



# Elasticity of Demand by Abdhut Deheri

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# Introduction

- Elasticity is a measure of how much buyers and sellers respond to changes in market conditions. When studying how some event or policy affects a market, we can discuss not only the direction of the effects but also their magnitude.
- The law of demand states that a fall in the price of a good raises the quantity demanded. The **price elasticity of demand** measures how much the quantity demanded responds to a change in price.
- Demand for a good is said to be *elastic* if the quantity demanded responds substantially to changes in the price. Demand is said to be *inelastic* if the quantity demanded responds only slightly to changes in the price.
- The price elasticity of demand for any good measures how willing consumers are to buy less of the good as its price rises.

- **Availability of Close Substitutes** Goods with close substitutes tend to have more elastic demand because it is easier for consumers to switch from that good to others. Example: Tea and Coffee,
- By contrast, because eggs are a food without a close substitute, the demand for eggs is less elastic than the demand for butter. A small increase in the price of eggs does not cause a sizable drop in the quantity of eggs sold.
- **Necessities versus Luxuries** Necessities tend to have inelastic demands, whereas luxuries have elastic demands. When the price of a doctor's visit rises, people do not dramatically reduce the number of times they go to the doctor, although they might go somewhat less often.
- By contrast, when the price of sailboats rises, the quantity of sailboats demanded falls substantially. The reason is that most people view doctor visits as a necessity and sailboats as a luxury.

- **Definition of the Market:** The elasticity of demand in any market depends on how we draw the boundaries of the market. Narrowly defined markets tend to have more elastic demand than broadly defined markets because it is easier to find close substitutes for narrowly defined goods. For example, food, a broad category, has a fairly inelastic demand because there are no good substitutes for food. Ice cream, a narrower category, has a more elastic demand because it is easy to substitute other desserts for ice cream. Vanilla ice cream, a very narrow category, has a very elastic demand because other flavors of ice cream are almost perfect substitutes for vanilla.
- **Time Horizon:** Goods tend to have more elastic demand over longer time horizons. When the price of gasoline rises, the quantity of gasoline demanded falls only slightly in the first few months. Over time, however, people buy more fuel-efficient cars, switch to public transportation, and move closer to where they work. Within several years, the quantity of gasoline demanded falls more substantially.

## Computing the Price Elasticity of Demand

- Economists compute the price elasticity of demand as the percentage change in the quantity demanded divided by the percentage change in the price.

$$\text{Price Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

## An Example

- 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. We calculate your elasticity of demand as

$$\textit{Price Elasticity of Demand} = \frac{20}{10} = 2$$

- If you try calculating the price elasticity of demand between two points on a demand curve, you will quickly notice an annoying problem: The elasticity from point A to point B seems different from the elasticity from point B to point A. For example, consider these numbers:

Point A: price = \$4    Quantity= 120

Point B: price = \$6    Quantity= 80

- Going from point A to point B, the price rises by 50 percent and the quantity falls by 33 percent, indicating that the price elasticity of demand is  $33/50$ , or 0.66.
- Going from point B to point A, the price falls by 33 percent and the quantity rises by 50 percent, indicating that the price elasticity of demand is  $50/33$ , or 1.5.

# Midpoint method

- One way to avoid this problem is to use the *midpoint method* for calculating elasticities. The standard procedure for computing a percentage change is to divide the change by the initial level. By contrast, the midpoint method computes a percentage change by dividing the change by the midpoint (or average) of the initial and final levels.
- For instance, \$5 is the midpoint between \$4 and \$6. Therefore, according to the midpoint method, a change from \$4 to \$6 is considered a 40 percent rise because  $(6 - 4) / 5 * 100 = 40$ . Similarly, a change from \$6 to \$4 is considered a 40 percent fall.



# The formula

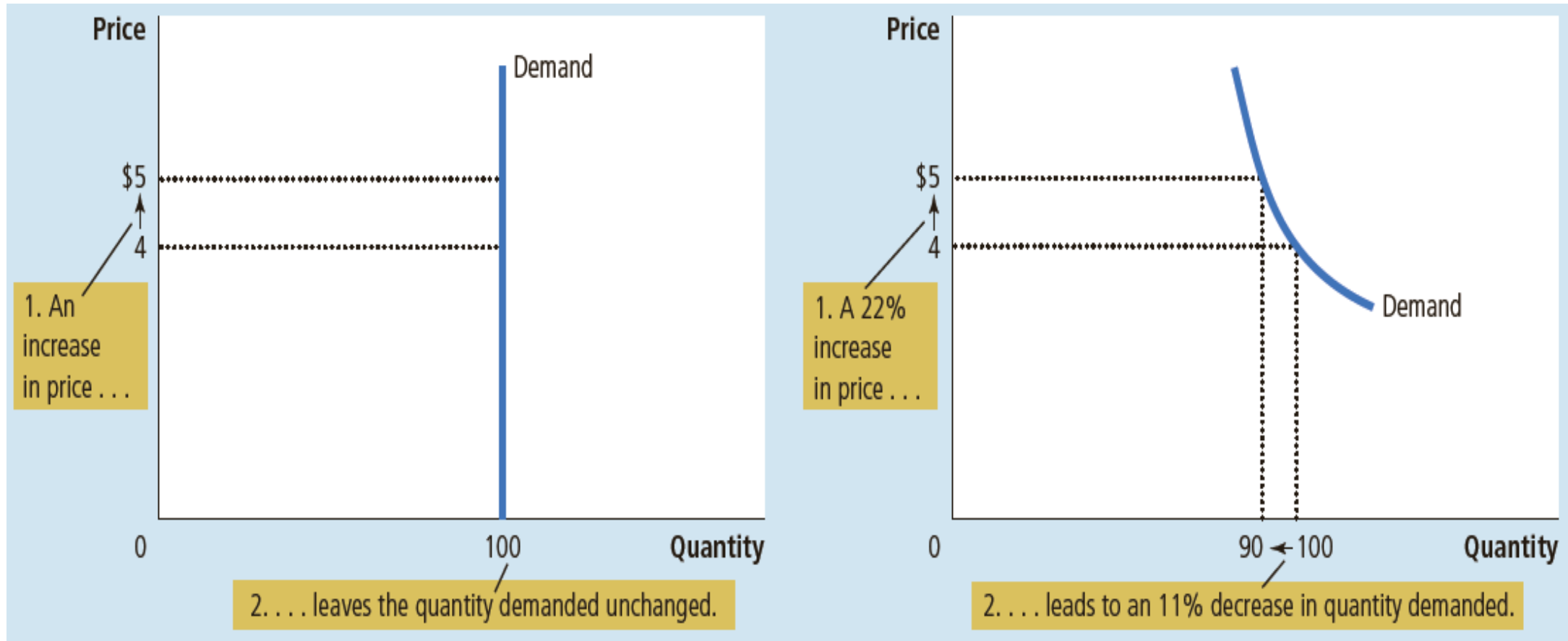
- The following formula expresses the midpoint method for calculating the price
- elasticity of demand between two points, denoted  $(Q_1, P_1)$  and  $(Q_2, P_2)$ :

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

# Types of Demand Curve Based on Elasticity

- Economists classify demand curves according to their elasticity. Demand is considered *elastic* when the elasticity is greater than 1, which means the quantity moves proportionately more than the price. Demand is considered *inelastic* when the elasticity is less than 1, which means the quantity moves proportionately less than the price. If the elasticity is exactly 1, the percentage change in quantity equals the percentage change in price, and demand is said to have *unit elasticity*.
- Because the price elasticity of demand measures how much quantity demanded responds to changes in the price, it is closely related to the slope of the demand curve. The following rule of thumb is a useful guide: The flatter the demand curve that passes through a given point, the greater the price elasticity of demand. The steeper the demand curve that passes through a given point, the smaller the price elasticity of demand.

