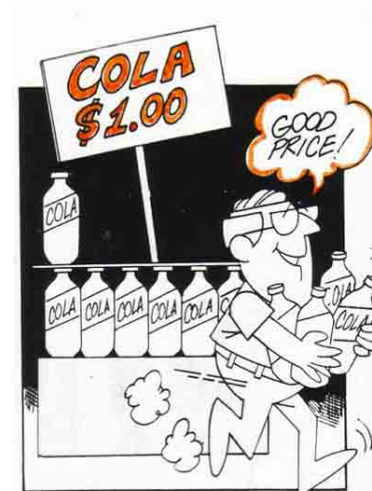# Elasticity

What is the difference between this …

… and this?

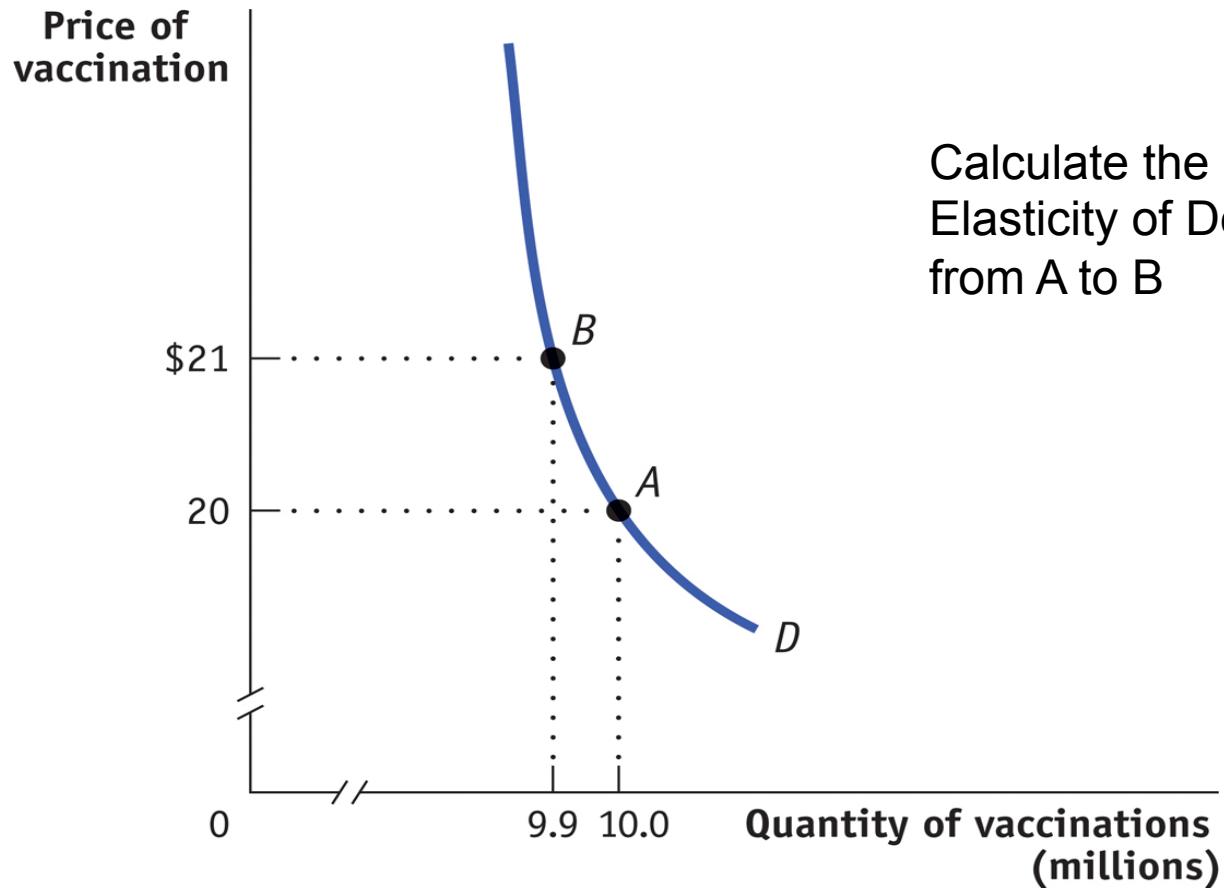# Defining and Measuring Elasticity (I)

Price elasticity of demand

> The **price elasticity of demand** is the ratio of the *percent change in the quantity demanded to the percent change in the price* as we move along the demand curve.

$$\left| \frac{\%\Delta Q}{\%\Delta P} \right|$$

> **Drop the minus sign.** Price elasticity of demand is **always negative** because of the inverse relationship between price and quantity demanded—so drop the minus sign and use absolute value.

