CHAPTER 5

Elasticity and its Application

PRINCIPLES OF
Economics
N. Gregory Mankiw

Premium PowerPoint Slides
by Ron Cronovich

In this chapter, look for the answers to these questions:

- What is elasticity? What kinds of issues can elasticity help us understand?
- What is the price elasticity of demand? How is it related to the demand curve? How is it related to revenue & expenditure?
- What is the price elasticity of supply? How is it related to the supply curve?
- What are the income and cross-price elasticities of demand?

1

A scenario…

You design websites for local businesses.
You charge $200 per website,
and currently sell 12 websites per month.

Your costs are rising
(including the opportunity cost of your time),
so you consider raising the price to $250.

The law of demand says that you won't sell as many websites if you raise your price.
How many fewer websites? How much will your revenue fall, or might it increase?

2

Elasticity

- Basic idea:
  - One type of elasticity measures how much demand for your websites will fall if you raise your price.
- Definition:
  Elasticity is

Price Elasticity of Demand

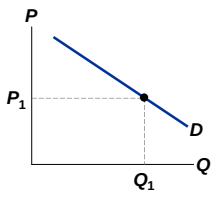
Price elasticity of demand =

- **Price elasticity of demand** measures
- Loosely speaking, it measures

Price Elasticity of Demand

Example:

Price elasticity of demand equals



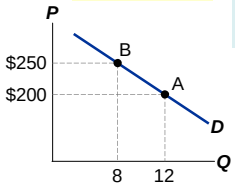
Price Elasticity of Demand

Along a ***D*** curve, ***P*** and ***Q*** move in opposite directions, which would make price elasticity negative.

We will drop the minus sign and report all price elasticities as positive numbers.

Calculating Percentage Changes

Demand for your websites



Standard method of computing the percentage (%) change:

$$\frac{\text{end value} - \text{start value}}{\text{start value}} \times 100\%$$

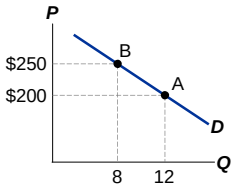
Going from A to B, the % change in ***P*** equals

($250–$200)/$200 = 25%

Calculating Percentage Changes

Problem:

Demand for your websites



From A to B,
P rises 25%, ***Q*** falls 33%,
elasticity = 33/25 = 1.33

From B to A,
P falls 20%, ***Q*** rises 50%,
elasticity = 50/20 = 2.50

Calculating Percentage Changes

- So, we instead use the **midpoint method**:
- The midpoint is
- It doesn't matter which value you use as the "start" and which as the "end" – you get the same answer either way!

Calculating Percentage Changes

- Using the midpoint method, the % change in ***P*** equals
- The % change in ***Q*** equals
- The price elasticity of demand equals

ACTIVE LEARNING **1**

Calculate an elasticity

Use the following information to calculate the price elasticity of demand for hotel rooms:

if P = \$70, Q^d = 5000

if P = \$90, Q^d = 3000

What determines price elasticity?

To learn the determinants of price elasticity, we look at a series of examples. Each compares two common goods.

In each example:

- Suppose the prices of both goods rise by 20%.
- The good for which Q^d falls the most (in percent) has the highest price elasticity of demand. Which good is it? Why?
- What lesson does the example teach us about the determinants of the price elasticity of demand?

EXAMPLE 1:
Breakfast cereal vs. Sunscreen

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?
- Lesson:

EXAMPLE 2:
"Blue Jeans" vs. "Clothing"

- The prices of both goods rise by 20%. For which good does Q^d drop the most? Why?
- Lesson:

EXAMPLE 3:

Insulin vs. Caribbean Cruises

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?

- Lesson:

EXAMPLE 4:

Gasoline in the Short Run vs. Gasoline in the Long Run

- The price of gasoline rises 20%. Does Q^d drop more in the short run or the long run? Why?

- Lesson:

The Determinants of Price Elasticity: A Summary

The price elasticity of demand depends on:

The Variety of Demand Curves

- The price elasticity of demand is closely related to the slope of the demand curve.
- Rule of thumb:
- Five different classifications of ***D*** curves….

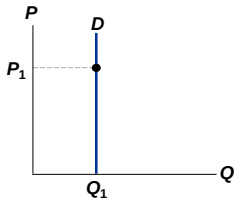
"Perfectly inelastic demand" (one extreme case)

Price elasticity of demand = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

D curve:

Consumers' price sensitivity:

Elasticity:



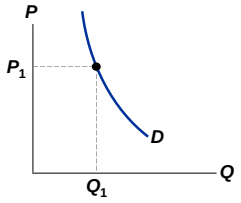
"Inelastic demand"

Price elasticity of demand = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

D curve:

Consumers' price sensitivity:

Elasticity:



