Elasticity and Its Application

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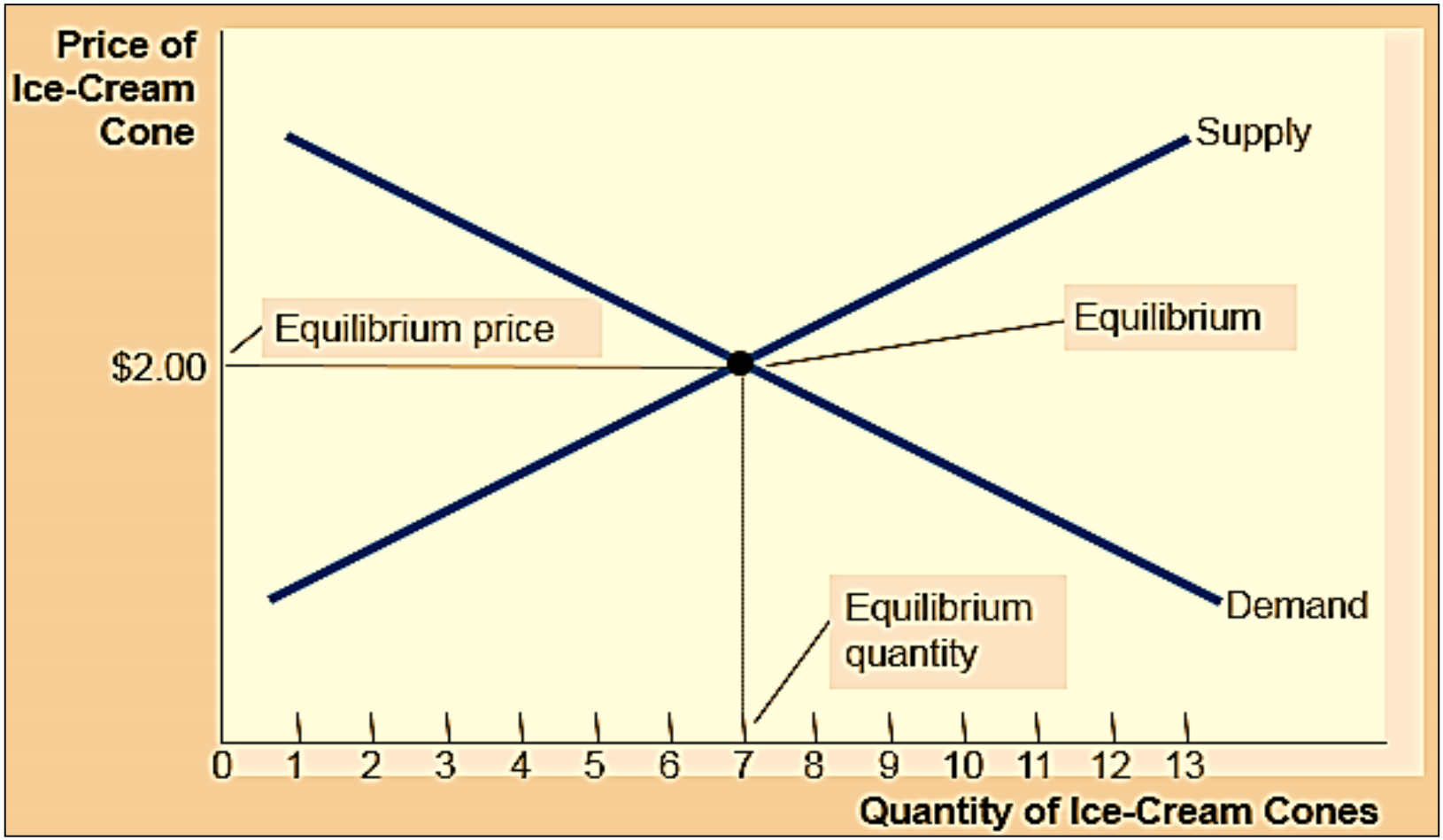
OUTLINE

1) Brief Recap of –
   - Market Equilibrium
   - Excess Supply and Demand
2) Shifts in Equilibrium
3) Elasticity and Its Applications
   - Case Studies
   - Numerical Examples

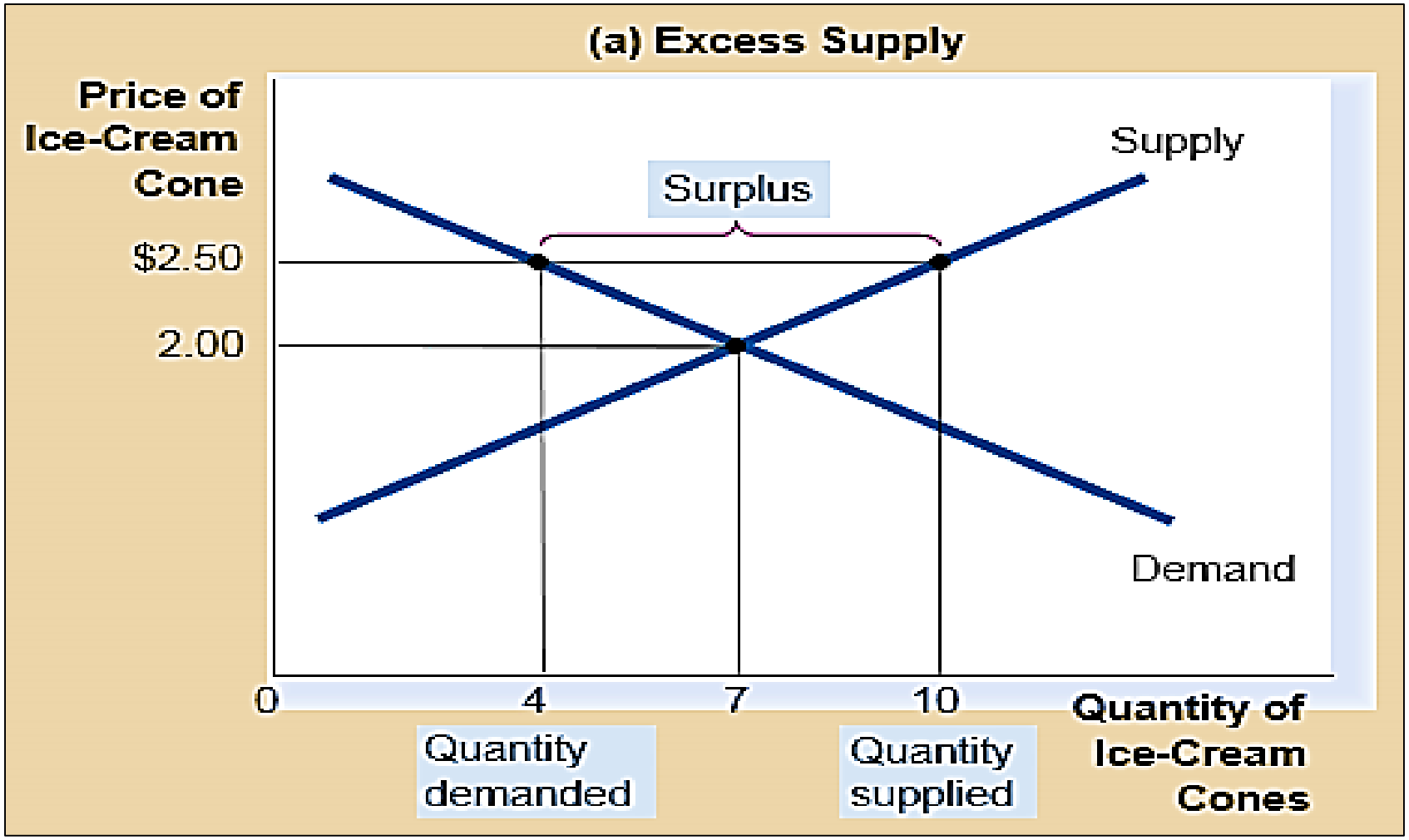
Market Equilibrium

- **Refers to a situation in which the price has reached the level where quantity supplied equals quantity demanded**
- ***At the equilibrium price, the quantity of the good that buyers are willing and able to buy exactly balances the quantity that sellers are willing and able to sell***