Defining and Measuring Elasticity (II)

Demand for Vaccinations

Calculate the Price
Elasticity of Demand
from A to B

Defining and Measuring Elasticity (III)

The Midpoint Method

- Percentage change can vary depending on which variables are used to measure. The midpoint method alleviates this problem.

- The **midpoint method** is a technique for calculating the percent change using averages of starting and final values (midpoints).

	Price	Quantity demanded
Situation A	$0.90	1,100
Situation B	$1.10	900

Defining and Measuring Elasticity (IV)

Estimating Elasticites

- Assumptions: It's easy to estimate elasticities of demand from real-world data.

- Fact: Changes in price aren't the only thing affecting change in the quantity demanded. Other factors include:

    - changes in income

    - changes in the population

    - changes in the prices of other goods

- To estimate price elasticity of demand, economists must use careful statistical analysis to separate the influence of these different factors, holding other things equal.

Defining and Measuring Elasticity (V)

Some Estimated Price Elasticities of Demand

TABLE 5-1 Some Estimated Price Elasticities of Demand

Good	Price elasticity of demand
Inelastic demand	
Eggs	0.1
Beef	0.4
Stationery	0.5
Gasoline	0.5
Elastic demand	
Housing	1.2
Restaurant meals	2.3
Airline travel	2.4
Foreign travel	4.1

Check your understanding

Answer the following questions

- The price of strawberries falls from $1.50 to $1.00 per carton and the quantity demanded goes from 100,000 to 200,000 cartons. **Using the midpoint method, the price elasticity of demand is?**

- At the present level of consumption, 4,000 movie tickets, and at the current price, $5 per ticket, the price elasticity of demand for movie tickets is 1. **Using the midpoint method, calculate the percentage by which the owners of movie theaters must reduce price in order to sell 5,000 tickets.**

- The price elasticity of demand for ice-cream sandwiches is 1.2 at the current price of $0.50 per sandwich and the current consumption level of 100,000 sandwiches. **Calculate the change in the quantity demanded when price rises by $0.05.**

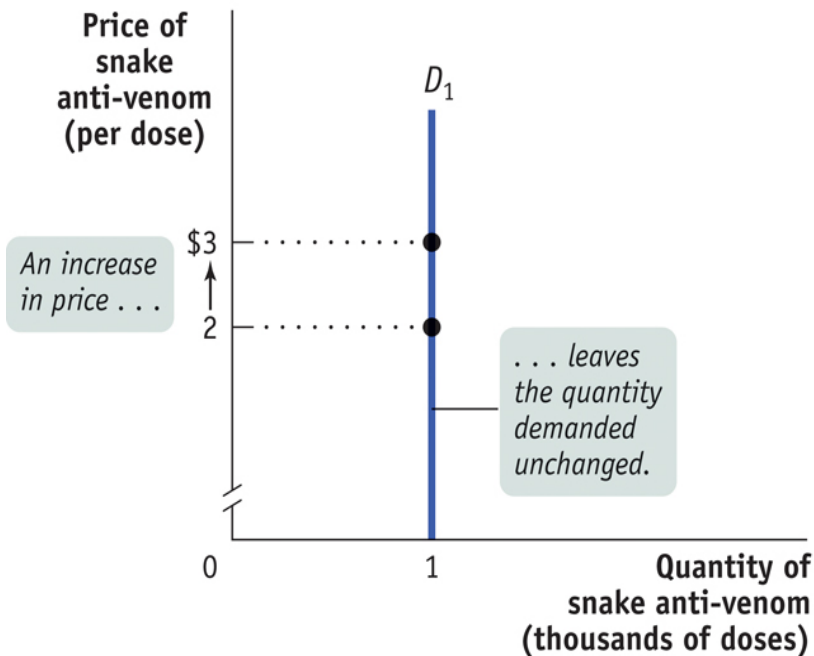# Measuring the Price Elasticity of Demand (I)

Extreme cases of price elasticity of demand (I)

- Demand is **perfectly inelastic** when the quantity demanded does not respond at all to changes in the price.
    - The demand curve is a **vertical line**.

