N. GREGORY MANKIW

PRINCIPLES OF

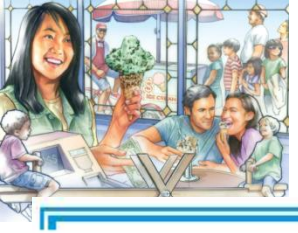
ECONOMICS

Eight Edition

CHAPTER 5

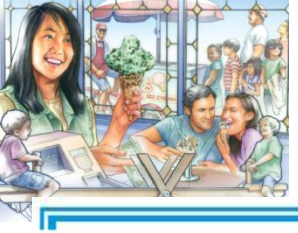
Elasticity and Its Application

PowerPoint Slides prepared by:
V. Andreea CHIRITESCU
Eastern Illinois University



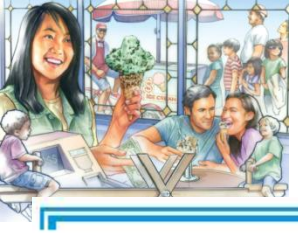
The Elasticity of Demand, Part 1

- Elasticity
  - Measure of the responsiveness of quantity demanded or quantity supplied
    - To a change in one of its determinants
- Price elasticity of demand
  - How much the quantity demanded of a good responds to a change in the price of that good



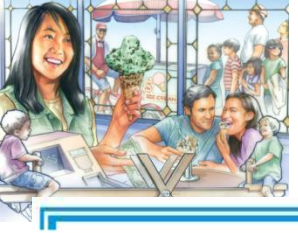
The Elasticity of Demand, Part 2

- Price elasticity of demand
  - Percentage change in quantity demanded divided by the percentage change in price
- Elastic demand
  - Quantity demanded responds substantially to changes in price
- Inelastic demand
  - Quantity demanded responds only slightly to changes in price



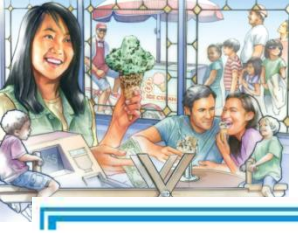
The Elasticity of Demand, Part 3

- Determinants of price elasticity of demand
  - Availability of close substitutes
    - Goods with close substitutes: more elastic demand
  - Necessities versus luxuries
    - Necessities: inelastic demand
    - Luxuries: elastic demand



The Elasticity of Demand, Part 4

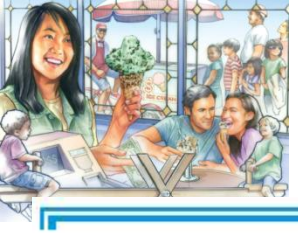
- Determinants of price elasticity of demand
  - Definition of the market
    - Narrowly defined markets: more elastic demand
  - Time horizon
    - Demand is more elastic over longer time horizons



The Elasticity of Demand, Part 5

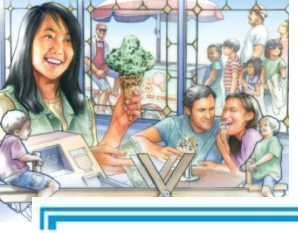
- Computing the price elasticity of demand
  - Percentage change in quantity demanded divided by percentage change in price
  - Use absolute value (drop the minus sign)
- Midpoint method
  - Two points: (Q_1, P_1) and (Q_2, P_2)

$$\text{Price elasticity of demand} = \frac{(Q_2 - Q_1)/[(Q_2 + Q_1)/2]}{(P_2 - P_1)/[(P_2 + P_1)/2]}$$



The Elasticity of Demand, Part 6

- Variety of demand curves
  - Demand is elastic
    - Price elasticity of demand > 1
  - Demand is inelastic
    - Price elasticity of demand < 1
  - Demand has unit elasticity
    - Price elasticity of demand = 1

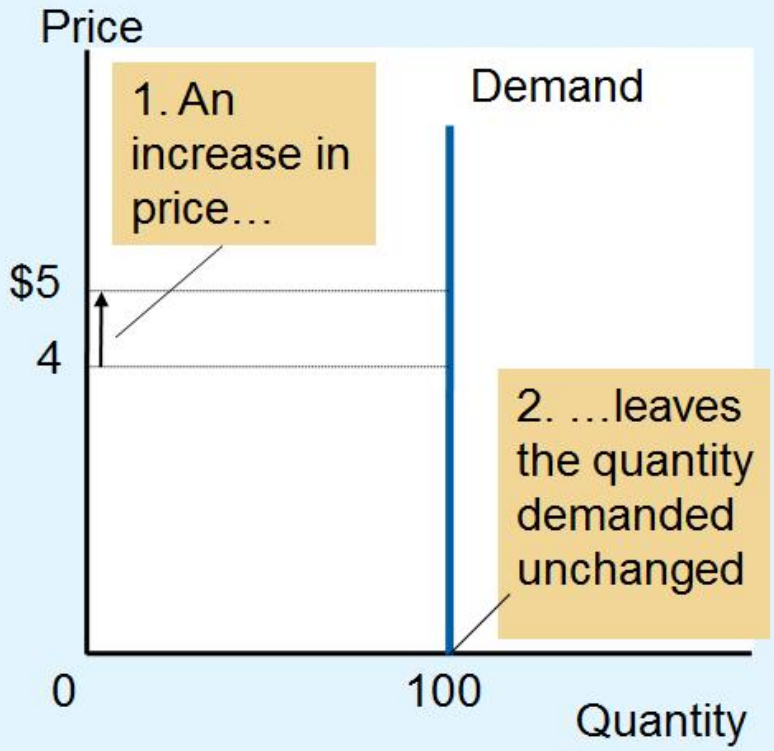


The Elasticity of Demand, Part 7

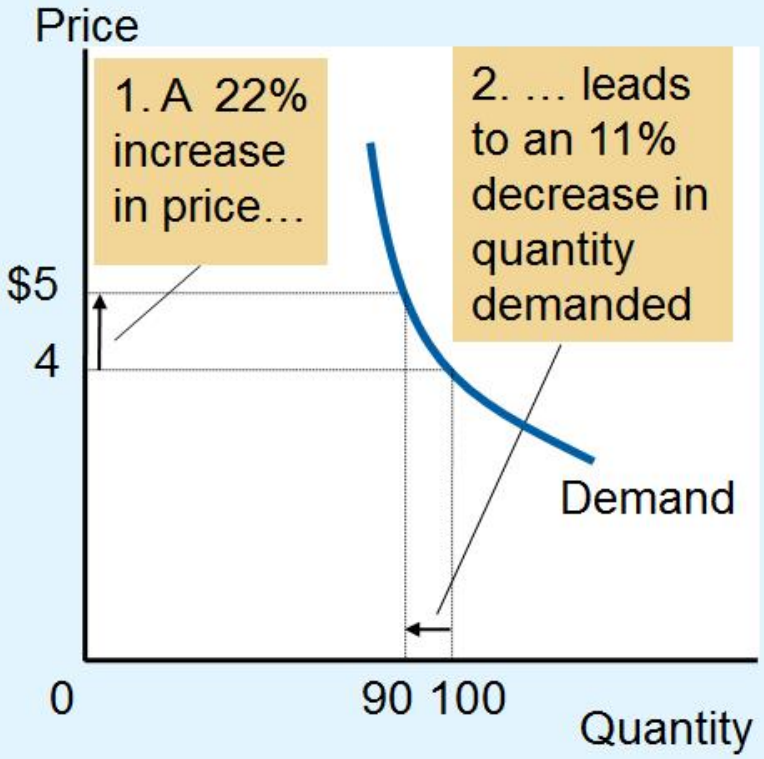
- Variety of demand curves
  - Demand is perfectly inelastic
    - Price elasticity of demand = 0
    - Demand curve is vertical
  - Demand is perfectly elastic
    - Price elasticity of demand = infinity
    - Demand curve is horizontal
- The flatter the demand curve
  - The greater the price elasticity of demand

Figure 1 The Price Elasticity of Demand (a, b)

