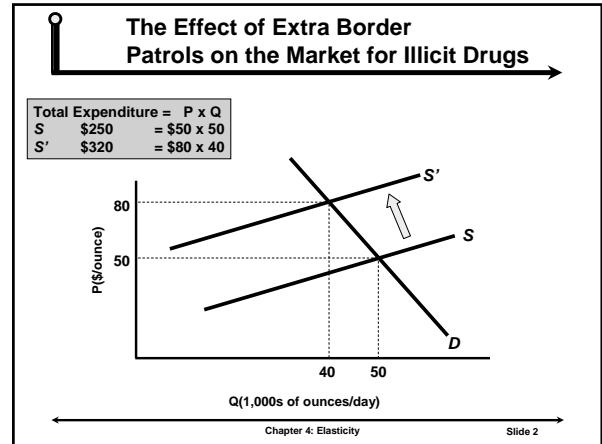


Elasticity

CHAPTER 4



Price Elasticity of Demand

- Elasticity
 - A measure of the extent to which quantity demanded and quantity supplied respond to variations in price, income, and other factors.

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Price Elasticity of Demand

- Defined
 - Generally
 - ◆ A measure of the responsiveness of the quantity demanded of a good to a change in the price of that good.
 - Formally
 - ◆ The percentage change in the quantity demanded that results from a 1 percent change in its price.

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Price Elasticity of Demand

- Measuring Price Elasticity of Demand

$$\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$
- Observations
 - Price elasticity of demand will always be negative (inverse relationship between price and quantity).
 - For convenience we drop the negative sign.

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Price Elasticity of Demand

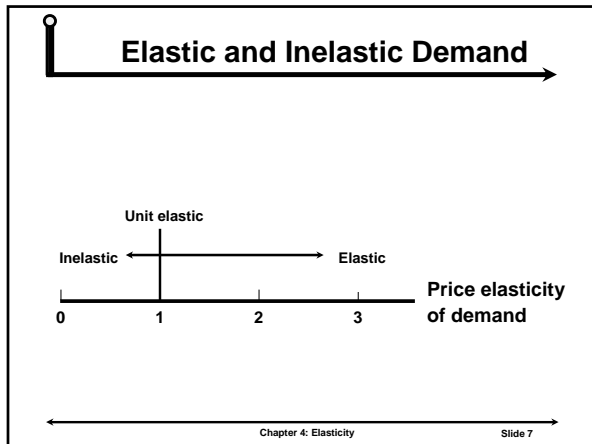
- Measuring Price Elasticity of Demand

$$\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

When $\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$ is

 - > 1: elastic
 - < 1: inelastic
 - = 1: unit elastic

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Price Elasticity of Demand

- What is the elasticity of demand for pizza?
 - Originally
 - ◆ Price = \$1/slice
 - ◆ Quantity demanded = 400 slices/day
 - New
 - ◆ Price = \$0.97/slice
 - ◆ Quantity demanded = 404 slices/day, then

$$\frac{\% \text{ Change in Quantity}}{\% \text{ Change in Price}} = \frac{1}{3} : \text{Inelastic}$$

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Price Elasticity of Demand

- What is the elasticity of season ski passes?
 - Originally
 - ◆ Price = \$400
 - ◆ Quantity demanded = 10,000 passes/year
 - New
 - ◆ Price = \$380
 - ◆ Quantity demanded = 12,000 passes/year, then

$$\frac{\% \text{ Change in Quantity}}{\% \text{ Change in Price}} = \frac{20}{5} : \text{Elastic}$$

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Price Elasticity of Demand

- Determinants of Price Elasticity of Demand
 - Substitution Possibilities
 - Budget Share
 - Time

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Price Elasticity Estimates for Selected Products

Good or service	Price elasticity
Green peas	2.80
Restaurant meals	1.63
Automobiles	1.35
Electricity	1.20
Beer	1.19
Movies	0.87
Air travel (foreign)	0.77
Shoes	0.70
Coffee	0.25
Theater, opera	0.18

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Price Elasticity of Demand

- Why is the price elasticity of demand more than 14 times larger for green peas than for theater and opera performances?