Equilibrium of Supply and Demand



Markets NOT in Equilibrium

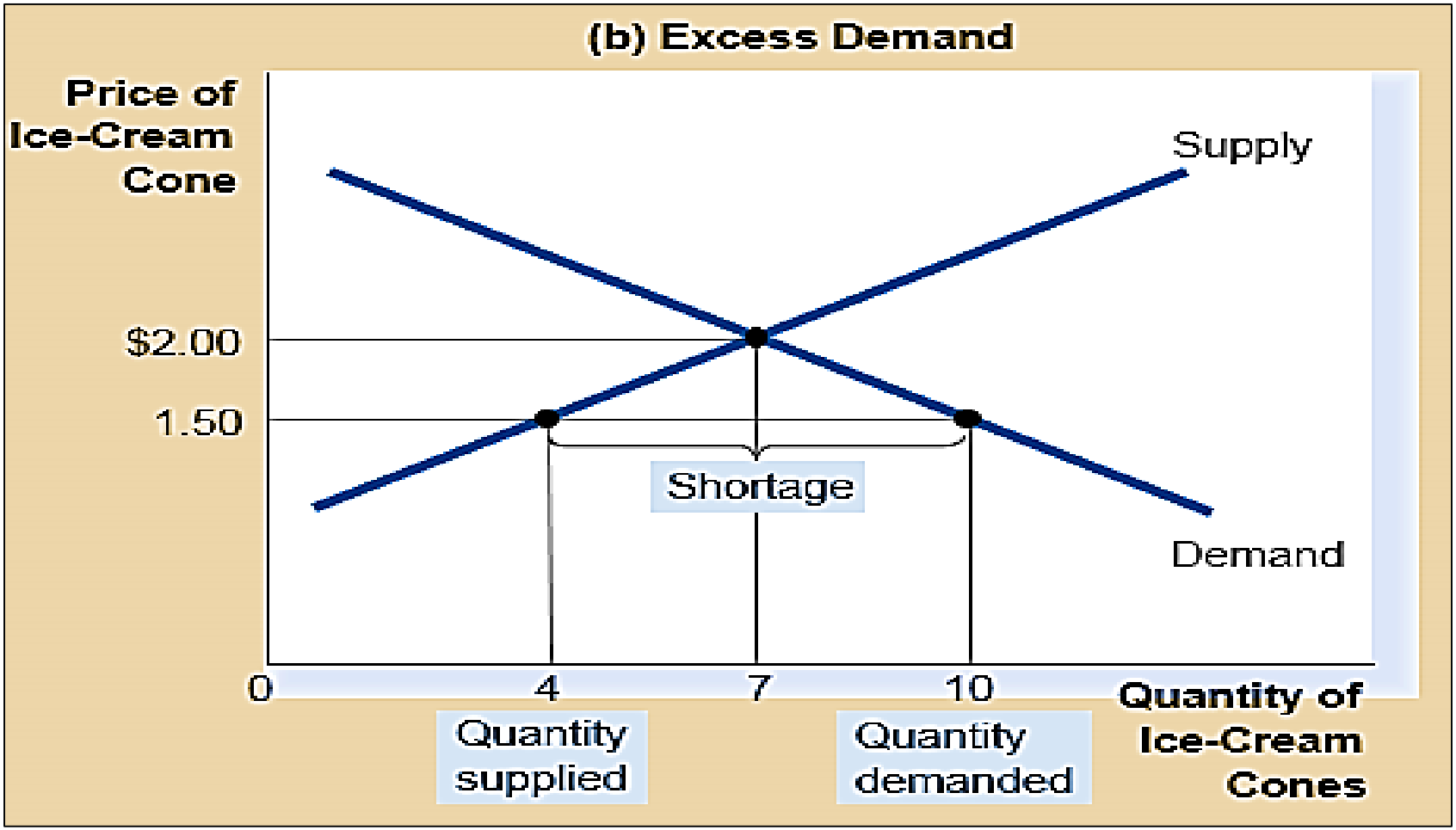


Markets NOT in Equilibrium

Surplus

- When price > equilibrium price, then quantity supplied > quantity demanded
  - There is **excess supply** or a **surplus**
  - Suppliers will **lower the price** to increase sales, thereby moving toward equilibrium

Markets NOT in Equilibrium



Markets NOT in Equilibrium

Shortage

- When price < equilibrium price, then quantity demanded > the quantity supplied
  - There is **excess demand** or a **shortage**
  - Suppliers will **raise the price** due to too many buyers chasing too few goods, thereby moving toward equilibrium

Cont.

Law of Supply and Demand

- The claim that the price of any good 'naturally' adjusts to bring the quantity supplied and the quantity demanded for that good into balance

Cont.

