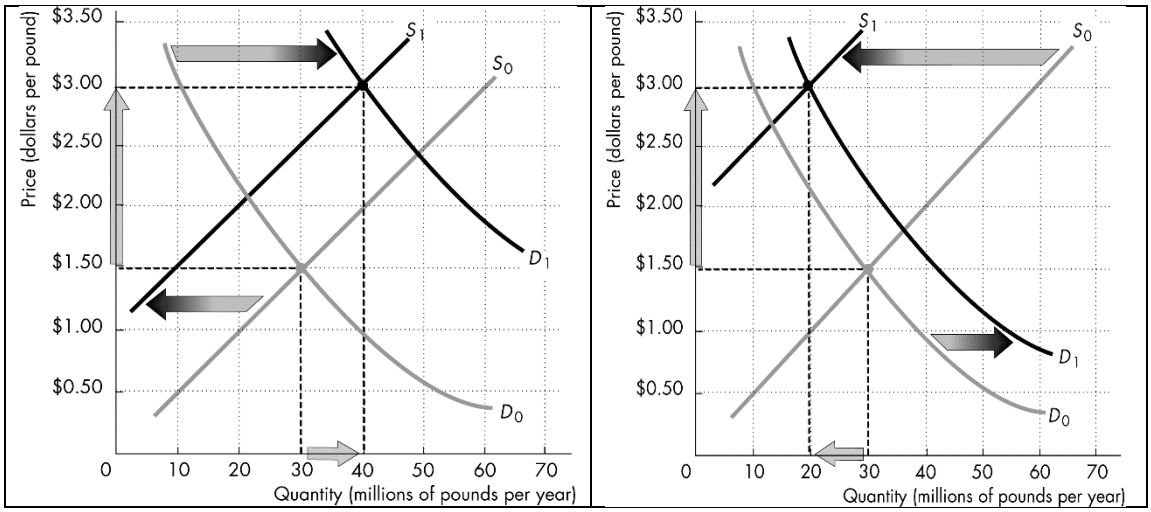
7.1 a. Equilibrium occurs where the supply curve and the demand curve intersect. As shown in the figure in the text, the equilibrium price is $750 per refrigerator, and the equilibrium quantity is 200,000 refrigerators. The increase in consumers' incomes shifts the demand curve to the right by 100,000 units at every price. The new demand curve intersects the supply curve at the new equilibrium price of $1,000 per refrigerator and the new equilibrium quantity of 250,000 refrigerators.

b. To meet the higher future demand, you could increase your current production of refrigerators and store them in inventory. You could also reduce your costs by securing materials used to produce refrigerators before your competitors do.

7.2 Cereal producers use corn in the production of cereal. An increase in the price of corn increases the costs of cereal producers (including Kellogg's), shifting the supply curve for cereal leftward. At the same time, increasing consumer incomes increase the demand for name-brand cereal and shift the demand curve for name-brand cereal to the right. The figures below show how these changes affect the market for name-brand cereal. They differ because in the first figure the shift in the demand curve exceeds that in the supply curve, while in the second figure the magnitudes of the shifts are reversed. The price rises in both figures, so it is unambiguous that the price of name-brand cereal rises. The effect on the quantity, however, is ambiguous. The first figure shows that it increases if the change in demand is larger, but the second figure shows that it decreases if the change in supply is larger.

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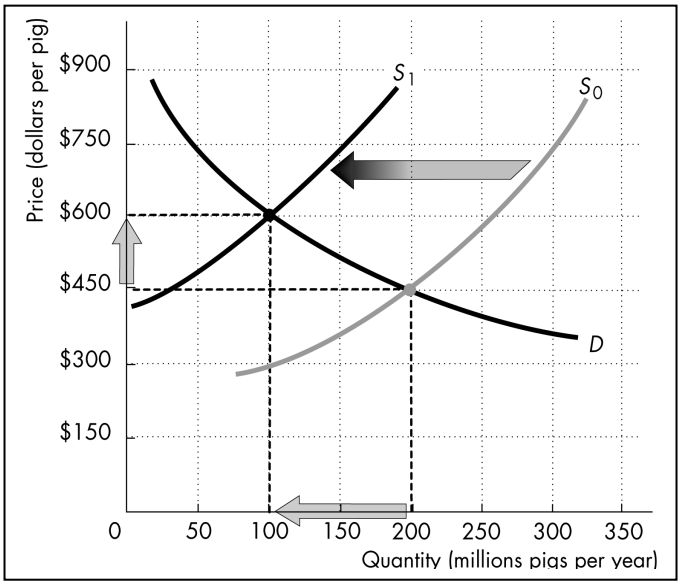
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7.3 These regulations increase the demand for ethanol by requiring oil refiners to use it in their gasoline. The increase in demand for ethanol increases the equilibrium price and quantity of ethanol, which clearly increases the producers' profits. The increase in profit is the reason ethanol producers lobby the government to increase the amount of ethanol oil refiners must use.

7.4 Demographic information helps breweries forecast demand for their product. For example, the demand for beer will be higher in a region with a larger number of young adult males. Using supply and demand analysis, the brewery executives should expect higher-than-average quantity and price in these areas.

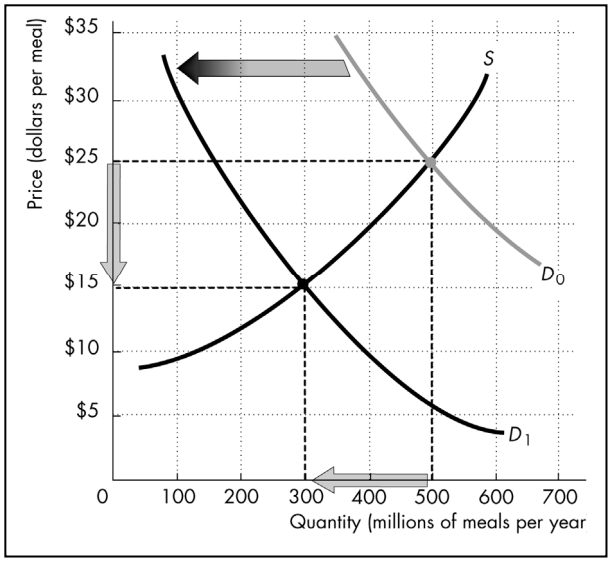
7.5 a. Corn and soy are used in the production of pigs, so increases in the prices of corn and soy lead to a decrease in the supply of pigs and a leftward shift in the supply curve. The figure shows that the equilibrium quantity of pigs will decrease and the price will rise. Pigs are used to produce baby back ribs, so your costs will increase. Your company should attempt to purchase pork before prices rise. They should also prepare to increase the price of their baby back rib menu items and maybe look for a new protein to feature.



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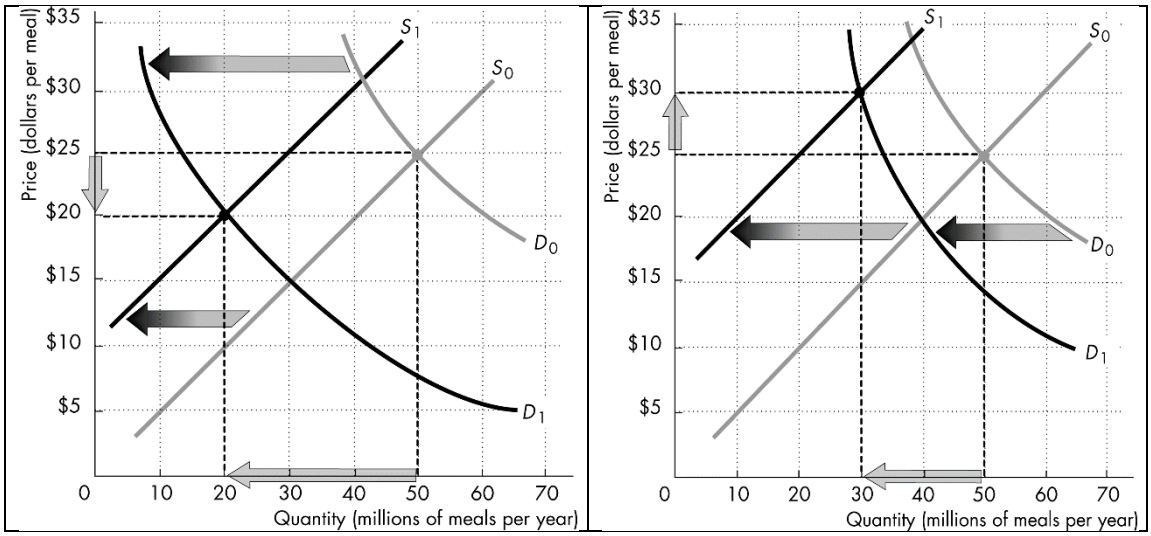
b. Dining at casual restaurants is a normal good, so a decrease in consumer incomes decreases the demand and causes a leftward shift in the demand curve. The figure shows that the equilibrium quantity and price of dining at casual restaurants both decrease.



c. As part a concluded, costs will increase at casual dining restaurants such as Chili's. So the supply of casual dining decreases, and the supply curve shifts to the left. Consumers' incomes fall, so as part b demonstrated, the demand for casual dining decreases, and the demand curve shifts to the left. The figures show how these changes affect the price and quantity of casual dining. In the first figure, the decrease in demand exceeds that in supply, while in the second figure the decrease in supply exceeds that in demand. In both figures, the equilibrium quantity decreases, so the change in the quantity is unambiguous: It will decrease. But in the first figure, the price of casual dining falls, and in the second, it rises. So the change in the equilibrium price of casual dining is ambiguous. Regardless, the executives at your company should plan to serve fewer customers at your restaurants. The managers could reduce personnel and try to renegotiate contracts with suppliers, pressing for lower prices and/or reduced quantities. They could also look at switching their meals to feature proteins whose prices have not risen as much. And the executives should seriously consider slowing or even halting expansion plans.

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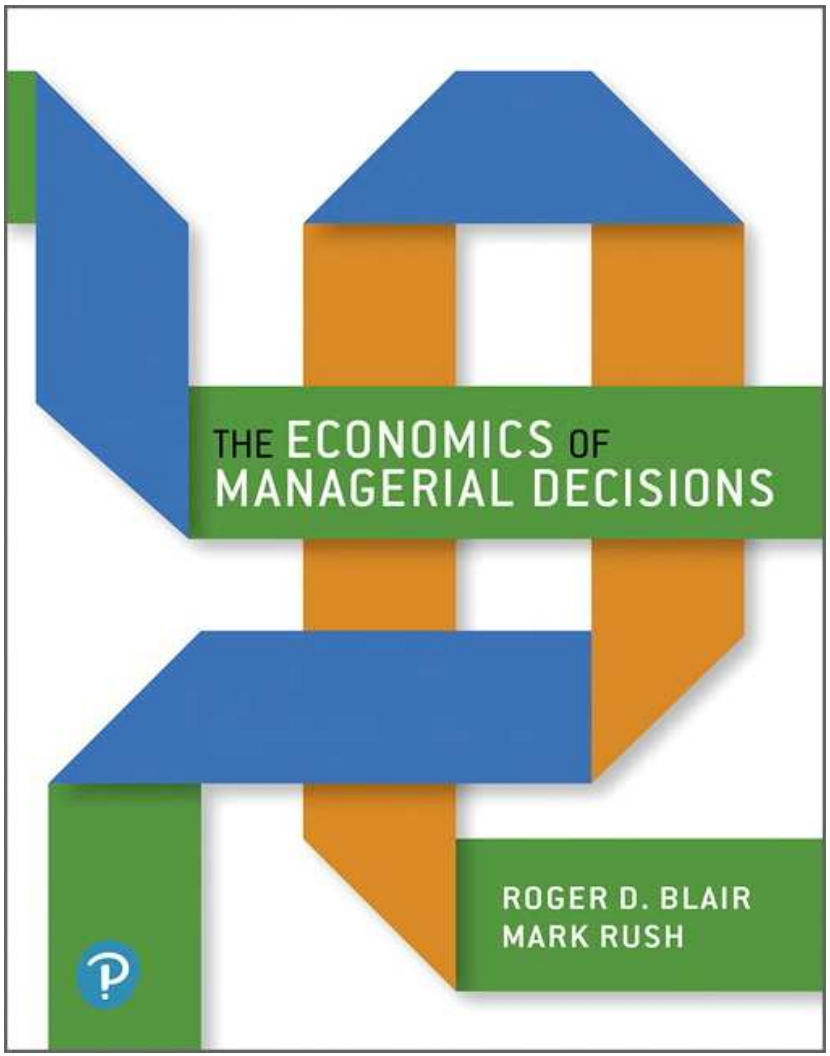
7.6 The demand for scientific cat food decreases, so the demand curve shifts to the left. The result is a fall in both the equilibrium quantity and the equilibrium price. Top management could shift production toward natural cat foods and use marketing that emphasizes the natural aspects of their products. They might also consider rebranding their cat food with a name that emphasizes its natural attributes.