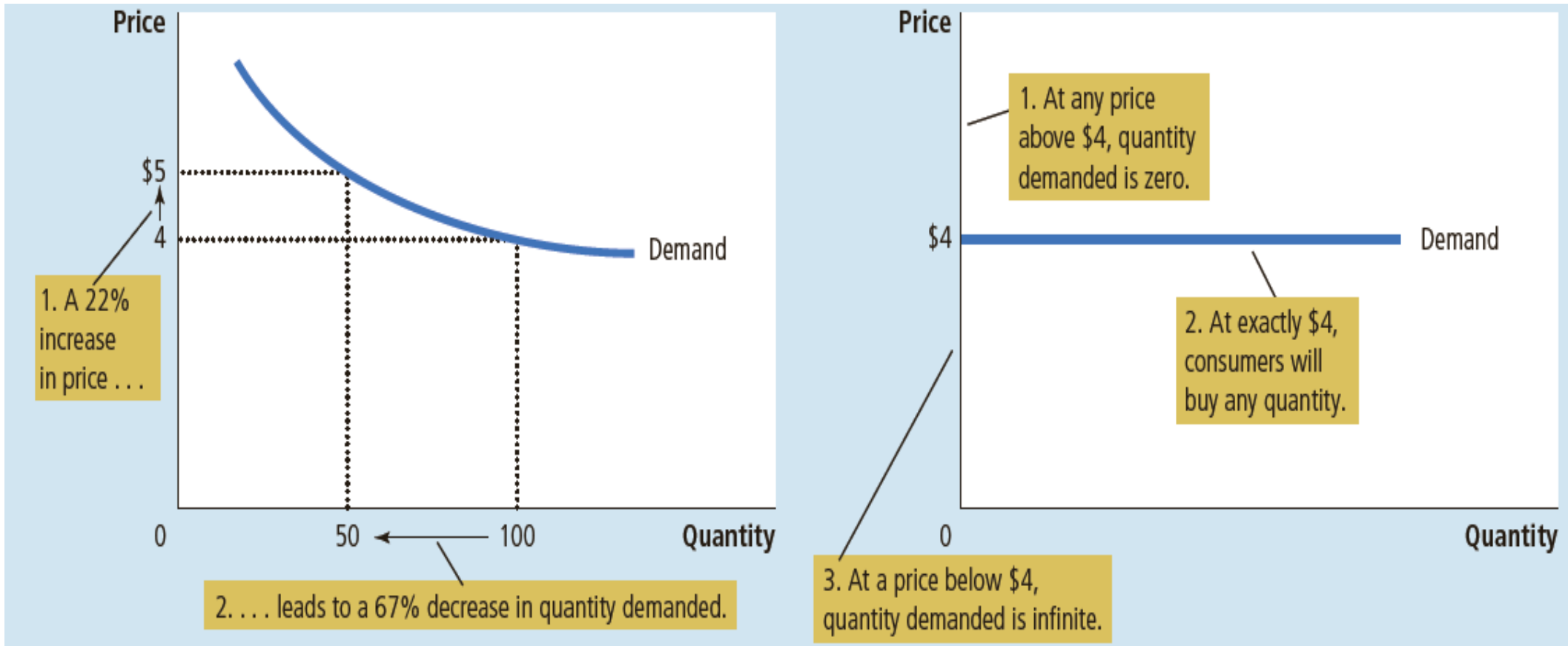
## Inelastic demand curve



a) Perfectly Inelastic Demand Curve:  
Elasticity is equals to 0

b) Inelastic Demand Curve:  
Elasticity is less than 1

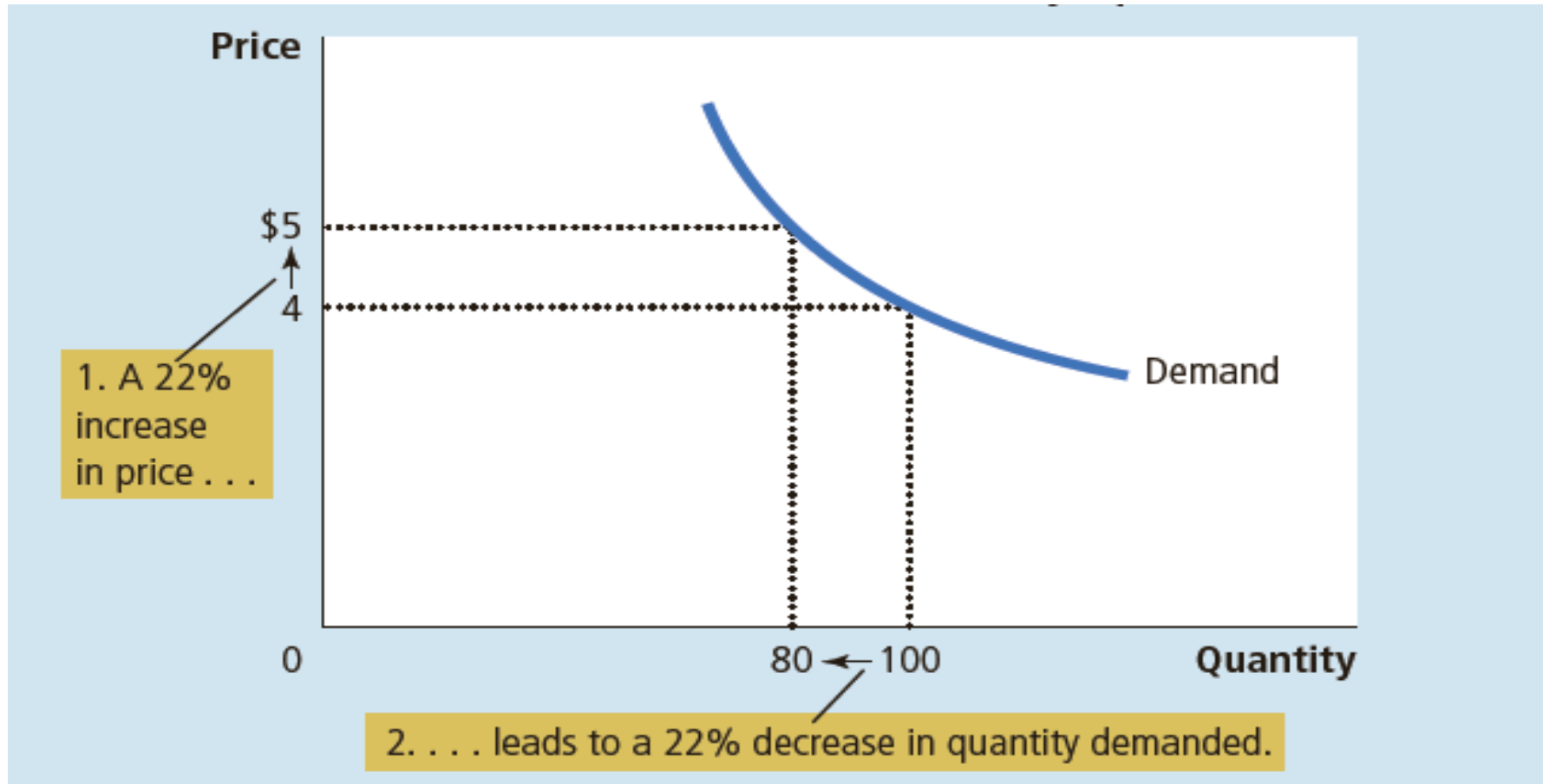
## Elastic Demand Curve



c) Elastic Demand Curve:  
