



**Micro**

*McEachern*

**ECON**

*2010-2011*

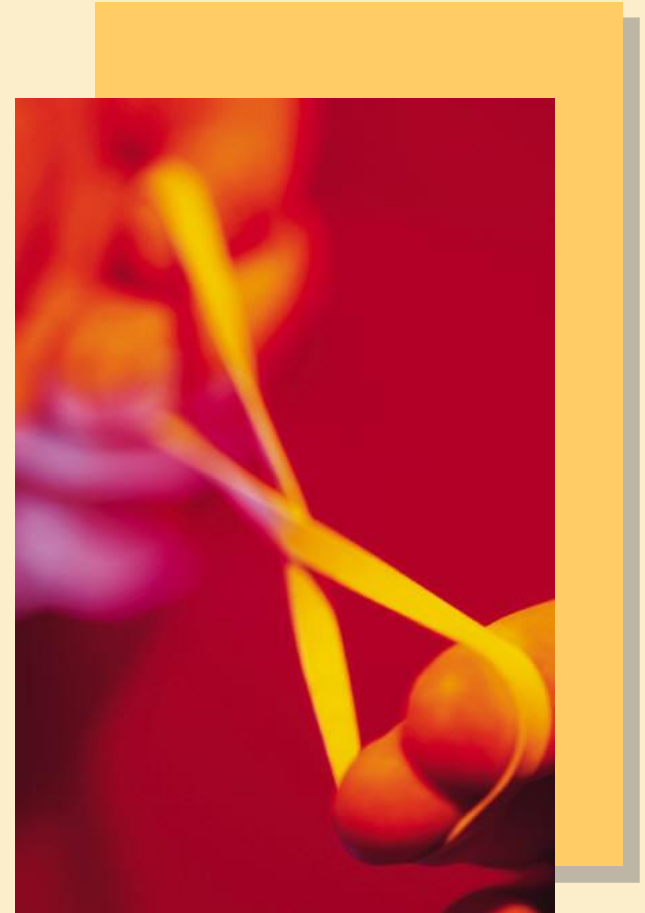
**CHAPTER** **5**

*Elasticity of  
Demand and Supply*

**Designed by  
Amy McGuire, B-books, Ltd.**

# Price Elasticity of Demand

- **Elasticity**
  - Responsiveness
- **Price elasticity of demand**
  - Consumers' responsiveness to a change in price
  - Percentage change in quantity demanded divided by percentage change in price



LO<sup>1</sup>

# Price Elasticity of Demand

$$E_D = \frac{\% \Delta q}{\% \Delta p}$$

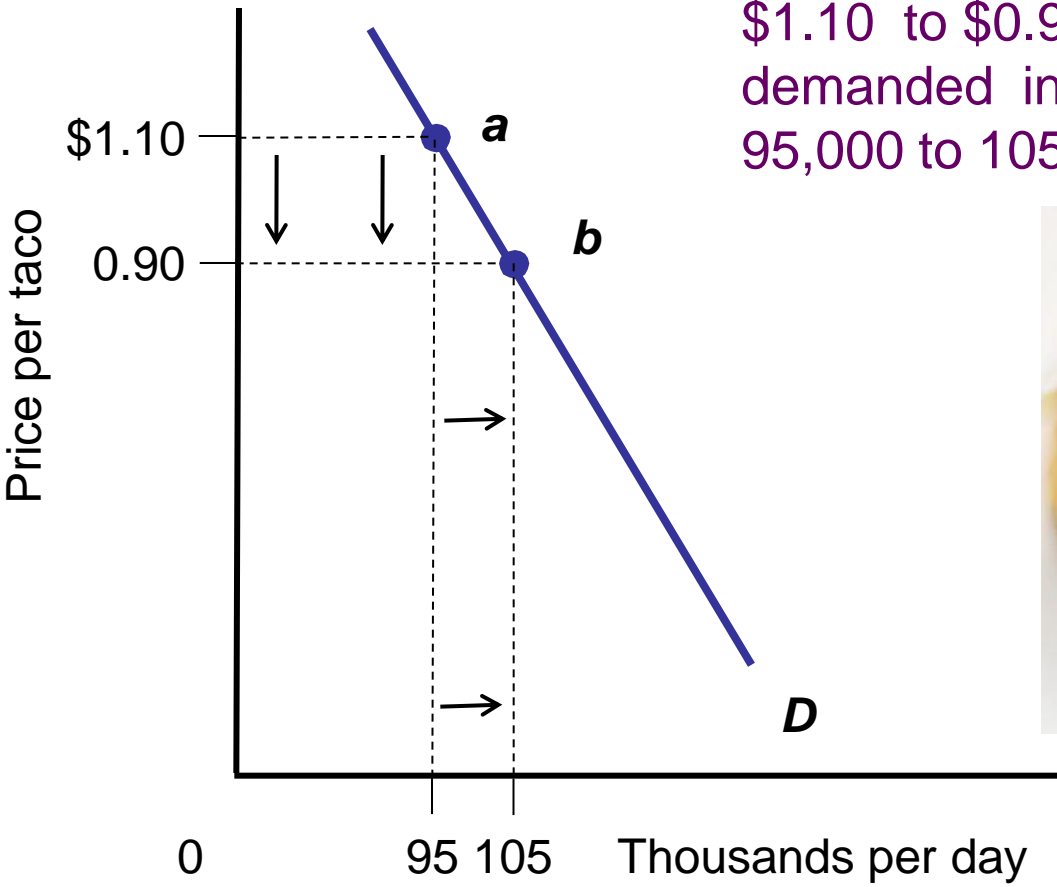
$$E_D = \frac{\Delta q}{(q + q')/2} \div \frac{\Delta p}{(p + p')/2}$$

- Law of demand
- $E_D$  negative
- Absolute value of  $E_D$  positive

LO<sup>1</sup>

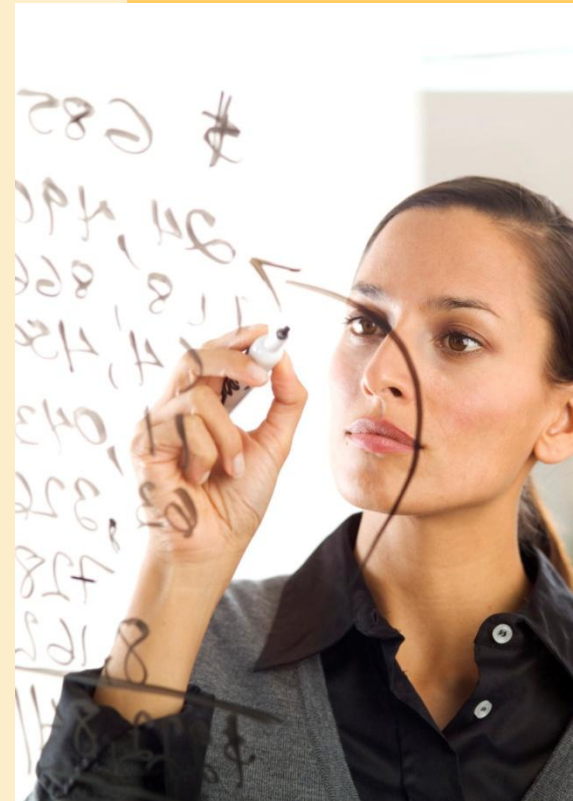
# Demand Curve for Tacos

If the price of tacos drops from \$1.10 to \$0.90, the quantity demanded increases from 95,000 to 105,000.