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The Economics of Managerial Decisions

First Edition



Chapter 2

Demand and Supply

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Learning Objectives

2.1 Describe the factors that affect the demand for goods and services.

2.2 Describe the factors that affect the supply of goods and services.

2.3 Determine the market equilibrium price and quantity using the demand and supply model.

2.4 Explain why perfectly competitive markets are socially optimal.

2.5 Use the demand and supply model to predict how changes in the market affect the price and quantity of a good or service.

2.6 Explain the effects of price ceilings and price floors.

2.7 Apply the demand and supply model to make better managerial decisions.

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What is a Market?

Market: Any arrangement that allows buyers and sellers to transact their business.

We first study the behavior of buyers (the demanders), then the behavior of sellers (the suppliers), and then we combine the two.

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The Law of Demand

Learning Objective 2.1

Price influences people's willingness to buy a product.

Example: How many cups of coffee will you buy per week if the price is $3? If the price is $5?

Law of Demand: All other things remaining the same, the higher the price of the good or service, the smaller the quantity demanded; the lower the price of the good or service, the larger the quantity demanded.

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Substitution Effect

Learning Objective 2.1

Substitution effect: When the price of a good or service changes, its price compared to the prices of other substitute goods or services changes.

- Example: When the price of chicken increases, consumers switch to beef or pork purchases which causes less chicken to be purchased.

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Income Effect

Learning Objective 2.1

Income effect: When the price of a good or service changes, buyers' purchasing power changes.

- Example: When price of chicken increases there's less income left over in the budget to buy other goods and services. Less chicken will be purchased as well as other goods.

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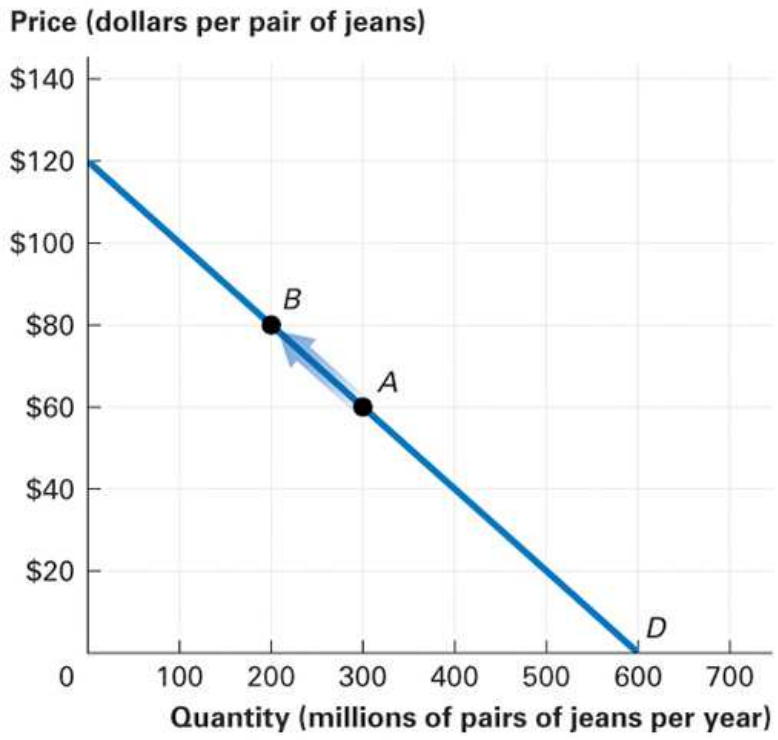
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Figure 2.1 A Demand Curve

Learning Objective 2.1

- The demand curve for jeans, *D*, shows the quantity of jeans demanded at all different prices.
- The slope of the demand curve reflects the law of demand: As the price rises, the quantity of jeans demanded decreases.
- When the price rises from $60 to $80, there is a movement up along the demand curve from point *A* to point *B*. The quantity demanded decreases from 300 million to 200 million pairs of jeans.



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Change in Quantity Demanded

Learning Objective 2.1

A change in the quantity demanded is represented by a movement along a given demand curve.

- A downward movement along the demand curve is an increase in the quantity demanded.
- An upward movement along the demand curve is a decrease in the quantity demanded.

Cause: The only factor that causes a change in the quantity demanded is a change in price of the product or service.

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The Demand Function

Learning Objective 2.1

Demand can be written algebraically as a **Demand Function:**

$$Q^d = a - (b \times P)$$

- Q^d= Quantity demanded of a pair of jeans
- P = Price of a pair of jeans
- a = The value of the horizontal intercept value; the quantity of jeans demanded when price= $0
- b = The change in quantity demanded caused by a $1 change in price of a pair of jeans

Dependent variable = Q^d

Independent variable = P

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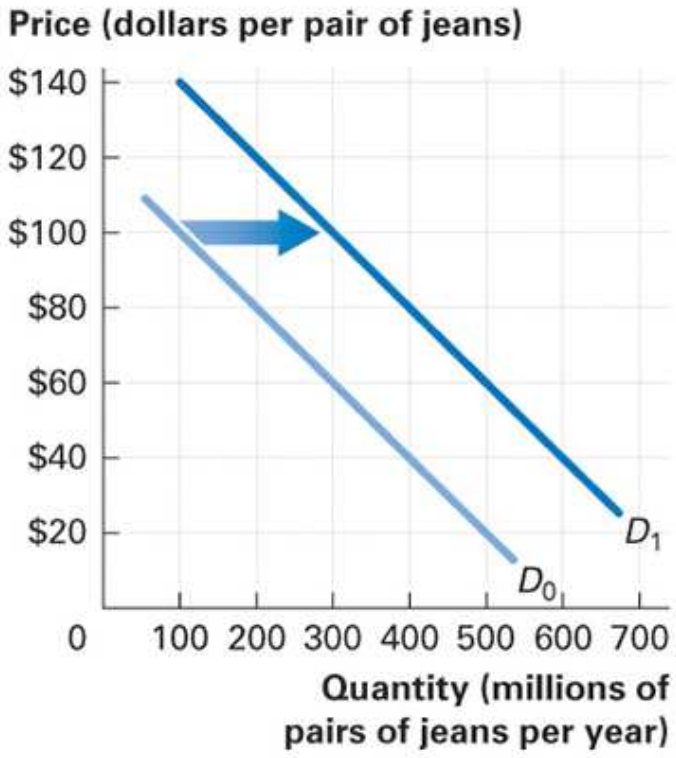
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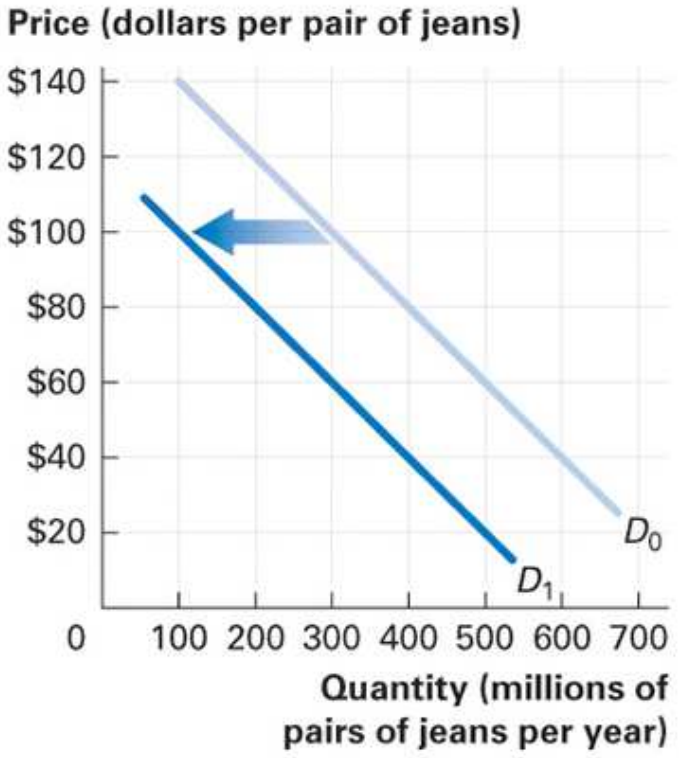
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Figure 2.3 Change in Demand

Learning Objective 2.1

A change in any relevant factor other than the price of the product itself creates a change in demand and shifts the demand curve.





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Change in Demand

Learning Objective 2.1

Factors that cause a change in demand include:

- Change in Income (Normal and Inferior Goods)
- Price of Related Goods and Services (Substitutes and Complements)
- Consumers' Preferences & Advertising
- Financial Market Conditions
- Expected Future Price
- Number of Demanders

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Demand Function – adding variables

Learning objective 2.1

A demand function can include more variables than just the price of the product.

$Q^d = f(P, P_{SKIRTS}, \text{INCOME})$

- This demand function assumes that the quantity demanded of jeans depends on the price of jeans and also the price of skirts and customers' income.

If the demand function is linear, it can be written as:

$$Q^d = a - (b \times P) + (c \times P_{SKIRTS}) + (d \times \text{INCOME})$$

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The Law of Supply

Learning Objective 2.2

Price influences firms' willingness to sell a product.

Example: Assuming input costs are constant, how many cups of coffee would you offer to sell per week if the price is $3? If the price is $5?

Law of Supply: All other things remaining the same, the higher the price of the good or service, the larger the quantity supplied; the lower the price of the good or service, the smaller the quantity supplied.