(a) Perfectly Inelastic Demand: Elasticity Equals 0



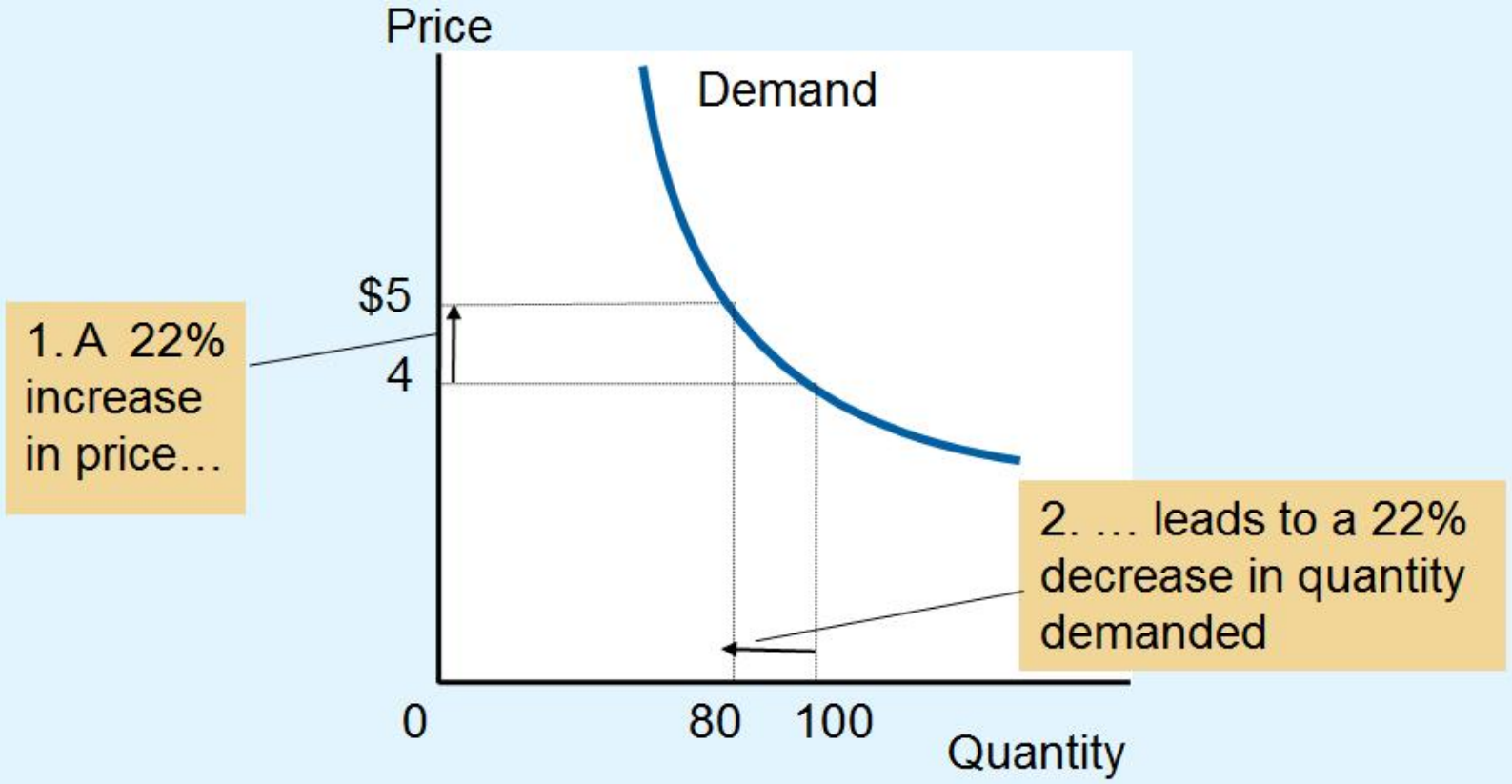
(b) Inelastic Demand: Elasticity Is Less Than 1



The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

Figure 1 The Price Elasticity of Demand (c)

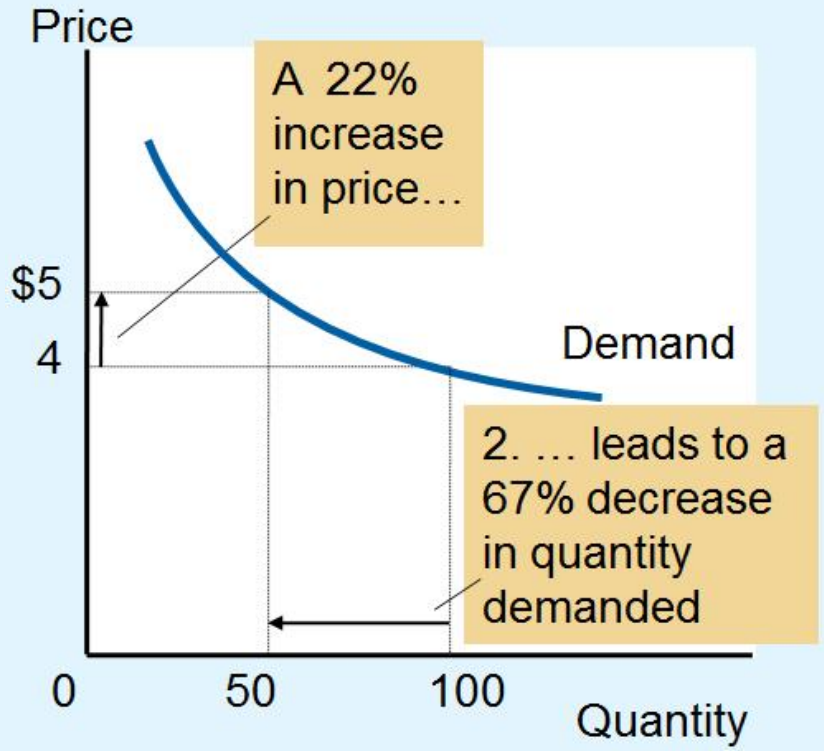
(c) Unit Elastic Demand: Elasticity Equals 1



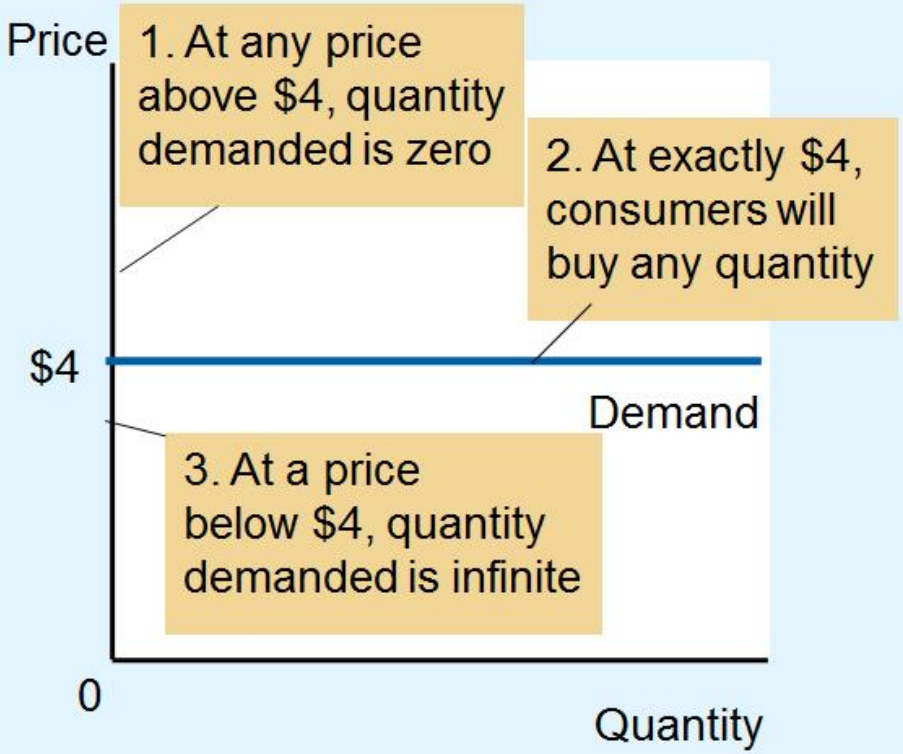
The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

Figure 1 The Price Elasticity of Demand (d, e)