# Categories of $E_D$

- **If  $\% \Delta q < \% \Delta p$** 
  - $E_D$  between 0 and 1
  - Inelastic D
- **If  $\% \Delta q > \% \Delta p$** 
  - $E_D$  greater than 1
  - Elastic D
- **If  $\% \Delta q = \% \Delta p$** 
  - $E_D = 1$
  - Unit elastic D



# Elasticity and Total Revenue

- Total revenue = price \* quantity demanded at this price
- $TR = p * q$
- As  $p$  decreases
  - If  $D$  elastic, TR increases
  - If  $D$  inelastic, TR decreases
  - If  $D$  unit elastic, TR unchanged



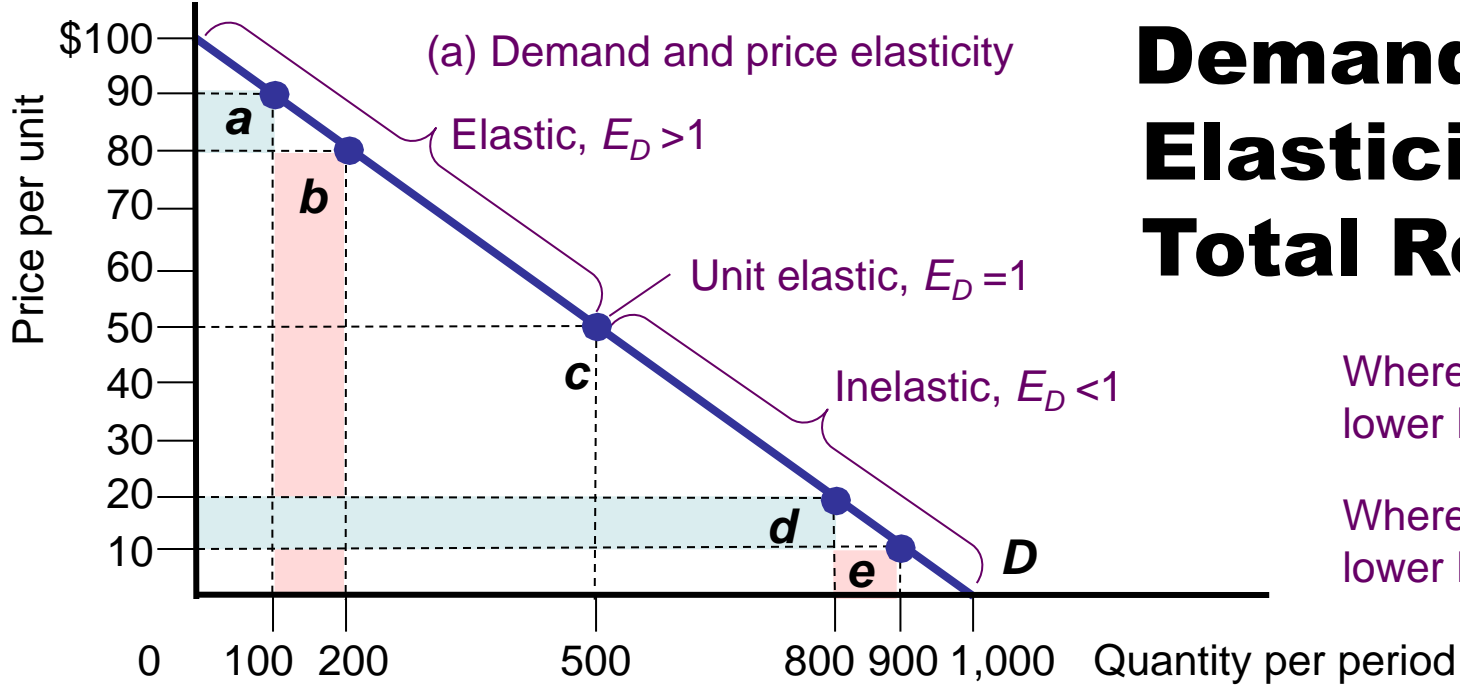
LO<sup>1</sup>

# Price Elasticity and the Linear D Curve

- **Linear D curve**
  - **Constant slope**
  - **Different elasticity**
  - **D becomes less elastic as we move downward**
- **D upper half: elastic**
- **D lower half: inelastic**
- **D midpoint: unit elastic**

