



Elasticity and Its Applications

Topic 4: Sensitivity of Markets



Elasticity . . .

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



Common Elasticity Measures

- Demand Elasticity
- Supply Elasticity
- Income Elasticity
- Cross-elasticity



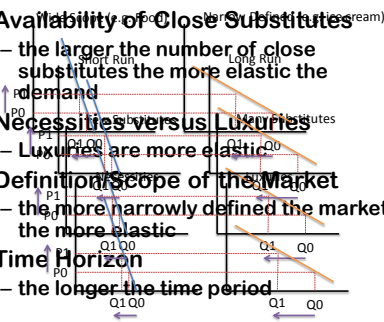
THE ELASTICITY OF DEMAND

- *Price elasticity of demand* is a measure of how much the quantity demanded of a good responds to a change in the price of that good.
- Price elasticity of demand is the percentage change in quantity demanded given a percent change in the price.
- Although it is always negative it is stated in absolute terms.



The Price Elasticity of Demand and Its Determinants

- **Availability of Close Substitutes**
 - the larger the number of close substitutes the more elastic the demand
- **Necessities versus Luxuries**
 - Luxuries are more elastic
- **Definition Scope of the Market**
 - the more narrowly defined the market the more elastic
- **Time Horizon**
 - the longer the time period



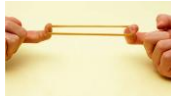
The Price Elasticity of Demand and Its Determinants

- Demand tends to be more elastic :
 - the larger the number of close substitutes.
 - if the good is a luxury.
 - the more narrowly defined the market.
 - the longer the time period.

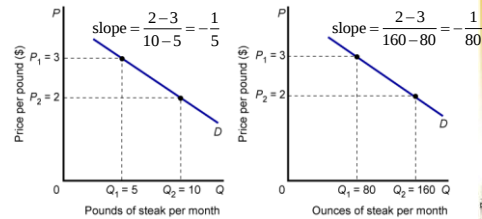


Slope Versus the Elasticity

- The value of the slope of the demand curve and the value of elasticity are not the same.
- Unlike the value of the slope, the value of elasticity is a useful measure of responsiveness.



Slope Versus Elasticity



- Changing the units of measure yields a very different value of the slope, yet the behavior of buyers in both diagrams is identical.



Calculating Elasticities

- Calculating percentage changes:

$$\% \text{ change in price} = \frac{P_2 - P_1}{P_1} \times 100\%$$

$$\% \text{ change in quantity demanded} = \frac{Q_2 - Q_1}{Q_1} \times 100\%$$

- Calculating **ELASTICITY**:

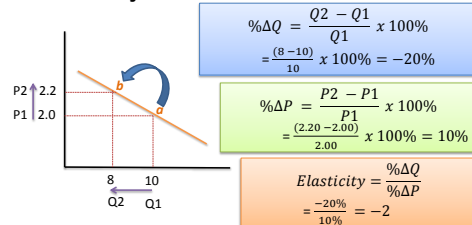
$$\text{Elasticity} = \frac{\% \text{ Change in Quantity}}{\% \text{ Change in Price}}$$



Computing the Price Elasticity of Demand

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

- 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:



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

- The midpoint formula is preferable when calculating the price elasticity of demand because it gives the same answer regardless of the direction of the change.

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



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:

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

$$\text{Price Elasticity of Demand} = \frac{(10-8) / (10+8) / 2}{(2.20-2.00) / (2.00+2.20) / 2} = \frac{22\%}{9.5\%} = 2.32$$



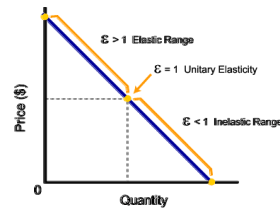
Interpreting Elasticities

Here is how to interpret two different values of elasticity:

- When $\varepsilon = 0.2$, a 10% increase in price leads to a 2% decrease in quantity demanded.
- When $\varepsilon = 2.0$, a 10% increase in price leads to a 20% decrease in quantity demanded.