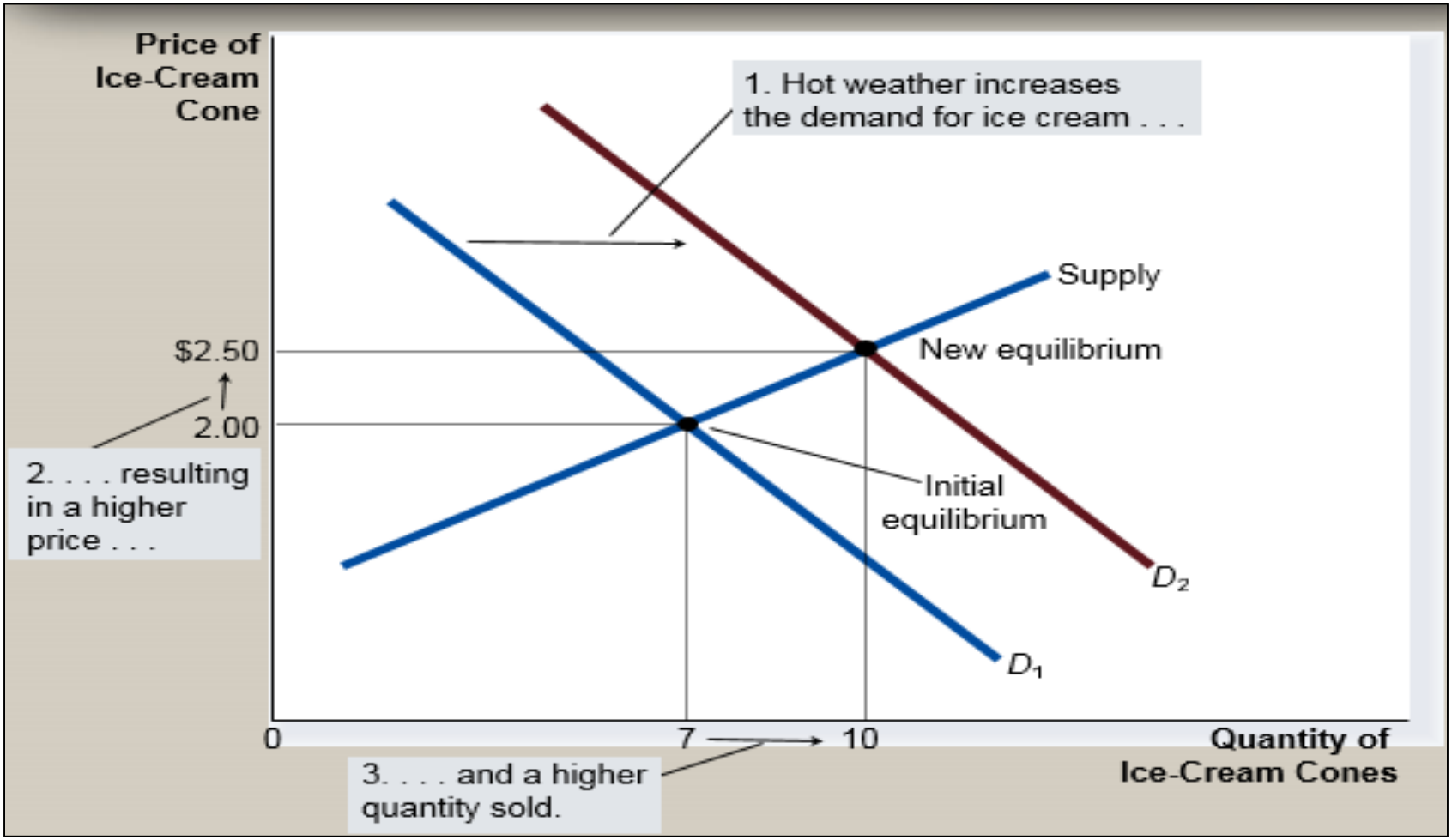
Three Steps to Analyzing Changes in Equilibrium

1) *Decide whether the event shifts the supply or demand curve (or both)*

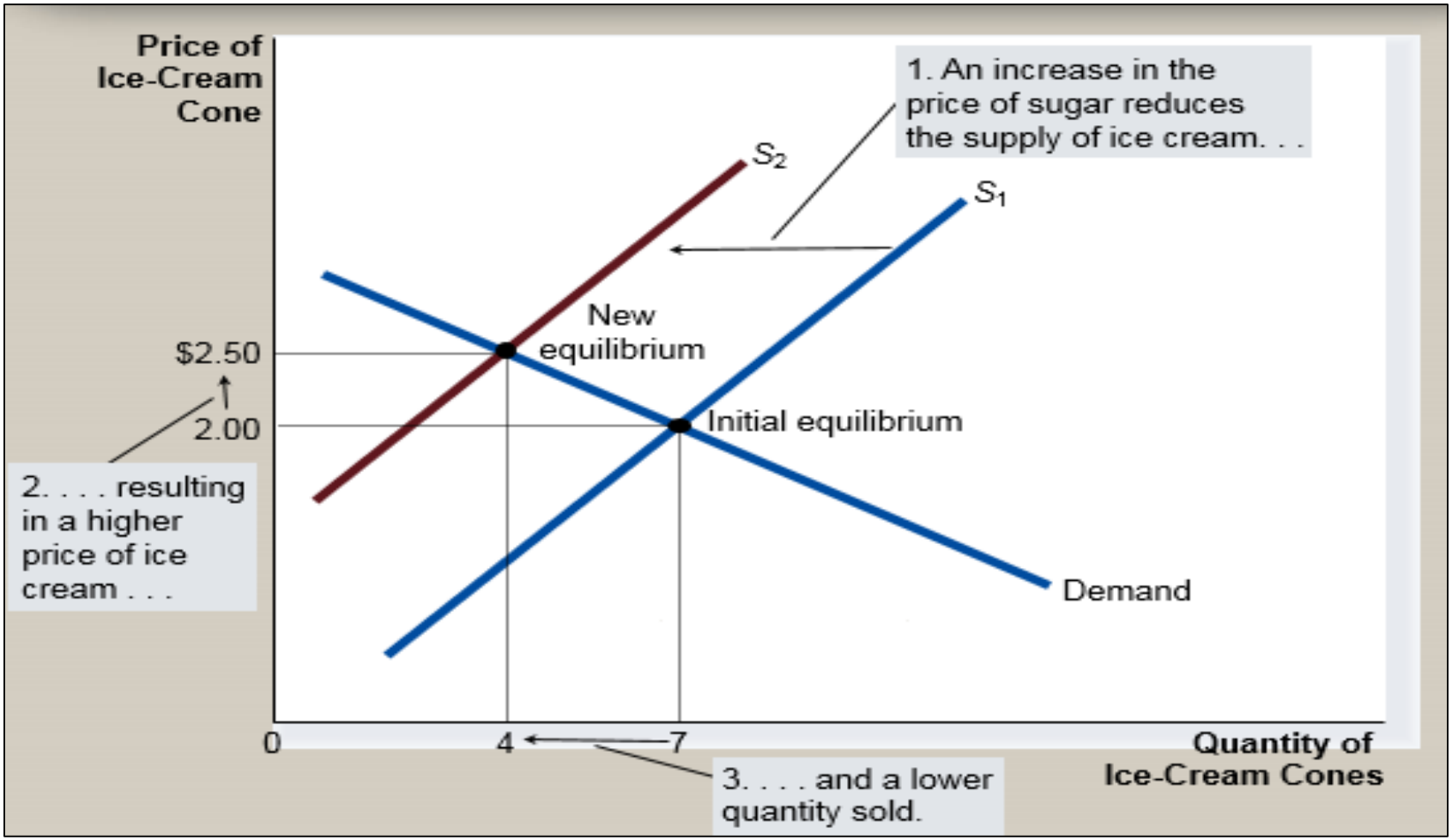
2) *Decide whether the curve(s) shift(s) to the left or to the right*

3) *Use the supply-and-demand diagram to see how the shift affects equilibrium price and quantity*