- Demand is **perfectly elastic** when any price increase will cause the quantity demanded to drop to zero.
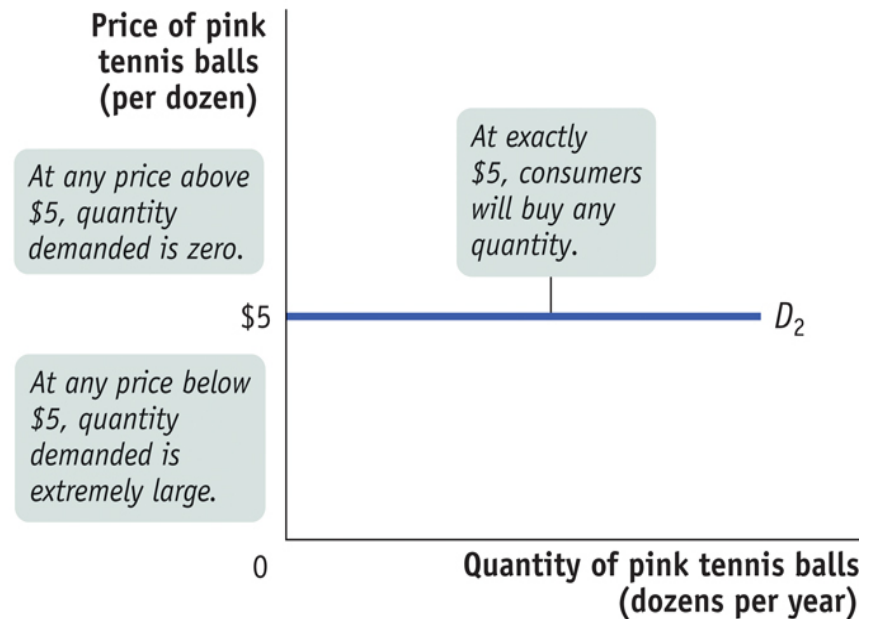   - The demand curve is a **horizontal line**.

Measuring the Price Elasticity of Demand (II)

Extreme cases of price elasticity of demand (II)

(a) Perfectly Inelastic Demand:
Price Elasticity of Demand = 0

Price of snake anti-venom (per dose)

D_1

An increase in price . . .

$3

2

. . . leaves the quantity demanded unchanged.

0   1   Quantity of snake anti-venom (thousands of doses)

(b) Perfectly Elastic Demand:
Price Elasticity of Demand = ∞

Price of pink tennis balls (per dozen)

At any price above $5, quantity demanded is zero.

At exactly $5, consumers will buy any quantity.

$5 D_2

At any price below $5, quantity demanded is extremely large.