Elasticity is greater than 1

d) Perfectly Elastic Demand Curve:  
Elasticity is equals to infinity

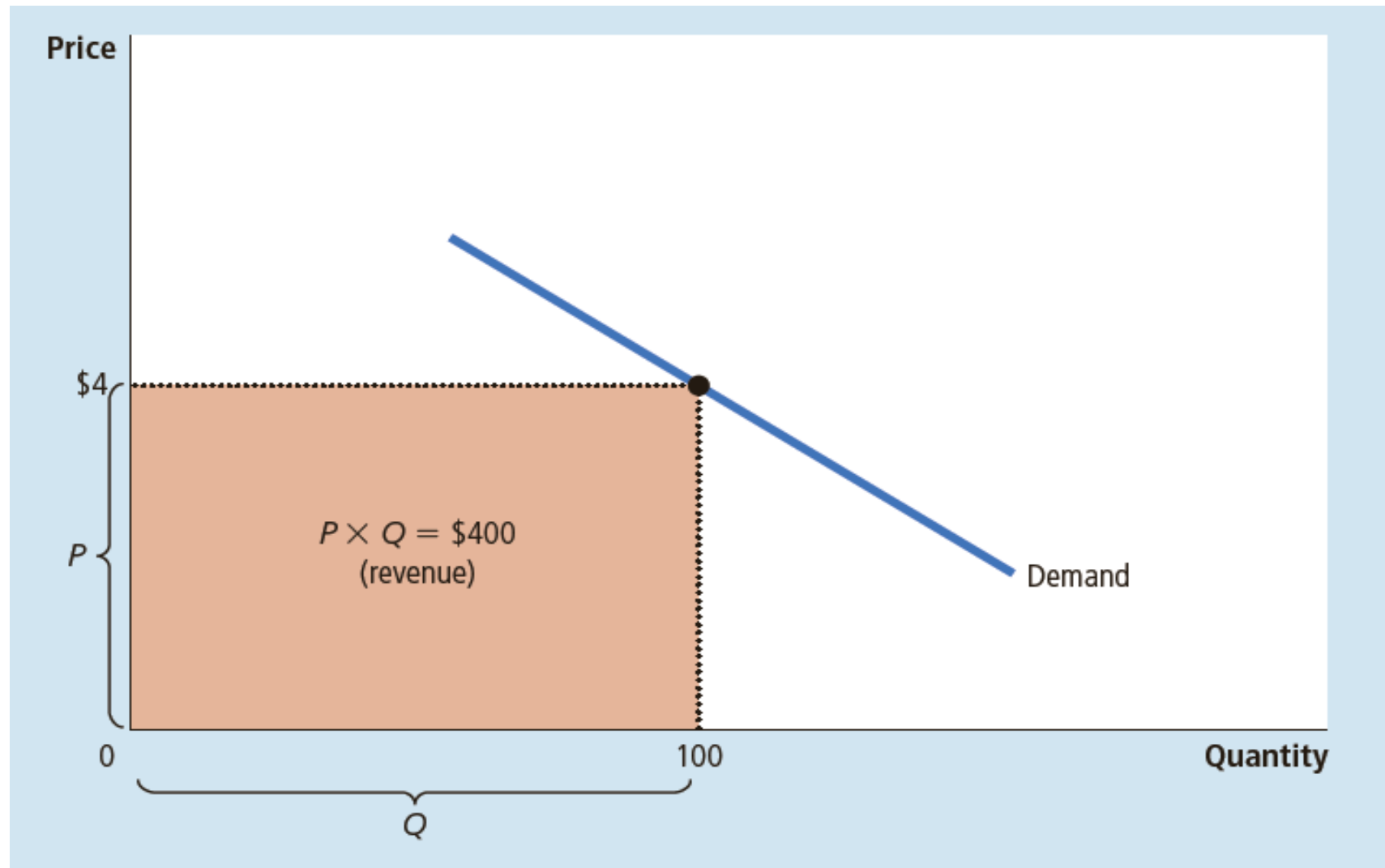
## Unitary Elastic Demand



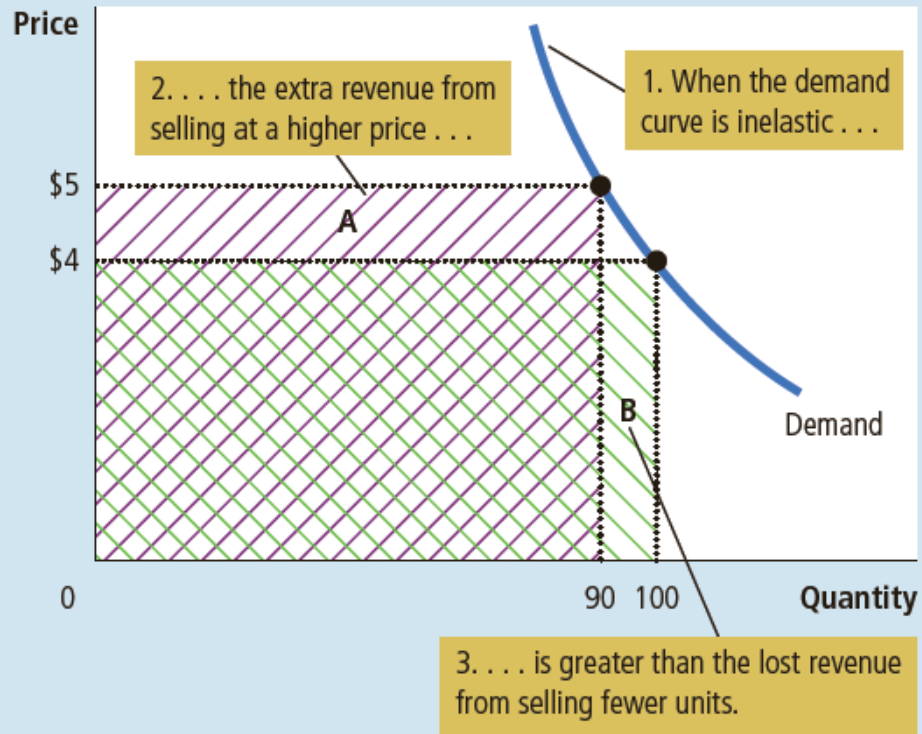
d) Unitary elastic demand curve: Elasticity equals to 1