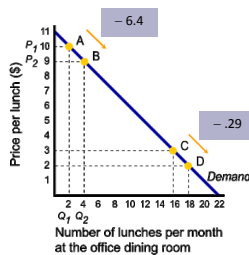


Elasticity Changes along a Straight-Line Demand Curve



- Price elasticity of demand decreases as we move downward along a straight line demand curve.
- Demand is elastic in the upper range and inelastic in the lower range of the line.

Elasticity Changes along a Straight-Line Demand Curve



- Along the elastic range, elasticity values are greater than one.
- Along the inelastic range, elasticity values are less than one.



Types of Elasticity

Hypothetical Demand Elasticities for Four Products

PRODUCT	% CHANGE IN PRICE (%ΔP)	% CHANGE IN QUANTITY DEMANDED (%ΔQ _D)	ELASTICITY (%ΔQ _D ÷ %ΔP)	
Insulin	+10%	0%	0.0	Perfectly inelastic
Basic telephone service	+10%	-1%	-0.1	Inelastic
Beef	+10%	-10%	-1.0	Unitarity elastic
Bananas	+10%	-30%	-3.0	Elastic

Perfectly Elastic and Inelastic Demand Curves

- When demand does not respond at all to a change in price, demand is **perfectly inelastic**.
- Quantity demanded changes infinitely with any change in price.

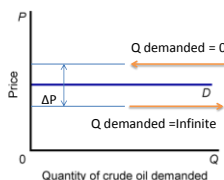
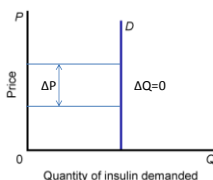
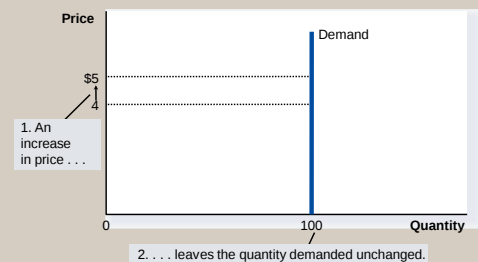


Figure 1 The Price Elasticity of Demand

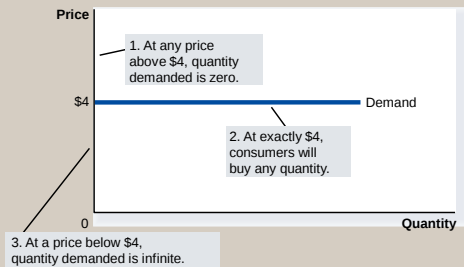
(a) Perfectly Inelastic Demand: Elasticity Equals 0



Copyright © 2003 Southwestern Publishing Group

Figure 1 The Price Elasticity of Demand

(e) Perfectly Elastic Demand: Elasticity Equals Infinity



The Variety 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.
- **Unit Elastic**
 - Quantity demanded changes by the same percentage as the price.

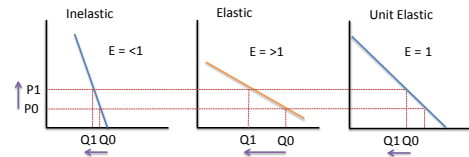


Figure 1 The Price Elasticity of Demand

(b) Inelastic Demand: Elasticity Is Less Than 1

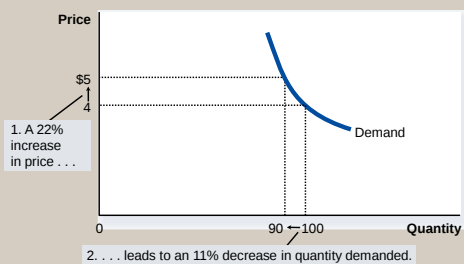


Figure 1 The Price Elasticity of Demand

(c) Unit Elastic Demand: Elasticity Equals 1

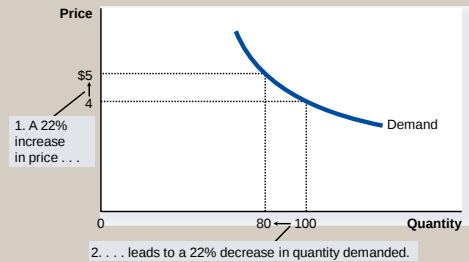
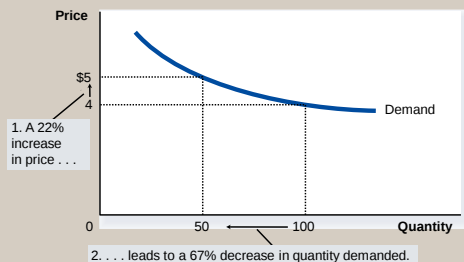