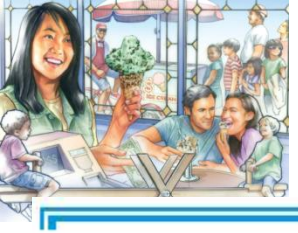
(d) Elastic demand:
Elasticity > 1



(e) Perfectly elastic demand:
Elasticity equals infinity



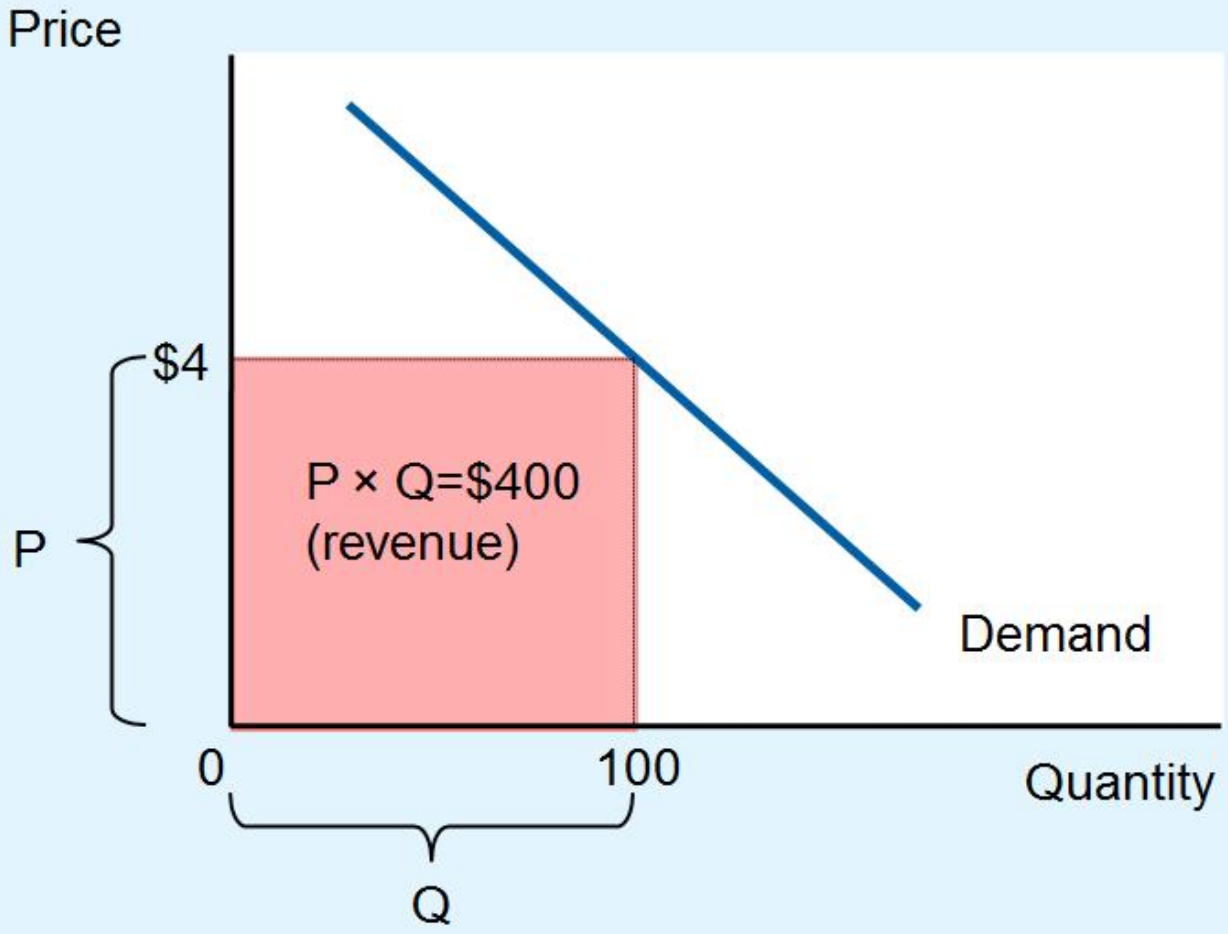
The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.



The Elasticity of Demand, Part 8

- Total revenue, TR
  - Amount paid by buyers and received by sellers of a good
  - Price of the good times the quantity sold ($P \times Q$)
- For a price increase
  - If demand is inelastic, TR increases
  - If demand is elastic, TR decreases

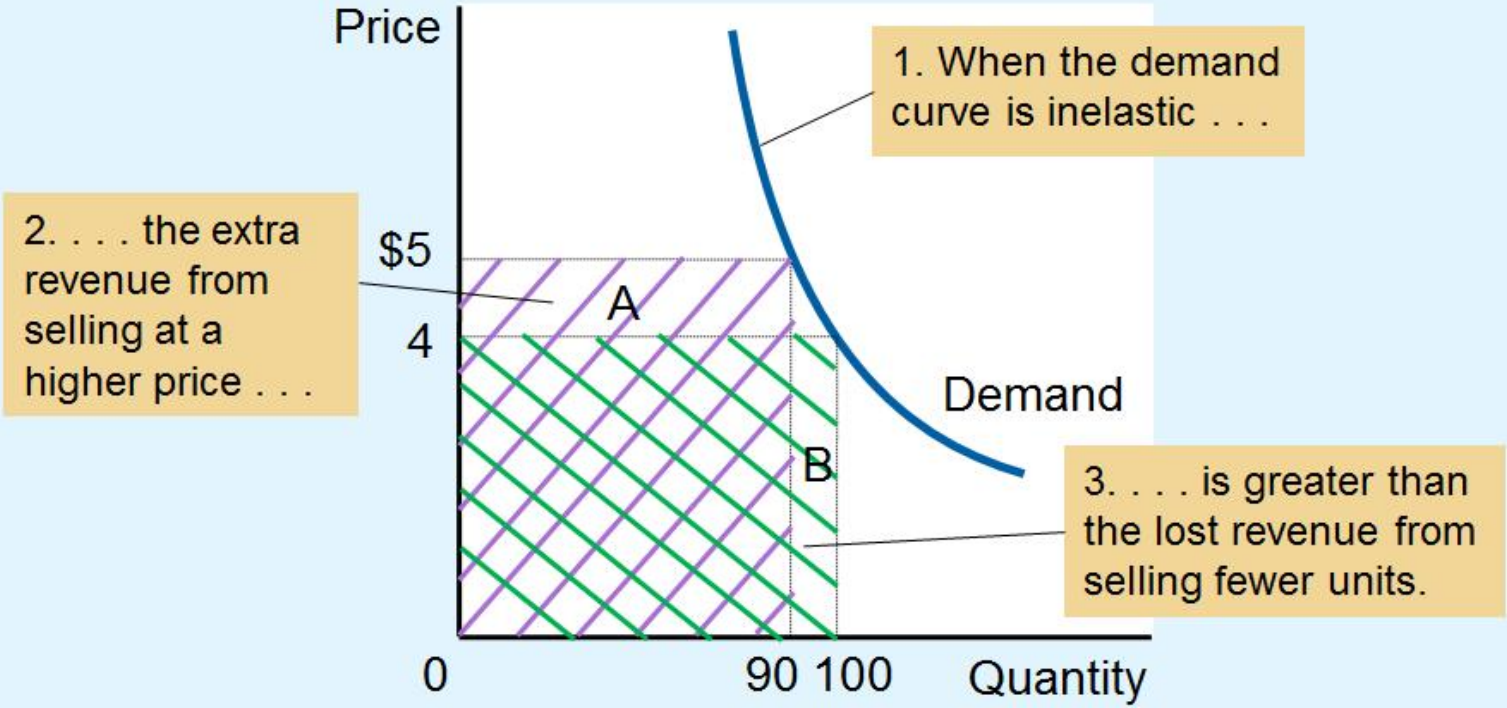
Figure 2 Total Revenue



The total amount paid by buyers, and received as revenue by sellers, equals the area of the box under the demand curve, P × Q.
Here, at a price of $4, the quantity demanded is 100, and total revenue is $400.

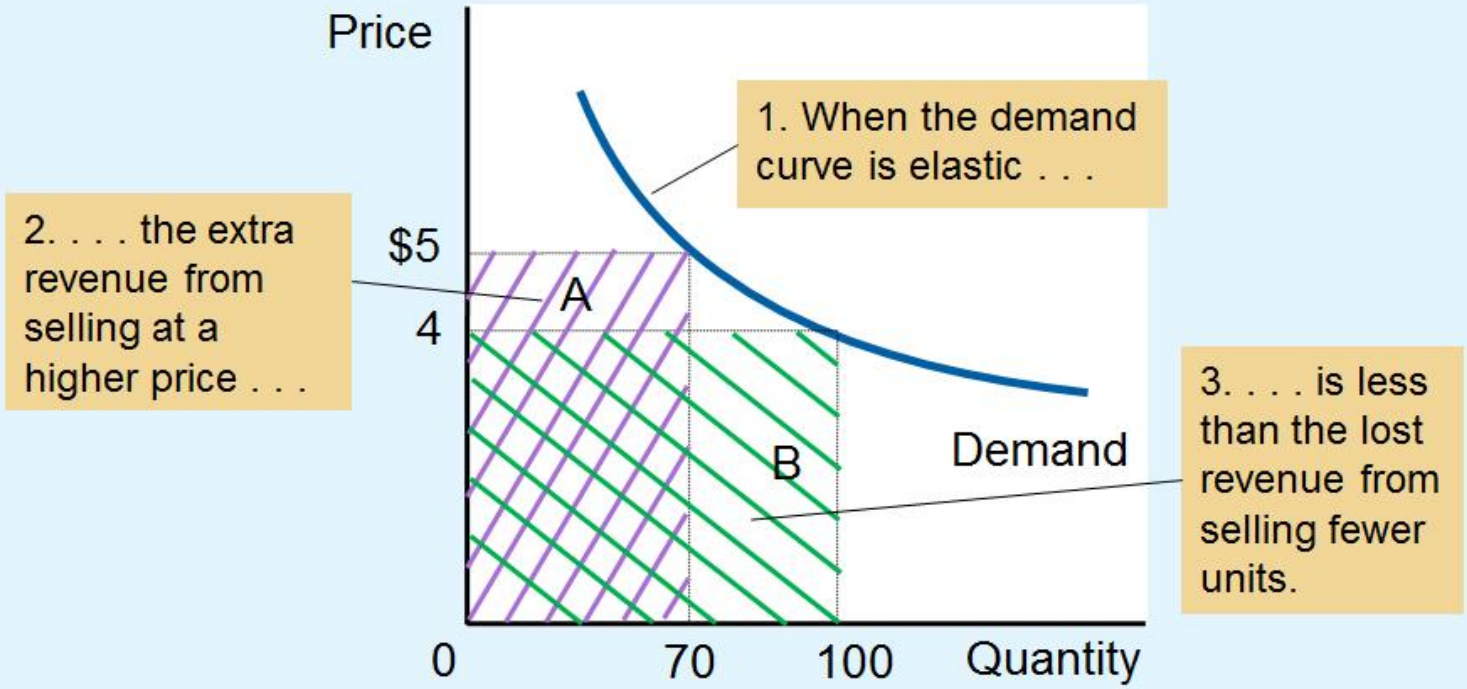
Figure 3 How Total Revenue Changes When Price Changes (a)