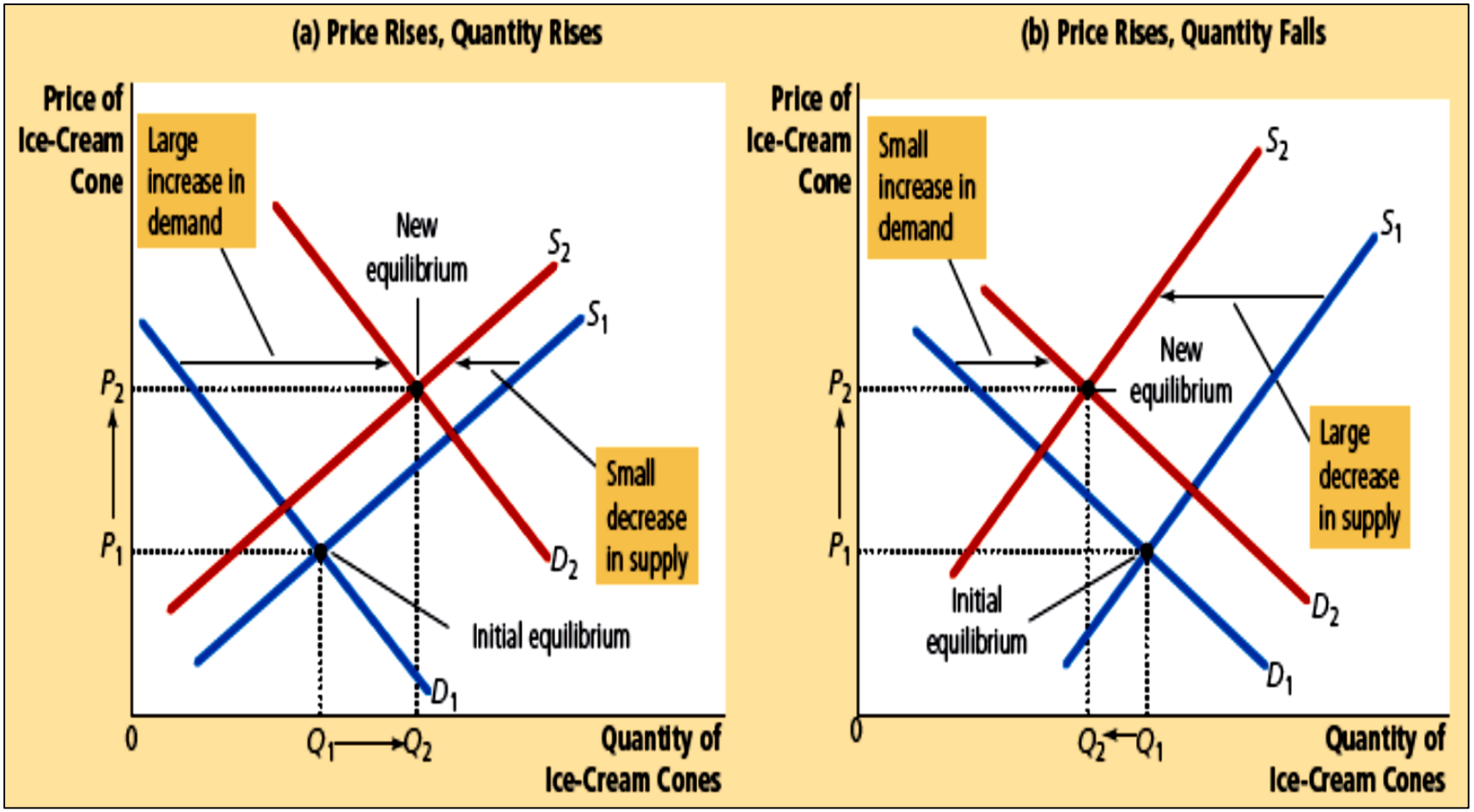
How an Increase in Demand Affects the Equilibrium?



How a Decrease in Supply Affects the Equilibrium?



How does Shifts in Demand and Supply Affect the Equilibrium?



2. Elasticity and its Applications

Elasticity

- … allows us to analyse supply and demand with greater precision
- … is a measure of how much buyers and sellers respond to changes in market conditions

Cont.

Price Elasticity of Demand

- … measure of how much the quantity demanded of a good responds to a change in the price of that good
- … measures as the percentage change in quantity demanded given a percent change in the price

Determinants of Price Elasticity

What determines price elasticity?

To learn the determinants of price elasticity,
we look at a series of examples.
Each compares two common goods.

In each example:

- Suppose the prices of both goods rise by 20%.
- The good for which Q^d falls the most (in percent) has the highest price elasticity of demand. Which good is it? Why?
- What lesson does the example teach us about the determinants of the price elasticity of demand?

Cont.

EXAMPLE 1:
Cold drink - Pepsi vs. Edible salt

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?
  - Pepsi has close substitutes (*e.g.*, Thumbs up, fanta etc), so buyers can easily switch if the price rises.
  - Salt has no close substitutes. So consumers would probably not buy much less if its price rises.
- Lesson: ***Price elasticity is higher when close substitutes are available.***

Cont.

EXAMPLE 2:
"Jeans" vs. "Clothing"

- The prices of both goods rise by 20%. For which good does Q^d drop the most? Why?
  - For a narrowly defined good such as jeans, there may be many substitutes (formal pant, track pant, shorts)
  - There are fewer substitutes available for broadly defined goods (There aren't too many substitutes for clothing,
- Lesson: ***Price elasticity is higher for narrowly defined goods than broadly defined ones.***

Cont.

EXAMPLE 3:
Insulin vs. Caribbean Cruises

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?
  - To millions of diabetics, insulin is a necessity. A rise in its price would cause little or no decrease in demand.
  - A cruise is a luxury. If the price rises, some people will forego it.
- Lesson: ***Price elasticity is higher for luxuries than for necessities.***

Cont.

EXAMPLE 4:
Cooking gas in the Short Run vs. Cooking gas in the Long Run -- Urban areas

- The price of gasoline rises 20%. Does Q^d drop more in the short run or the long run? Why?
  - In the short run, people will continue to use in absence of close substitutes --- inelastic
  - In the long run, good substitutes like solar energy, electric *chulha* may come --- elastic
- Lesson: ***Price elasticity is higher in the long run than the short run.***

Cont.

Determinants of Price Elasticity of Demand

1) Availability of Close Substitutes
2) Necessities versus Luxuries
3) Definition of the Market
4) Time Horizon

Cont.

Demand tends to be more elastic :

1) The larger the number of close substitutes
2) If the good is a luxury
3) The more narrowly defined the market
4) The longer the time period

Computing Price Elasticity of Demand

- **The price elasticity of demand is computed as the percentage change in the quantity demanded divided by the percentage change in price**

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

Cont.

- **For example: Suppose that a 10 percent increase in the price of an ice-cream cone causes the amount of ice cream you buy to fall by 20 percent.**

$$\text{Price elasticity of demand} = \frac{20 \text{ percent}}{10 \text{ percent}} = 2.$$

Cont.

- **Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand would be calculated as:**

$$\frac{\frac{(10-8)}{10}\times 100}{\frac{(2.20-2.00)}{2.00}\times 100} = \frac{20\%}{10\%} = 2$$

The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- **Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand, using the midpoint formula, would be calculated as:**

$$\frac{\dfrac{(10-8)}{(10+8)/2}}{\dfrac{(2.20-2.00)}{(2.00+2.20)/2}} = \frac{22\%}{9.5\%} = 2.32$$

Varieties of Demand Curves

- **Inelastic Demand**
  - Quantity demanded does not respond strongly to price changes
  - Price elasticity of demand is less than one
- **Elastic Demand**
  - Quantity demanded responds strongly to changes in price
  - Price elasticity of demand is greater than one

Cont.

Perfectly Inelastic

- Quantity demanded does not respond to price changes

Perfectly Elastic

- Quantity demanded changes infinitely with any change in price

Unit Elastic

- Quantity demanded changes by the same percentage as the price

Cont.

