AS.180.102 (04): Elements of Microeconomics

Chapter 5 - Elasticity and its Application

Kieran Allsop

September 20, 2024

Reminders

- Assignment 1 grades and solutions posted. Make sure to review the solutions and see me in office hours if you have any questions
- Assignment 2 posted, due next Friday (September 27th)
- First midterm is on the horizon on Thursday October 3rd

Questions from last week?

Outline

Main Takeaway

Elasticity captures **how** market participants change behavior in response to changing prices.

- These slides cover chapter 5: Elasticity and its Application

Elasticity

- Recall from last week. What causes demand for a good to change?

Elasticity

- Recall from last week. What causes demand for a good to change?

1. Its price is lower (law of demand)
2. Incomes are higher (for normal goods)
3. Price of substitutes is higher
4. Price of complements is lower

- The **elasticities of demand** will tell us *how big* the change in demand is for these cases.

Elasticity of demand

- A goods demand may be
  - **Elastic**: Demand responds a lot in response to price change
  - **Inelastic**: Demand responds a little in response to price change

1. What are some examples of inelastic goods?
2. What are some examples of elastic goods?
3. Let's take a specific example: the Ford F-150. What factors will influence this product's elasticity of demand?

Elasticity of demand

- What factors will influence a good's elasticity?
  1. **Availability of close substitutes**: other kinds of trucks, cars, bikes, etc.
  2. **Necessities vs. luxuries**: do you need it for work? For fun?
  3. **Market definition**: Are we considering the market for Ford F150s? For pickup trucks? For motor vehicles?)
  4. **Time horizon**: In the short run, maybe we need a pickup; in the long-run, maybe we retool our lives to accommodate a different car or no car at all

Elasticity of demand

- We have a simple equation to find the price elasticity of demand:

$$\text{Price elasticity of demand} = \frac{\%\text{ change in quantity demanded}}{\%\text{ change in price}} = \frac{\%\Delta Q}{\%\Delta P}$$

- Will this value be greater or less than 0? Why?

Percentage change refresher

- If good A used to cost \$10, and now it costs \$14, what is the percentage change?

Percentage change refresher

- If good A used to cost \$10, and now it costs \$14, what is the percentage change?

$$\boxed{\frac{\text{Change in price}}{\text{Original price}} * 100\%} = \frac{\$14 - \$10}{\$10} * 100\% = 40\%$$

Calculating elasticity

- Consider two points on a demand curve:
  - Point A: Price is $P_A = 12$ and quantity demanded is $Q_A = 60$
  - Point B: $P_B = 8$ and $Q_B = 80$
- Take our formula and calculate the price elasticity of demand:
  1. Moving from point A to point B
  2. Moving from point B to point A

Calculating elasticity

- Consider two points on a demand curve:
  - Point A: Price is $P_A = 12$ and quantity demanded is $Q_A = 60$
  - Point B: $P_B = 8$ and $Q_B = 80$
- Take our formula and calculate the price elasticity of demand:
  1. Moving from point A to point B
     - ★ $P_e = \frac{1/3}{-1/3} = -1$
  2. Moving from point B to point A

Calculating elasticity

- Consider two points on a demand curve:
  - Point A: Price is $P_A = 12$ and quantity demanded is $Q_A = 60$
  - Point B: $P_B = 8$ and $Q_B = 80$
- Take our formula and calculate the price elasticity of demand:
  1. Moving from point A to point B
     - ★ $P_e = \frac{1/3}{-1/3} = -1$
  2. Moving from point B to point A
     - ★ $P_e = \frac{-1/4}{1/2} = -\frac{1}{2}$
- We get two different values. This is why we need the midpoint technique.

Midpoint technique

- Instead of taking the % change w.r.t. the original price, use an average of the two prices as your base, use an average of the two:

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

- This is the formula we will use!

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
2. What is the new base quantity?
3. What is the % change for quantity?
4. What is the % change for price?

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
   - \$10
2. What is the new base quantity?
3. What is the % change for quantity?
4. What is the % change for price?

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
   - \$10
2. What is the new base quantity?
   - 70
3. What is the % change for quantity?
4. What is the % change for price?

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
   - \$10
2. What is the new base quantity?
   - 70
3. What is the % change for quantity?
   - $\frac{2}{7}$
4. What is the % change for price?

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
   - \$10
2. What is the new base quantity?
   - 70
3. What is the % change for quantity?
   - $\frac{2}{7}$
4. What is the % change for price?
   - $\frac{2}{5}$

- Then put it all together to get our new elasticity estimate.