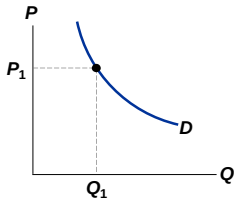
"Unit elastic demand"

Price elasticity of demand = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

D curve:

Consumers' price sensitivity:

Elasticity:



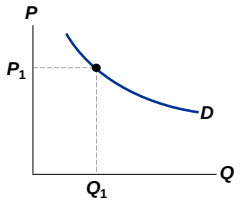
"Elastic demand"

Price elasticity of demand = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

D curve:

Consumers' price sensitivity:

Elasticity:



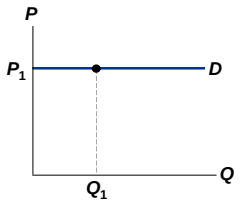
"Perfectly elastic demand" (the other extreme)

Price elasticity of demand = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

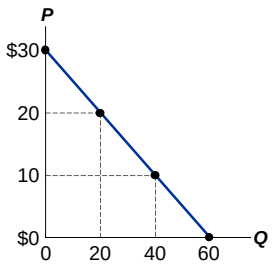
D curve:

Consumers' price sensitivity:

Elasticity:



Elasticity of a Linear Demand Curve



The slope of a linear demand curve is constant, but its elasticity is not.

Price Elasticity and Total Revenue

- Continuing our scenario, if you raise your price from $200 to $250, would your revenue rise or fall?

Revenue = ***P*** x ***Q***

- A price increase has two effects on revenue:

- Which of these two effects is bigger?
  It depends on the price elasticity of demand.

Price Elasticity and Total Revenue

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } \boldsymbol{Q}}{\text{Percentage change in } \boldsymbol{P}}$$

Revenue = ***P*** x ***Q***

- If demand is elastic, then

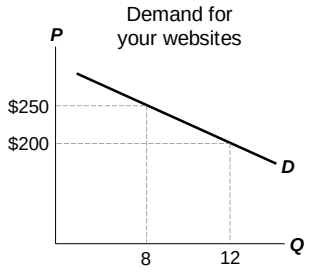
Price Elasticity and Total Revenue

Elastic demand (elasticity = 1.8)

If ***P*** = $200, ***Q*** = 12 and revenue = _____

If ***P*** = $250, ***Q*** = 8 and revenue = _____

When ***D*** is elastic, a price increase causes revenue to _____.



Price Elasticity and Total Revenue

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q}{\text{Percentage change in } P}$$

§ If demand is inelastic, then Revenue = ***P*** x ***Q***

§ In our example, suppose that ***Q*** only falls to 10 (instead of 8) when you raise your price to $250.

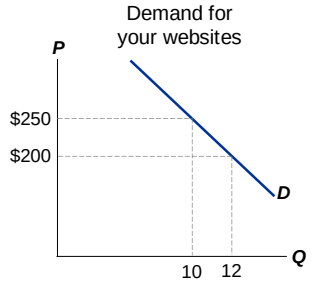
Price Elasticity and Total Revenue

Now, demand is inelastic:
elasticity = 0.82

If ***P*** = $200, ***Q*** = 12 and revenue = _____

If ***P*** = $250, ***Q*** = 10 and revenue = _____

When ***D*** is inelastic, a price increase causes revenue to _____.



ACTIVE LEARNING 2

Elasticity and expenditure/revenue

A. Pharmacies raise the price of insulin by 10%. Does total expenditure on insulin rise or fall?

B. As a result of a fare war, the price of a luxury cruise falls 20%. Does luxury cruise companies' total revenue rise or fall?

31

ACTIVE LEARNING 2

Answers

32

APPLICATION: Does Drug Interdiction Increase or Decrease Drug-Related Crime?

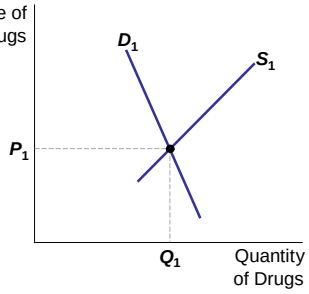
- One side effect of illegal drug use is crime: Users often turn to crime to finance their habit.
- We examine two policies designed to reduce illegal drug use and see what effects they have on drug-related crime.
- For simplicity, we assume the total dollar value of drug-related crime equals total expenditure on drugs.
- Demand for illegal drugs is inelastic, due to addiction issues.

Policy 1: Interdiction

Interdiction reduces the supply of drugs.

Since demand for drugs is inelastic,

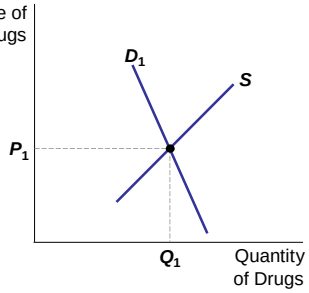
Result:



Policy 2: Education

Education reduces the demand for drugs.