# Total Revenue and the Price Elasticity of Demand

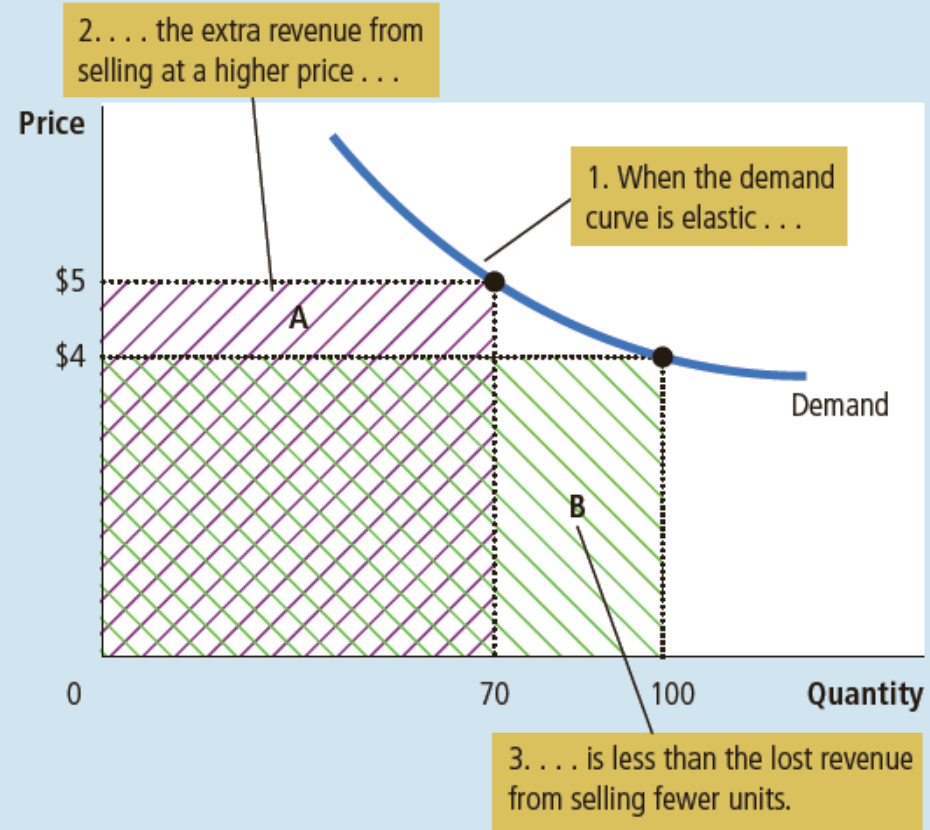


(a) The Case of Inelastic Demand



a) Total revenue rises from \$400 to \$450

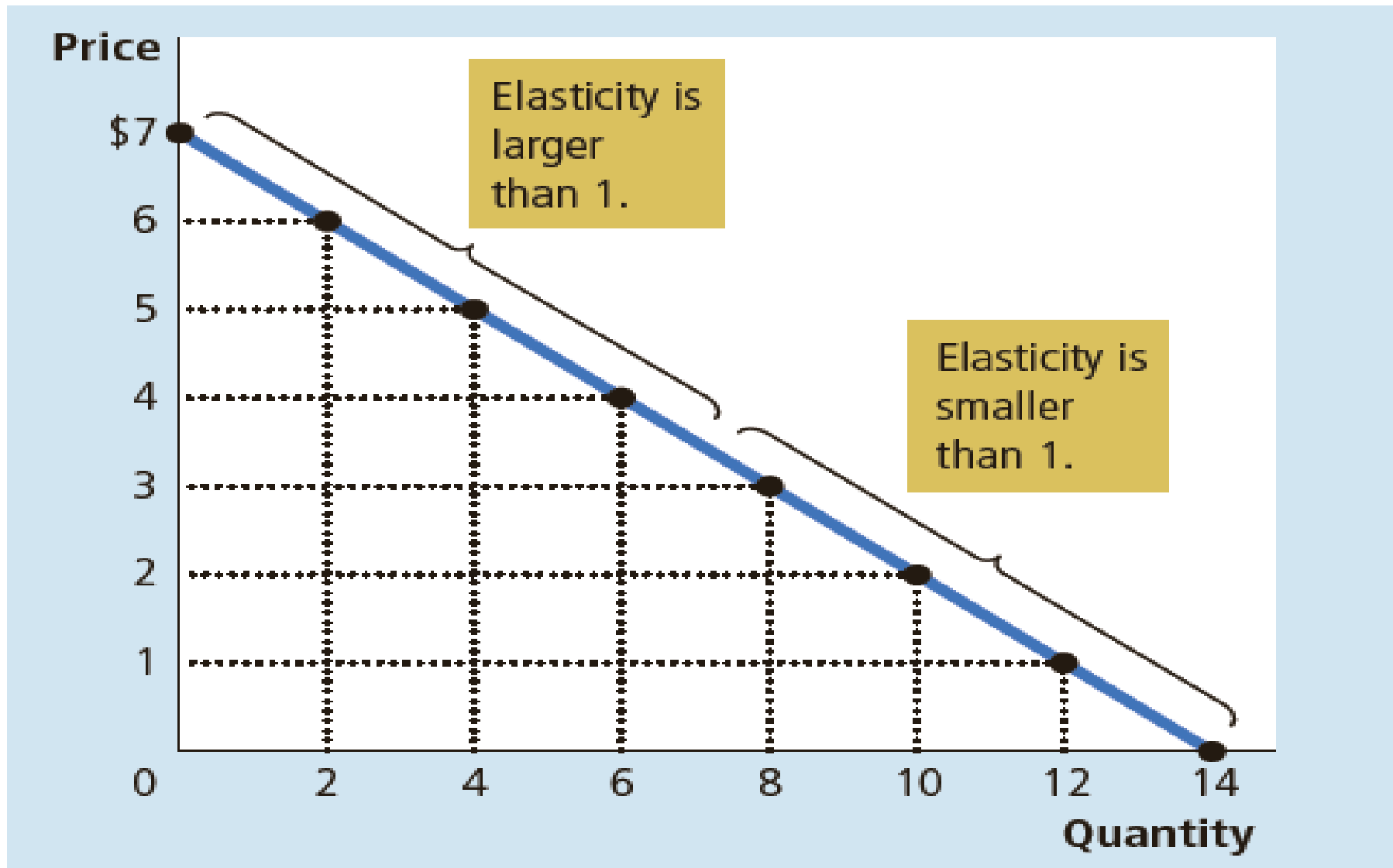
(b) The Case of Elastic Demand



b) Total revenue falls from \$400 to \$350

- When demand is inelastic (a price elasticity less than 1), price and total revenue move in the same direction: If the price increases, total revenue also increases.
- When demand is elastic (a price elasticity greater than 1), price and total revenue move in opposite directions: If the price increases, total revenue decreases.
- If demand is unit elastic (a price elasticity exactly equal to 1), total revenue remains constant when the price changes.

## Elasticity and Total Revenue along a Linear Demand Curve



Price	Quantity	Total Revenue (Price × 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 Income Elasticity of Demand

- Income *Elasticity of Demand* = 
$$\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Income}}$$
- **For normal goods:** Higher income raises the quantity demanded. Because quantity demanded and income move in the same direction, normal goods have positive income elasticities.
- **For inferior goods:** Higher income lowers the quantity demanded. Because quantity demanded and income move in opposite directions, inferior goods have negative income elasticities.

# The Cross Elasticity of Demand

- The **cross-price elasticity of demand** measures how the quantity demanded of one good responds to a change in the price of another good. It is calculated as the percentage change in quantity demanded of good 1 divided by the percentage change in the price of good 2.
- *Income Elasticity of Demand* = 
$$\frac{\text{Percentage Change in Quantity Demanded of good 1}}{\text{Percentage Change in Price of good 2}}$$

- *Substitutes* are goods that are typically used in place of one another, such as hamburgers and hot dogs. An increase in hot dog prices induces people to grill hamburgers instead. Because the price of hot dogs and the quantity of hamburgers demanded move in the same direction, the cross-price elasticity is positive.
- Conversely, *complements* are goods that are typically used together, such as computers and software. In this case, the cross-price elasticity is negative, indicating that an increase in the price of computers reduces the quantity of software demanded.