(a) The Case of Inelastic Demand

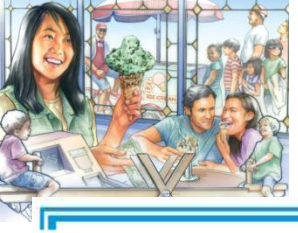


The impact of a price change on total revenue (the product of price and quantity) depends on the elasticity of demand. In panel (a), the demand curve is inelastic.
In this case, an increase in the price leads to a decrease in quantity demanded that is proportionately smaller, so total revenue increases. Here an increase in the price from $4 to $5 causes the quantity demanded to fall from 100 to 90. Total revenue rises from $400 to $450.

Figure 3 How Total Revenue Changes When Price Changes (b)

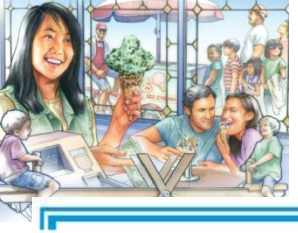


The impact of a price change on total revenue (the product of price and quantity) depends on the elasticity of demand. In panel (b), the demand curve is elastic.
In this case, an increase in the price leads to a decrease in quantity demanded that is proportionately larger, so total revenue decreases. Here an increase in the price from $4 to $5 causes the quantity demanded to fall from 100 to 70. Total revenue falls from $400 to $350.



The Elasticity of Demand, Part 9

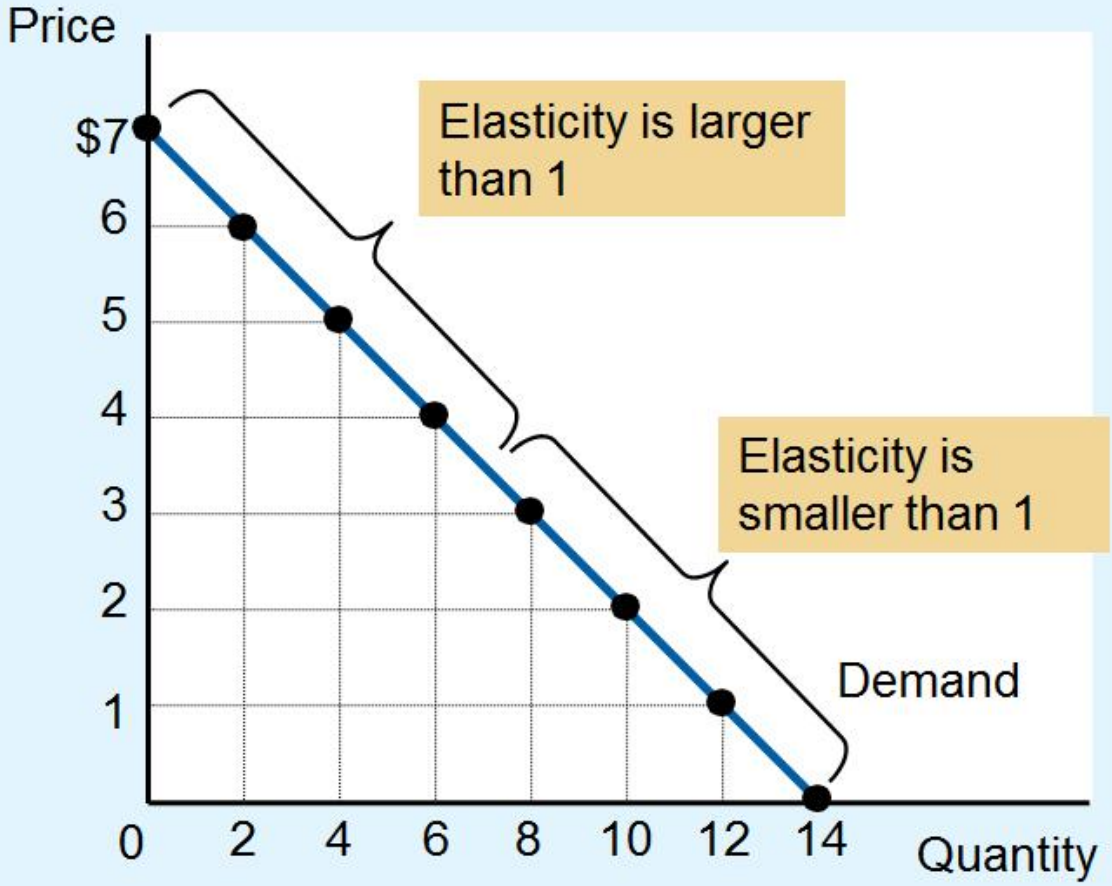
- When demand is inelastic (elasticity < 1)
  - P and TR move in the same direction
    - If P ↑, TR also ↑
- When demand is elastic (elasticity > 1)
  - P and TR move in opposite directions
    - If P ↑, TR ↓
- If demand is unit elastic (elasticity = 1)
  - Total revenue remains constant when the price changes



The Elasticity of Demand, Part 10

- Linear demand curve
  - Constant slope
    - Rise over run
  - Different price elasticities
    - Inelastic demand: points with low price and high quantity
    - Elastic demand: points with high price and low quantity

Figure 4 Elasticity along a Linear Demand Curve

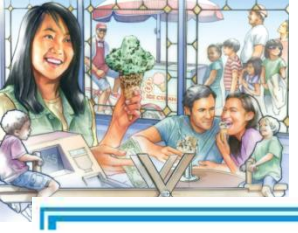


The slope of a linear demand curve is constant, but its elasticity is not. The price elasticity of demand is calculated using the demand schedule in the table and the midpoint method.
At points with a low price and high quantity, the demand curve is inelastic.
At points with a high price and low quantity, the demand curve is elastic.

Figure 4 Elasticity along a Linear Demand Curve

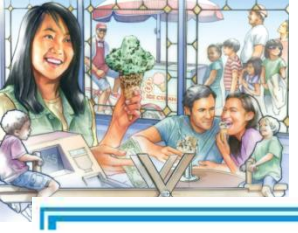
Price	Quantity	Total Revenue (Price x Quantity)	Percentage Change in Price	Percentage Change in Quantity	Elasticity	Description
$7	0	$0	15	200	13.0	Elastic
6	2	12	18	67	3.7	Elastic
5	4	20	22	40	1.8	Elastic
4	6	24	29	29	1.0	Unit elastic
3	8	24	40	22	0.6	Inelastic
2	10	20	67	18	0.3	Inelastic
1	12	12	200	15	0.1	Inelastic
0	14	0				

The slope of a linear demand curve is constant, but its elasticity is not. The price elasticity of demand is calculated using the demand schedule in the table and the midpoint method. At points with a low price and high quantity, the demand curve is inelastic. At points with a high price and low quantity, the demand curve is elastic.



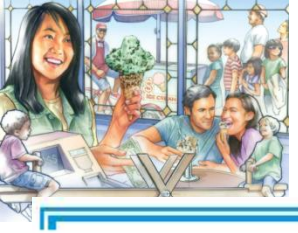
The Elasticity of Demand, Part 11

- Income elasticity of demand
  - How much the quantity demanded of a good responds to a change in consumers' income
  - Percentage change in quantity demanded
    - Divided by the percentage change in income



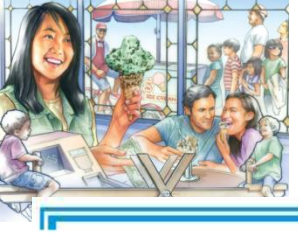
The Elasticity of Demand, Part 12

- Normal goods
  - Positive income elasticity
  - Necessities
    - Smaller income elasticities
  - Luxuries
    - Large income elasticities
- Inferior goods
  - Negative income elasticities



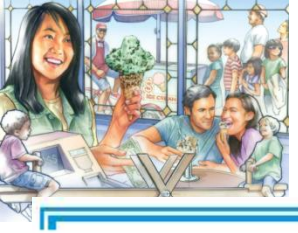
The Elasticity of Demand, Part 13

- Cross-price elasticity of demand
  - How much the quantity demanded of one good responds to a change in the price of another good
  - Percentage change in quantity demanded of the first good
    - Divided by the percentage change in price of the second good