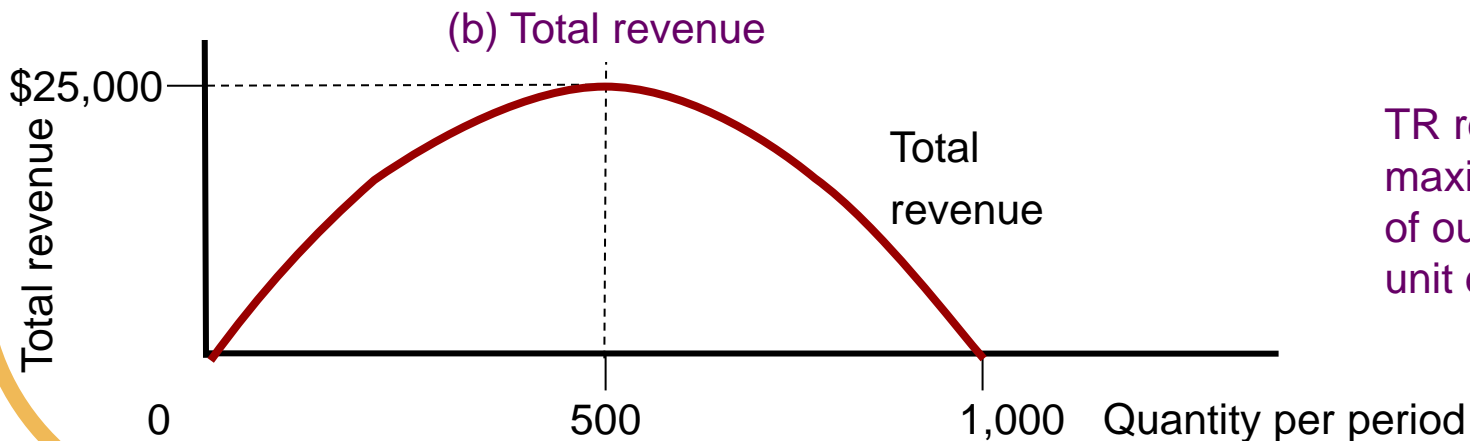
# Exhibit 2

## Demand, Price Elasticity, and Total Revenue



Where D is elastic, a lower P increases TR

Where D is inelastic, a lower P decreases TR



TR reaches a maximum at the rate of output where D is unit elastic



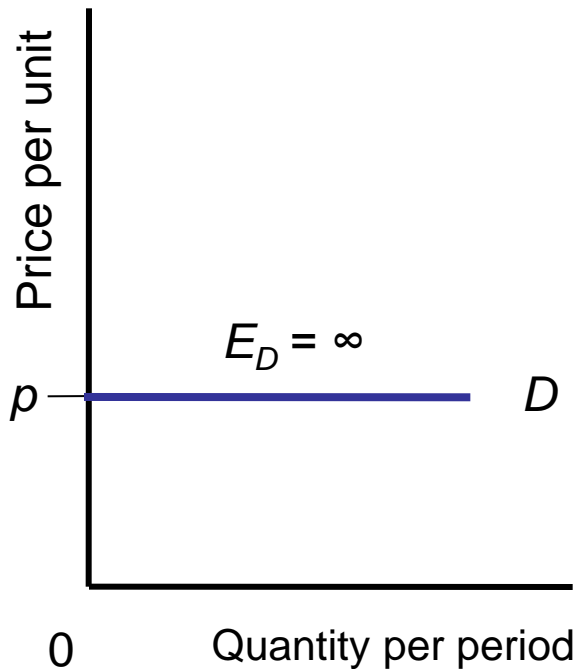
# Constant-Elasticity Demand Curves

- **Perfectly elastic D curve**
  - Horizontal;  $E_D = \infty$
  - Consumers don't tolerate P increases
- **Perfectly inelastic D curve**
  - Vertical;  $E_D = 0$
  - 'Price is no object'
- **Unit-elastic D curve**
  - $\% \Delta p$  causes an exact opposite  $\% \Delta q$

LO<sup>1</sup>

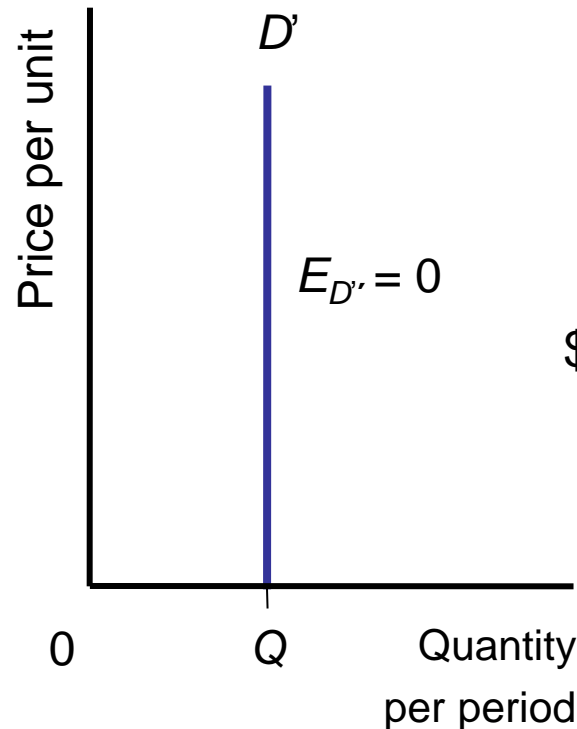
## Constant-Elasticity Demand Curves

(a) Perfectly elastic



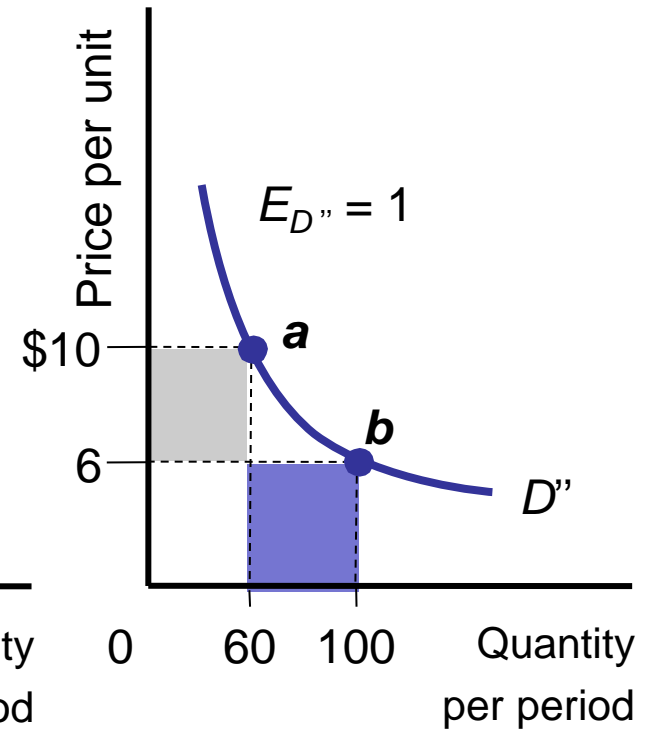
Consumers demand all quantity offered for sale at  $p$ , but demand nothing at a price above  $p$

(b) Perfectly inelastic



Consumers demand  $Q$  regardless of price

(c) Unit elastic



Total revenue is the same for each  $p$ - $q$  combination

# Summary of Price Elasticity of Demand Effects of a 10 Percent Increase in Price

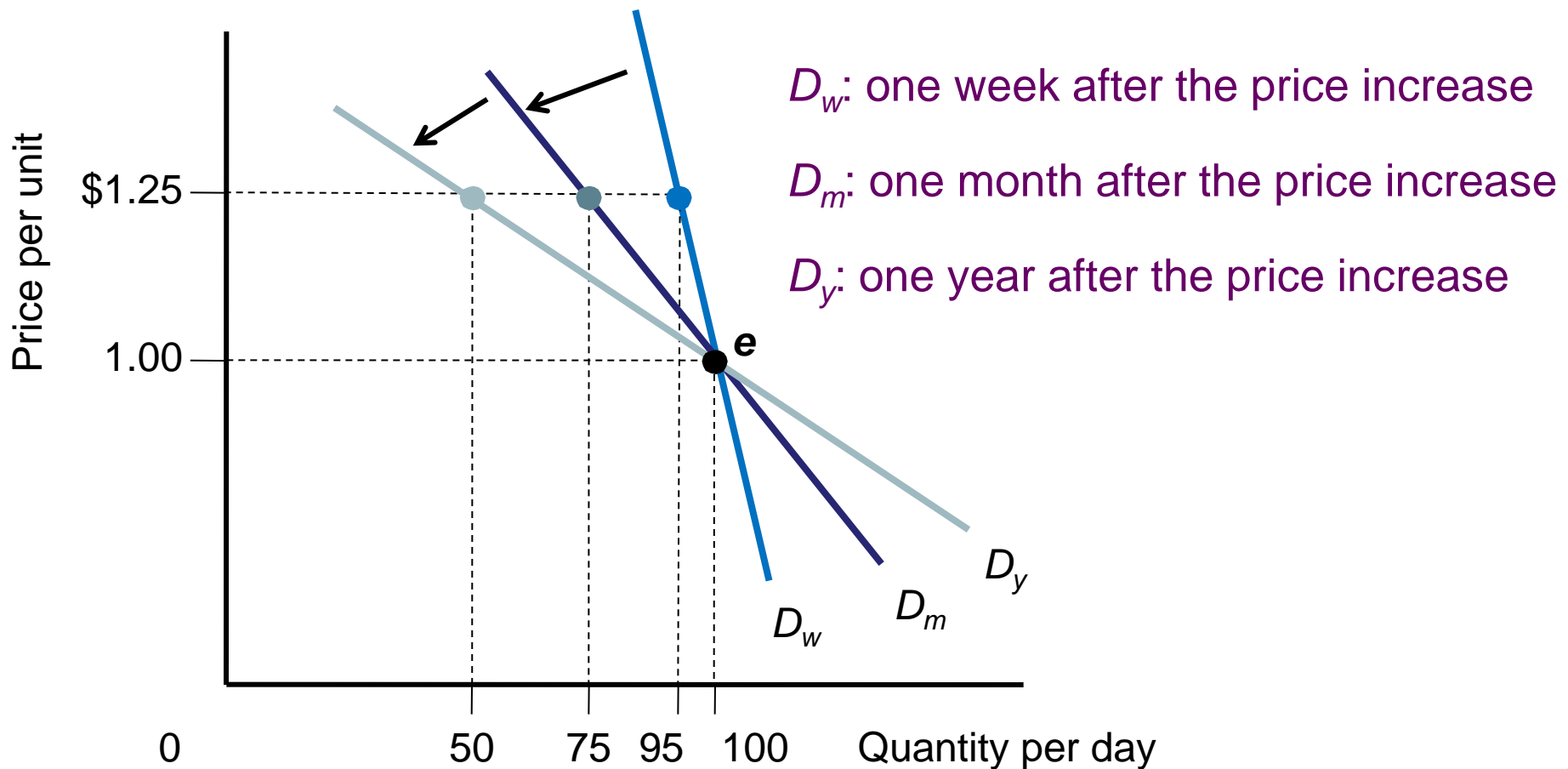
Absolute Value of Price Elasticity	Type of Demand	What Happens to Quantity Demanded	What Happens to Total Revenue
$E_D = 0$	Perfectly inelastic	No change	Increases by 10 percent
$0 < E_D < 1$	Inelastic	Drops by less than 10 percent	Increases by less than 10 percent
$E_D = 1$	Unit elastic	Drops by 10 percent	No change
$1 < E_D < \infty$	Elastic	Drops by more than 10 percent	Decreases
$E_D = \infty$	Perfectly elastic	Drops to 0	Drops to 0