Figure 1 The Price Elasticity of Demand

(d) Elastic Demand: Elasticity Is Greater Than 1

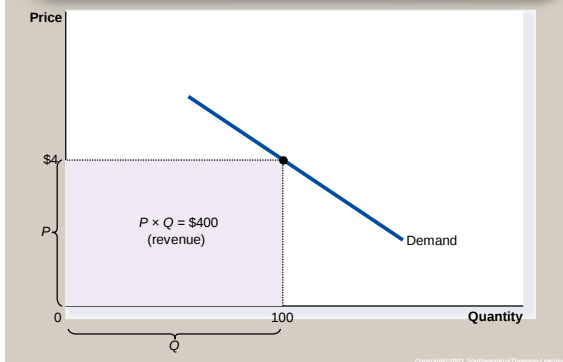


Total Revenue and the Price Elasticity of Demand

- **Total revenue** is the amount paid by buyers and received by sellers of a good.
- Computed as the price of the good times the quantity sold.

$$TR = P \times Q$$

Figure 2 Total Revenue

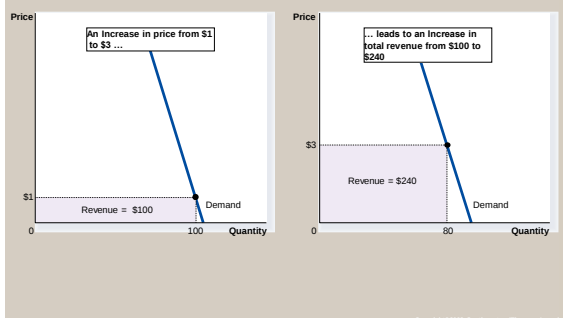


Elasticity and Total Revenue along a Linear Demand Curve

- With an inelastic demand curve, an increase in price leads to a decrease in quantity that is proportionately smaller. Thus, *total revenue increases*.



Figure 3 How Total Revenue Changes When Price Changes: Inelastic Demand



Elasticity and Total Revenue along a Linear Demand Curve

- With an elastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately larger. Thus, *total revenue decreases*.

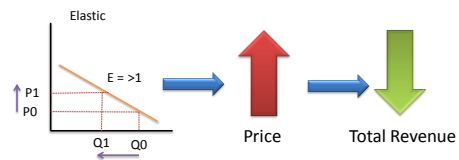
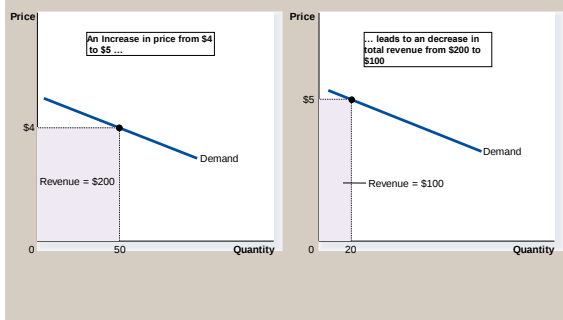


Figure 4 How Total Revenue Changes When Price Changes: Elastic Demand



Income Elasticity of Demand

- *Income elasticity of demand* measures how much the quantity demanded of a good responds to a change in consumers' income.
- It is computed as the percentage change in the quantity demanded divided by the percentage change in income.

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

Income Elasticity and Type of Good

- **Types of Goods**
 - Normal Goods
 - Inferior Goods
- Higher income raises the quantity demanded for normal goods but lowers the quantity demanded for inferior goods.