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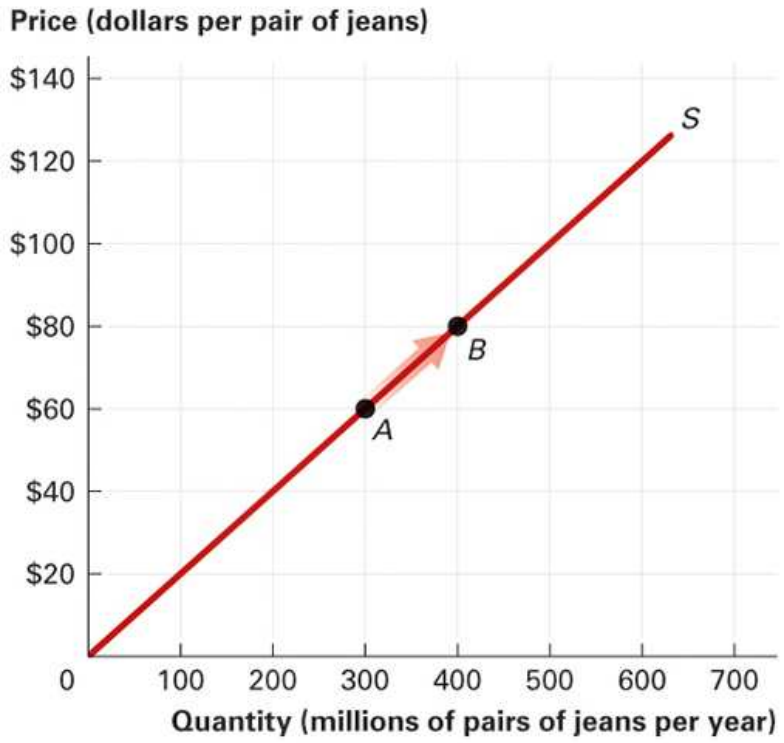
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Figure 2.4 A Supply Curve

Learning Objective 2.2

- The supply curve of jeans, *S*, shows the quantity of jeans supplied at all different prices.
- The slope of the supply curve reflects the law of supply: As the price rises, the quantity of jeans supplied increases.
- When the price rises from $60 to $80, there is a movement up along the supply curve from point *A* to point *B*. The quantity supplied increases from 300 million to 400 million pairs of jeans.



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Change in Quantity Supplied

Learning Objective 2.2

A change in the quantity supplied is represented by a movement along a given supply curve.

- A downward movement along the supply curve is a decrease in the quantity supplied.
- An upward movement along the supply curve is an increase in the quantity supplied.

Cause: The only factor that causes a change in the quantity supplied is a change in price of the product or service.

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Supply Function

Learning Objective 2.2

$$Q^S = r + (s \times P)$$

- Q^S = Quantity supplied of a pair of jeans
- P = Price of a pair of jeans
- r = The value of the horizontal intercept; the quantity supplied of jeans supplied when P = \$0
- s = The change in quantity supplied caused by a \$1 change in price of a pair of jeans

Dependent variable = Q^S

Independent variable = P

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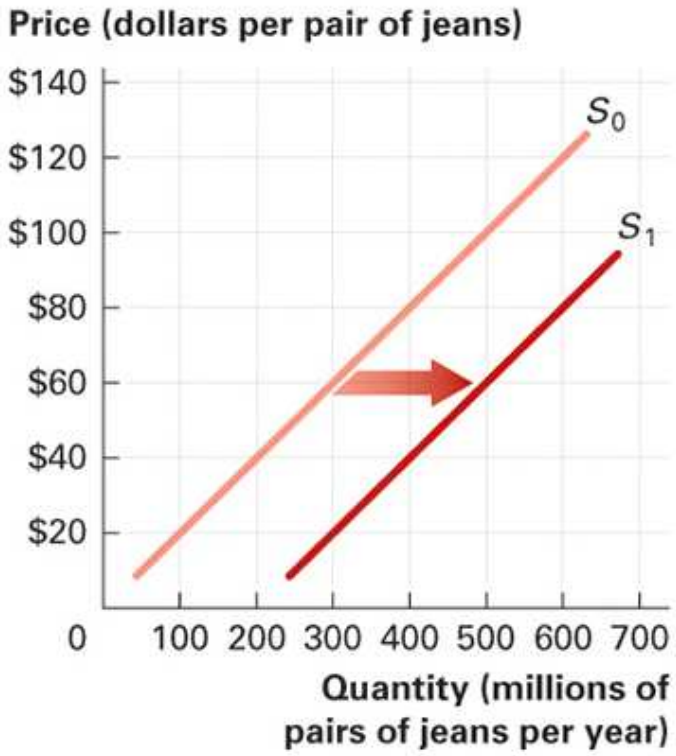
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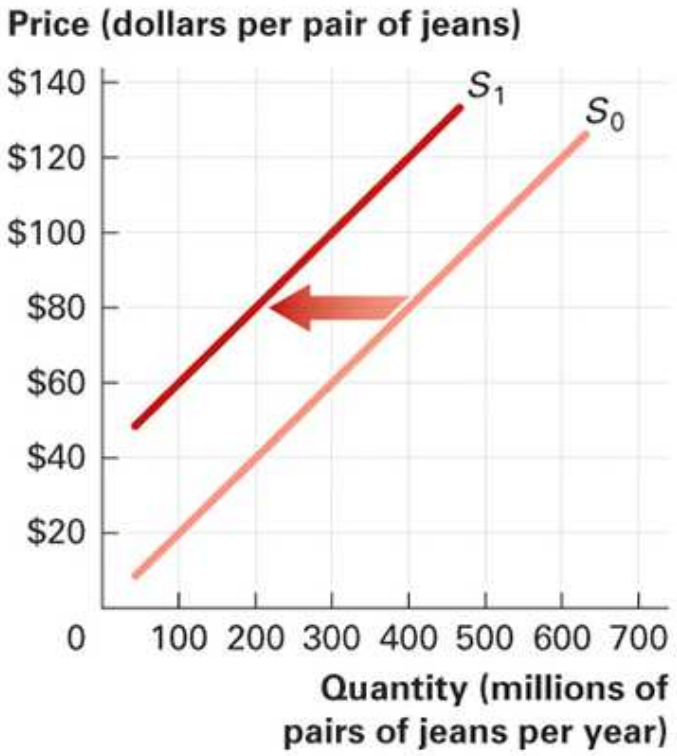
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Figure 2.6 Changes in Supply

Learning Objective 2.2

A change in any relevant factor other than the price of the product itself creates a change in supply and shifts the supply curve.





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Change in Supply

Learning Objective 2.2

Factors that cause a change in demand include:

- Costs
- Price of Related Goods (substitutes in production and complements in production)
- Technology
- State of Nature
- Expected Future Price
- Number of Suppliers

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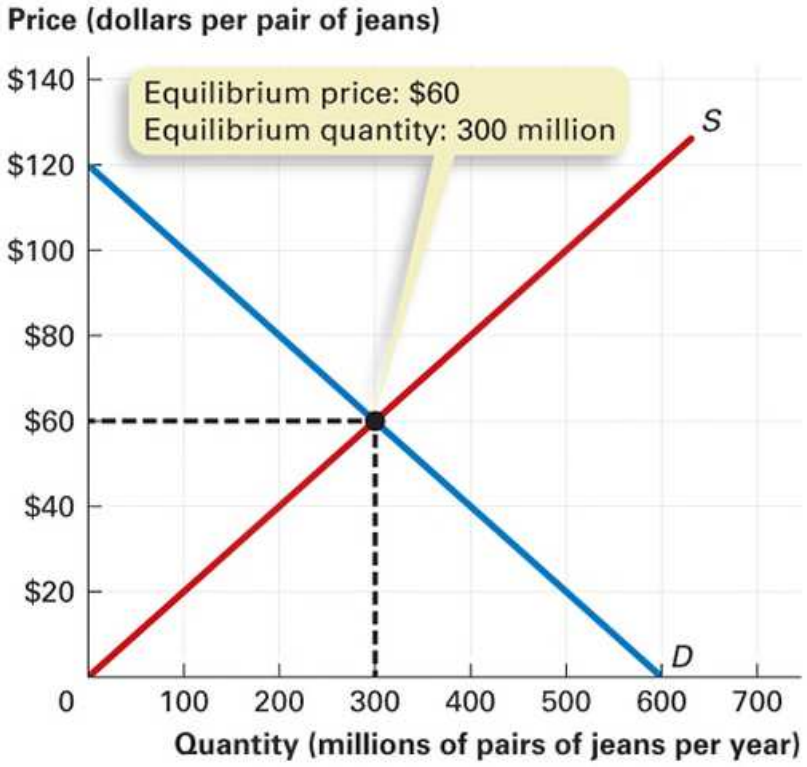
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Equilibrium Price & Quantity

Learning Objective 2.3

Equilibrium price: The price at which the quantity demanded equals the quantity supplied.

Equilibrium quantity: The quantity bought and sold at the equilibrium price.



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Determining Equilibrium Price

Learning Objective 2.3

To determine the equilibrium price and quantity using the algebraic demand and supply functions, first set the demand and supply functions equal to solve for the price:

$$Q^d = 600{,}000{,}000 - (5{,}000{,}000 \times P)$$

$$Q^s = 5{,}000{,}000 \times P$$

Set $Q^d = Q^s$ and solve for P:

$$600{,}000{,}000 - 5{,}000{,}000 \times P = 5{,}000{,}000 \times P$$

$$600{,}000{,}000 = 5{,}000{,}000 \times P + 500{,}000{,}000 \times P$$

$$600{,}000{,}000 = 10{,}000{,}000 \times P$$

$$P = 600{,}000{,}000/10{,}000{,}000$$

$$P = \$60$$

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Determining Equilibrium Quantity

Learning Objective 2.3

Second, substitute the equilibrium price ($60) into *either* the demand or supply function to determine the equilibrium quantity.

Demand function

$$Q^d = 600{,}000{,}0000 - 5{,}000{,}000 \times P$$
$$= 600{,}000{,}000 - 5{,}000{,}000 \times (60)$$
$$= 600{,}000{,}000 - 300{,}000{,}000$$
$$= 300{,}000{,}000$$

Supply function

$$Q^s = 5{,}000{,}000 \times P$$
$$= 5{,}000{,}000 \times (60)$$
$$= 300{,}000{,}000$$

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Competition and Society

Learning Objective 2.4

Perfectly Competitive markets are socially optimal because they foster the optimal allocation of society's scarce resources.

Total Surplus: The amount by which total benefit exceeds total cost. The total surplus equals the difference between the marginal benefit and marginal cost for each unit summed over the units produced.

- If the Marginal Benefit (*MB*) of a pair of jeans is $100 and the Marginal Cost (*MC*) of the pair of jeans is $20, the surplus of benefit over cost to society of this pair of jeans is $80.

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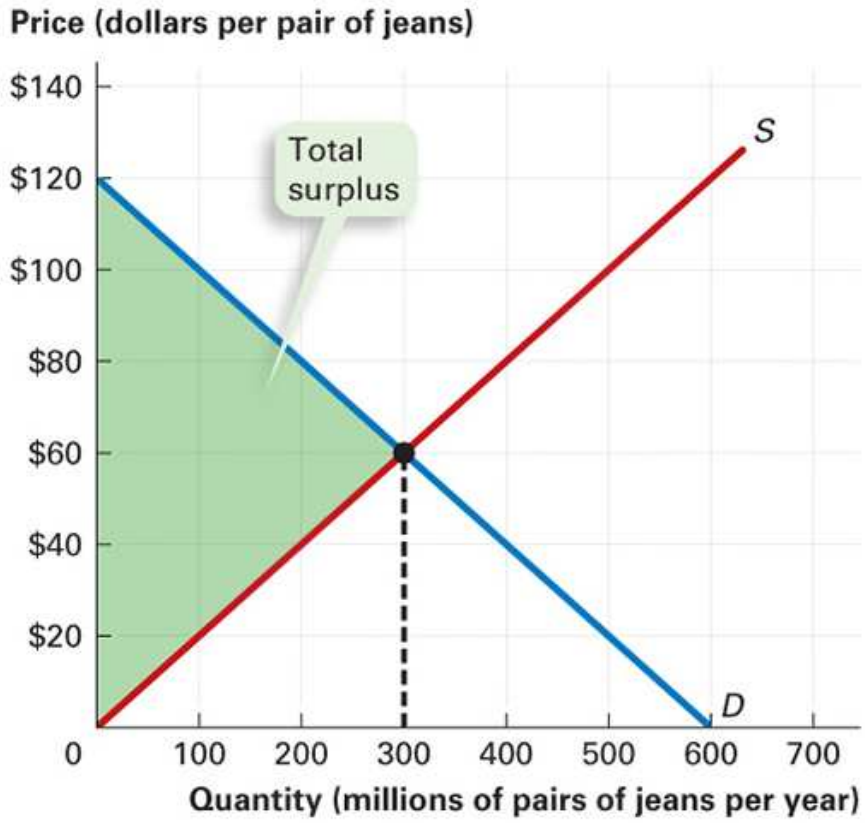
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Efficient Quantity of Output

Learning Objective 2.4

Efficient quantity: The quantity of output that yields the largest total surplus of benefit over cost for society.