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A Graphical Interpretation of Price Elasticity

- For small changes in price

$$\text{Price elasticity} = \epsilon = \frac{\Delta Q/Q}{\Delta P/P}$$

Where Q is the original quantity and P is the original price

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A Graphical Interpretation of Price Elasticity

- Example
 - Originally
 - Price (P) = \$100
 - Quantity (Q) = 20
 - New
 - Price (P) = \$105
 - Quantity (Q) = 15

$$\epsilon = \frac{5/20}{5/100} = \frac{25}{5} = 5 : \text{Elastic}$$

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A Graphical Interpretation of Price Elasticity of Demand

$$\text{Price elasticity at A} = \left(\frac{P}{Q} \right) \left(\frac{1}{\text{slope}} \right)$$

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Calculating Price Elasticity of Demand

$$\text{slope} = \frac{\text{vertical intercept}}{\text{horizontal intercept}} = \frac{20}{5} = 4$$

$$\epsilon_A = \frac{8}{3} \times \frac{1}{4} = \frac{8}{12} = \frac{2}{3}$$

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Calculating Price Elasticity of Demand

Question
What is the price elasticity of demand when $P = \$4$?

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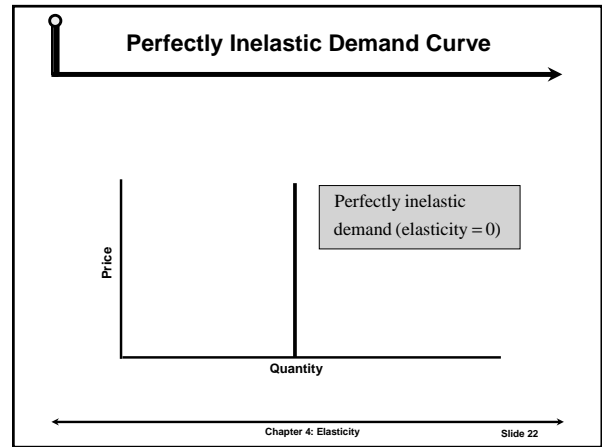
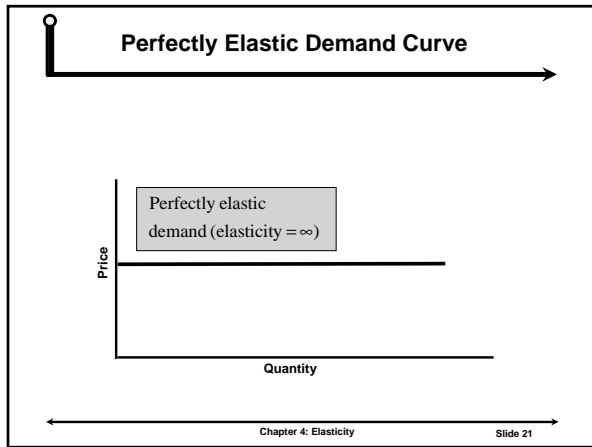
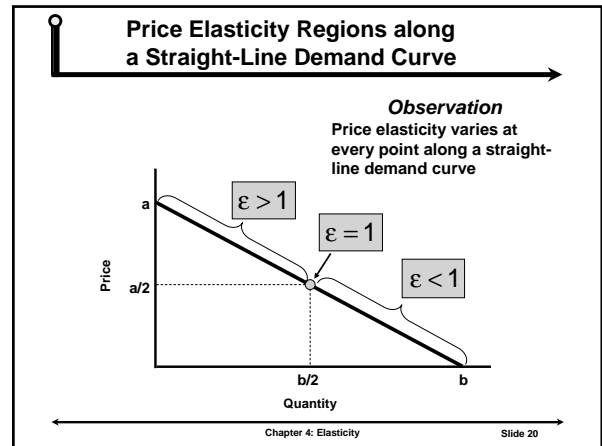
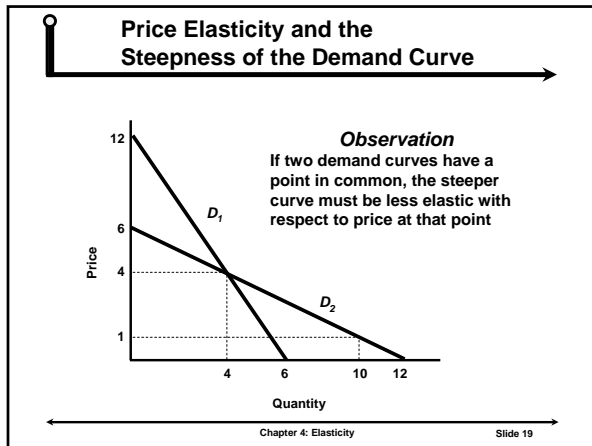
Price Elasticity and the Steepness of the Demand Curve