Result:



Price Elasticity of Supply

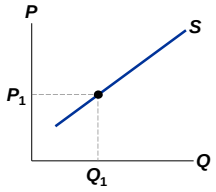
Price elasticity of supply =

- **Price elasticity of supply** measures
- Loosely speaking, it measures
- Again, use the midpoint method to compute the percentage changes.

Price Elasticity of Supply

Example:

Price elasticity of supply equals



The Variety of Supply Curves

- The slope of the supply curve is closely related to price elasticity of supply.
- Rule of thumb:
- Five different classifications….

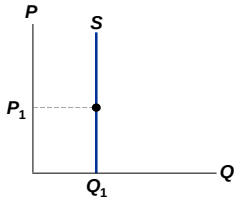
"Perfectly inelastic" (one extreme)

$$\text{Price elasticity of supply} = \frac{\%\text{ change in } Q}{\%\text{ change in } P} = \_\_\_\_$$

S curve:

Sellers' price sensitivity:

Elasticity:



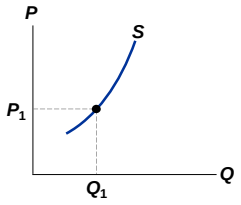
"Inelastic"

Price elasticity of supply = $\frac{\text{\% change in } \boldsymbol{Q}}{\text{\% change in } \boldsymbol{P}}$ = _____

S curve:

Sellers' price sensitivity:

Elasticity:



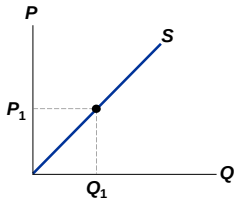
"Unit elastic"

Price elasticity of supply = $\frac{\text{\% change in } \boldsymbol{Q}}{\text{\% change in } \boldsymbol{P}}$ = _____

S curve:

Sellers' price sensitivity:

Elasticity:



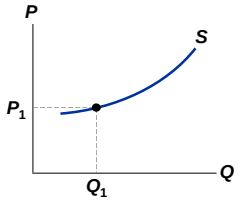
"Elastic"

Price elasticity of supply = $\frac{\text{\% change in } \boldsymbol{Q}}{\text{\% change in } \boldsymbol{P}}$ = _____

S curve:

Sellers' price sensitivity:

Elasticity:



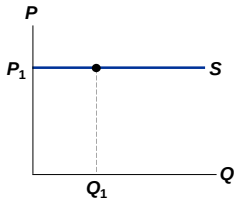
"Perfectly elastic" (the other extreme)

Price elasticity of supply = $\frac{\%\text{ change in } Q}{\%\text{ change in } P}$ = _____

S curve:

Sellers' price sensitivity:

Elasticity:



The Determinants of Supply Elasticity

- Example: Supply of beachfront property is harder to vary and thus less elastic than supply of new cars.
- For many goods, price elasticity of supply is _____ in the long run than in the short run, because firms can build new factories, or new firms may be able to enter the market.

ACTIVE LEARNING 3

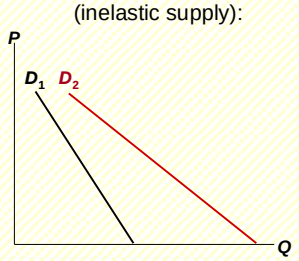
Elasticity and changes in equilibrium

- The supply of beachfront property is inelastic. The supply of new cars is elastic.
- Suppose population growth causes demand for both goods to double (at each price, Q^d doubles).
- For which product will ***P*** change the most?
- For which product will ***Q*** change the most?

ACTIVE LEARNING 3

Answers

Beachfront property
(inelastic supply):

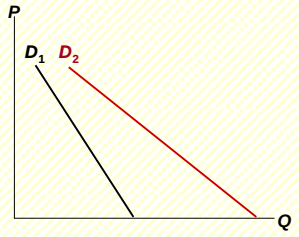


47

ACTIVE LEARNING 3

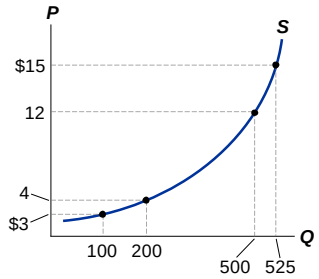
Answers

New cars
(elastic supply):



48

How the Price Elasticity of Supply Can Vary



Other Elasticities

- **Income elasticity of demand**: measures

Income elasticity of demand =

- Recall from Chapter 4: An increase in income causes an increase in demand for a *normal* good.
- Hence, for normal goods, income elasticity
- For *inferior* goods, income elasticity

Other Elasticities

- **Cross-price elasticity of demand**: measures

Cross-price elast. of demand =

- For substitutes, cross-price elasticity (*e.g.*, an increase in price of beef causes an increase in demand for chicken)
- For complements, cross-price elasticity (*e.g.*, an increase in price of computers causes decrease in demand for software)