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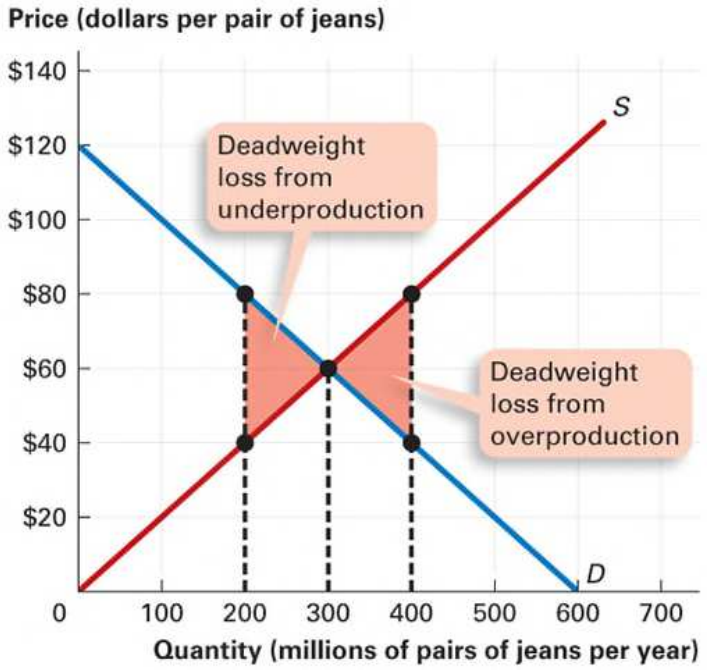
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Deadweight Loss

Learning Objective 2.4

Deadweight loss: The loss in total surplus from producing less or more than the efficient quantity.

- *Underproduction* means some units are not produced even though their marginal benefit is greater than their marginal cost
- *Overproduction* means some units are produced even though their marginal benefit is less than their marginal cost



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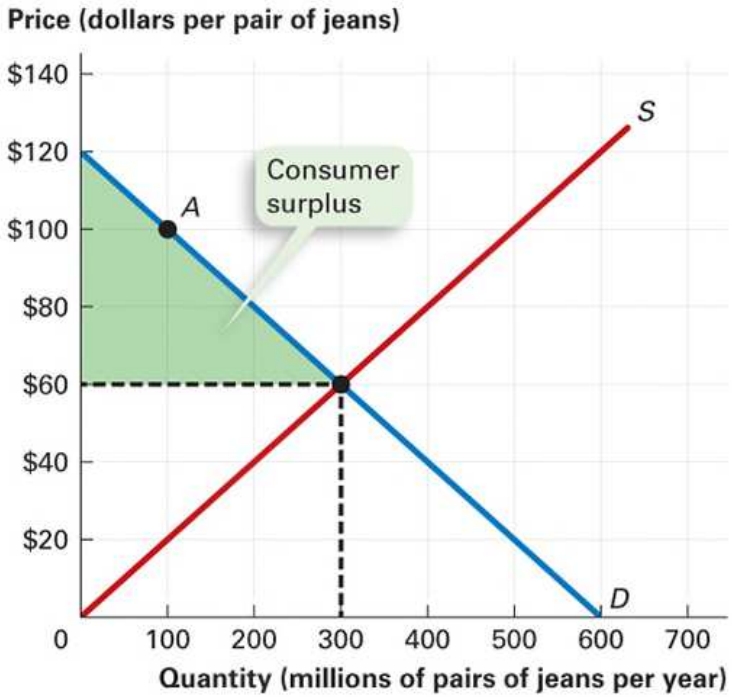
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Consumer Surplus

Learning Objective 2.4

Consumer surplus: The difference between the maximum price consumers are willing to pay for each unit of a product and the price actually paid, summed over the quantity of units purchased.



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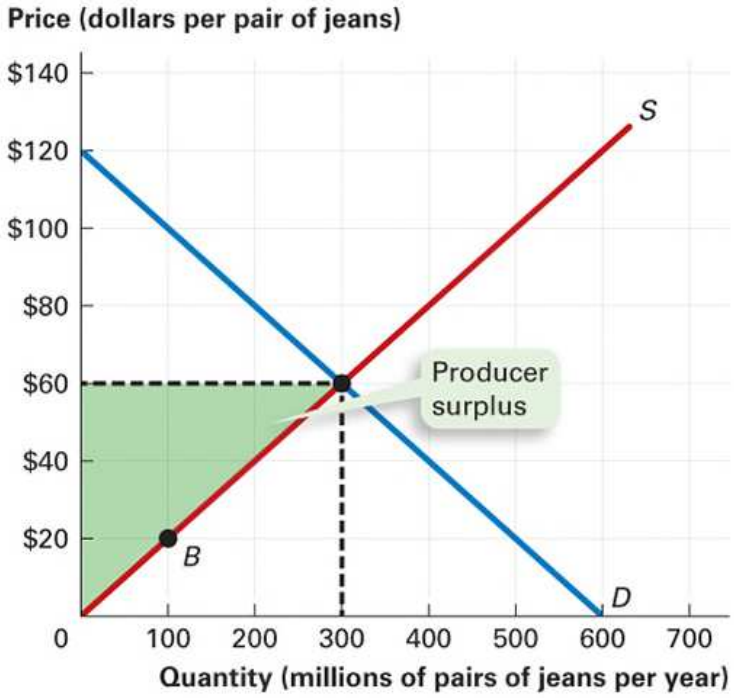
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Producer Surplus

Learning Objective 2.4

Producer surplus: The difference between the actual price producers receive for each unit and the minimum price they are willing to accept to produce that unit, summed over the quantity of units produced.



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Changes in Market Equilibrium

Learning Objective 2.5

If a relevant factor changes so that either the demand or supply changes, the equilibrium price and quantity change.

To determine how the equilibrium price and quantity change using a demand and supply diagram, follow 4 steps:

1. Draw a demand and supply diagram and label the initial equilibrium price and quantity
2. Determine which curve (demand or supply) shifts
3. Determine the direction of the shift (right or left)
4. Draw the new curve in the diagram, and use the new equilibrium to determine the change in the equilibrium price and quantity

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Changes in Market Equilibrium

Learning Objective 2.5

When only a single curve shifts, that is, when *either* demand *or* supply changes, the effects on the both the equilibrium price and quantity can be determined.

	Price	Quantity
Demand increases	Rises	Increases
Demand decreases	Falls	Decreases
Supply increases	Falls	Increases
Supply decreases	Rises	Decreases

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Shifts of Both Supply and Demand

Learning Objective 2.5

If two relevant factors change so that *both* the demand and supply change, the equilibrium price and/or quantity changes.

- The effect on the price and quantity depend on the relative magnitudes of the changes.
- Unless you know the relative magnitudes of the changes, you will know *either* how the price changes but the quantity change will be ambiguous *or* how the quantity changes but the price change will be ambiguous.

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Shifts of Both Supply and Demand

Learning Objective 2.5

When two relevant factors change so that *both* the demand and supply change, to determine how the equilibrium price and quantity change using a demand and supply diagram, follow 4 steps:

1. Draw two demand and supply diagrams, and label the initial equilibrium price and quantity.
2. Determine which curve (demand or supply) the first factor shifts and determine the direction of the shift (left or right).
3. Determine which curve (demand or supply) the second factor shifts and determine the direction of the shift (left or right).
4. In one diagram, draw a large shift of the demand curve and a small shift of the supply curve. In the other diagram, draw a small shift of the demand curve and a large shift of the supply curve. Compare how the equilibrium price and quantity change in each diagram.

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Price Controls

Learning Objective 2.6

In some markets, governments use price controls to prevent the price from reaching its equilibrium

Price ceiling: A government regulation that sets the maximum legal price.

- *Rent control*: As of 2014 four states and the District of Columbia have some form of rent control which prevents the rent from rising to its equilibrium level.
- *Gasoline price caps*: The 1970's OPEC oil crisis led OPEC to limit the amount of oil they exported to the United States. The U.S. government imposed gasoline price caps which forced the price of gasoline below the equilibrium level.

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Price Controls

Learning Objective 2.6

In some markets, governments use price controls to prevent the price from reaching its equilibrium

Price floor: A government regulation that sets the minimum legal price.

- *Minimum Wage*: The minimum wage is set above the equilibrium wage in order to increase the wage paid (lower-skilled) workers.
- *Agricultural goods*: Many agricultural products, such as milk in Maine, have price floors set above the equilibrium price to increase farmers' incomes.

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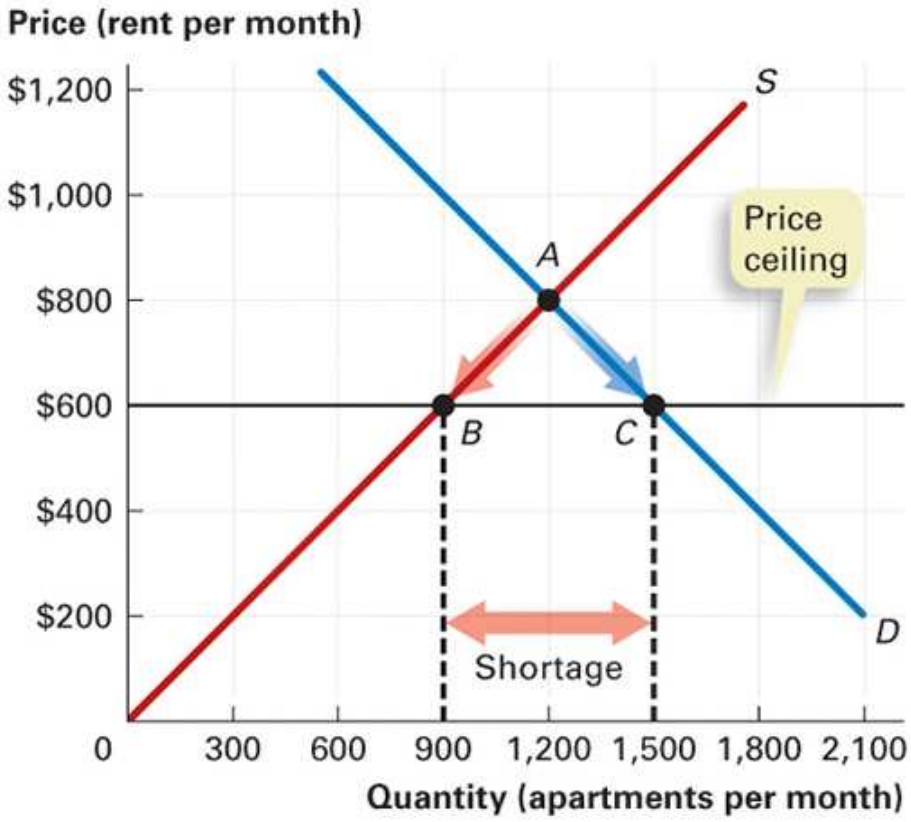
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Price Ceiling

Learning Objective 2.6

If a price ceiling is set below the equilibrium price, it forces the price to be less than the equilibrium price and creates a shortage.