Income Elasticity

- Goods consumers regard as necessities tend to be income inelastic
 - Examples include food, fuel, clothing, utilities, and medical services.
- Goods consumers regard as luxuries tend to be income elastic.
 - Examples include sports cars, furs, and expensive foods.

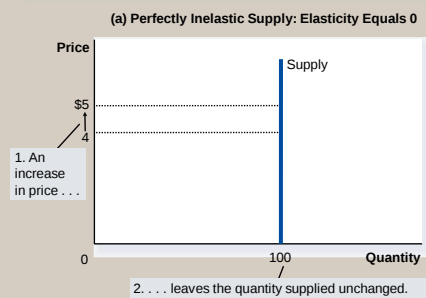


THE ELASTICITY OF SUPPLY

- **Price elasticity of supply** is a measure of how much the quantity supplied of a good responds to a change in the price of that good.
- Price elasticity of supply is the percentage change in quantity supplied resulting from a percent change in price.

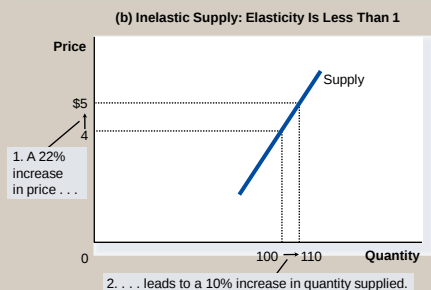


Figure 6 The Price Elasticity of Supply



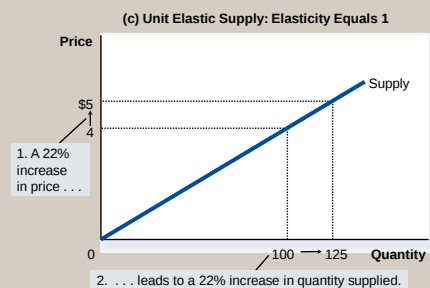
Copyright © 2011 Southwestern Thomson Learning

Figure 6 The Price Elasticity of Supply



Copyright © 2011 Southwestern Thomson Learning

Figure 6 The Price Elasticity of Supply



Copyright © 2011 Southwestern Thomson Learning

Figure 6 The Price Elasticity of Supply

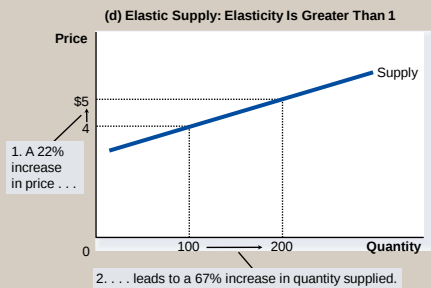
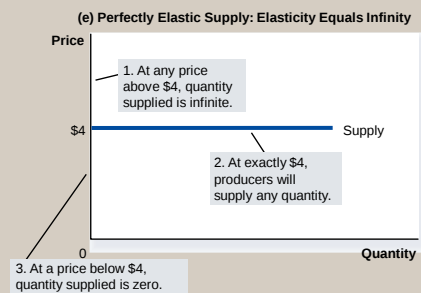


Figure 6 The Price Elasticity of Supply



Determinants of Elasticity of Supply

- Ability of sellers to change the amount of the good they produce.
 - Beach-front land is inelastic.
 - Books, cars, or manufactured goods are elastic.
- Time period.
 - Supply is more elastic in the long run.

Computing the Price Elasticity of Supply

- The price elasticity of supply is computed as the percentage change in the quantity supplied divided by the percentage change in price.

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

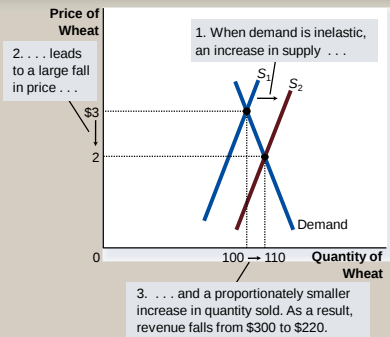
APPLICATIONS OF ELASTICITY

- Can good news for farming be bad news for farmers?
- What happens to wheat farmers and the market for wheat when scientists discover a new wheat hybrid that is more productive than existing varieties?