What is the price elasticity of demand when $P = \$4$?

$$\epsilon_{D_1} = \left(\frac{4}{4} \right) \left(\frac{1}{12/6} \right) = \frac{1}{2}$$

$$\epsilon_{D_2} = \left(\frac{4}{4} \right) \left(\frac{1}{6/12} \right) = 2$$

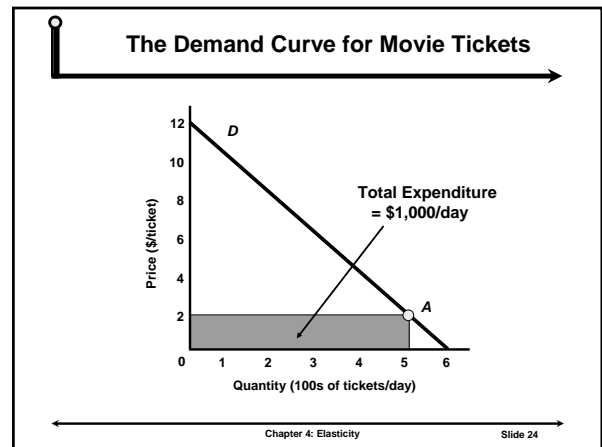
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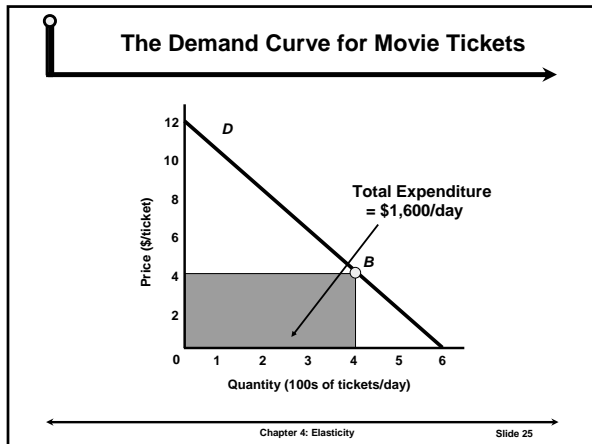


Elasticity and Total Expenditure

- Total Expenditure = $P \times Q$
 - Market demand measures the quantity (Q) at each price (P)
- Total Expenditure = Total Revenue

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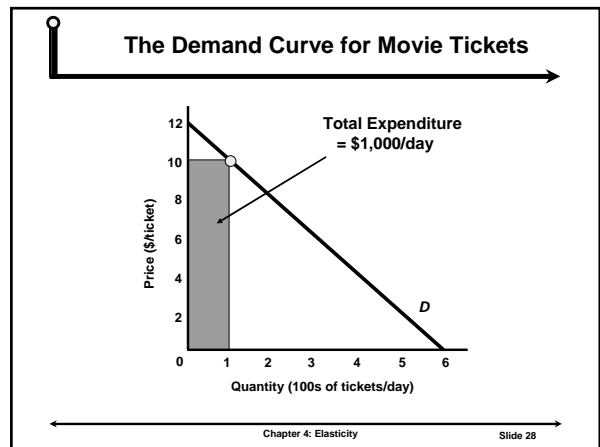
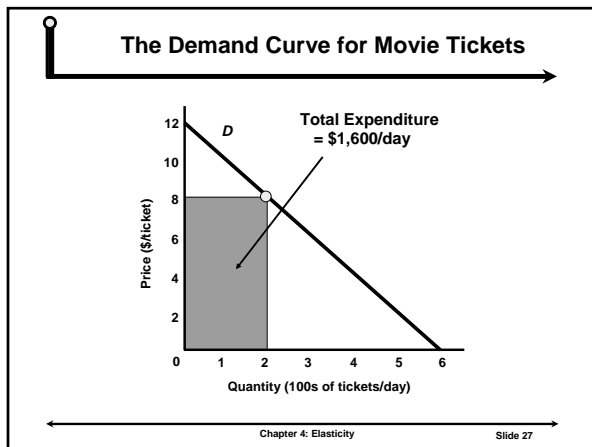




Elasticity and Total Expenditure

- Will increasing the market price always increase total revenue?