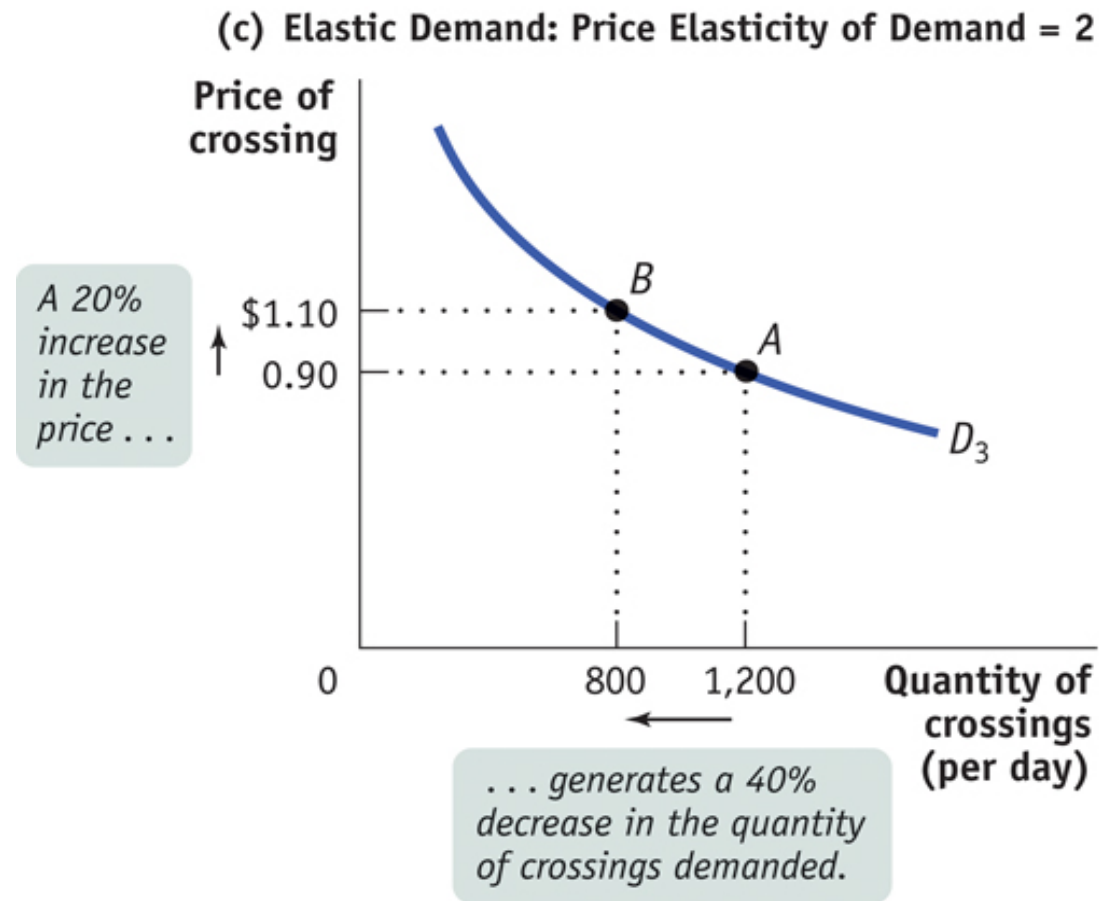0   Quantity of pink tennis balls (dozens per year)

Interpreting Price Elasticity of Demand (I)

Elastic, Inelastic, Unit-elastic

- **Demand is elastic if the price elasticity of demand is greater than 1**
  - Price elasticity of demand > 1

- **Demand is inelastic if the price elasticity of demand is less than 1**
  - Price elasticity of demand < 1