APPLICATIONS OF ELASTICITY

- Examine whether the supply or demand curve shifts.
- Determine the direction of the shift of the curve.
- Use the supply-and-demand diagram to see how the market equilibrium changes.

Figure 8 An Increase in Supply in the Market for Wheat



Compute the Price Elasticity of Demand

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

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

Demand is inelastic



Application: TAXES

- Governments levy taxes to raise revenue for public projects.
- **Tax incidence** is the manner in which the burden of a tax is shared among participants in a market.

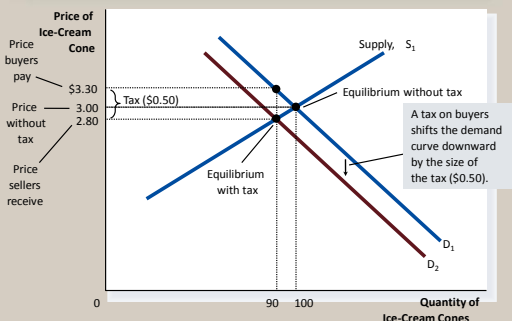


Elasticity and Tax Incidence

- Tax incidence is the study of who bears the burden of a tax.
- Taxes result in a change in market equilibrium.
- Buyers pay more and sellers receive less, regardless of whom the tax is levied on.



Figure 6 A Tax on Buyers

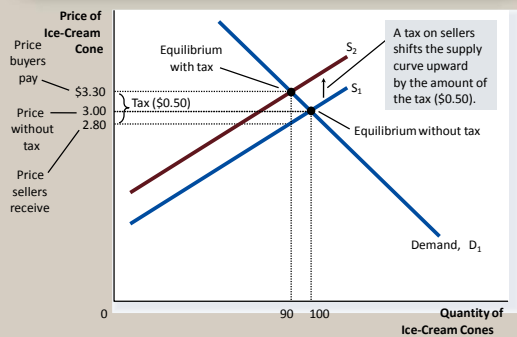


Elasticity and Tax Incidence

- What was the impact of tax?
 - Taxes discourage market activity.
 - When a good is taxed, the quantity sold is smaller.
 - Buyers and sellers share the tax burden.



Figure 7 A Tax on Sellers



Elasticity and Tax Incidence

- In what proportions is the burden of the tax divided?
- Is there a difference between taxes levied on sellers compared to buyers?
- The answers to these questions depend on the elasticity of demand and the elasticity of supply.



Figure 9 How the Burden of a Tax Is Divided

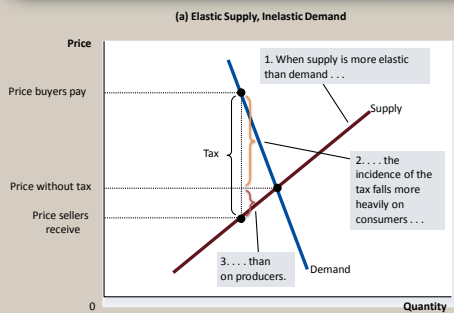
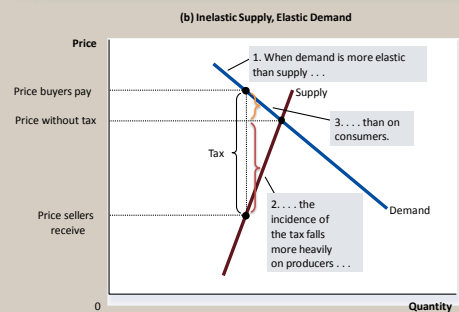


Figure 9 How the Burden of a Tax Is Divided



ELASTICITY AND TAX INCIDENCE

So, how is the burden of the tax divided?

- The burden of a tax falls more heavily on the side of the market that is less elastic.
- More Inelastic Demand, buyers pay more
- More Inelastic Supply, Sellers pay more



Next: Utility Analysis

Study for Tutorial