The Variety of Demand Curves

- The price elasticity of demand is closely related to the slope of the demand curve.
- **Rule of thumb:**
  The flatter the curve, the bigger the elasticity.
  The steeper the curve, the smaller the elasticity.
- Five different classifications of ***D*** curves….

The Price Elasticity of Demand

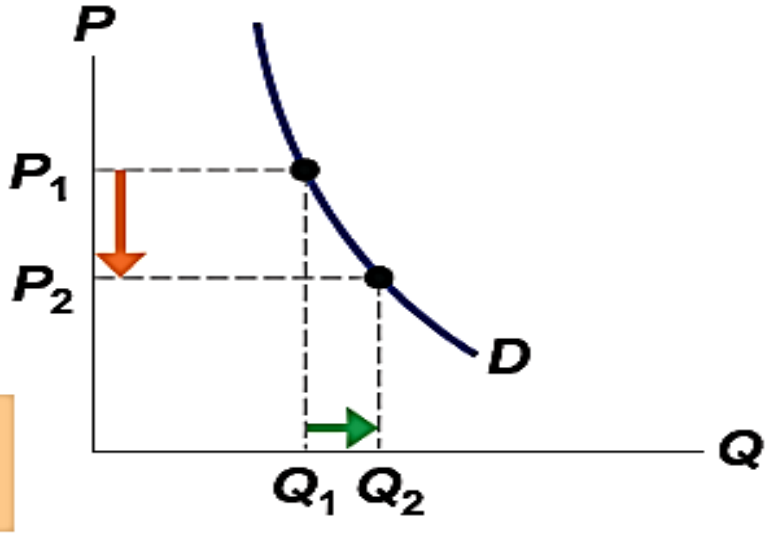
"Inelastic demand"

$$\text{Price elasticity of demand} = \frac{\%\text{ change in } Q}{\%\text{ change in } P} = \frac{< 10\%}{10\%} < 1$$

D curve:
relatively steep

Consumers' price sensitivity:
relatively low

Elasticity:
< 1



P falls by 10%

Q rises less than 10%

The Price Elasticity of Demand

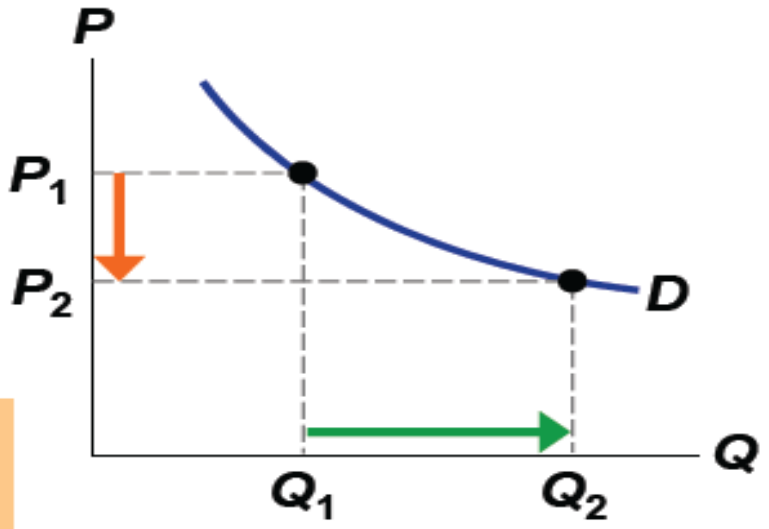
"Elastic demand"

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{> 10\%}{10\%} > 1$$

D curve:
relatively flat

Consumers' price sensitivity:
relatively high

Elasticity:
> 1



P falls by 10%

Q rises more than 10%

The Price Elasticity of Demand

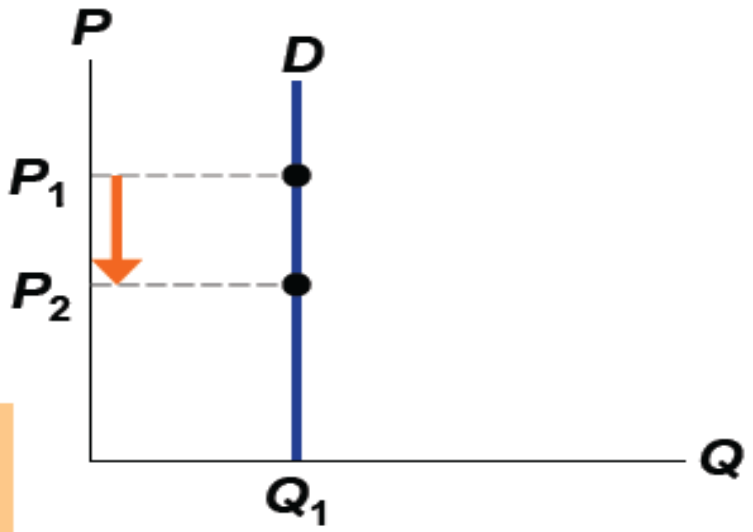
"Perfectly inelastic demand" (one extreme case)

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{0\%}{10\%} = 0$$

D curve:
vertical

Consumers' price sensitivity:
none

Elasticity:
0



P falls by 10%

Q changes by 0%

The Price Elasticity of Demand

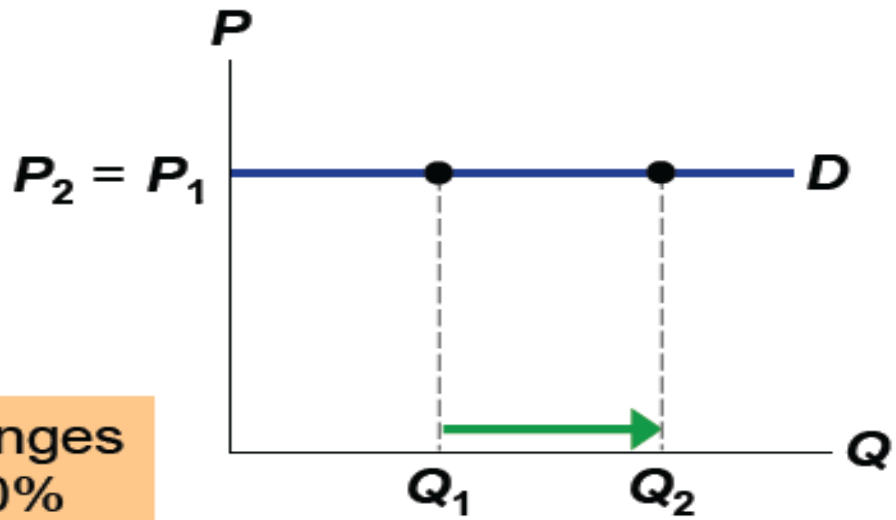
"Perfectly elastic demand" (the other extreme)

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{\text{any } \%}{0\%} = \text{infinity}$$