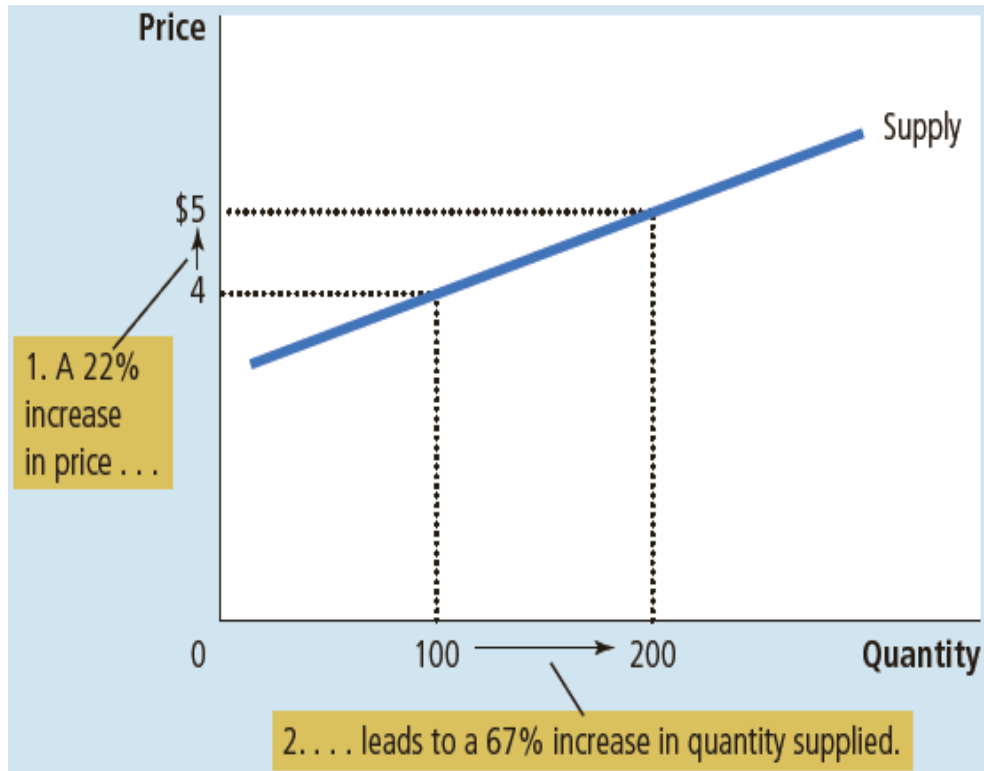
# The Price Elasticity of Supply and Its Determinants

- The **price elasticity of supply** measures how much the quantity supplied responds to changes in the price.
- Supply of a good is said to be *elastic* if the quantity supplied responds substantially to changes in the price.
- Supply is said to be *inelastic* if the quantity supplied responds only slightly to changes in the price.

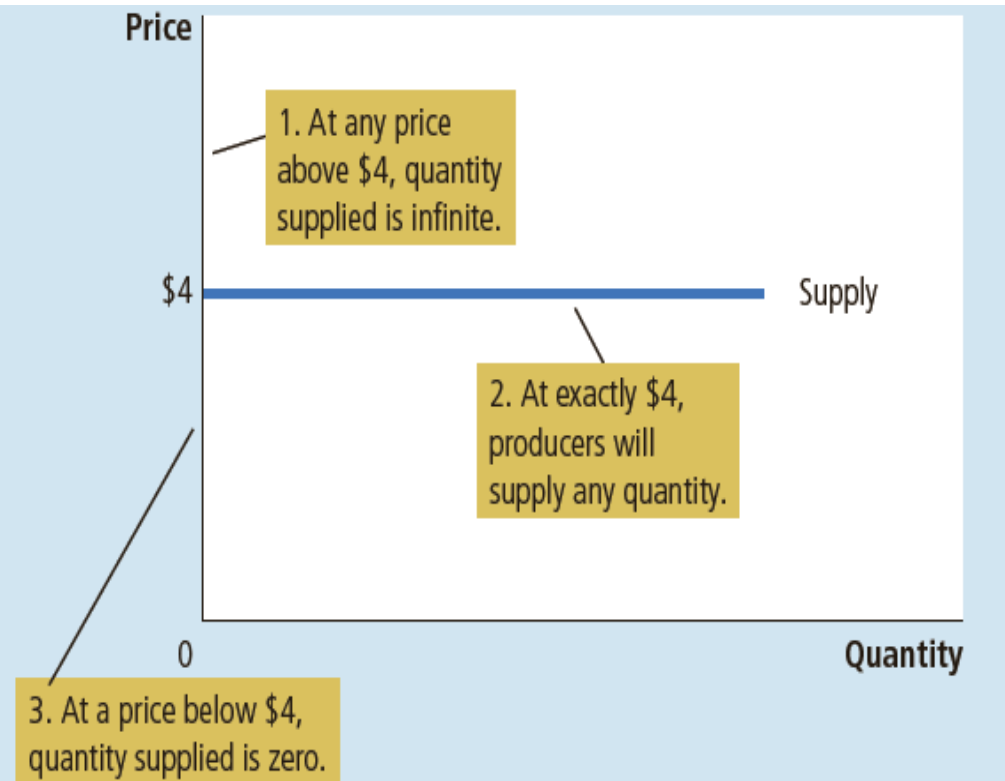
# The Formula:

- *Price Elasticity of Supply* = 
$$\frac{\text{Percentage Change in Quantity Supplied}}{\text{Percentage Change in Price}}$$
- The price elasticity of supply depends on the flexibility of sellers to change the amount of the good they produce. For example, beachfront land has an inelastic supply because it is almost impossible to produce more of it.
- Manufactured goods, such as books, cars, and televisions, have elastic supplies because firms that produce them can run their factories longer in response to a higher price.
- In most markets, a key determinant of the price elasticity of supply is the time period being considered.





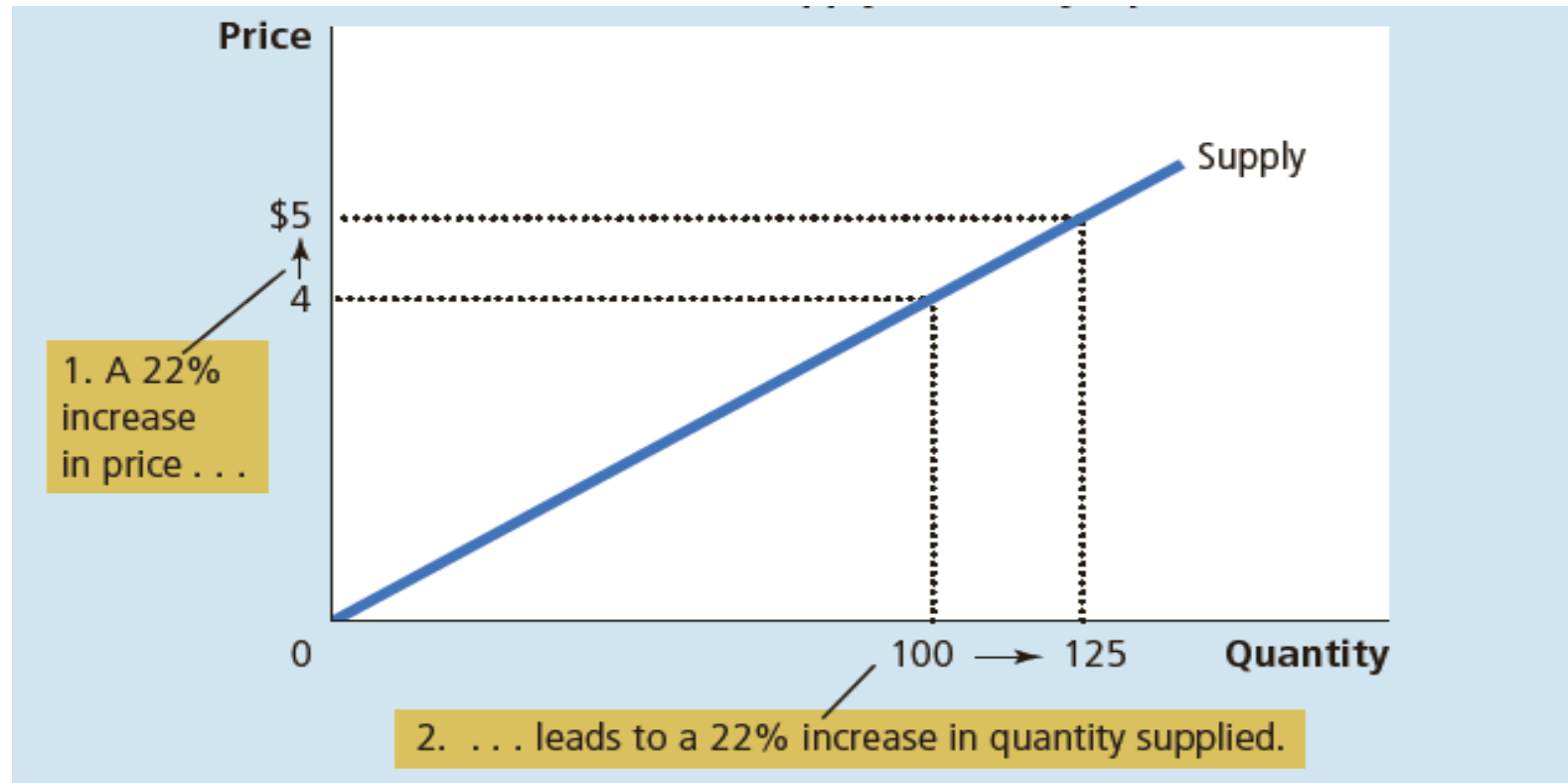
**a) Elastic Supply: Elasticity Is Greater Than 1**