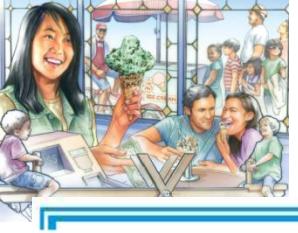
The Elasticity of Demand, Part 14

- Substitutes
  - Goods typically used in place of one another
  - Positive cross-price elasticity
- Complements
  - Goods that are typically used together
  - Negative cross-price elasticity



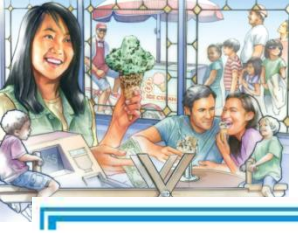
The Elasticity of Supply, Part 1

- Price elasticity of supply
  - How much the quantity supplied of a good responds to a change in the price of that good
  - Percentage change in quantity supplied
    - Divided by the percentage change in price
  - Depends on the flexibility of sellers to change the amount of the good they produce



The Elasticity of Supply, Part 2

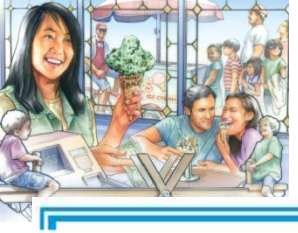
- Elastic supply
  - Quantity supplied responds substantially to changes in the price
- Inelastic supply
  - Quantity supplied responds only slightly to changes in the price
- Determinant of price elasticity of supply
  - Time period
    - Supply is more elastic in the long run



The Elasticity of Supply, Part 3

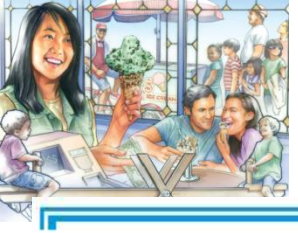
- Computing price elasticity of supply
  - Percentage change in quantity supplied divided by percentage change in price
  - Always positive
- Midpoint method
  - Two points: (Q_1, P_1) and (Q_2, P_2)

$$\text{Price elasticity of supply} = \frac{(Q_2 - Q_1) / [(Q_2 + Q_1) / 2]}{(P_2 - P_1) / [(P_2 + P_1) / 2]}$$



The Elasticity of Supply, Part 4

- Variety of supply curves
  - Supply is unit elastic
    - Price elasticity of supply = 1
  - Supply is elastic
    - Price elasticity of supply > 1
  - Supply is inelastic
    - Price elasticity of supply < 1

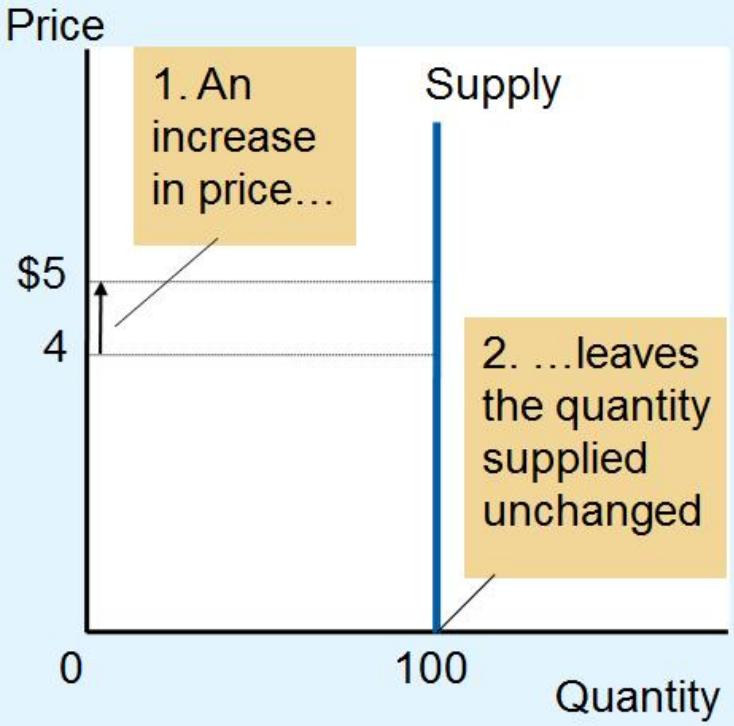


The Elasticity of Supply, Part 5

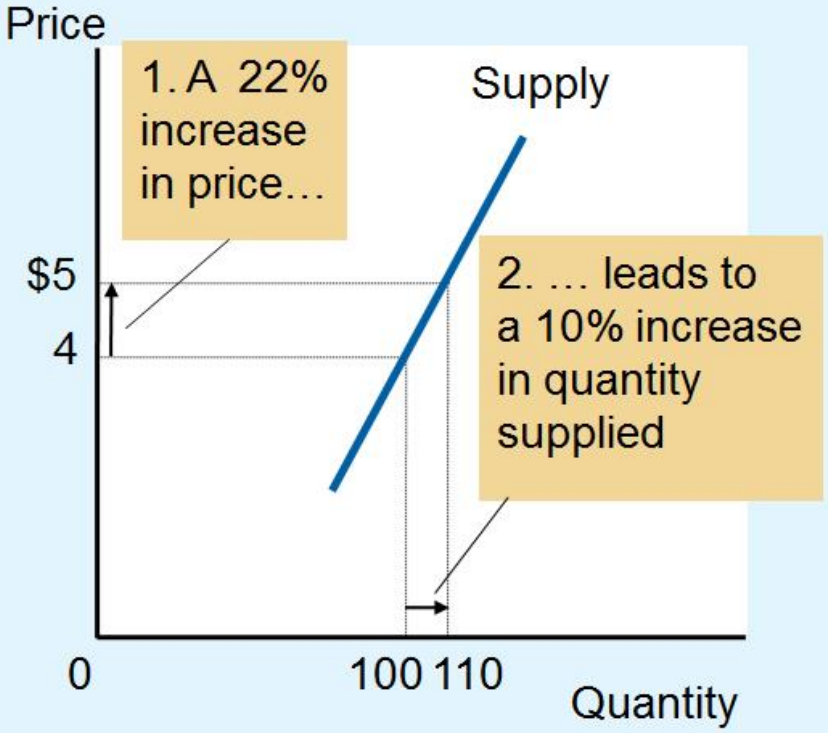
- Variety of supply curves
  - Supply is perfectly inelastic
    - Price elasticity of supply = 0
    - Supply curve is vertical
  - Supply is perfectly elastic
    - Price elasticity of supply = infinity
    - Supply curve is horizontal

Figure 5 The Price Elasticity of Supply (a, b)

(a) Perfectly Inelastic Supply: Elasticity Equals 0



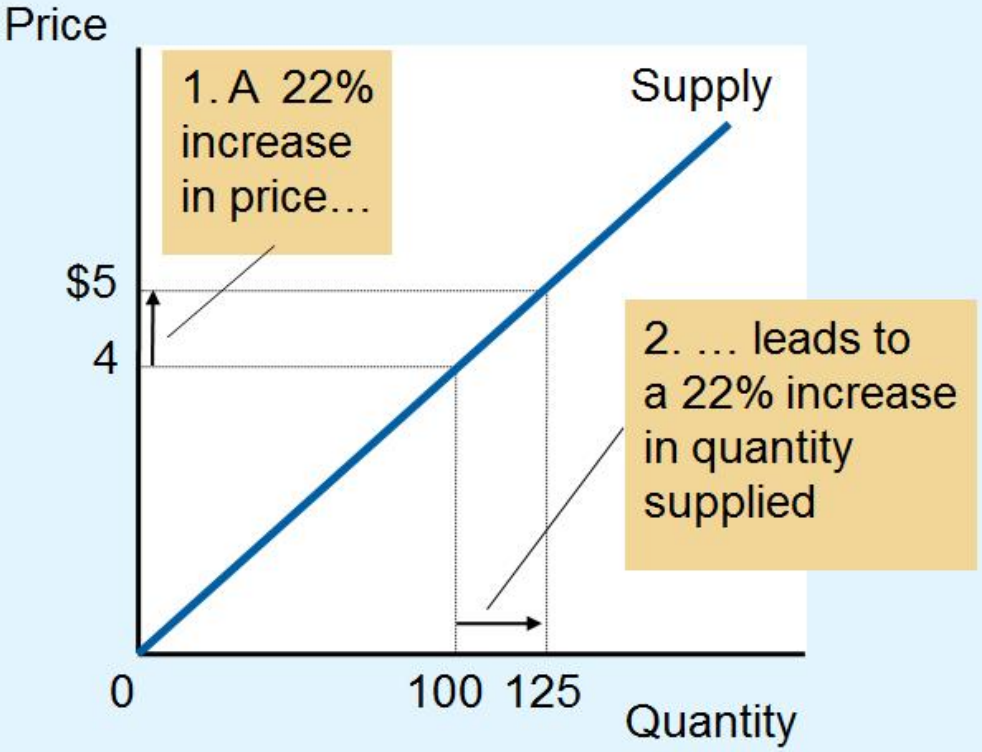
(b) Inelastic Supply: Elasticity Is Less Than 1



The price elasticity of supply determines whether the supply curve is steep or flat.
Note that all percentage changes are calculated using the midpoint method.