D curve:
horizontal

Consumers' price sensitivity:
extreme

Elasticity:
infinity



P changes by 0%

Q changes by any %

The Price Elasticity of Demand

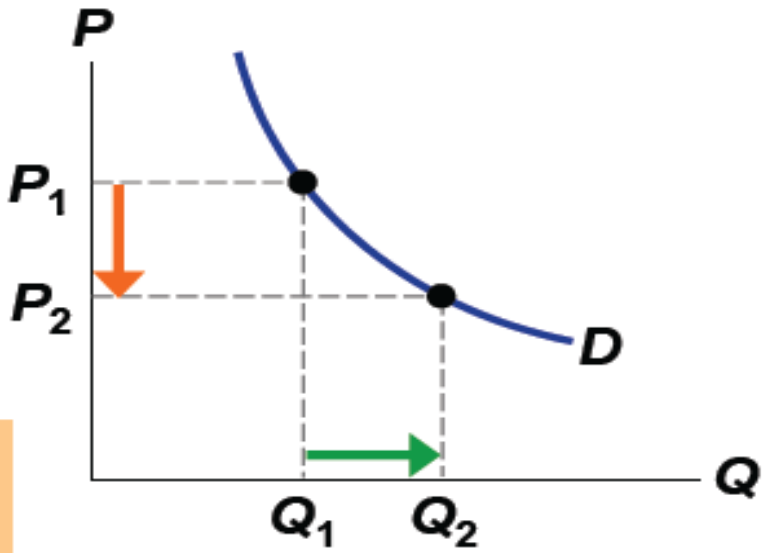
"Unit elastic demand"

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{10\%}{10\%} = 1$$

D curve:
intermediate slope

Consumers' price sensitivity:
intermediate

Elasticity:
1



Price Elasticity of Demand and Total Revenue

- Continuing our scenario, if you raise your price from $200 to $250, would your revenue rise or fall?

$$\text{Revenue} = \boldsymbol{P} \times \boldsymbol{Q}$$

- **Does raising price bring in more revenue?**
  - Higher ***P*** means more revenue on each unit you sell.
  - But you sell fewer units (lower ***Q***), due to Law of Demand.
- Which of these two effects is bigger?
  It depends on the price elasticity of demand.

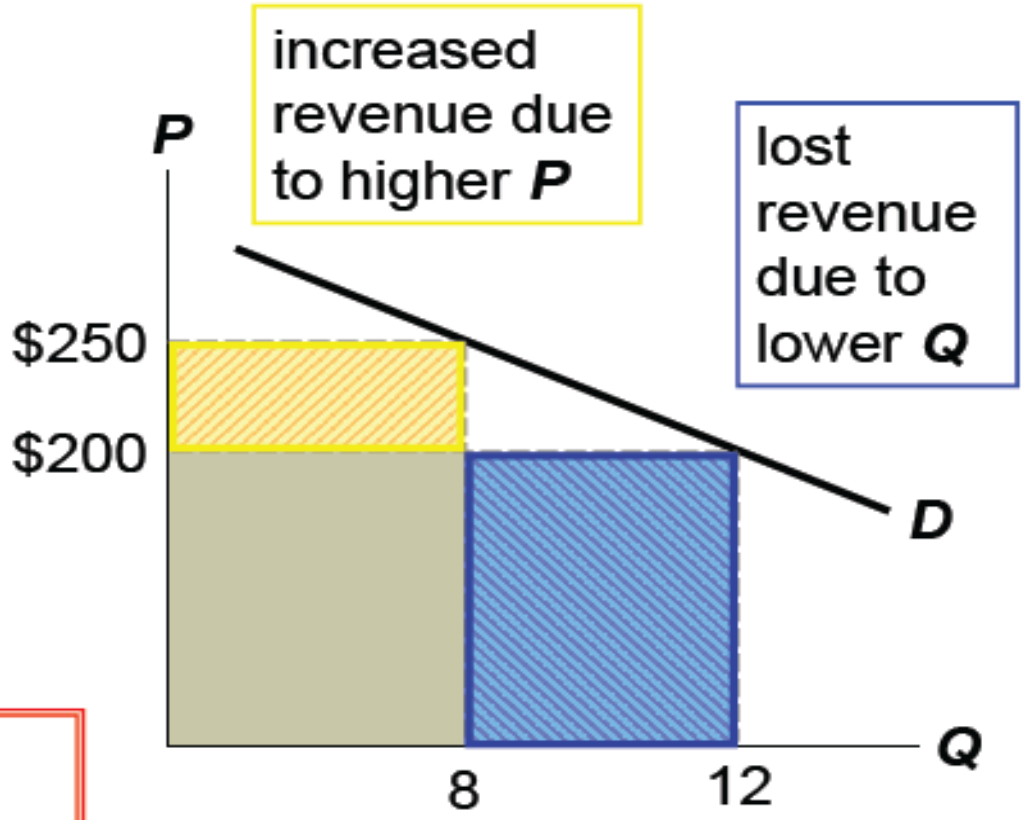
Price Elasticity and Total Revenue

Elastic demand
(elasticity = 1.8)

If ***P*** = \$200,
Q = 12 and
revenue = \$2400.

If ***P*** = \$250,
Q = 8 and
revenue = \$2000.

When ***D*** is elastic,
a price increase
causes revenue to fall.



Price Elasticity and Total Revenue

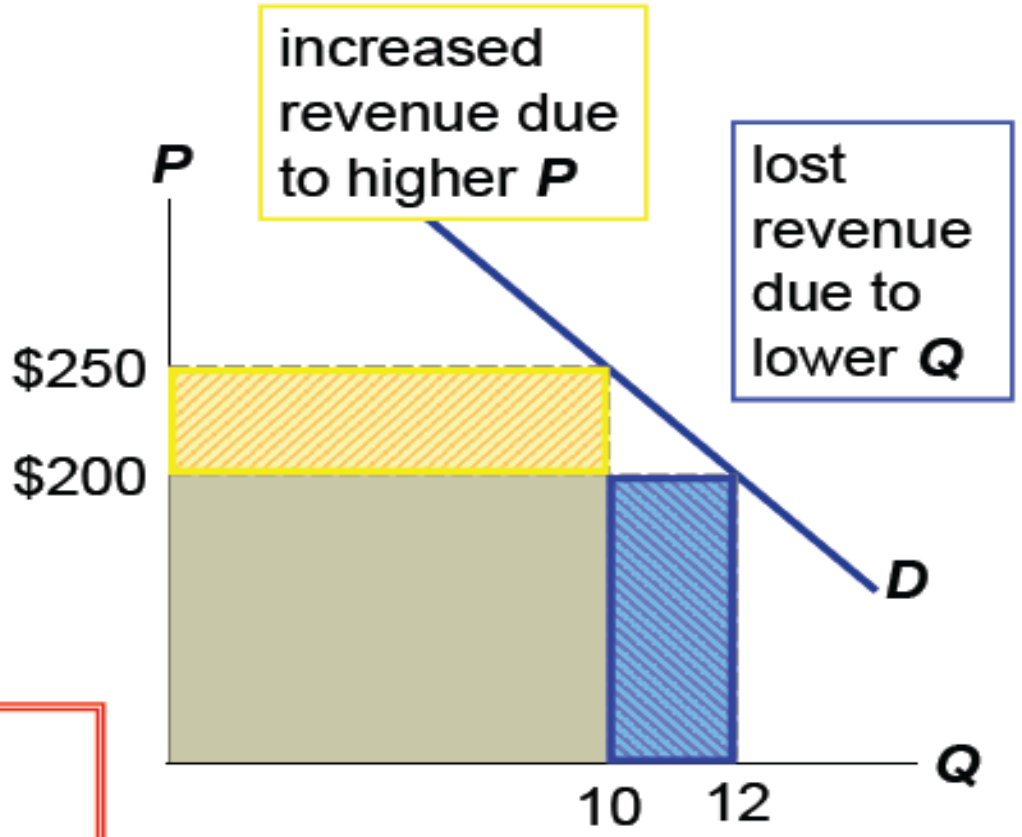
Now, demand is inelastic:

elasticity = 0.82

If ***P*** = \$200, ***Q*** = 12 and revenue = \$2400.