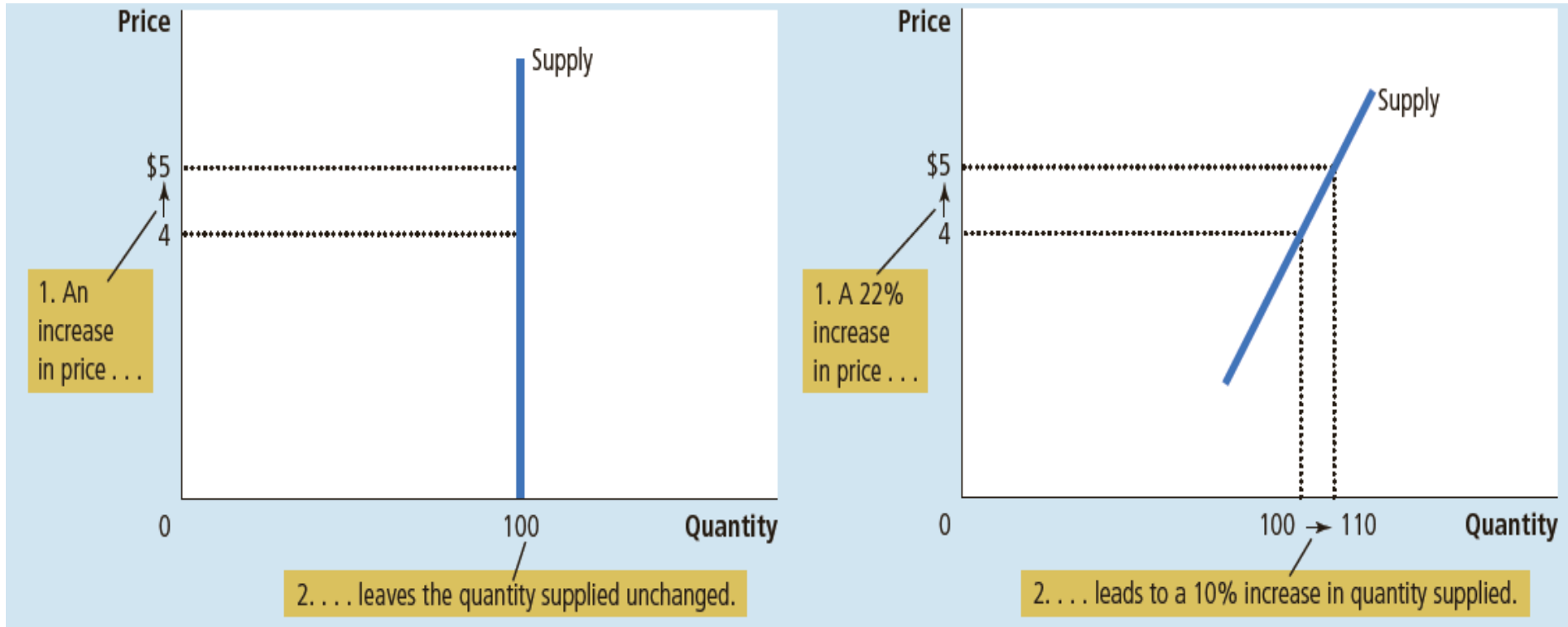
**b) Perfectly Elastic Supply: Elasticity equals infinity**

# Elastic Supply Curve

# Unitary Elastic Supply Curve



c) Elasticity of Supply = 1



d) Perfectly Inelastic Supply: Elasticity = 0

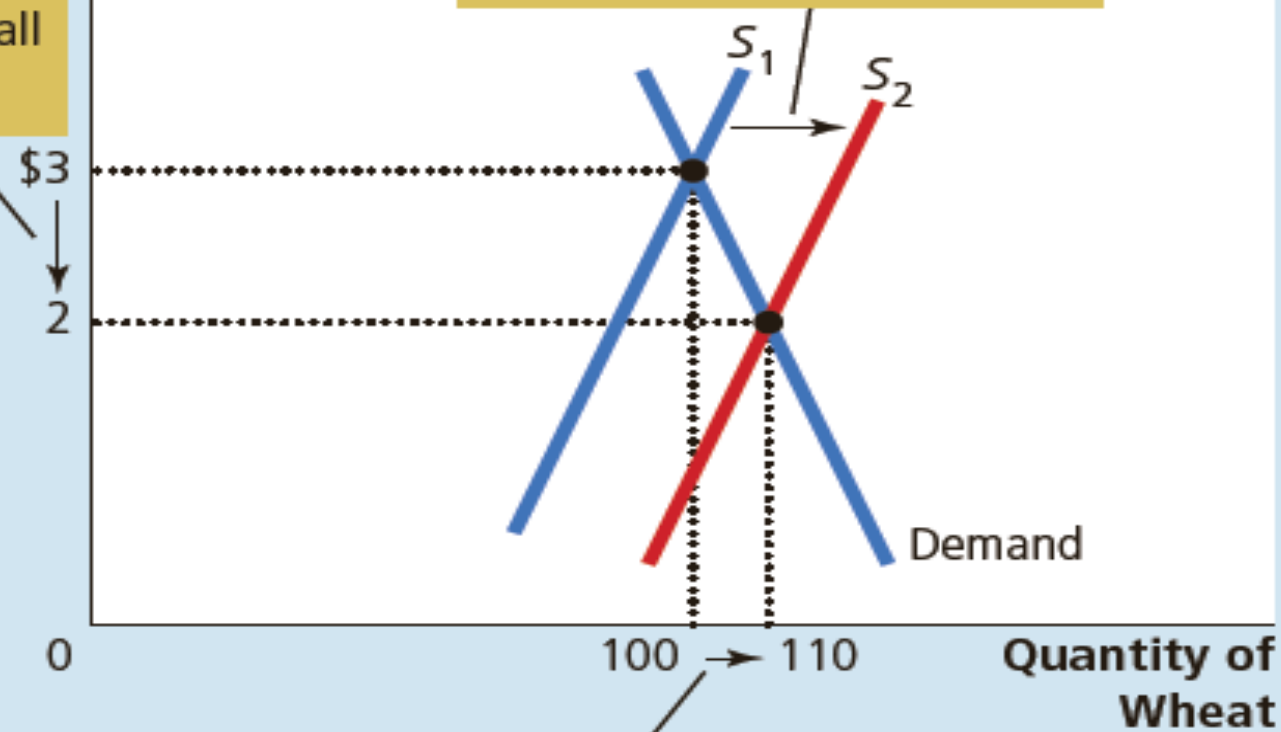
e) Inelastic Supply: Elasticity Is less Than 1