# Determinants of Price Elasticity of D

- $E_D$  is greater:
  - The greater the availability of substitutes, and the more similar the substitutes
  - The more important the good as a share of the consumer's budget
  - The longer the period of adjustment (time)



# Demand Becomes More Elastic over Time



$D_y$  is more elastic than  $D_m$ , which is more elastic than  $D_w$

# Elasticity Estimates

- **Short run**
  - **Consumers have little time to adjust**
- **Long run**
  - **Consumers can fully adjust to a price change**
- **Demand is more elastic in the long run**



# Selected Price Elasticities of Demand (Absolute Values)

Product	Short Run	Long Run
Cigarettes (among adults)	—	0.4
Electricity (residential)	0.1	1.9
Air travel	0.1	2.4
Medical care and hospitalization	0.3	0.9
Gasoline	0.4	1.5
Milk	0.4	—
Fish (cod)	0.5	—
Wine	0.7	1.2
Movies	0.9	3.7
Natural gas (residential)	1.4	2.1
Automobiles	1.9	2.2
Chevrolets	—	4.0

# Deterring Young Smokers

- ◆ Health hazard
  - ◆ Kills 440,000 Americans a year
    - ◆ Lung cancer; Heart disease; Emphysema; Stroke
- ◆ Cost to society
  - ◆ \$7.18 per pack sold
    - ◆ Higher health cost
    - ◆ Lost worker productivity
  - ◆ Total: \$150 billion a year
    - ◆ \$3,400 per smoker per year





# Deterring Young Smokers

- ◆ Discouraging smoking
  - ◆ Prohibit the sale of cigarettes to minors
  - ◆ Higher cigarette tax
    - ◆  $E_D$  is higher for teens
      - ◆ Big share of budget
      - ◆ Less peer pressure
      - ◆ Not an addiction yet
    - ◆ Reduces teen smoking
  - ◆ Change consumer tastes



# Price Elasticity of Supply

- **Elasticity**
  - Responsiveness
- **Price elasticity of supply**
  - Producers' responsiveness to a change in price
  - Percentage change in quantity supplied divided by percentage change in price



# Price Elasticity of Supply

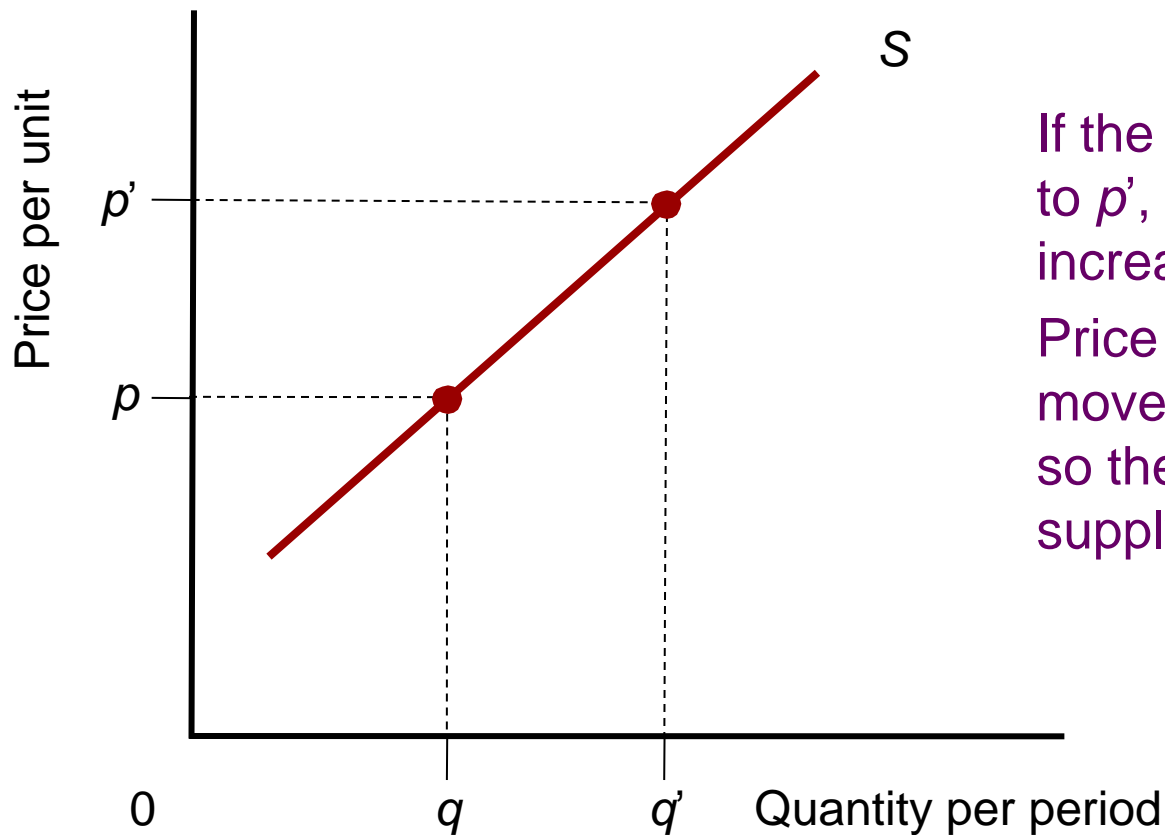
$$E_s = \frac{\% \Delta q}{\% \Delta p}$$

$$E_s = \frac{\Delta q}{(q + q')/2} \div \frac{\Delta p}{(p + p')/2}$$

- Law of supply
- $E_s$  positive



# Price Elasticity of Supply



If the price increases from  $p$  to  $p'$ , the quantity supplied increases from  $q$  to  $q'$ .