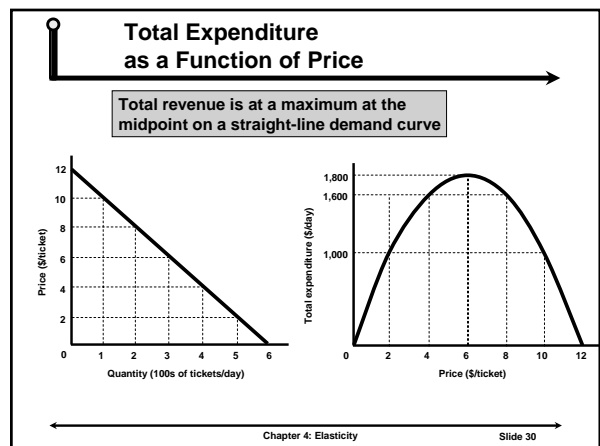
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Total Expenditure as a Function of Price

Price (\$/ticket)	Total expenditure (\$/day)
12	0
10	1,000
8	1,600
6	1,800
4	1,600
2	1,000
0	0

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Elasticity and Total Expenditure

- A price increase will increase total revenue when the % change in P is greater than the % change in Q .

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Elasticity and Total Expenditure

- Should a rock band raise or lower its price to increase total revenue?

$P = \$20$
 $Q = 5,000$
 $\epsilon = 3$

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Elasticity and Total Expenditure

- Should a rock band raise or lower its price to increase total revenue?
 - Total revenue = $\$20 \times 5,000 = \$100,000/\text{week}$
 - If P is increased 10%, Q will decrease 30%
 - ◆ Total revenue = $\$22 \times 3,500 = \$77,000/\text{week}$
 - If P is lowered 10%, Q will increase 30%
 - ◆ Total revenue = $\$18 \times 6,500 = \$117,000/\text{week}$

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Elasticity and Total Expenditure

- When price elasticity is greater than 1, changes in price and changes in total expenditures always move in opposite directions.
- When price elasticity is less than 1, changes in price and changes in total expenditures always move in the same direction.

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Elasticity and Total Expenditure

- Cross-Price Elasticity of Demand
 - The percentage by which quantity demanded of the first good changes in response to a 1 percent change in the price of the second good.

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Elasticity and Total Expenditure

- Cross-Price Elasticity of Demand
 - Substitute Goods
 - ◆ When the cross-price elasticity of demand is positive.
 - Complement Goods
 - ◆ When the cross-price elasticity of demand is negative.

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Elasticity and Total Expenditure

- Income Elasticity of Demand
 - The percentage by which quantity demanded changes in response to a 1 percent change in income.

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Elasticity and Total Expenditure

- Income Elasticity of Demand
 - Normal Goods
 - Income elasticity is positive
 - Inferior Goods
 - Income elasticity is negative

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The Price Elasticity of Supply

- Price Elasticity of Supply
 - The percentage change in the quantity supplied that occurs in response to a 1 percent change in price.

$$\text{Price elasticity of supply} = \frac{\Delta Q/Q}{\Delta P/P}$$

$$\text{Price elasticity of supply} = \left(\frac{P}{Q}\right) \left(\frac{1}{\text{slope}}\right)$$

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Calculating the Price Elasticity of Supply Graphically

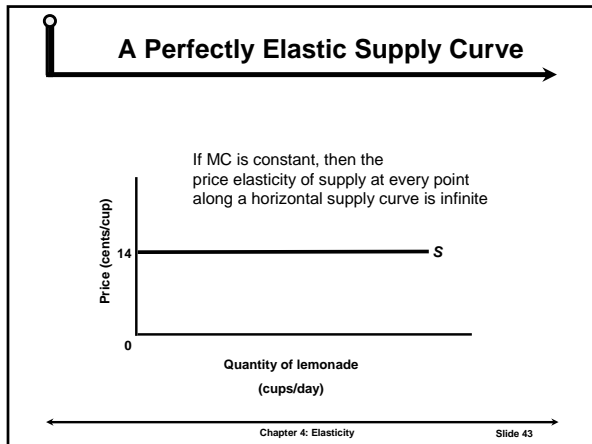
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A Supply Curve for Which Price Elasticity Declines as Quantity Rises

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A Perfectly Inelastic Supply Curve

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- ### The Price Elasticity of Supply
- Determinants of Supply Elasticity
 - Flexibility of inputs
 - Mobility of inputs
 - Ability to produce substitute inputs
 - Time
- Chapter 4: Elasticity Slide 44

- ### The Price Elasticity of Supply
- Economic Naturalist
- Why are gasoline prices so much more volatile than car prices?
 - ◆ Demand for gasoline is more inelastic
 - ◆ Gasoline market has larger and more frequent supply shifts
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