The price ceiling (rent ceiling) of $600 in the figure means that the quantity of apartments demanded is 1,500, the quantity of apartments supplied is 900, so there is a shortage of 600 apartments.



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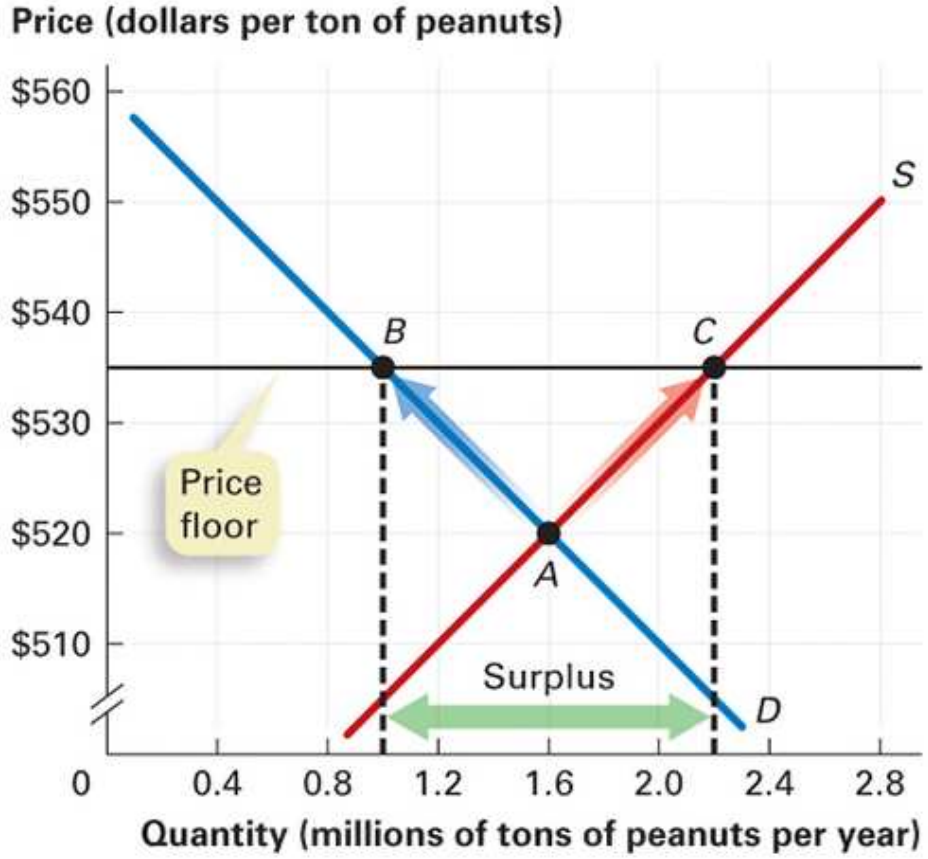
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Price Floor

Learning Objective 2.6

If a price floor is set above the equilibrium price, it forces the price to be higher than the equilibrium price and creates a surplus.

The price floor of $535 in the figure means that the quantity of peanuts demanded is 1.0 million tons, the quantity of peanuts supplied is 2.2 million tons, so there is a surplus of 1.2 million tons.



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Using the Demand and Supply Model

Learning Objective 2.7

As a manager, you can use the demand and supply model to help you:

- Predict changes in the price of your product or the cost to produce it based on changes in demand and/or supply.
- Predict changes in the output of inputs used to produce your product.
- Determine if production changes are necessary to increase your firm's profit.

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Managerial Applications (1 of 2)

Learning Objective 2.7

Example: What happens to equilibrium price and quantity of a good if the number of its buyers increases?

Answer: The increase in the number of buyers increases the demand (the demand curve shifts to the right), which increases the price and quantity.

Example: What happens to equilibrium price and quantity of a product if the cost of a resource used to produce it falls?

Answer: The fall in cost increases the supply (the supply curve shifts to the right), which decreases the price and increases the quantity.

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Managerial Applications (2 of 2)

Learning Objective 2.7

Example: What happens to the equilibrium price and quantity of a good if *both* the cost of a resource used to produce the good falls, while the number of the good's buyers increases?

Answer: The decrease in the cost of producing the good increases the supply and the increase in the number of buyers increases the demand. Both the demand and supply curves shift to the right. Consequently the quantity increases, but the change in price is ambiguous—it depends on the relative magnitudes of the increase in supply and demand (it rises if the demand shift is larger, falls if the supply shift is larger, and does not change if the shifts are equal).

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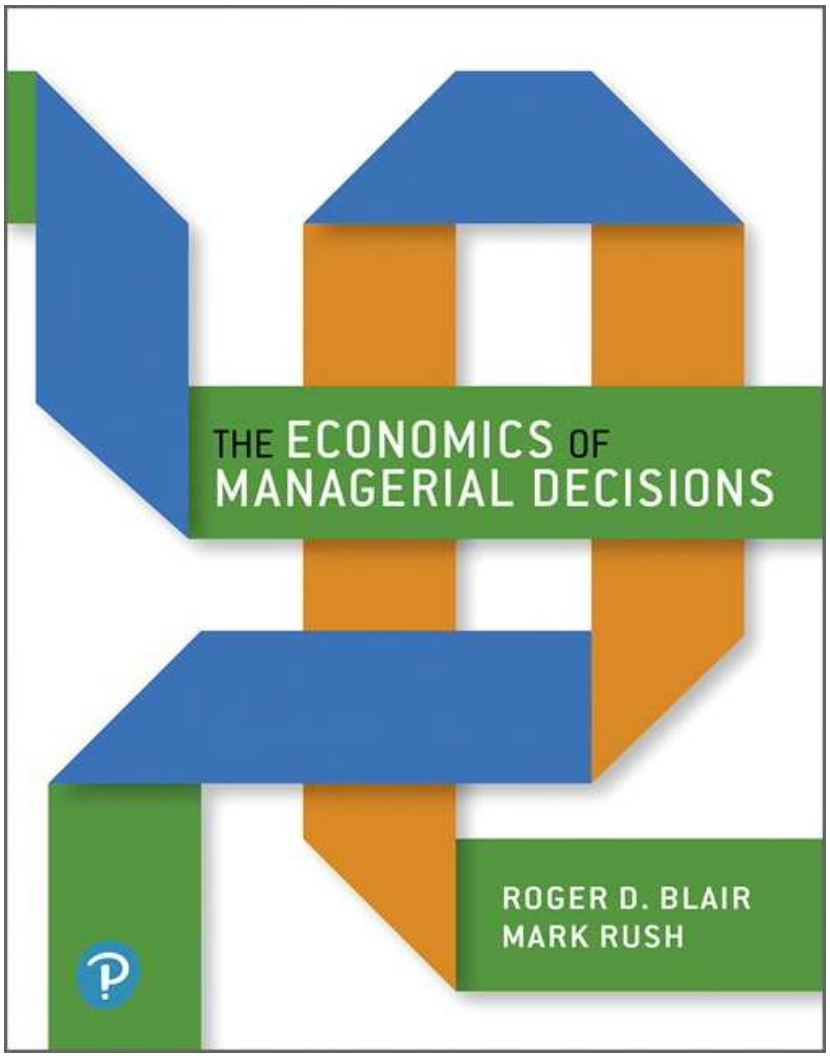
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The Economics of Managerial Decisions

First Edition



Chapter 2

Demand and Supply

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Learning Objectives

2.1 Describe the factors that affect the demand for goods and services.

2.2 Describe the factors that affect the supply of goods and services.

2.3 Determine the market equilibrium price and quantity using the demand and supply model.

2.4 Explain why perfectly competitive markets are socially optimal.

2.5 Use the demand and supply model to predict how changes in the market affect the price and quantity of a good or service.

2.6 Explain the effects of price ceilings and price floors.

2.7 Apply the demand and supply model to make better managerial decisions.

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What is a Market?

Market: Any arrangement that allows buyers and sellers to transact their business.

We first study the behavior of buyers (the demanders), then the behavior of sellers (the suppliers), and then we combine the two.

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The Law of Demand

Learning Objective 2.1

Price influences people's willingness to buy a product.

Example: How many cups of coffee will you buy per week if the price is $3? If the price is $5?

Law of Demand: All other things remaining the same, the higher the price of the good or service, the smaller the quantity demanded; the lower the price of the good or service, the larger the quantity demanded.

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Substitution Effect

Learning Objective 2.1

Substitution effect: When the price of a good or service changes, its price compared to the prices of other substitute goods or services changes.

- Example: When the price of chicken increases, consumers switch to beef or pork purchases which causes less chicken to be purchased.

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Income Effect

Learning Objective 2.1

Income effect: When the price of a good or service changes, buyers' purchasing power changes.

- Example: When price of chicken increases there's less income left over in the budget to buy other goods and services. Less chicken will be purchased as well as other goods.

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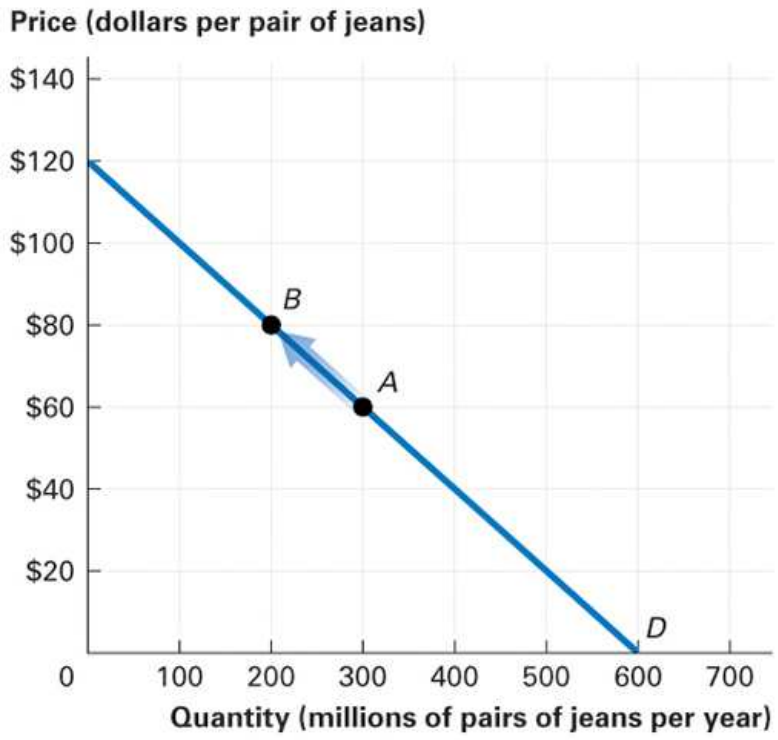
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Figure 2.1 A Demand Curve

Learning Objective 2.1

- The demand curve for jeans, *D*, shows the quantity of jeans demanded at all different prices.
- The slope of the demand curve reflects the law of demand: As the price rises, the quantity of jeans demanded decreases.
- When the price rises from $60 to $80, there is a movement up along the demand curve from point *A* to point *B*. The quantity demanded decreases from 300 million to 200 million pairs of jeans.



