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1.1 Goals of this class

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- Expand on supply and demand: *how much* do quantities change in responses to:
 - changes in price?
 - changes in income?
 - changes in price of related goods?
- Learn implications for total revenue, taxes.

2 Price Elasticity of Demand

2.1 Computing Elasticity

Elasticity

- Recall law of demand: all other things remaining equal, the higher the price of the good, the lower is the quantity demanded.
- **Price elasticity of demand:**
 - Answers how responsive demand is to changes in price.
 - When the price increases by 1%, by how much does the quantity demanded decrease?
- Formula:

$$\text{Price elasticity of dem.} = \frac{\text{Perc. Change in Quantity Demanded}}{\text{Perc. change in price}}$$

Average Percentage Changes

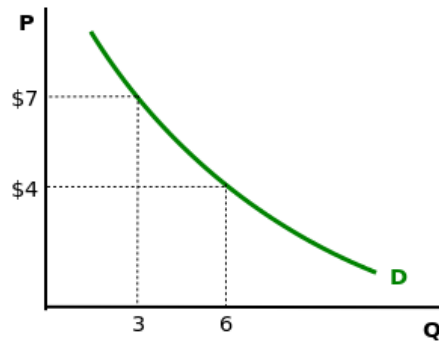
- Usual percentage change:

$$\% \Delta Q_d = \frac{Q_2 - Q_1}{Q_1} \text{ or..}$$

$$\% \Delta Q_d = \frac{Q_1 - Q_2}{Q_2}$$

- Average percentage change:

$$\% \Delta Q_d = \frac{Q_2 - Q_1}{Q_{ave}}$$

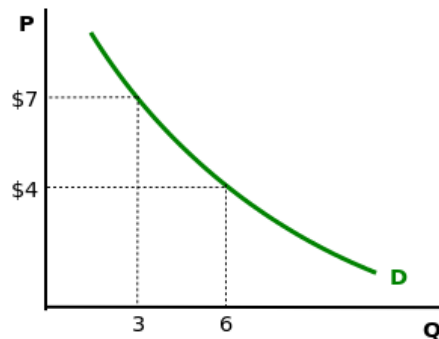


Computing Elasticity

- Elasticity of demand:

$$e_d = \frac{\% \Delta Q_d}{\% \Delta P} = \frac{\frac{Q_2 - Q_1}{Q_{ave}}}{\frac{P_2 - P_1}{P_{ave}}}$$

- Compute the elasticity of demand between these two points.



2.2 Elastic vs. Inelastic Demand

Elastic vs. Inelastic Demand

- Demand is **elastic** if demand is very responsive to changes in price.
- **Elastic demand:** when an increase (decrease) in price causes a *greater percentage* decrease (increase) in quantity demanded.
- When demand is elastic, $e_d < -1$.
- Demand is **inelastic** if demand is not very responsive to changes in price.

- **Inelastic demand:** when an increase (decrease) in price causes a *smaller percentage* decrease (increase) in quantity demanded.
- When demand is inelastic, $-1 < e_d < 0$.

Perfectly Inelastic

- Demand is **perfectly inelastic** when quantity demanded does not change at all due to changes in price.
- i.e. consumers will buy the same amount at any price.
- Perfectly inelastic demand $\rightarrow e_d = 0$.
- If a demand curve is perfectly inelastic, what will be the shape/slope?

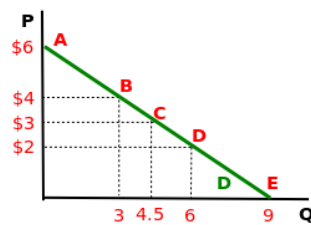
Perfectly Elastic

- Demand is **perfectly elastic** when quantity demanded changes by infinitely large amounts due to small changes in price.
- i.e. consumers are completely inflexible to increases in price.
- Perfectly elastic demand $\rightarrow e_d = -\infty$.
- If a demand curve is perfectly elastic, what will be the shape/slope?

Straight Line Demand Curve

- Elasticity at a single point for a straight line demand curve:

$$e_d = \frac{1}{m} \left(\frac{P}{Q} \right)$$



- Compute elasticities at each point:
 - Last name A-D: compute point A.
 - Last name E-I: compute point B.
 - Last name J-N: compute point C.
 - Last name M-P: compute point D.
 - Last name Q-Z: compute point D.