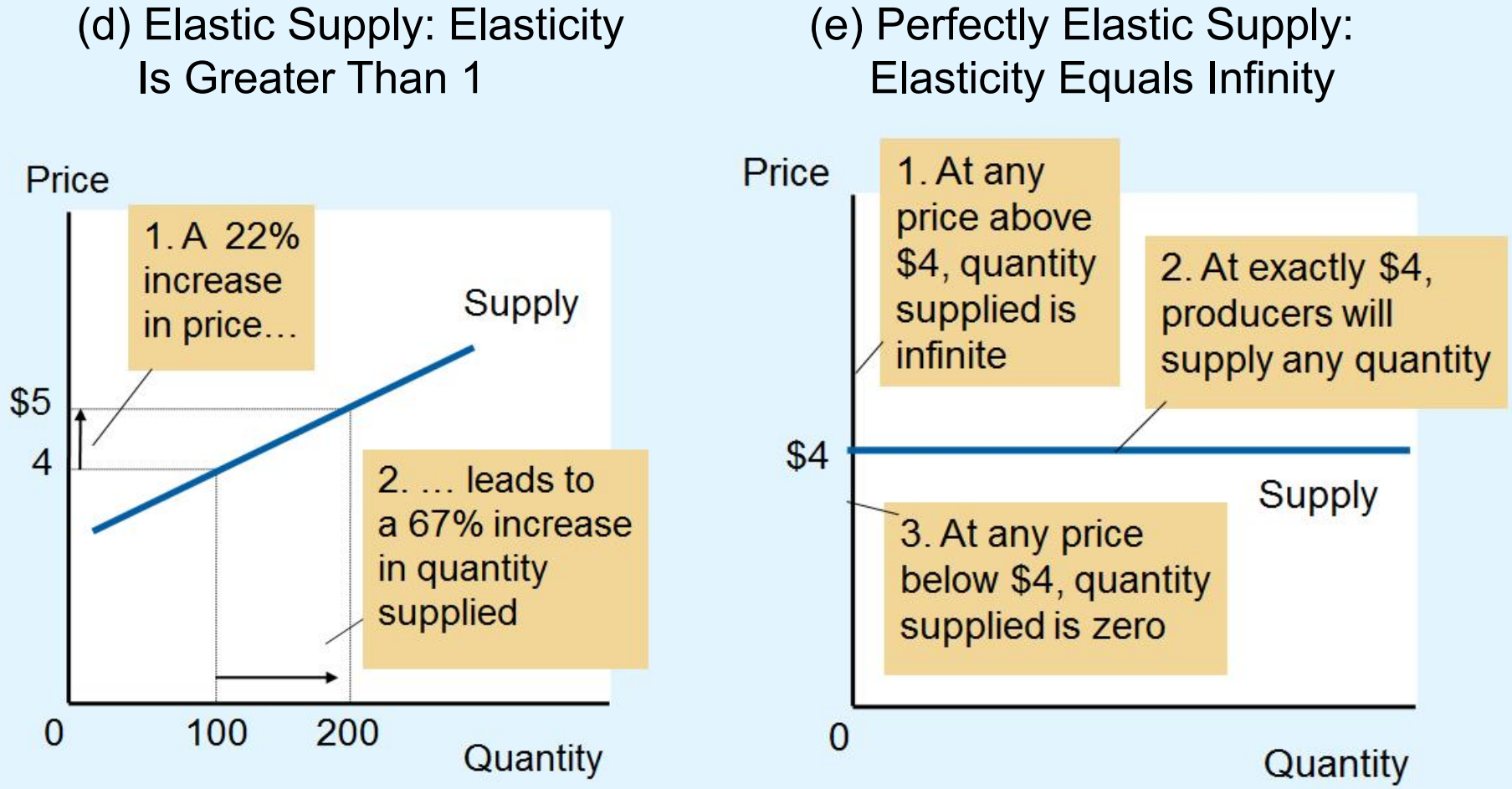
Figure 5 The Price Elasticity of Supply (c)

(c) Unit Elastic Supply: Elasticity Equals 1

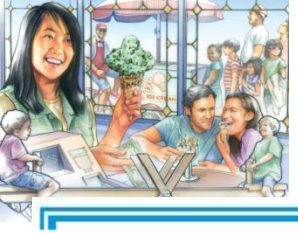


The price elasticity of supply determines whether the supply curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

Figure 5 The Price Elasticity of Supply (d, e)



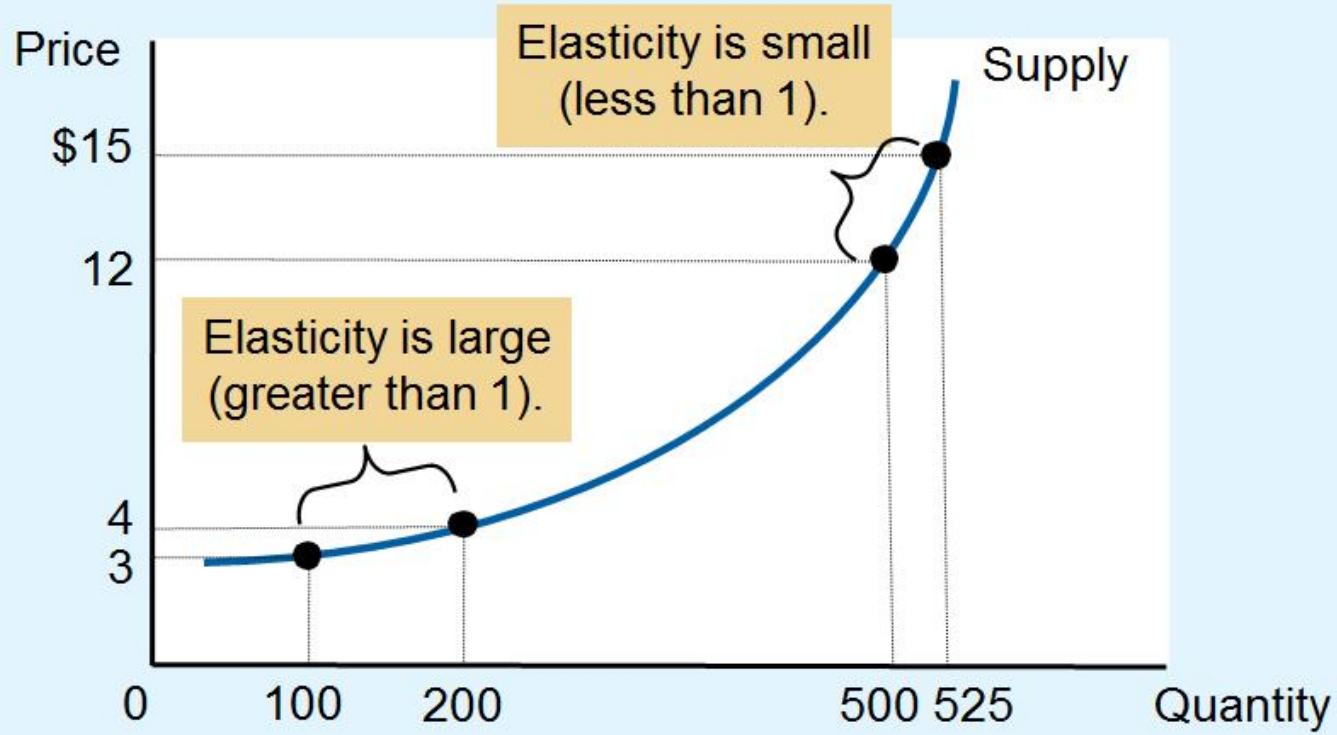
The price elasticity of supply determines whether the supply curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.



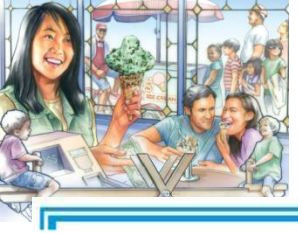
The Elasticity of Supply, Part 6

- Supply curve
  - Different price elasticities
    - Points with low price and low quantity
      - Elastic supply
      - Capacity for production not being used
    - Points with high price and high quantity
      - Inelastic supply

Figure 6 How the Price Elasticity of Supply Can Vary



Because firms often have a maximum capacity for production, the elasticity of supply may be very high at low levels of quantity supplied and very low at high levels of quantity supplied. Here an increase in price from $3 to $4 increases the quantity supplied from 100 to 200. Because the 67 percent increase in quantity supplied (computed using the midpoint method) is larger than the 29 percent increase in price, the supply curve is elastic in this range.
By contrast, when the price rises from $12 to $15, the quantity supplied rises only from 500 to 525. Because the 5 percent increase in quantity supplied is smaller than the 22 percent increase in price, the supply curve is inelastic in this range.