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Change in Quantity Demanded

Learning Objective 2.1

A change in the quantity demanded is represented by a movement along a given demand curve.

- A downward movement along the demand curve is an increase in the quantity demanded.
- An upward movement along the demand curve is a decrease in the quantity demanded.

Cause: The only factor that causes a change in the quantity demanded is a change in price of the product or service.

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The Demand Function

Learning Objective 2.1

Demand can be written algebraically as a **Demand Function:**

$$Q^d = a - (b \times P)$$

- Q^d= Quantity demanded of a pair of jeans
- P = Price of a pair of jeans
- a = The value of the horizontal intercept value; the quantity of jeans demanded when price= $0
- b = The change in quantity demanded caused by a $1 change in price of a pair of jeans

Dependent variable = Q^d

Independent variable = P

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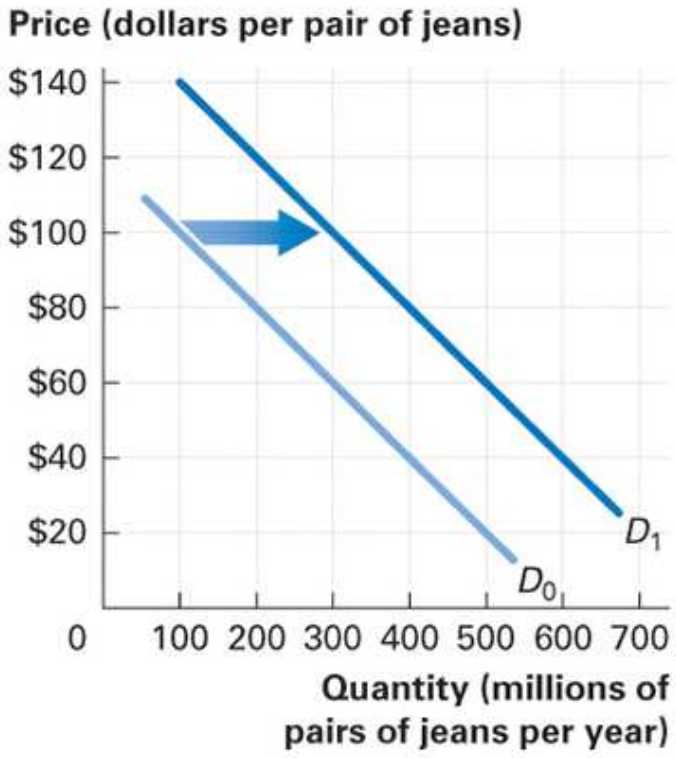
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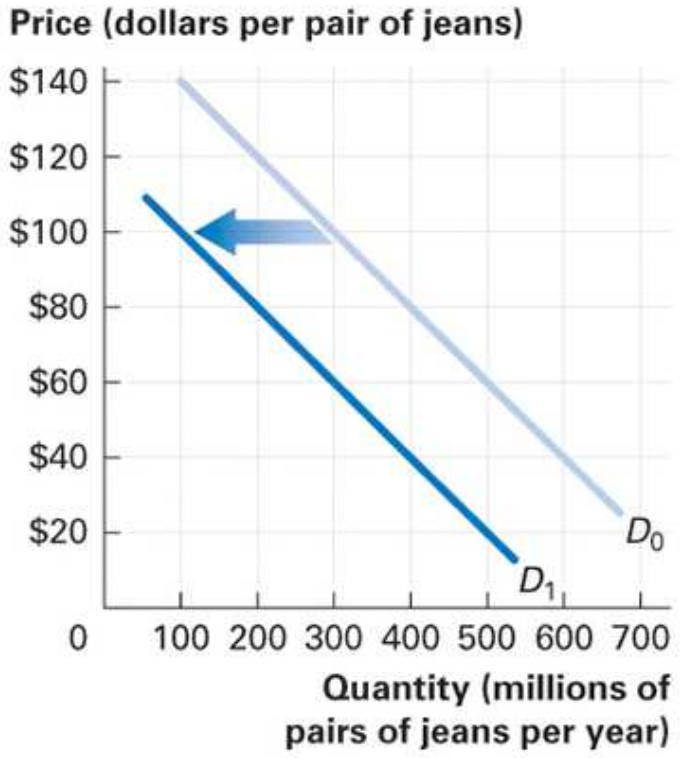
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Figure 2.3 Change in Demand

Learning Objective 2.1

A change in any relevant factor other than the price of the product itself creates a change in demand and shifts the demand curve.





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Change in Demand

Learning Objective 2.1

Factors that cause a change in demand include:

- Change in Income (Normal and Inferior Goods)
- Price of Related Goods and Services (Substitutes and Complements)
- Consumers' Preferences & Advertising
- Financial Market Conditions
- Expected Future Price
- Number of Demanders

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Demand Function – adding variables

Learning objective 2.1

A demand function can include more variables than just the price of the product.

$Q^d = f(P, P_{SKIRTS}, \text{INCOME})$

- This demand function assumes that the quantity demanded of jeans depends on the price of jeans and also the price of skirts and customers' income.

If the demand function is linear, it can be written as:

$$Q^d = a - (b \times P) + (c \times P_{SKIRTS}) + (d \times \text{INCOME})$$

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The Law of Supply

Learning Objective 2.2

Price influences firms' willingness to sell a product.

Example: Assuming input costs are constant, how many cups of coffee would you offer to sell per week if the price is $3? If the price is $5?

Law of Supply: All other things remaining the same, the higher the price of the good or service, the larger the quantity supplied; the lower the price of the good or service, the smaller the quantity supplied.

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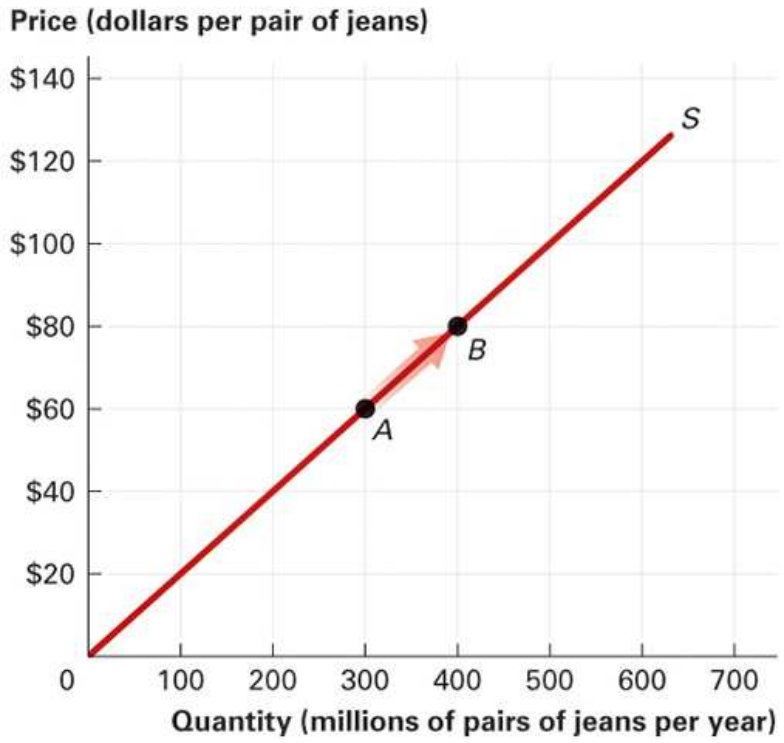
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Figure 2.4 A Supply Curve

Learning Objective 2.2

- The supply curve of jeans, *S*, shows the quantity of jeans supplied at all different prices.
- The slope of the supply curve reflects the law of supply: As the price rises, the quantity of jeans supplied increases.
- When the price rises from $60 to $80, there is a movement up along the supply curve from point *A* to point *B*. The quantity supplied increases from 300 million to 400 million pairs of jeans.



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Change in Quantity Supplied

Learning Objective 2.2

A change in the quantity supplied is represented by a movement along a given supply curve.

- A downward movement along the supply curve is a decrease in the quantity supplied.
- An upward movement along the supply curve is an increase in the quantity supplied.

Cause: The only factor that causes a change in the quantity supplied is a change in price of the product or service.

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Supply Function

Learning Objective 2.2

Supply can be written algebraically as a **Supply Function:**

$$Q^s = r + (s \times P)$$

- Q^s = Quantity supplied of a pair of jeans
- P = Price of a pair of jeans
- r = The value of the horizontal intercept; the quantity supplied of jeans supplied when P = \$0
- s = The change in quantity supplied caused by a \$1 change in price of a pair of jeans

Dependent variable = Q^s

Independent variable = P

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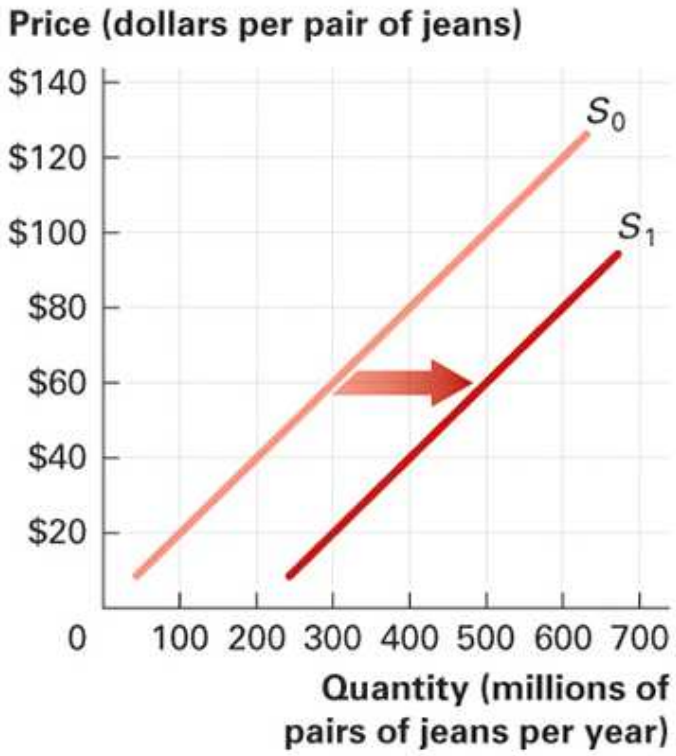
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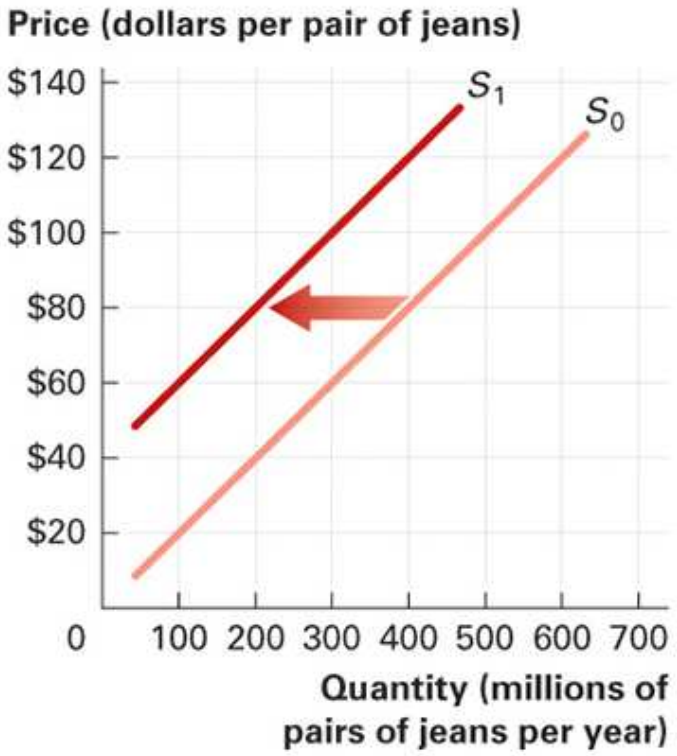
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Figure 2.6 Changes in Supply

Learning Objective 2.2

A change in any relevant factor other than the price of the product itself creates a change in supply and shifts the supply curve.