Price and quantity supplied move in the same direction, so the price elasticity of supply is a positive number.

# Categories of $E_s$

- If  $\% \Delta q < \% \Delta p$ 
  - $E_s$  between 0 and 1
  - Inelastic S
- If  $\% \Delta q > \% \Delta p$ 
  - $E_s$  greater than 1
  - Elastic S
- If  $\% \Delta q = \% \Delta p$ 
  - $E_s = 1$
  - Unit elastic S



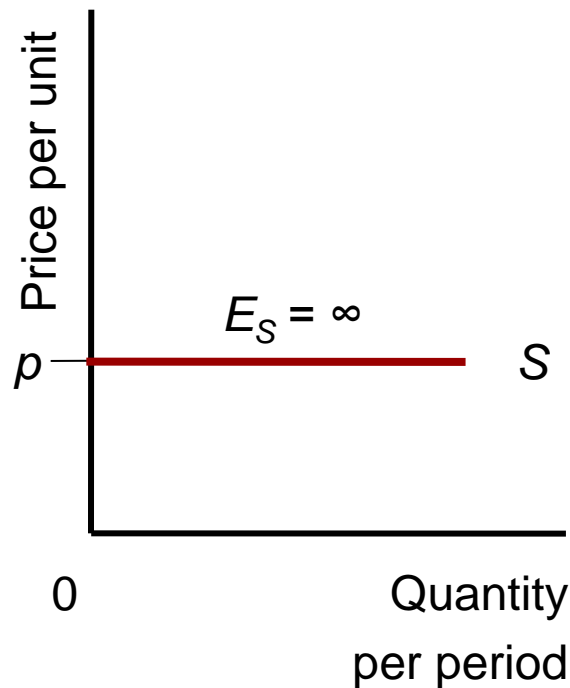
# Constant-Elasticity Supply Curves

- **Perfectly elastic S curve**
  - Horizontal;  $E_S = \infty$
  - Producers supply 0 at a price below P
- **Perfectly inelastic S curve**
  - Vertical;  $E_S = 0$
  - Goods in fixed supply
- **Unit-elastic S curve**
  - $\% \Delta p$  causes an exact opposite  $\% \Delta q$
  - S curve is a ray from the origin



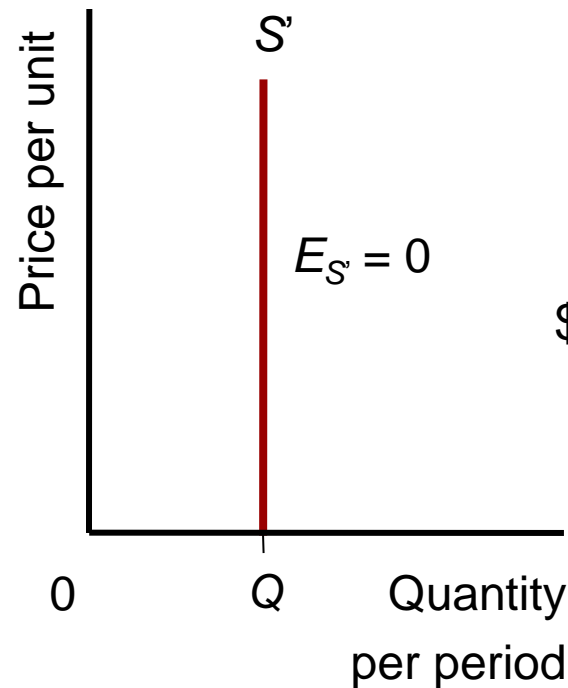
# Constant-Elasticity Supply Curves

(a) Perfectly elastic



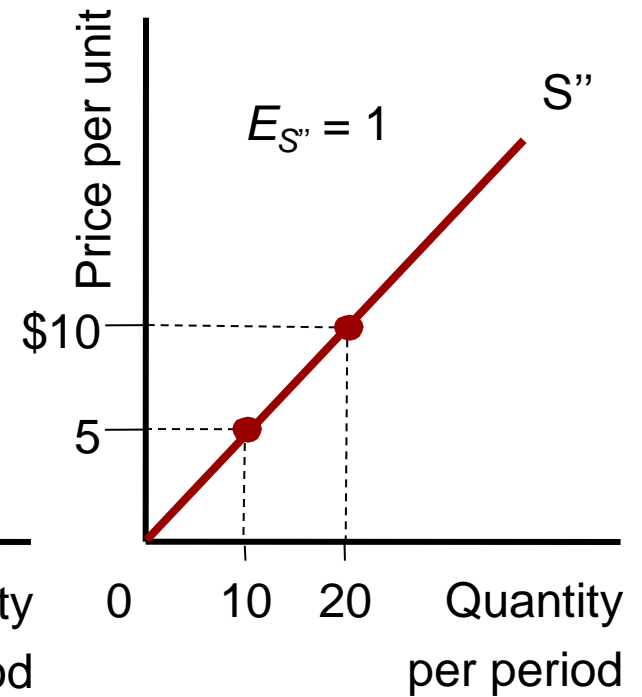
Firms supply any amount of output demanded at  $p$ , but supply 0 at prices below  $p$ .

(b) Perfectly inelastic



Quantity supplied is independent of the price

(c) Unit elastic



Any  $\% \Delta p$  results in the same  $\% \Delta q$  supplied.