Calculating elasticity

- Return to our original example:
  - $P_A = 12$ and $Q_A = 60$
  - $P_B = 8$ and $Q_B = 80$

1. What is the new base price?
   - \$10
2. What is the new base quantity?
   - 70
3. What is the % change for quantity?
   - $\frac{2}{7}$
4. What is the % change for price?
   - $\frac{2}{5}$

- Then put it all together to get our new elasticity estimate.
  - $\frac{5}{7}$

Elasticity

Say we have a linear demand curve:

- Quantity demanded is 0 when price is 100
- Quantity demanded is 12 when price is 4

1. Calculate the formula for the demand curve (slope and intercept) and draw graphically
2. Is the elasticity constant? Why or why not?
3. Pick a few example points, and use the midpoint formula to check the elasticity when:
   1. Price is close to 100
   2. Price is close to 0
   3. Price is around 50
4. How will total revenue vary as price moves from 0 to 100?

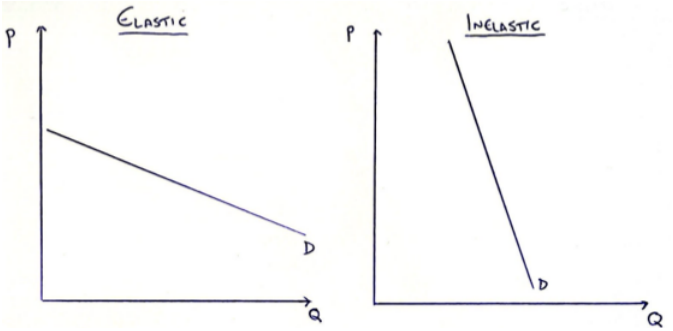
Types of elasticity

- Demand might be:
  - Elastic
  - Inelastic
  - Unit elastic
  - Perfectly elastic
  - Perfectly inelastic
- How would you draw each of these?

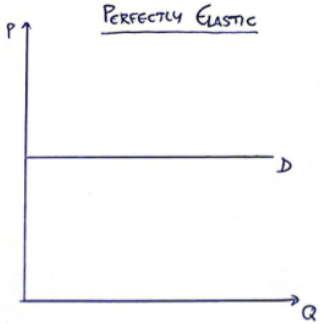
Types of elasticity

- Demand might be:
  - Elastic
  - Inelastic
  - Unit elastic
  - Perfectly elastic
  - Perfectly inelastic
- How would you draw each of these?
- Elastic: Demand change % is greater than price change %
- Inelastic: Demand change % is less than price change %
- Unit elastic: Demand change % is equal to price change %
- Perfectly elastic: Price change has no impact on demand
- Perfectly inelastic: Small price change has enormous impact on demand

Types of elasticity



Types of elasticity



Different elasticities

We have focused on the *price elasticity of demand*, but there are others.

In general, we can find the *X elasticity of Y* as:

$$\text{X elasticity of Y} = \frac{\%\ \Delta \text{ of Y}}{\%\ \Delta \text{ of X}}$$

Some important elasticities:

- Price elasticity of supply
- Income elasticity of demand
- Cross-price elasticity of demand

Different elasticities

Price elasticity of supply:

- Will be positive, unlike price elasticity of demand
- price elasticity of supply $= \dfrac{\%\ \Delta \text{ of demand}}{\%\ \Delta \text{ of price}} = \frac{\%\Delta Q}{\%\Delta P}$

Income elasticity of demand:

- Positive for normal goods, negative for inferior goods
- income elasticity of demand $= \dfrac{\%\ \Delta \text{ of demand}}{\%\ \Delta \text{ of income}} = \frac{\%\Delta Q}{\%\Delta Y}$

Cross-price elasticity of demand:

- Positive for substitutes, negative for complements
- CP elasticity of demand $= \dfrac{\%\ \Delta \text{ of demand for good 1}}{\%\ \Delta \text{ of price of good 2}} = \frac{\%\Delta Q_1}{\%\Delta P_2}$

Supply elasticities

Firms will react to a change in price based on their *price elasticity of supply*.

The same ideas are in play. Firms may have supply that is:

- elastic: an X% change in price $\rightarrow <$ X% change in supply
- inelastic: an X% change in price $\rightarrow >$ X% change in supply
- unit elastic: an X% change in price $\rightarrow$ X% change in supply
- perfectly elastic: any change in price $\rightarrow$ enormous change in supply
- perfectly inelastic: any change in price $\rightarrow$ no change in supply (perfectly vertical)

Elasticity examples

Let's use some intuition, and choose three products for which we think:

1. Demand is inelastic
2. Demand is elastic
3. Supply is inelastic
4. Supply is elastic

Application

Let's think about the market for airline tickets:

Price	Q_D **(Business)**	Q_D **(Vacation)**	Q_S **(Firms)**
\$150	2,100	1,000	2,300
\$200	2,000	800	2,400
\$250	1,900	600	2,500
\$300	1,800	400	2,600

Table: Market for airline tickets

Which group do you expect to be elastic? Inelastic? Why? Calculate the elasticities.

Appliction

Business people	Vacationers	Firms
0.17	0.78	0.15
0.23	1.29	0.18
0.3	2.2	0.22

Table: Elasticities for airline tickets

Was your intuition for the elasticities correct? When is this market in *equilibrium*?