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Change in Supply

Learning Objective 2.2

Factors that cause a change in supply include:

- Costs
- Price of Related Goods (substitutes in production and complements in production)
- Technology
- State of Nature
- Expected Future Price
- Number of Suppliers

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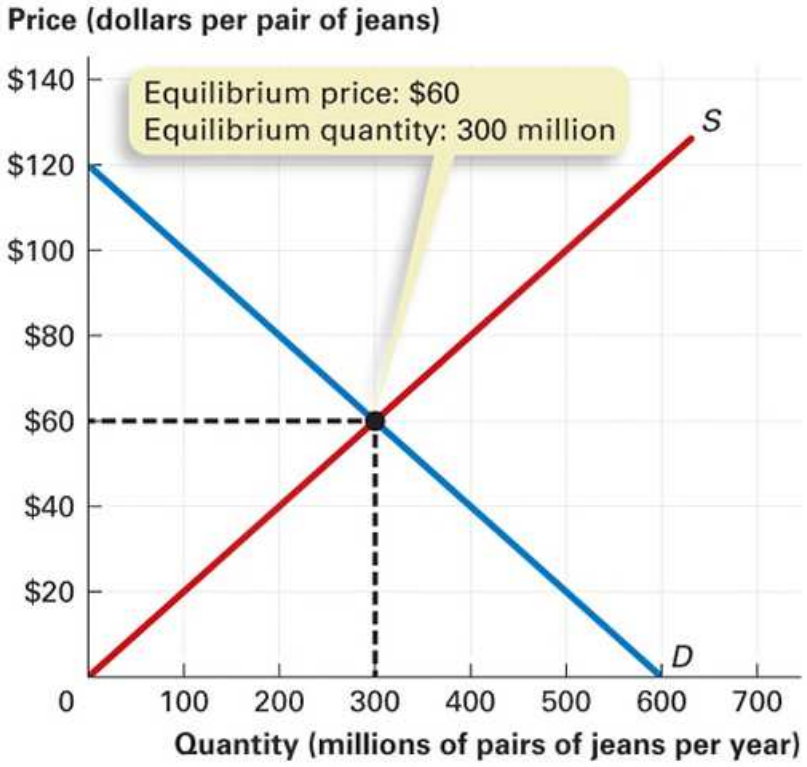
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Equilibrium Price & Quantity

Learning Objective 2.3

Equilibrium price: The price at which the quantity demanded equals the quantity supplied.

Equilibrium quantity: The quantity bought and sold at the equilibrium price.



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Determining Equilibrium Price

Learning Objective 2.3

To determine the equilibrium price and quantity using the algebraic demand and supply functions, first set the demand and supply functions equal to solve for the price:

$$Q^d = 600{,}000{,}000 - (5{,}000{,}000 \times P)$$

$$Q^s = 5{,}000{,}000 \times P$$

Set $Q^d = Q^s$ and solve for P:

$$600{,}000{,}000 - 5{,}000{,}000 \times P = 5{,}000{,}000 \times P$$

$$600{,}000{,}000 = 5{,}000{,}000 \times P + 500{,}000{,}000 \times P$$

$$600{,}000{,}000 = 10{,}000{,}000 \times P$$

$$P = 600{,}000{,}000/10{,}000{,}000$$

$$P = \$60$$

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Determining Equilibrium Quantity

Learning Objective 2.3

Second, substitute the equilibrium price ($60) into *either* the demand or supply function to determine the equilibrium quantity

Demand function

$$Q^d = 600{,}000{,}0000 - 5{,}000{,}000 \times P$$
$$= 600{,}000{,}000 - 5{,}000{,}000 \times (60)$$
$$= 600{,}000{,}000 - 300{,}000{,}000$$
$$= 300{,}000{,}000$$

Supply function

$$Q^s = 5{,}000{,}000 \times P$$
$$= 5{,}000{,}000 \times (60)$$
$$= 300{,}000{,}000$$

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Competition and Society

Learning Objective 2.4

Perfectly Competitive markets are socially optimal because they foster the optimal allocation of society's scarce resources.

Total Surplus: The amount by which total benefit exceeds total cost. The total surplus equals the difference between the marginal benefit and marginal cost for each unit summed over the units produced.

- If the Marginal Benefit (*MB*) of a pair of jeans is $100 and the Marginal Cost (*MC*) of the pair of jeans is $20, the surplus of benefit over cost to society of this pair of jeans is $80.

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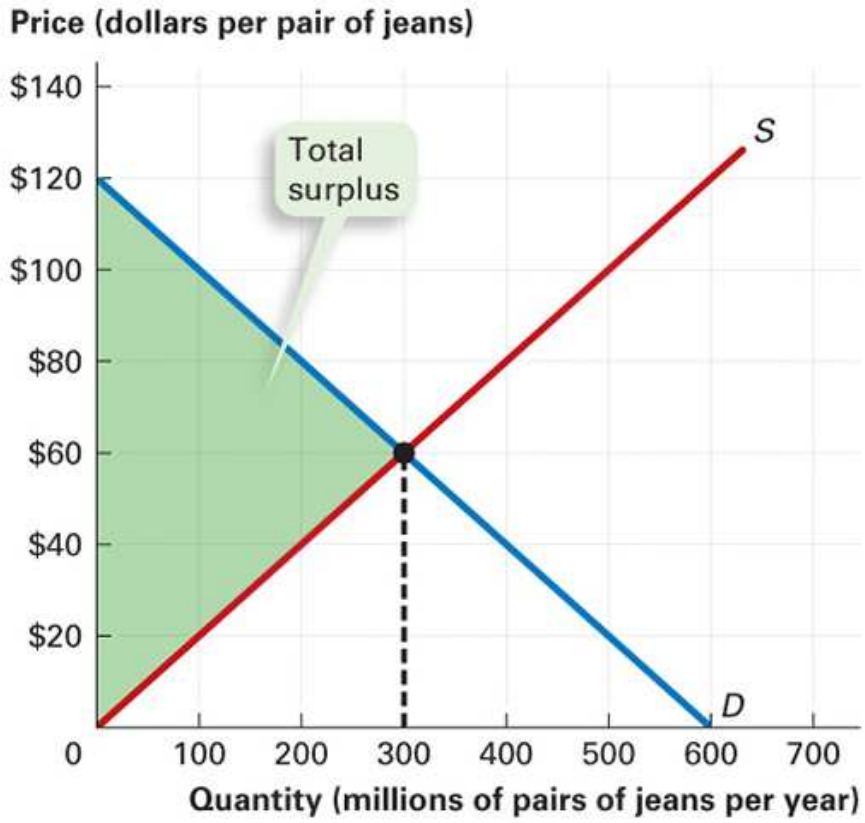
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Efficient Quantity of Output

Learning Objective 2.4

Efficient quantity: The quantity of output that yields the largest total surplus of benefit over cost for society.



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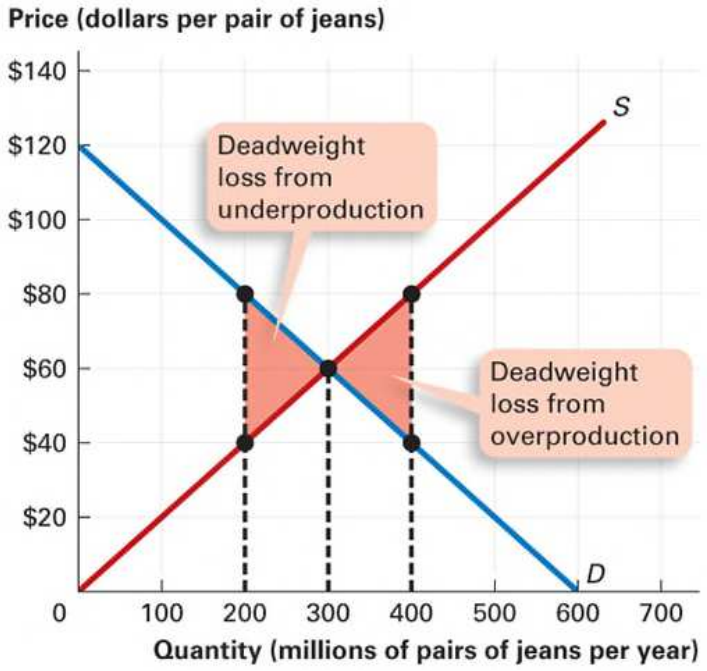
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Deadweight Loss

Learning Objective 2.4

Deadweight loss: The loss in total surplus from producing less or more than the efficient quantity.

- *Underproduction* means some units are not produced even though their marginal benefit is greater than their marginal cost
- *Overproduction* means some units are produced even though their marginal benefit is less than their marginal cost



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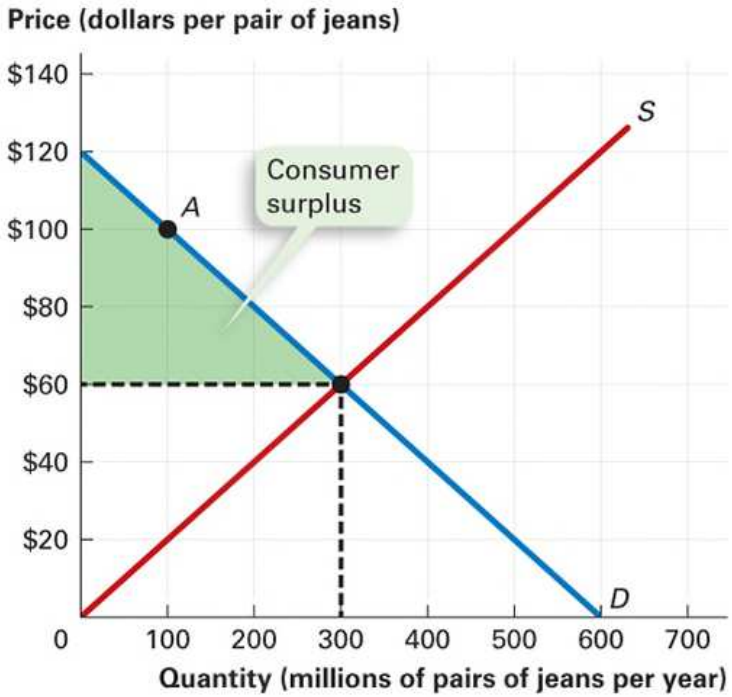
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Consumer Surplus

Learning Objective 2.4

Consumer surplus: The difference between the maximum price consumers are willing to pay for each unit of a product and the price actually paid, summed over the quantity of units purchased.