- **Demand is unit-elastic if the price elasticity of demand is exactly 1**
  - Price elasticity of demand = 1
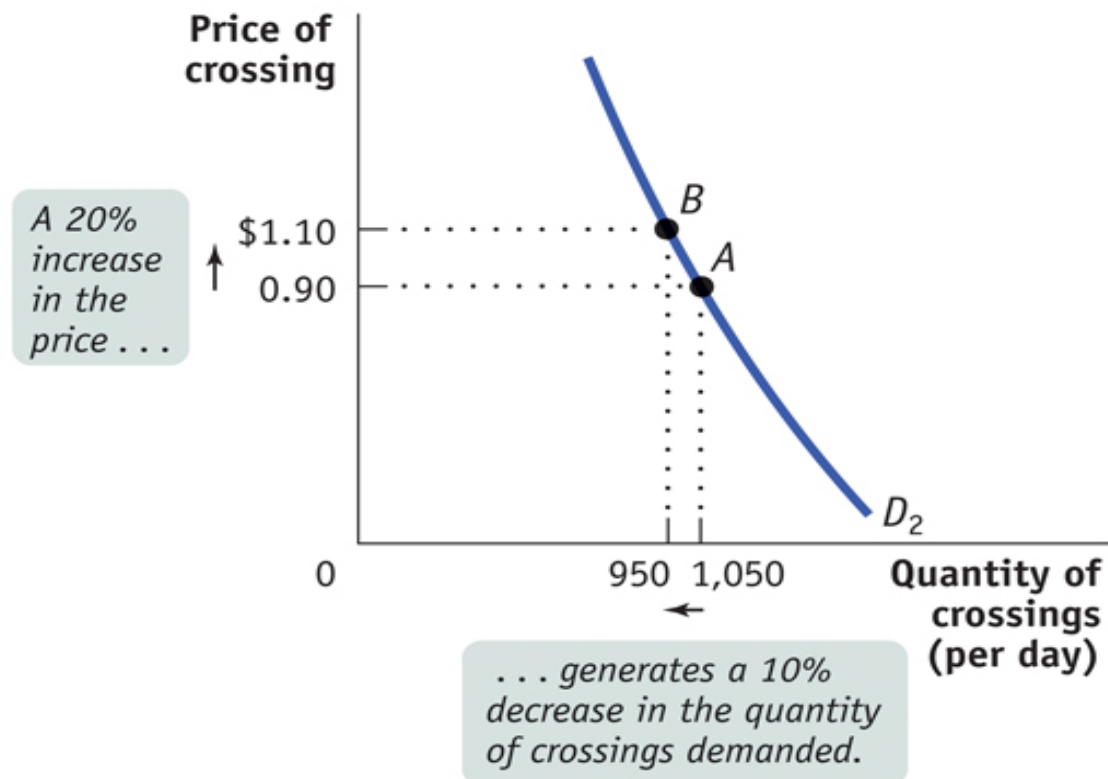
Interpreting Price Elasticity of Demand (II)

Elastic Demand

(c) **Elastic Demand: Price Elasticity of Demand = 2**

A 20% increase in the price . . .

. . . generates a 40% decrease in the quantity of crossings demanded.

Interpreting Price Elasticity of Demand (III)

Inelastic Demand

(b) Inelastic Demand: Price Elasticity of Demand = 0.5

A 20% increase in the price . . .

. . . generates a 10% decrease in the quantity of crossings demanded.

Interpreting Price Elasticity of Demand (IV)

Unit-elastic Demand

(a) Unit-Elastic Demand: Price Elasticity of Demand = 1
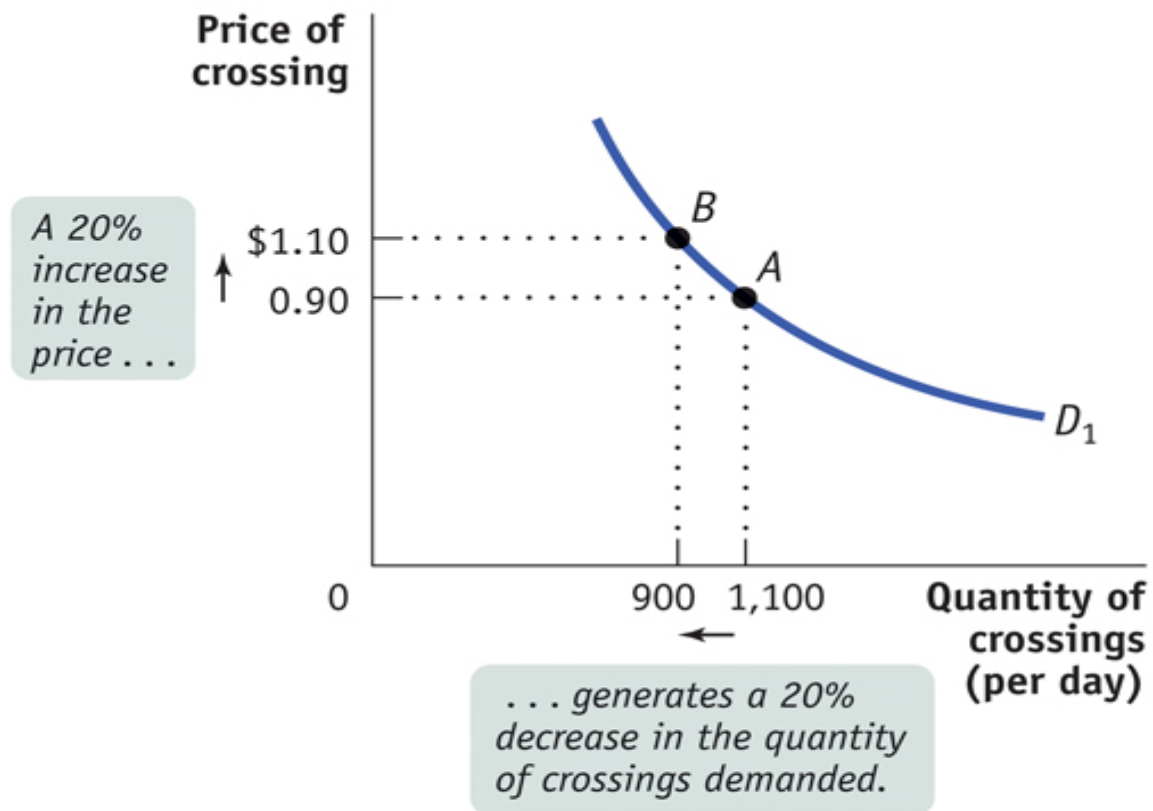
Why Does It Matter Whether Demand Is Elastic, Inelastic, or Elastic?