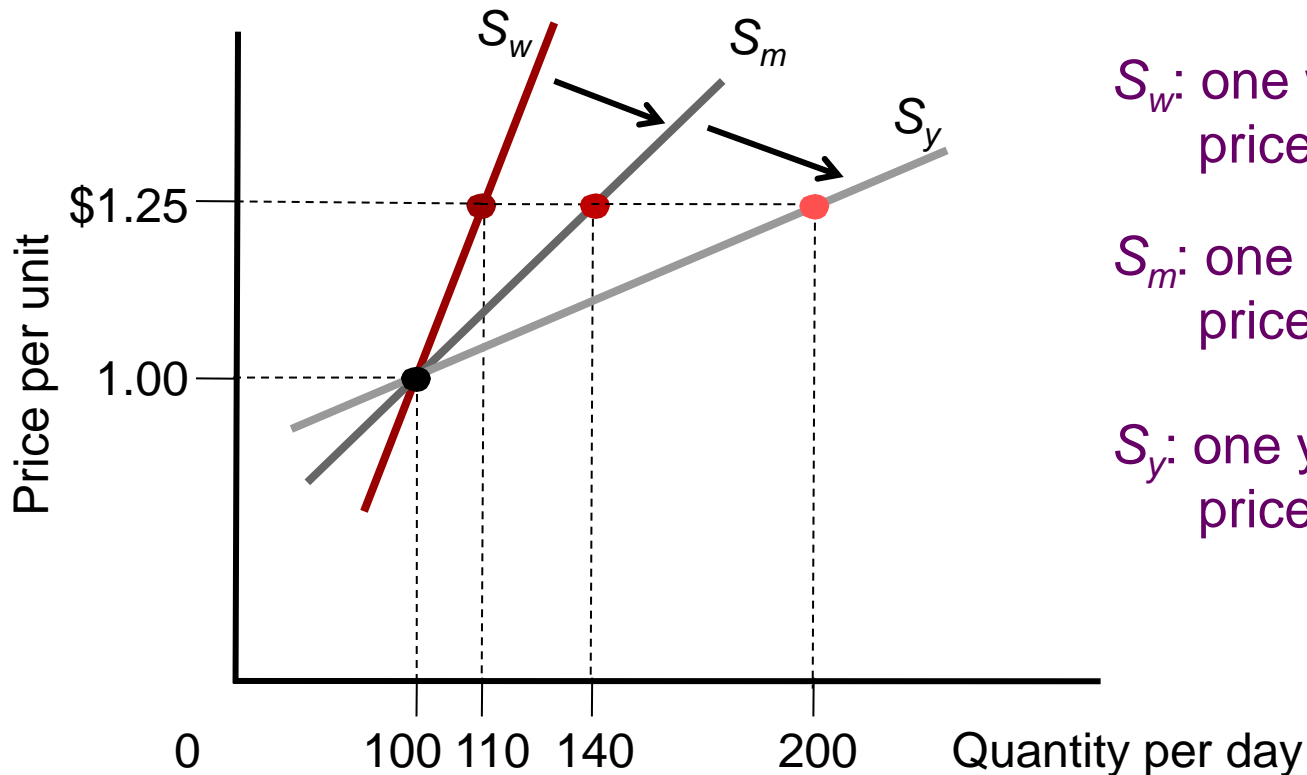
# Determinants of Supply Elasticity

- $E_s$  is greater:
  - If the marginal cost rises slowly as output expands
  - The longer the period of adjustment (time)





# Supply Becomes More Elastic over Time



$S_w$ : one week after the price increase

$S_m$ : one month after the price increase

$S_y$ : one year after the price increase

$S_w$  is less elastic than  $S_m$ , which is less elastic than  $S_y$

# Income Elasticity of Demand

- **Demand responsiveness to a change in consumer income**
- **Percentage change in demand divided by the percentage change in income that caused it**
- **Inferior goods**
  - **Negative income elasticity**
- **Normal goods**
  - **Positive income elasticity**



# Income Elasticity of Demand

- Normal goods
  - Income inelastic
    - Elasticity between 0 and 1
    - Necessities
  - Income elastic
    - Elasticity  $> 1$
    - Luxuries



# Selected Income Elasticities of Demand

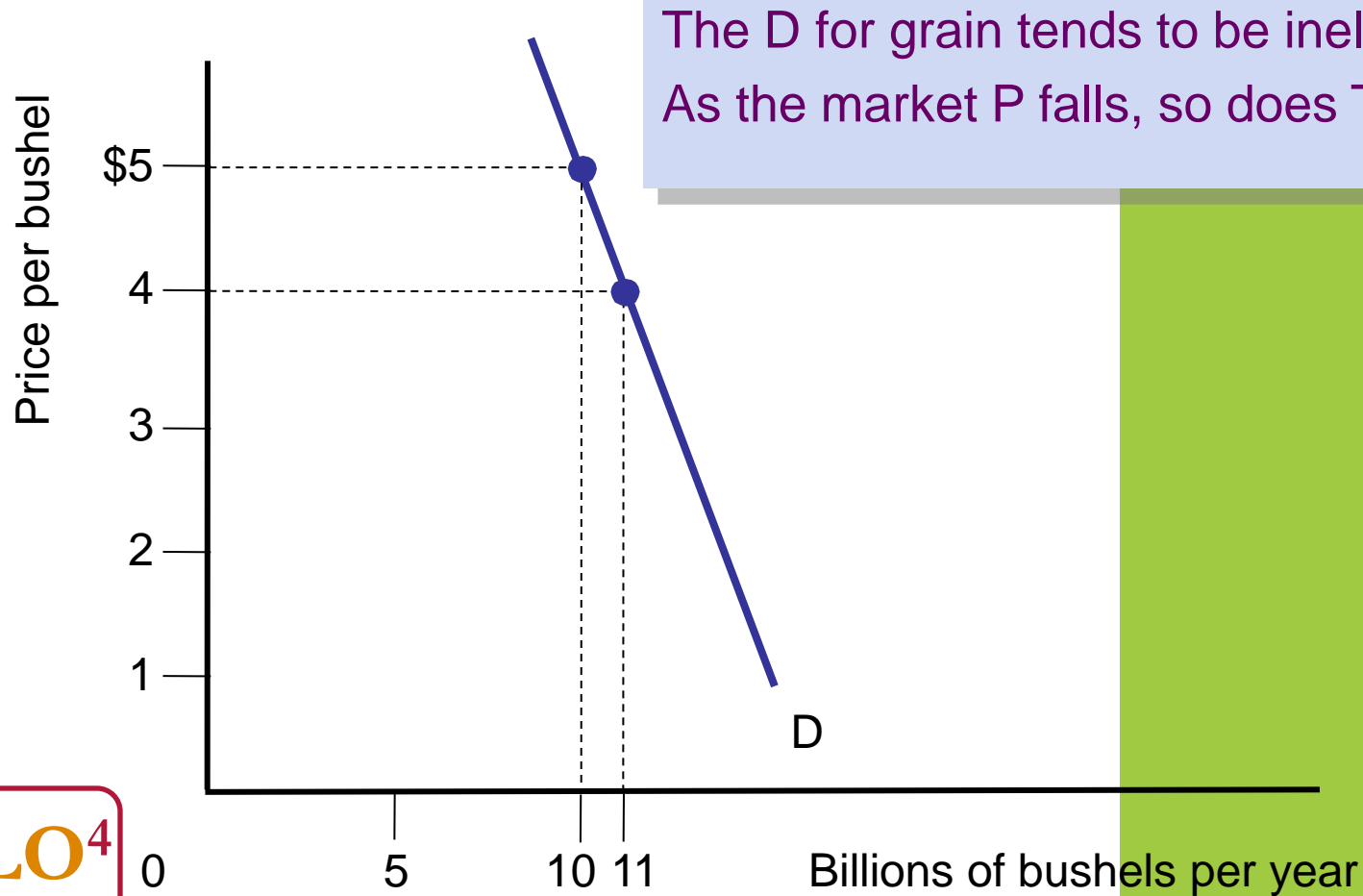
Product	Income Elasticity	Product	Income Elasticity
Wine	5.03	Physicians' services	0.75
Private education	2.46	Coca-Cola	0.68
Automobiles	2.45	Beef	0.62
Owner-occupied housing	1.49	Food	0.51
Furniture	1.48	Coffee	0.51
Dental service	1.42	Cigarettes	0.50
Restaurant meals	1.40	Gasoline and oil	0.48
Spirits ('hard' liquor)	1.21	Rental housing	0.43
Shoes	1.10	Pork	0.18
Chicken	1.06	Beer	-0.09
Clothing	0.92	Flour	-0.36