# Inelastic Supply Curve

Price of  
Wheat

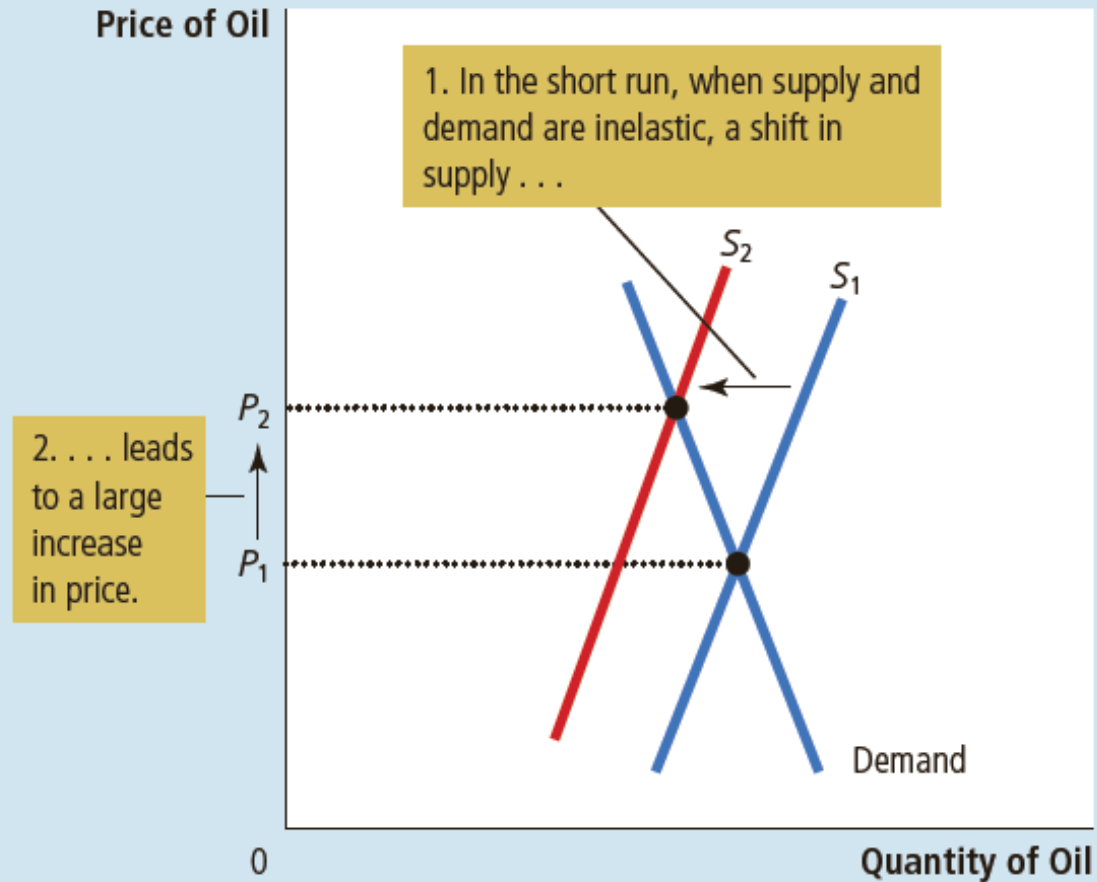
2. . . . leads  
to a large fall  
in price . . .

1. When demand is inelastic,  
an increase in supply . . .

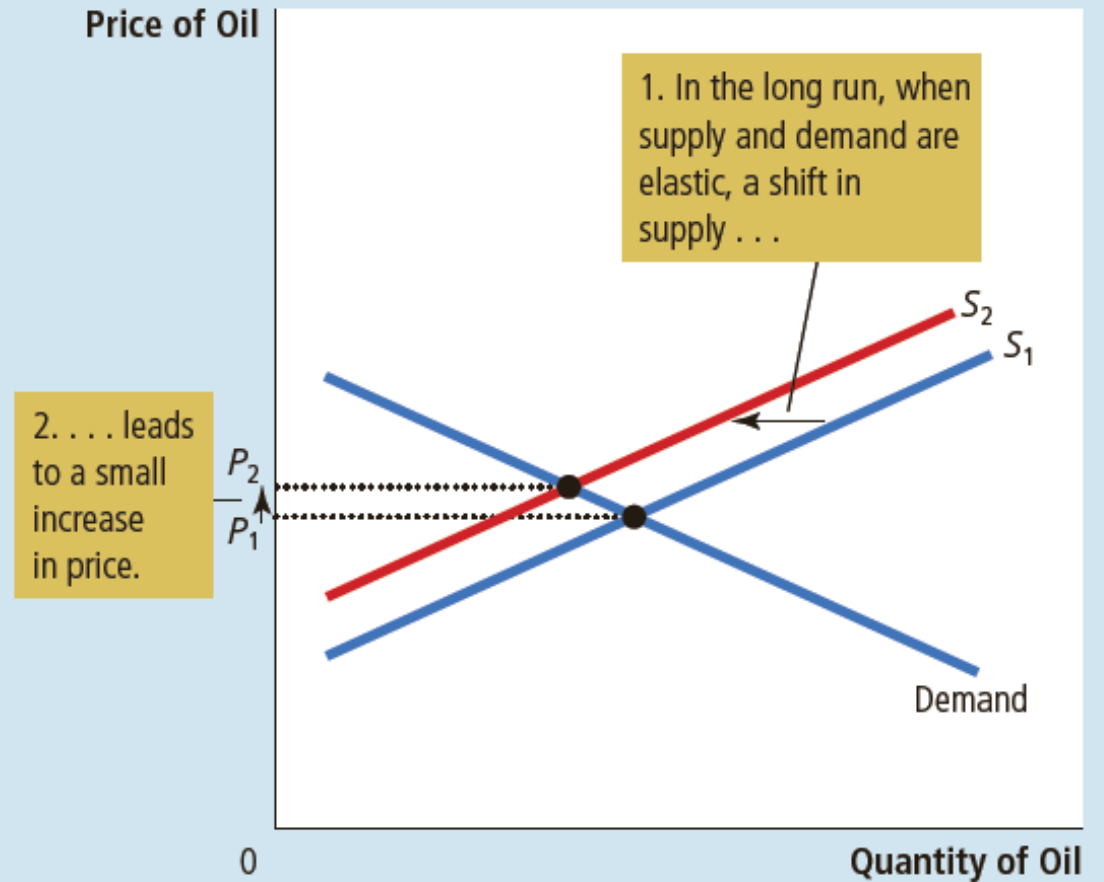


3. . . . and a proportionately smaller increase  
in quantity sold. As a result, revenue falls  
from \$300 to \$220.