- It matters because elasticity predicts how *changes in the price* of a good will affect the total revenue earned by producers from the sale of that good.

- The **total revenue** is defined as the *total value of sales* of a good or service:

Total revenue = Price × Quantity sold

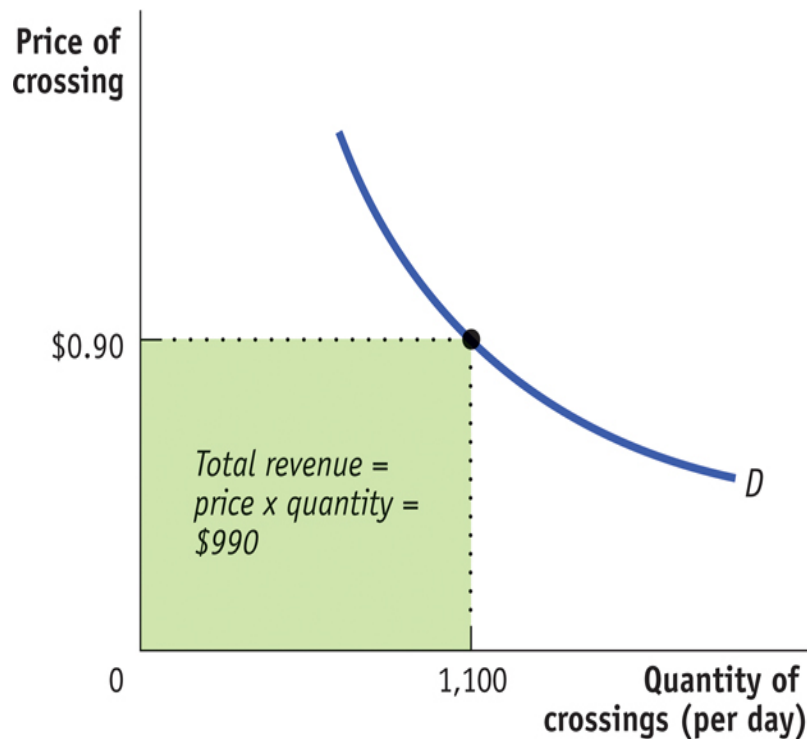# Elasticity and Total Revenue: Two Effects (I)

Price effect vs. Quantity effect (I)

- When a seller raises the price of a good, there are **two effects** in action (except in the rare case of a good with perfectly elastic or perfectly inelastic demand).

  - *A price effect:* After a price increase, each unit sold sells at a higher price, which tends to raise revenue.