# The Market for Food and 'The Farm Problem'

- ◆ 1950: 10 million family farms
- ◆ Today: less than 3 million
- ◆ Demand
  - ◆ Price inelastic
    - ◆ Total revenue falls when P falls
  - ◆ Income inelastic
    - ◆ D increases
- ◆ Technological improvements
  - ◆ S increases



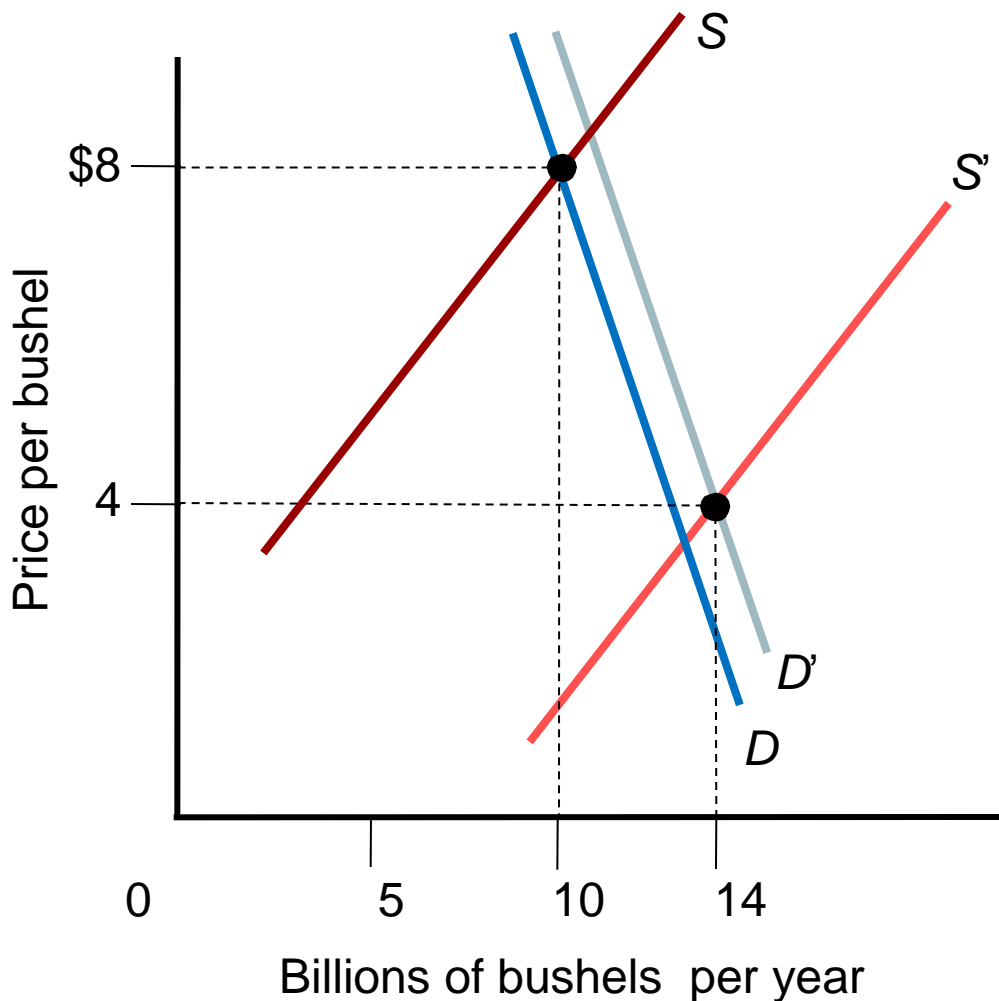
# The Demand for Grain



LO<sup>4</sup>

# The Effect on Increases in Demand and Supply on Farm Revenue

Exhibit 11



Technological advance  
- sharp increase in  $S$   
Increase in consumer income  
- small increase in  $D$   
Drop in  $P$   
Drop in total revenue

# Cross-Price Elasticity of Demand

- **Responsiveness of D for one good to changes in P of another good**
- **$\% \Delta$  in demand for one good divided by  $\% \Delta$  in price of another good**
  - **If positive: substitutes**
  - **If negative: complements**
  - **If zero: unrelated**





# Price Elasticity and Tax Incidence

- **Tax**
  - Decrease in  $S$  by the amount of tax
- **Tax incidence**
  - Consumers: high  $P$
  - Producers: net-of-tax receipt

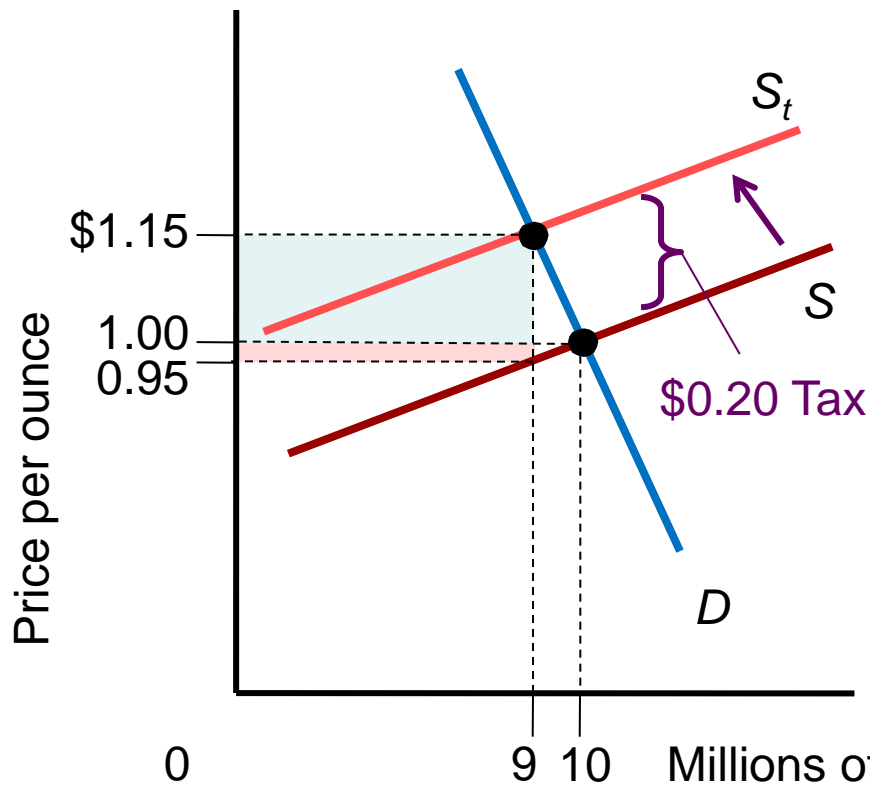
# Price Elasticity and Tax Incidence

- The more price elastic the  $D$ :
  - The more tax producers pay
  - The less tax consumers pay
- The more elastic the  $S$ :
  - The less tax producers pay
  - The more tax consumers pay