(a) The Oil Market in the Short Run

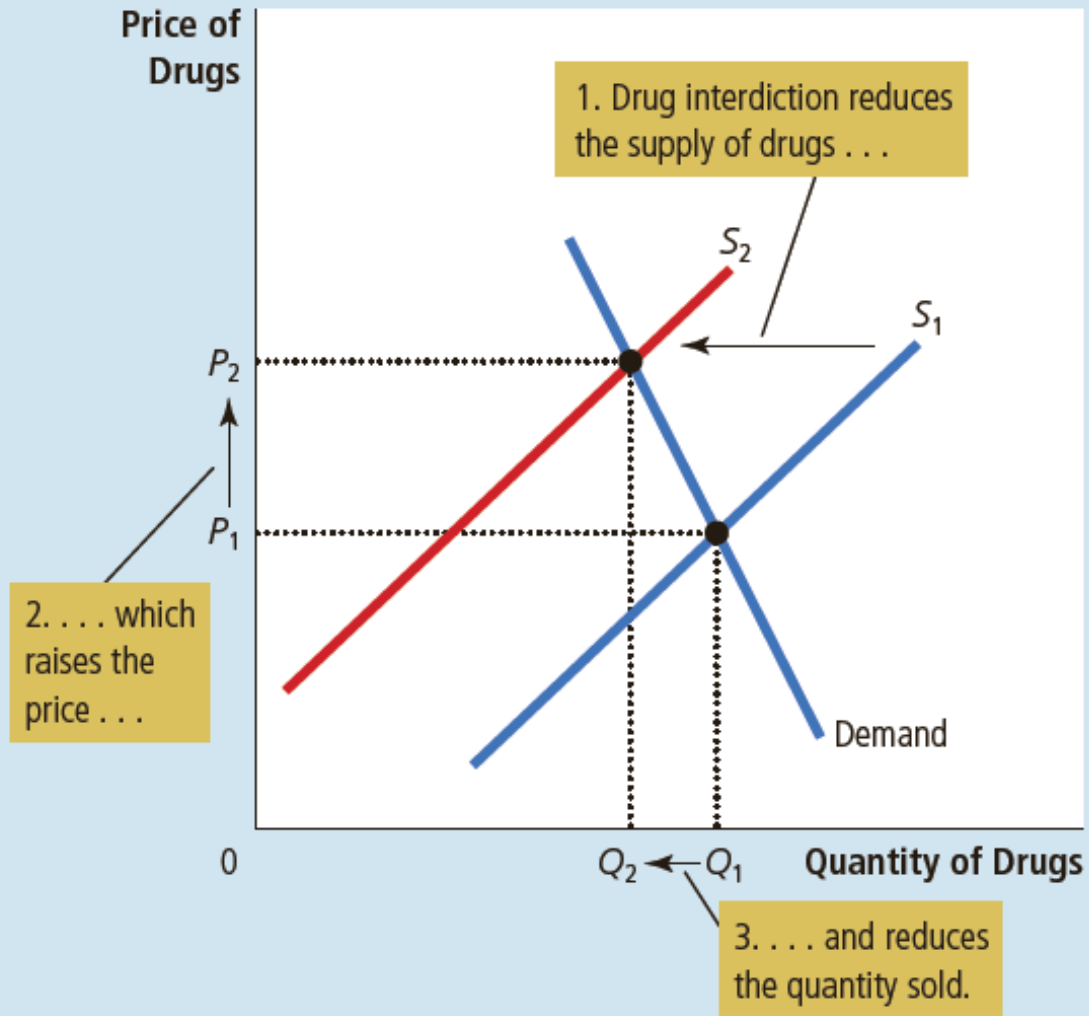


(b) The Oil Market in the Long Run

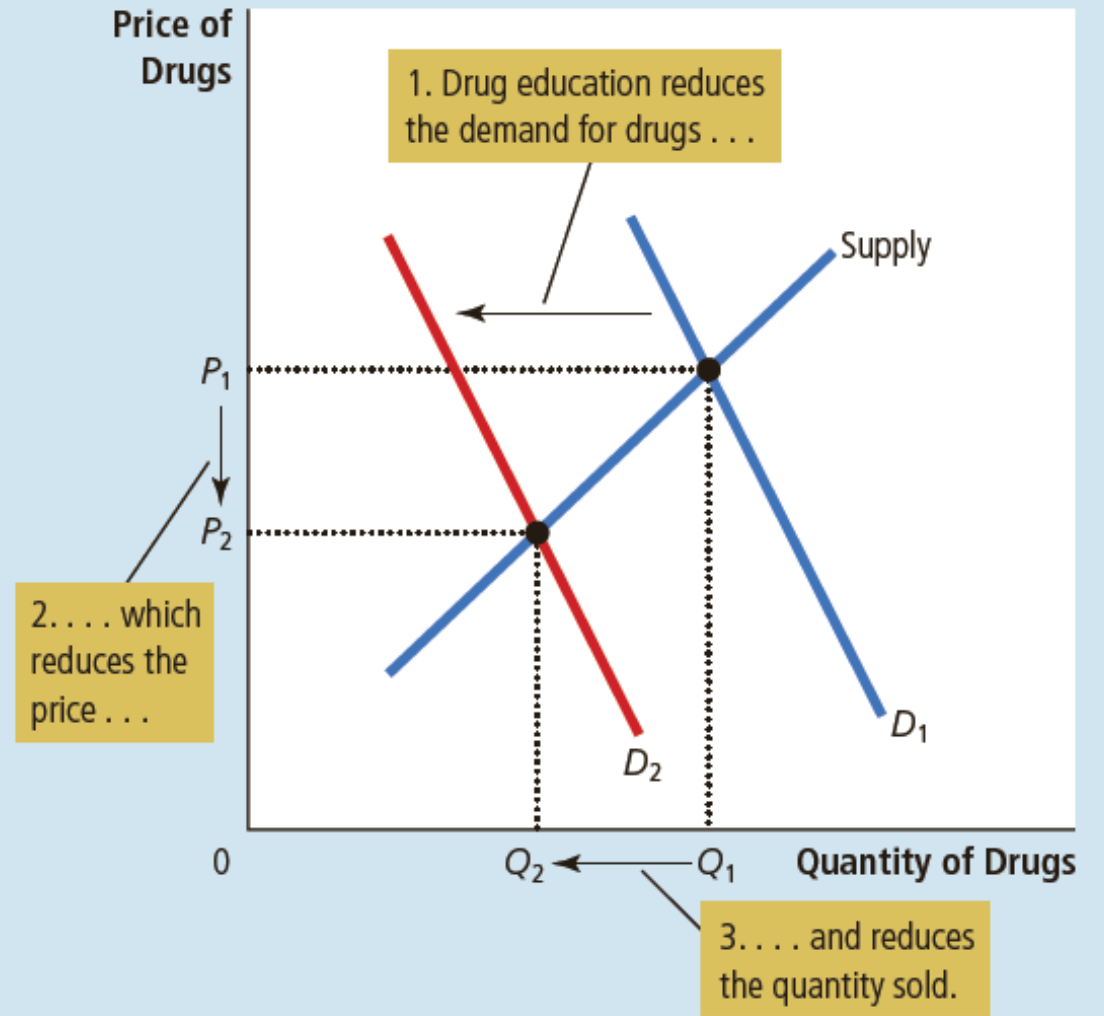




(a) Drug Interdiction



(b) Drug Education





Any Questions?