If ***P*** = \$250, ***Q*** = 10 and revenue = \$2500.

When ***D*** is inelastic, a price increase causes revenue to rise.



Other Elasticities

- **Income elasticity of demand**: measures the response of Q^d to a change in consumer income

$$\text{Income elasticity of demand} = \frac{\text{Percent change in } Q^d}{\text{Percent change in income}}$$

- Recall : An increase in income causes an increase in demand for a *normal* good.
- Hence, for normal goods, income elasticity > 0.
- For *inferior* goods, income elasticity < 0.

Other Elasticities

- **Cross-price elasticity of demand**: measures the response of demand for one good to changes in the price of another good

$$\text{Cross-price elast. of demand} = \frac{\%\ \text{change in } Q^d \text{ for good 1}}{\%\ \text{change in price of good 2}}$$

- For substitutes, cross-price elasticity > 0 (*e.g.*, an increase in price of tea causes an increase in demand for coffee)
- For complements, cross-price elasticity < 0 (*e.g.*, an increase in price of petrol causes decrease in demand for car)

Cont.

Price Elasticity of Supply

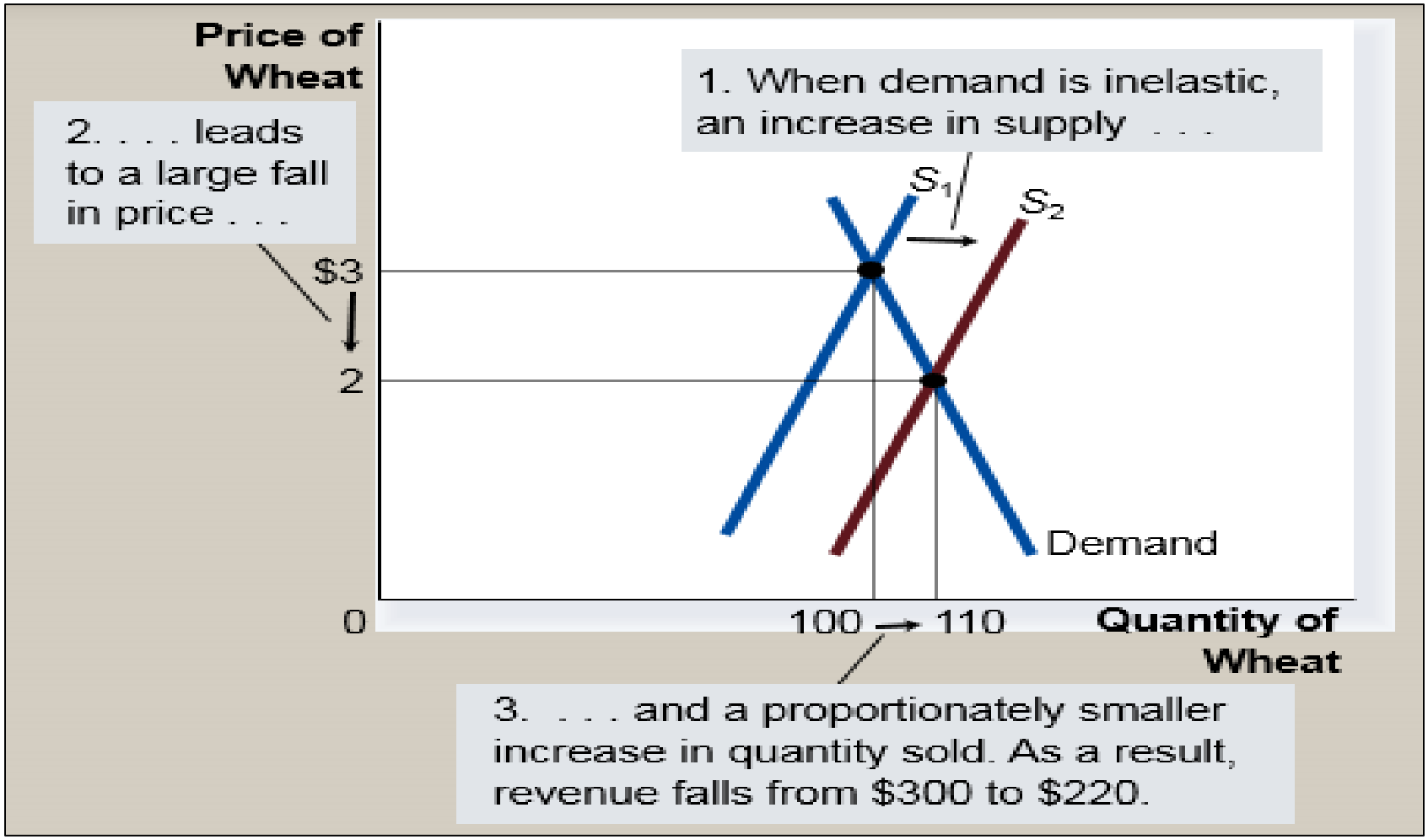
- … measure of how much the quantity supplied of a good responds to a change in the price of that good
- … measures as the percentage change in quantity supplied resulting from a percent change in price

Case Study - III

Can good news for farming be bad news for farmers?

- What happens to wheat farmers and the market for wheat when university agronomists discover a new wheat hybrid that is more productive than existing varieties?

Case Study - III



Case Study - III

$$E_D = \frac{\frac{100 - 110}{(100 + 110)/2}}{\frac{3.00 - 2.00}{(3.00 + 2.00)/2}}$$