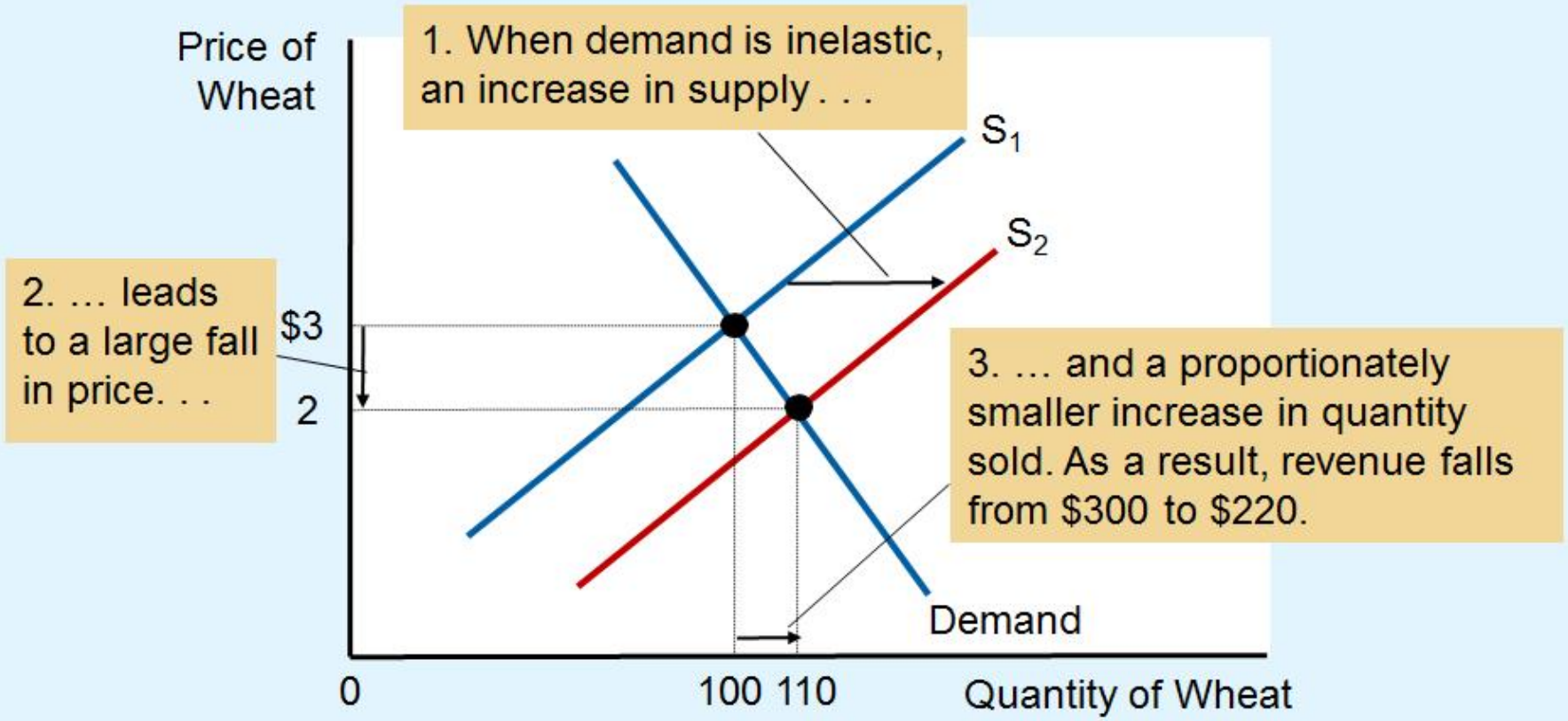


Three Applications, Part 1

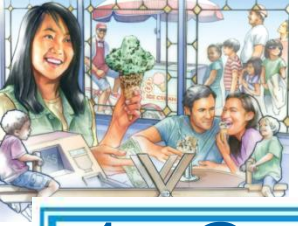
1. Can Good News for Farming Be Bad News for Farmers?

- New hybrid of wheat – increase production per acre by 20%
  - Supply curve shifts to the right
  - Higher quantity and lower price
  - Demand is inelastic: total revenue falls

Figure 7 An Increase in Supply in the Market for Wheat



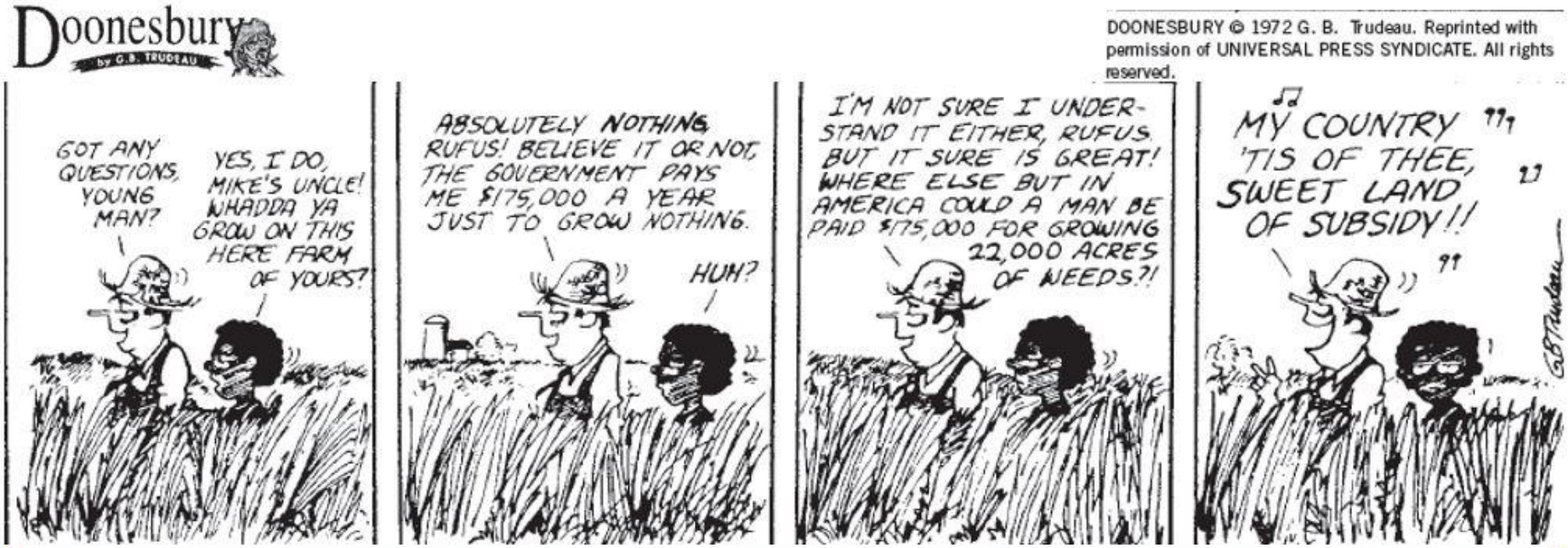
When an advance in farm technology increases the supply of wheat from S_1 to S_2, the price of wheat falls. Because the demand for wheat is inelastic, the increase in the quantity sold from 100 to 110 is proportionately smaller than the decrease in the price from $3 to $2. As a result, farmers' total revenue falls from $300 ($3 × 100) to $220 ($2 × 110).