  - *A quantity effect:* After a price increase, fewer units are sold, which tends to lower revenue.
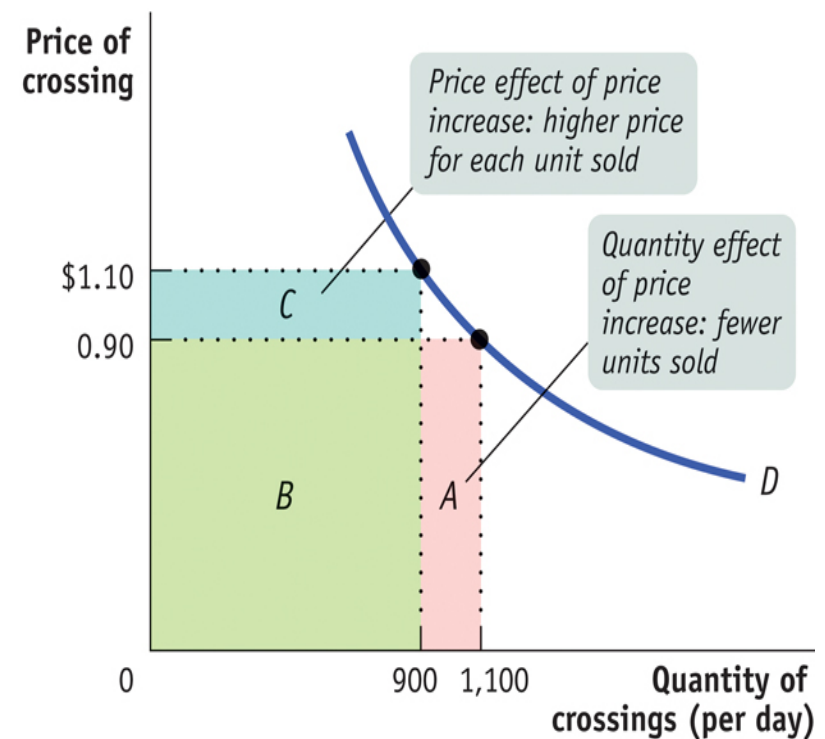
Elasticity and Total Revenue: Two Effects (II)

Price effect vs. Quantity effect (II)

(a) Total Revenue by Area

(b) Effect of a Price Increase on Total Revenue

Elasticity and Total Revenue: Two Effects (III)

Elasticity matters

- **If demand is *elastic* (price elasticity of demand > 1)**
  - An *increase in price reduces* total revenue.
  - The quantity effect is stronger than the price effect.
    - Price Increasing leads to Total Revenue Decreasing

- **If demand is *inelastic* (price elasticity of demand < 1)**
  - A *higher price increases* total revenue.
  - The price effect is stronger than the quantity effect.
    - Price Increasing leads to Total Revenue Increasing

- **If demand for a good is *unit-elastic* (the price elasticity of demand = 1), an *increase in price does not change total revenue*.**
  - The sales effect and price effect exactly offset each other.

Elasticity and Total Revenue: Two Effects (IV)

Example

**TABLE 5-2** Price Elasticity of Demand and Total Revenue

	Price of crossing = $0.90	Price of crossing = $1.10
Unit-elastic demand (price elasticity of demand = 1)		
Quantity demanded	1,100	900
Total revenue	$990	$990
Inelastic demand (price elasticity of demand = 0.5)		
Quantity demanded	1,050	950
Total revenue	$945	$1,045
Elastic demand (price elasticity of demand = 2)		
Quantity demanded	1,200	800
Total revenue	$1,080	$880

Price Elasticity Along the Demand Curve (I)

Moving Along the Demand Curve

- Elasticity *changes* along the demand curve.

  - When price is low, *increasing price will increase total revenue.*

  - When price is high, *increasing price will decrease total revenue.*

- Whenever we measure elasticity, we are measuring it at a *certain point* on the demand curve.