2.3 Total Revenue

Elasticity and Total Revenue

- If a firm increases its price, what will happen to the quantity demanded?
- If a firm increases its price, what will happen to total revenue?

$$\text{Total Revenue} = (\text{Price}) \times (\text{Quantity})$$

- If demand is inelastic \rightarrow percentage increase in price is larger \rightarrow increase revenue.
- If demand is elastic \rightarrow percentage increase in quantity is larger \rightarrow decrease revenue.
- What are some goods that have extra large sales taxes?

2.4 Determinants of Elasticity

Determinants of Elasticity

- Closeness of substitutes.
 - If there are more substitutes available and/or if the substitutes are very similar, the demand will be more elastic.
 - Goods that are necessities are usually inelastic.
- Proportion of income spent on good.
 - Goods that require large proportions of income are more elastic.
 - Example: doubling the price of cars vs. table salt.
- Time elapsed since price change.
 - As time progresses, the good becomes more elastic.
 - Example: gasoline.

3 More Demand Elasticities

3.1 Cross-Price Elasticity

Cross-Price Elasticity

- **Cross-Price Elasticity:** measures how much the demand for one good changes in response to a change in the price of a *related good*.

$$e_{x,y} = \frac{\text{Percentage change in demand of X}}{\text{Percentage change in price of Y}}$$

$$e_{x,y} = \frac{\% \Delta Q_X}{\% \Delta P_y} = \frac{\frac{Q_{x,2} - Q_{x,1}}{Q_{x,ave}}}{\frac{P_{y,2} - P_{y,1}}{P_{y,ave}}}$$

- Example: Suppose the price of Coke increases from \$1 to \$1.50, and as a result, the quantity of Pepsi sold increases from 300 to 700.

Substitutes vs. Complements

- If two goods are *substitutes*, the cross-price elasticity will be _____.
- If two goods are *complements*, the cross-price elasticity will be _____.
- The closer the relationship between the two goods, the larger will be the magnitude of the elasticity.

3.2 Income Elasticity

Income Elasticity

- **Income Elasticity:** measures how much the demand for one good changes in response to a change in income.

$$e_I = \frac{\text{Percentage change in demand of X}}{\text{Percentage change in income}}$$

$$e_I = \frac{\% \Delta Q_X}{\% \Delta I} = \frac{\frac{Q_{x,2} - Q_{x,1}}{Q_{x,ave}}}{\frac{I_2 - I_1}{I_{ave}}}$$

- Example: Suppose your income increases from \$8,000 to \$12,000 and as a result your demand for MP3s increases from 60 to 140.

Types of Goods

- **Normal goods:** income elasticity is positive.
- **Inferior goods:** income elasticity is negative.
- **Necessities:** income elasticity is between 0 and 1.
- **Luxury goods:** income elasticity is greater than 1.

4 Price Elasticity of Supply

4.1 Computing Supply

Price Elasticity of Supply

- **Price Elasticity of Supply:** measures how responsive supply is to changes in price.

$$\text{Price elasticity of supply} = \frac{\text{Perc. Change in Quantity Supplied}}{\text{Perc. change in price}}$$

$$e_s = \frac{\% \Delta Q_s}{\% \Delta P} = \frac{\frac{Q_2 - Q_1}{Q_{ave}}}{\frac{P_2 - P_1}{P_{ave}}}$$

4.2 Elastic and Inelastic Supply

Elastic and Inelastic Supply

- **Inelastic supply:** when the percentage change in quantity supplied is less than percentage change in price.

$$- 0 < e_s < 1$$

- **Elastic supply:** when the percentage change in quantity supplied is greater than percentage change in price.

$$- e_s > 1$$

- **Perfectly elastic supply:** when a small change in price leads to an infinitely large change in quantity supplied.
- **Perfectly inelastic supply:** when quantity supplied does not change in response to changes in price.

4.3 Determinants of Supply Elasticity

Determinants of Supply Elasticity

- Resource substitution possibilities: items that require unique factors of production have an inelastic supply.
- Time since price change:
 - Very short run: immediately following a change in price, sometimes supply cannot be changed at all → perfectly inelastic supply.
 - Short-run: some technological changes and substitutions are possible → supply becomes more elastic.
 - Long-run: long enough for all technological changes and substitutions possible. Could involve: building or destroying new factories, entire industries, educating populations, etc.

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5.1 What We Have Learned

- Measure how responsive demand is to changes in price: price elasticity of demand.
- Measure how substitutable goods are: cross-price elasticity.
- Measure how demand responds to income: income elasticity.
- Measure how responsive supply is to changes in price: price elasticity of price.
- Learned what can influence elasticity.
- Learned implications for total revenue.