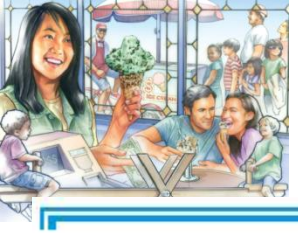


Three Applications, Part 2

1. Can Good News for Farming Be Bad News for Farmers?

- Paradox of public policy
  - Induce farmers not to plant crops



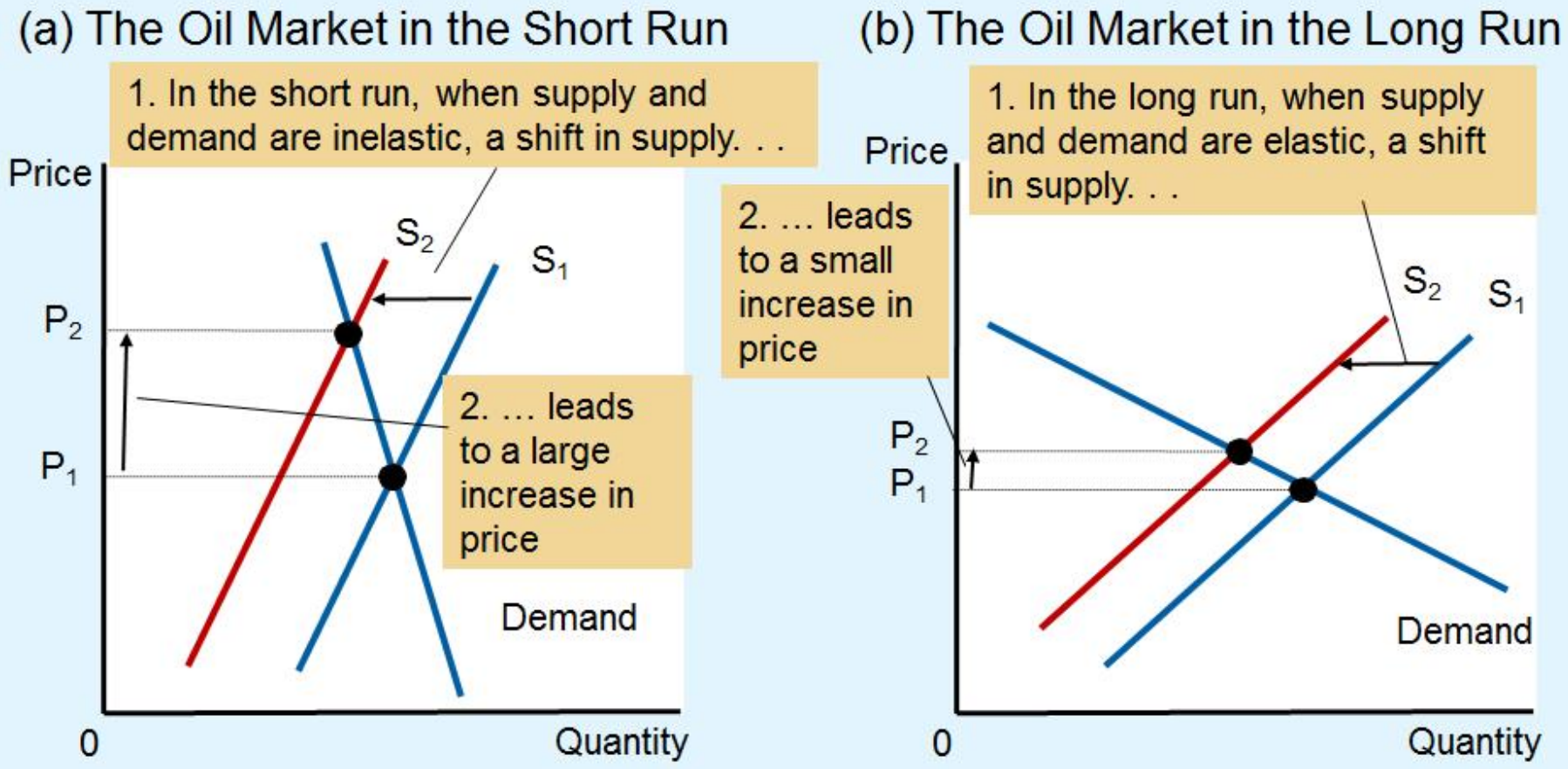


Three Applications, Part 3

2. Why Did OPEC Fail to Keep the Price of Oil High?

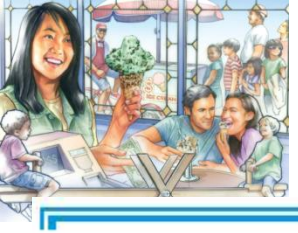
- Increase in prices: 1973 – 1974, 1971 – 1981
- Short-run: supply and demand are inelastic
  - Decrease in supply: large increase in price
- Long-run: supply and demand are elastic
  - Decrease in supply: small increase in price

Figure 8 A Reduction in Supply in the World Market for Oil



When the supply of oil falls, the response depends on the time horizon. In the short run, supply and demand are relatively inelastic, as in panel (a). Thus, when the supply curve shifts from S_1 to S_2, the price rises substantially.

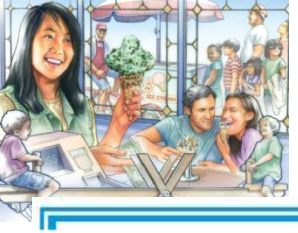
In the long run, however, supply and demand are relatively elastic, as in panel (b). In this case, the same size shift in the supply curve (S_1 to S_2) causes a smaller increase in the price.



Three Applications, Part 4

3. Does Drug Interdiction Increase or Decrease Drug-related Crime?

- Increase the number of federal agents devoted to the war on drugs
  - Illegal drugs: supply curve shifts left
    - Higher price and lower quantity
  - Amount of drug-related crimes
    - Inelastic demand for drugs
    - Higher drugs price: higher total revenue
    - Increase drug-related crime

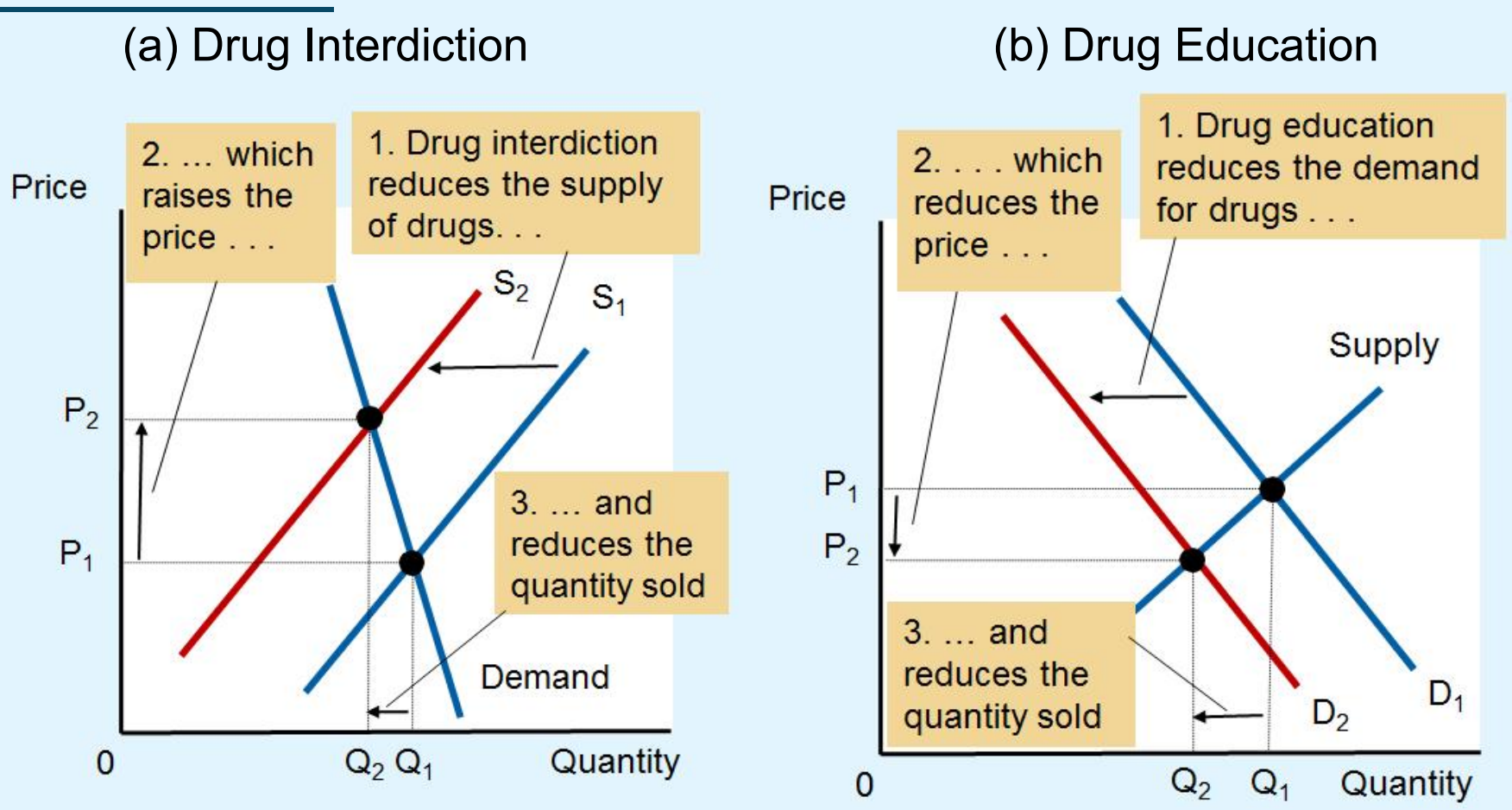


Three Applications, Part 5

3. Does Drug Interdiction Increase or Decrease Drug-related Crime?

- Policy of drug education
  - Reduce demand for illegal drugs
  - Left shift of demand curve
  - Lower quantity
  - Lower price
  - Reduce drug-related crime

Figure 9 Policies to Reduce the Use of Illegal Drugs



Drug interdiction reduces the supply of drugs from S_1 to S_2, as in panel (a). If the demand for drugs is inelastic, then the total amount paid by drug users rises, even as the amount of drug use falls.

By contrast, drug education reduces the demand for drugs from D_1 to D_2, as in panel (b). Because both price and quantity fall, the amount paid by drug users falls.