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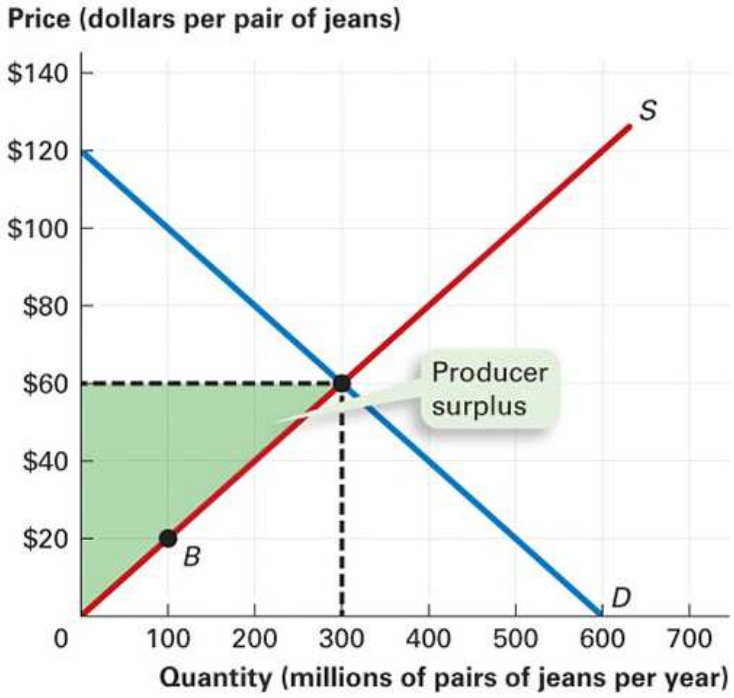
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Producer Surplus

Learning Objective 2.4

Producer surplus: The difference between the actual price producers receive for each unit and the minimum price they are willing to accept to produce that unit, summed over the quantity of units produced.



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Changes in Market Equilibrium

Learning Objective 2.5

If a relevant factor changes so that either the demand or supply changes, the equilibrium price and quantity change.

To determine how the equilibrium price and quantity change using a demand and supply diagram, follow 4 steps:

1. Draw a demand and supply diagram and label the initial equilibrium price and quantity
2. Determine which curve (demand or supply) shifts
3. Determine the direction of the shift (right or left)
4. Draw the new curve in the diagram and use the new equilibrium to determine the change in the equilibrium price and quantity

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Changes in Market Equilibrium

Learning Objective 2.5

When only a single curve shifts, that is, when *either* demand *or* supply changes, the effects on the both the equilibrium price and quantity can be determined.

	Price	Quantity
Demand increases	Rises	Increases
Demand decreases	Falls	Decreases
Supply increases	Falls	Increases
Supply decreases	Rises	Decreases

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Shifts of Both Supply and Demand

Learning Objective 2.5

If two relevant factors change so that *both* the demand and supply change, the equilibrium price and/or quantity changes.

- The effect on the price and quantity depend on the relative magnitudes of the changes.
- Unless you know the relative magnitudes of the changes, you will know *either* how the price changes, but the quantity change will be ambiguous *or* how the quantity changes but the price change will be ambiguous.

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Shifts of Both Supply and Demand

Learning Objective 2.5

When two relevant factors change so that *both* the demand and supply change, to determine how the equilibrium price and quantity change using a demand and supply diagram, follow 4 steps:

1. Draw two demand and supply diagrams and label the initial equilibrium price and quantity
2. Determine which curve (demand or supply) the first factor shifts, and determine the direction of the shift (left or right)
3. Determine which curve (demand or supply) the second factor shifts, and determine the direction of the shift (left or right)
4. In one diagram, draw a large shift of the demand curve and a small shift of the supply curve. In the other diagram, draw a small shift of the demand curve and a large shift of the supply curve. Compare how the equilibrium price and quantity change in each diagram.

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Price Controls

Learning Objective 2.6

In some markets, governments use price controls to prevent the price from reaching its equilibrium.

Price ceiling: A government regulation that sets the maximum legal price.

- *Rent control*: As of 2014 four states and the District of Columbia have some form of rent control which prevents the rent from rising to its equilibrium level
- *Gasoline price caps*: The 1970's OPEC oil crisis led OPEC to limit the amount of oil they exported to the United States. The U.S. government imposed gasoline price caps which forced the price of gasoline below the equilibrium level

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In some markets, governments use price controls to prevent the price from reaching its equilibrium.

Price floor: A government regulation that sets the minimum legal price.

- *Minimum Wage*: The minimum wage is set above the equilibrium wage in order to increase the wage paid (lower-skilled) workers
- *Agricultural goods*: Many agricultural products, such as milk in Maine, have price floors set above the equilibrium price to increase farmers' incomes

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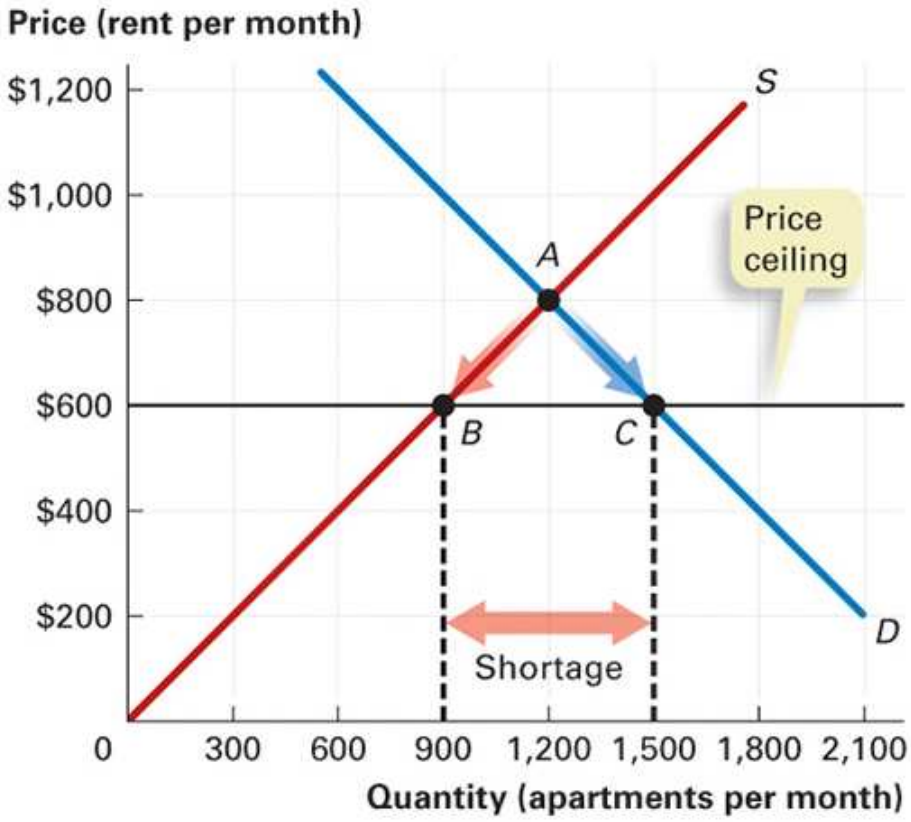
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Price Ceiling

Learning Objective 2.6

If a price ceiling is set below the equilibrium price, it forces the price to be less than the equilibrium price and creates a shortage.

The price ceiling (rent ceiling) of $600 in the figure means that the quantity of apartments demanded is 1,500, the quantity of apartments supplied is 900, so there is a shortage of 600 apartments.



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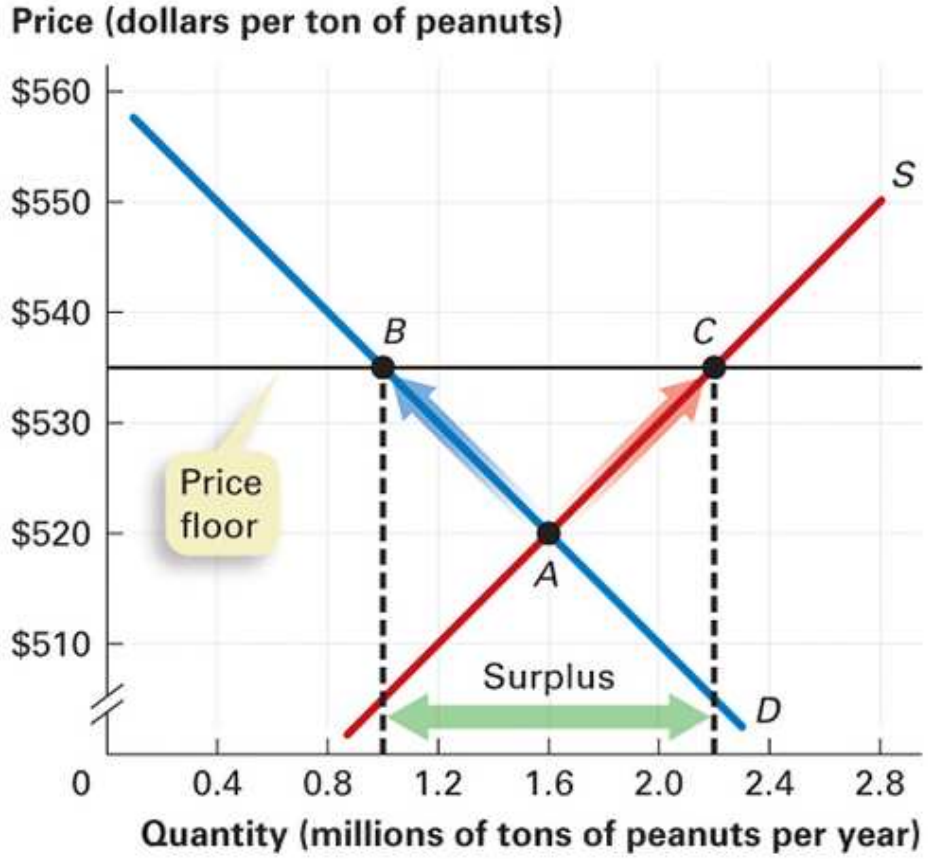
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Price Floor

Learning Objective 2.6

If a price floor is set above the equilibrium price, it forces the price to be higher than the equilibrium price and creates a surplus.

The price floor of $535 in the figure means that the quantity of peanuts demanded is 1.0 million tons, the quantity of peanuts supplied is 2.2 million tons, so there is a surplus of 1.2 million tons.



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Using the Demand and Supply Model

Learning Objective 2.7

As a manager, you can use the demand and supply model to help you:

- Predict changes in the price of your product or the cost to produce it based on changes in demand and/or supply.
- Predict changes in the output of inputs used to produce your product.
- Determine if production changes are necessary to increase your firm's profit.

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Managerial Applications (1 of 2)

Learning Objective 2.7

Example: What happens to equilibrium price and quantity of a good if the number of its buyers increases?

Answer: The increase in the number of buyers increases the demand (the demand curve shifts to the right), which increases the price and quantity.

Example: What happens to equilibrium price and quantity of a product if the cost of a resource used to produce it falls?

Answer: The fall in cost increases the supply (the supply curve shifts to the right), which decreases the price and increases the quantity.

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Managerial Applications (2 of 2)

Learning Objective 2.7

Example: What happens to the equilibrium price and quantity of a good if *both* the cost of a resource used to produce the good falls, while the number of the good's buyers increases?

Answer: The decrease in the cost of producing the good increases the supply and the increase in the number of buyers increases the demand. Both the demand and supply curves shift to the right. Consequently, the quantity increases, but the change in price is ambiguous—it depends on the relative magnitudes of the increase in supply and demand (it rises if the demand shift is larger, falls if the supply shift is larger, and does not change if the shifts are equal).

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