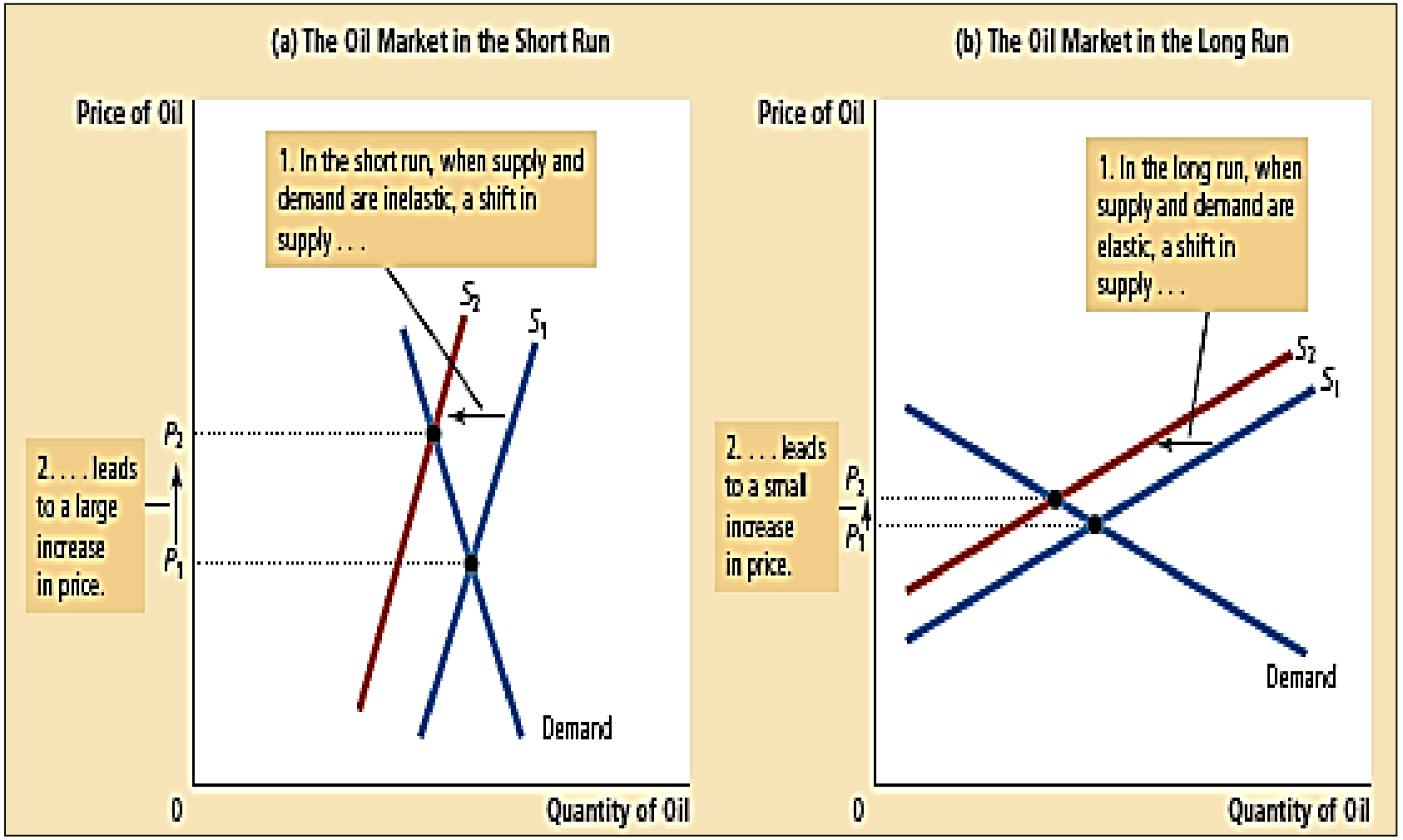
$$= \frac{-0.095}{0.4} \approx -0.24$$

Supply is inelastic

Case Study - IV

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

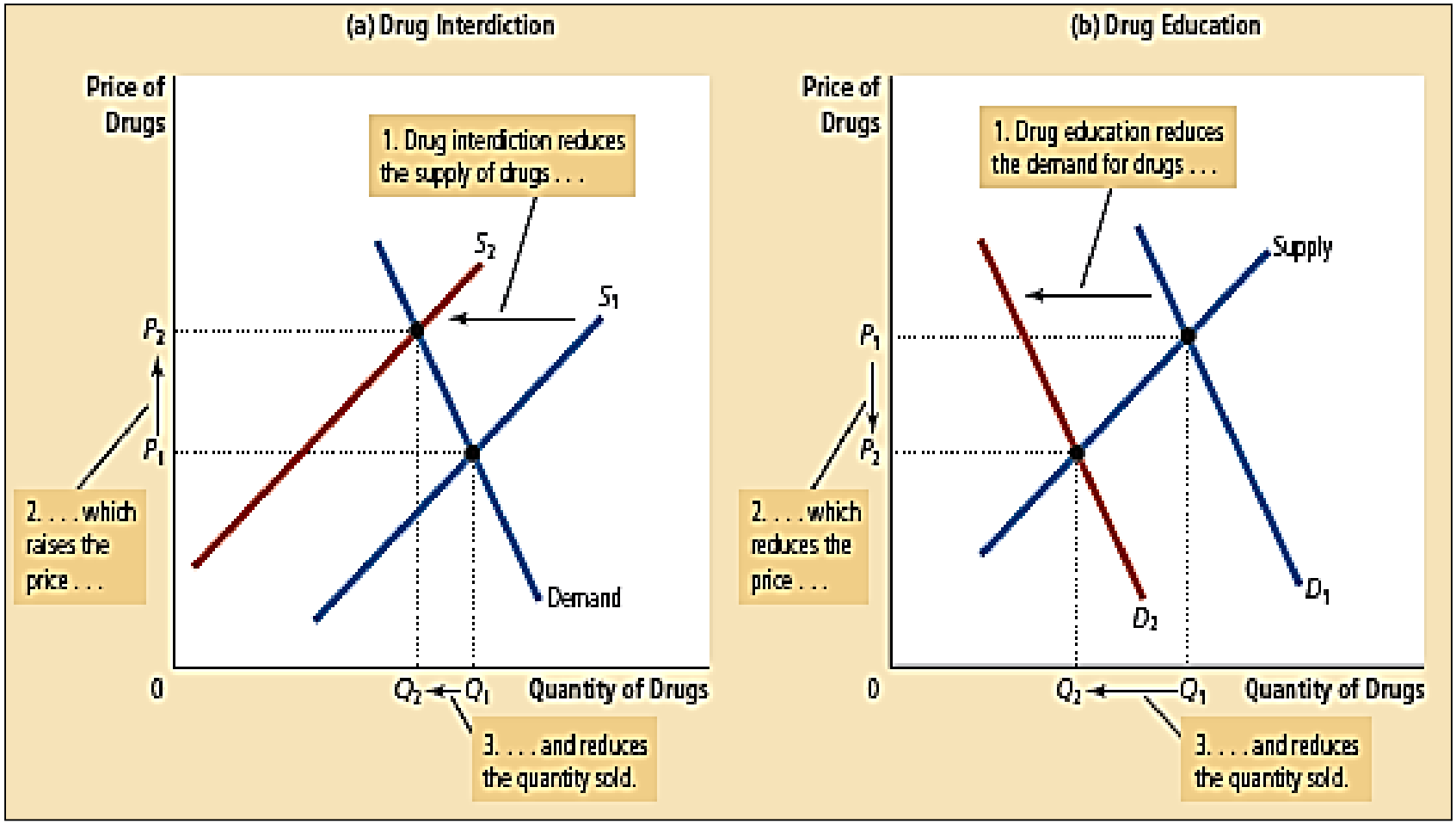
Case Study - IV



Case Study - V

Does Drug Interdiction Increase or Decrease Drug-Related Crime?

Case Study - V


(a) Drug Interdiction
Price of Drugs
1. Drug interdiction reduces the supply of drugs . . .
S_2
S_1
P_2
P_1
2. . . . which raises the price . . .
Demand
0
Q_2
Q_1
Quantity of Drugs
3. . . . and reduces the quantity sold.
(b) Drug Education
Price of Drugs
1. Drug education reduces the demand for drugs . . .
Supply
P_1
P_2
2. . . . which reduces the price . . .
D_2
D_1
0
Q_2
Q_1
Quantity of Drugs
3. . . . and reduces the quantity sold.

THANK YOU

HAPPY LEARNING