Price Elasticity Along the Demand Curve (II)
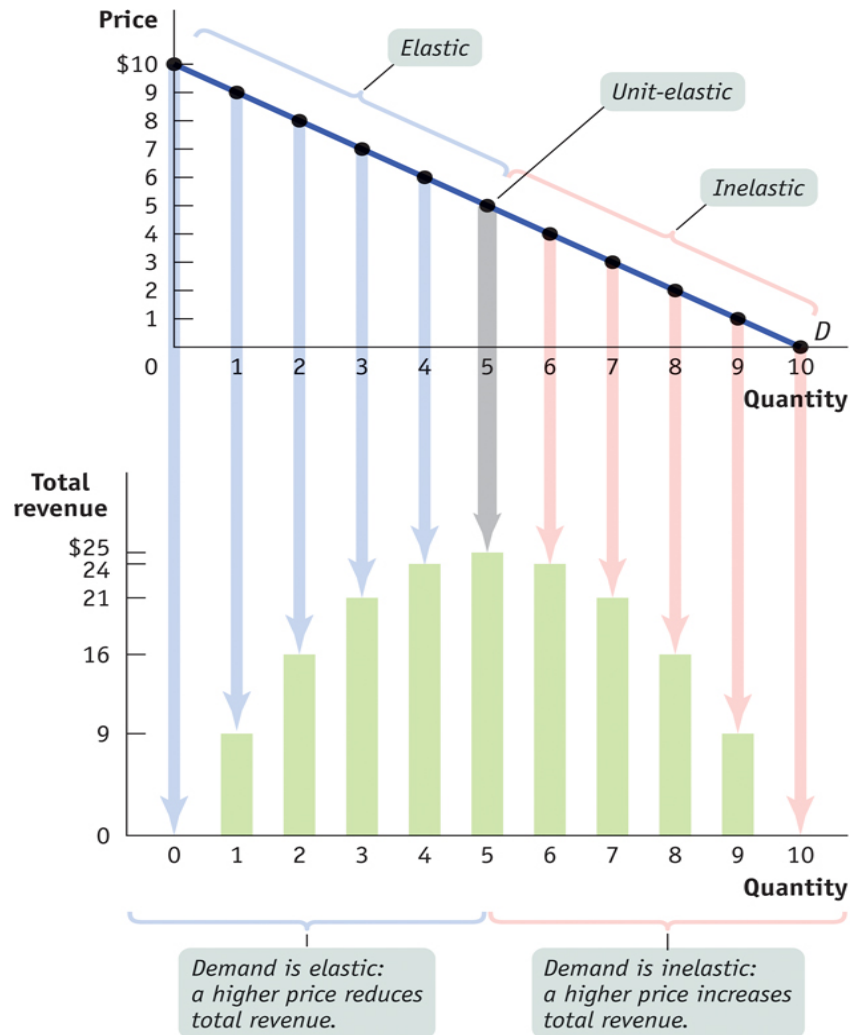
Demand Schedule and Total Revenue for a Linear Demand Curve

Price	Quantity demanded	Total revenue
$0	10	$0
1	9	9
2	8	16
3	7	21
4	6	24
5	5	25
6	4	24
7	3	21
8	2	16
9	1	9
10	0	0

Demand is elastic: a higher price reduces total revenue.

Demand is inelastic: a higher price increases total revenue.

What Factors Determine the Price Elasticity of Demand?

Determinants of Price Elasticity of Demand:

1. the availability of close substitutes

2. whether the good is a necessity or a luxury

3. the share of income spent on the good

4. the time elapsed since price change

Responding to Your Tuition Bill

- For years tuition has been rising faster than the overall cost of living, but does rising tuition keep people from going to college?

- A 1988 study found that a 3% increase in tuition led to an approximately 2% fall in the number of students enrolled at four-year institutions, giving a price elasticity of demand of 0.67 (2%/3%) and 0.9 for two-year institutions.

- Enrollment decision for students at two-year colleges was significantly more responsive to price than for students at four-year colleges.
  - The result: students at two-year colleges are more likely to forgo getting a degree because of tuition costs than students at four year colleges.

- A 1999 study confirmed this pattern. A 2008 study estimated the price elasticity of demand for 4 year institutions to be as low as 0.11.

KEY TERMS

Price Elasticity of Demand

Midpoint Method

Perfectly inelastic

Perfectly elastic

Elastic

Inelastic

Unit-elastic

Total Revenue

Price Effect

Quantity Effect