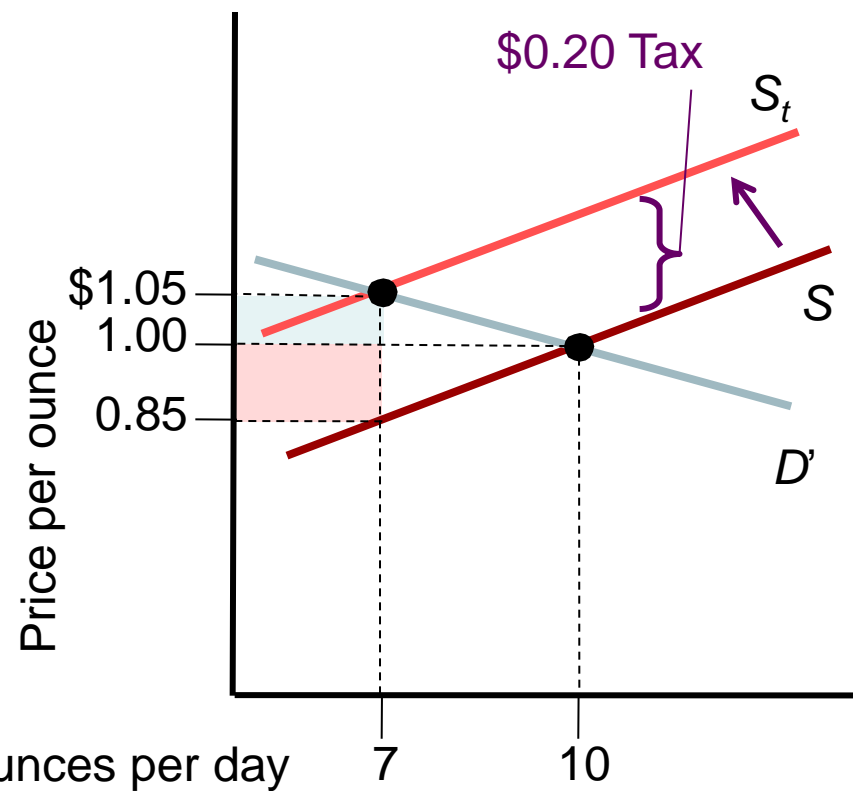
# Exhibit A

## Effects of Price Elasticity of $D$ on Tax Incidence

(a) *Less elastic demand*



(b) *More elastic demand*

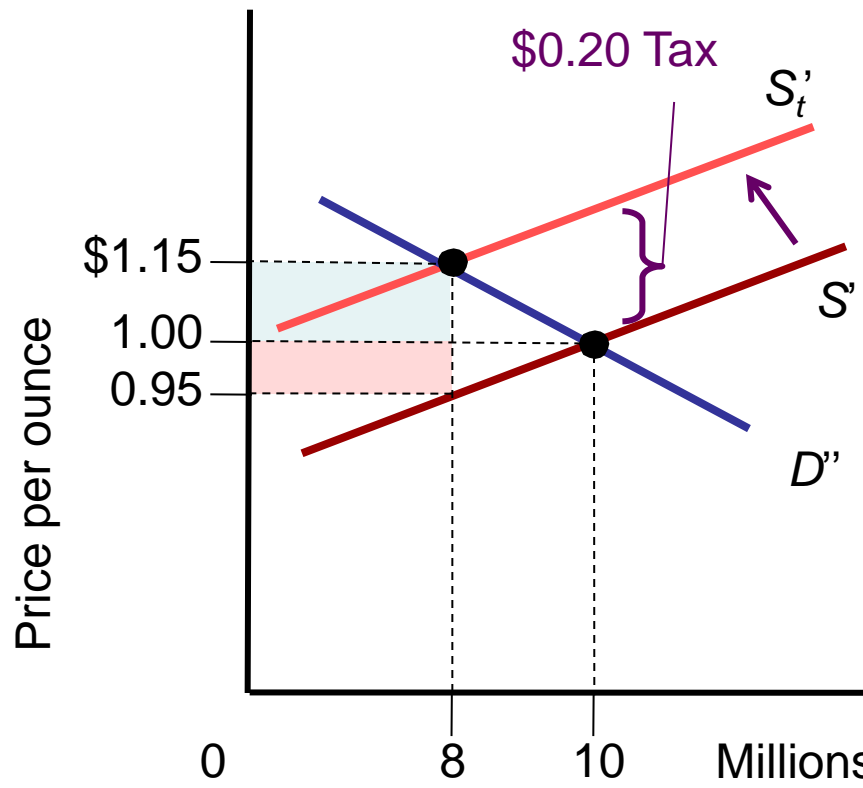


The more elastic the  $D$  curve, the more tax is paid by producers (lower net-of-tax receipt)

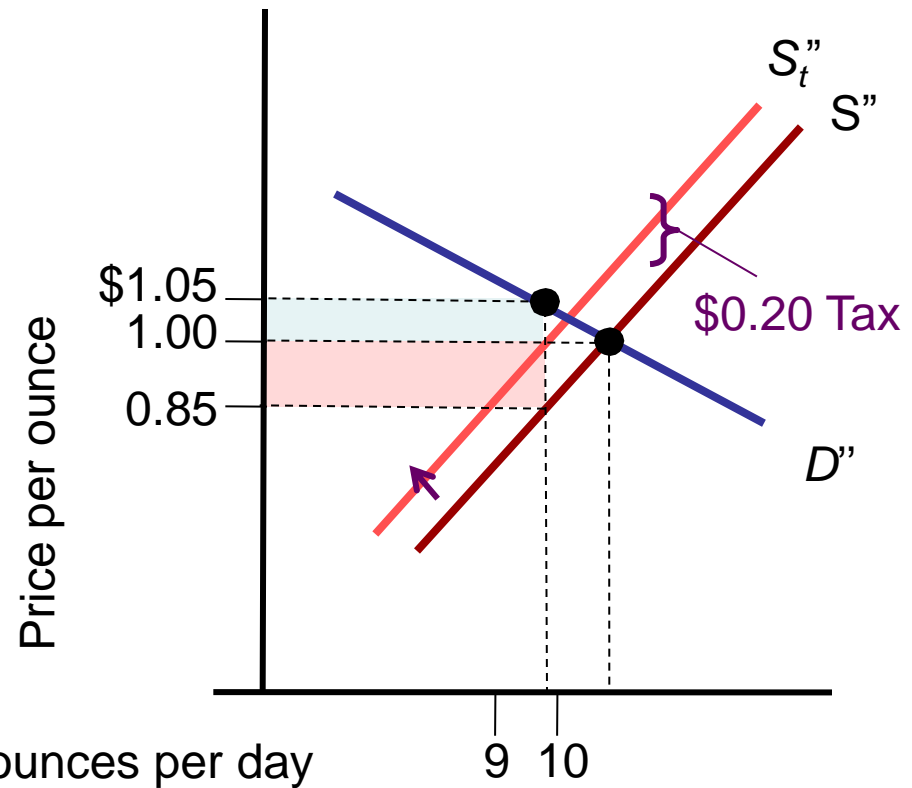
# Exhibit B

## Effects of Price Elasticity of Supply on Tax Incidence

(a) More elastic supply



(b) Less elastic supply



The more elastic the  $S$  curve, the more tax is paid by consumers as a higher price.