

Chapter 6 is the first of three chapters focusing on different aspects of consumer behavior. This chapter discusses **elasticity** and explains how it relates to demand and supply that you learned about in Chapter 3.

The concept of **price elasticity of demand** is of great importance for studying the material found in the remainder of the text. You must understand (1) what price elasticity measures; (2) how the price-elasticity formula is applied to measure the price elasticity of demand; (3) the difference between price elastic, price inelastic, and unit elastic; (4) how total revenue varies by the type of price elasticity of demand; (5) the meaning of perfect price elasticity and of perfect price inelasticity of demand; (6) the four major determinants of price elasticity of demand; and (7) the practical application of the concept to many economic issues.

When you have become thoroughly acquainted with the concept of price elasticity of demand, you will find that you have very little trouble understanding the **price elasticity of supply**. The transition requires no more than the substitution of the words "quantity supplied" for the words "quantity demanded." You should concentrate your attention on the meaning of price elasticity of supply and how it is affected by time. Several examples are provided to show how it affects the prices of many products.

The chapter also introduces you to two other elasticity concepts. The **cross elasticity of demand** measures the sensitivity of a change in the quantity demanded for one product due to a change in the price of another product. This concept is especially important in identifying whether two goods are substitutes for each other, complements to each other, or independent of each other. The **income elasticity of demand** assesses the change in the quantity demanded of a product resulting from a change in consumer incomes. It is useful for categorizing goods as normal or inferior. For normal goods, as income increases, the demand for them increases, whereas for inferior goods as income increases, the demand for them decreases.

So elasticity as presented in this chapter is all about the responsiveness of changes in quantity to a change in price or income. Understanding this concept will be useful for answering many questions about demand and supply.

■ CHECKLIST

When you have studied this chapter you should be able to

- Describe the concept of the price elasticity of demand.
- Compute the coefficient for the price when given the demand data.
- State the midpoint formula for price elasticity of demand and explain how it refines the original formula for price elasticity.
- State two reasons why the formula for price elasticity of demand uses percentages rather than absolute amounts in measuring consumer responsiveness.
- Explain the meaning of elastic, inelastic, and unit elastic as they relate to demand.
- Describe the concepts of perfectly elastic demand and perfectly inelastic demand and illustrate them with graphs.
- Apply the total-revenue test to determine whether demand is elastic, inelastic, or unit-elastic.
- Describe the relationship between price elasticity of demand and the price range for most demand curves.
- Explain why the slope of the demand curve is not a sound basis for judging price elasticity.
- Illustrate graphically the relationship between price elasticity of demand and total revenue.
- List the four major determinants of the price elasticity of demand, and explain how each determinant affects price elasticity.
- Describe several applications of the concept of price elasticity of demand.
- Describe the concept of the price elasticity of supply.
- Compute the coefficient for the price elasticity of supply when given the relevant data.
- Explain the effect of three time periods (immediate market period, short run, and long run) on price elasticity of supply.
- Describe several applications of price elasticity of supply.
- Describe the concept of the cross elasticity of demand.
- Compute the coefficient for the cross elasticity of demand when given relevant data.
- Use the cross elasticity of demand to categorize substitute goods, complementary goods, and independent goods.
- Give applications of cross elasticity of demand.
- Describe the concepts of the income elasticity of demand.
- Compute the coefficient for the income elasticity of demand when given relevant data.
- Use the income elasticity of demand to categorize goods as normal or inferior.
- Provide some insights using the concept of income elasticity.
- Use the concept of elasticity of demand to explain why different consumers pay different prices (*Last Word*).

■ CHAPTER OUTLINE

1. ***Price elasticity of demand*** is a measure of the responsiveness or sensitivity of quantity demanded to changes in the price of a product. When quantity demanded is

relatively responsive to a price change, demand is said to be *elastic*. When quantity demanded is relatively unresponsive to a price change, demand is said to be *inelastic*.

- a. The degree of elasticity can be measured by using a formula to compute the elasticity coefficient. E_d = percentage change in quantity demanded of product X *divided by* the percentage change in the price of product X.
 1. A **midpoint formula** calculates price elasticity across a price and quantity range to overcome the problem of selecting the reference points for the price range and the quantity range. In this formula, the *average* of the two quantities and the *average* of the two prices are used as reference points. This formula can be done in three steps: (a) calculate the change in quantity divided by the average of the two quantities; (b) calculate the change in price divided by the average of the two prices; (c) divide the quantity result from (a) by the price result from (b). For example, if the price falls from \$5 to \$4 while the quantity demanded rises from 10 units to 20 units, then using the midpoint formula, the price elasticity of demand is: (a) $[10 - 20]$ divided by $[(10 + 20)/2] = 0.67$; (b) $[(5 - 4)]$ divided by $[(5 + 4)/2] = 0.22$; (c) thus 0.67 divided by 0.22 means that E_d is approximately equal to 3.
 2. Economists use percentages rather than absolute amounts in measuring responsiveness because with absolute amounts the choice of units or scale can arbitrarily affect the perception of responsiveness.
 3. The price elasticity of demand coefficient is a negative number (has a minus sign) because price and quantity demanded are inversely related. Economists ignore the minus sign in front of the coefficient and focus their attention on its absolute value.
- b. The coefficient of price elasticity has several interpretations.
 1. **Elastic demand** occurs when the percentage change in quantity demanded is greater than the percentage change in price. The elasticity coefficient is greater than 1.
 2. **Inelastic demand** occurs when the percentage change in quantity demanded is less than the percentage change in price. The elasticity coefficient is less than 1.
 3. **Unit elasticity** occurs when the percentage change in quantity demanded is equal to the percentage change in price. The elasticity coefficient is equal to 1.
 4. **Perfectly inelastic demand** means that a change in price results in no change in quantity demanded of a product, whereas **perfectly elastic demand** means that a small change in price causes buyers to purchase all they desire of a product.
- c. **Total revenue (TR)** changes when price changes. The **total-revenue test** shows that when demand is
 1. *elastic*, a decrease in price will increase total revenue and an increase in price will decrease total revenue.

2. *inelastic*, a decrease in price will decrease total revenue and an increase in price will increase total revenue.
 3. *unit-elastic*, an increase or decrease in price will not affect total revenue.
 4. *Consider This* (A Bit of a Stretch). The difference between "elastic" and "inelastic" can be thought of as the amount or quantity of the stretch for a given change in price. An ACE bandage has a great deal of stretch and is "elastic," while a rubber tie-down has only minor stretch and would be "inelastic."
- d. Note several points about the graph of a linear demand curve and price elasticity of demand.
 1. It is not the same at all prices. Demand is typically elastic at higher prices and inelastic at lower prices.
 2. It cannot be judged from the slope of the demand curve.
 - e. The relationship between price elasticity of demand and total revenue can be shown by graphing the demand curve and the total-revenue curve, one above the other. In this case, the horizontal axis for each graph uses the same quantity scale. The vertical axis for demand represents price. The vertical axis for the total-revenue graph measures total revenue.
 1. When demand is price elastic, as price declines and quantity increases along the demand curve, total revenue increases in the total-revenue graph.
 2. Conversely, when demand is price inelastic, as price declines and quantity increases along the demand curve, total revenue decreases.
 3. When demand is unit-elastic, as price and quantity change along the demand curve, total revenue remains the same.
 - f. The price elasticity of demand for a product depends on four determinants.
 1. The number of good substitutes for the product. The more substitute products that are available for a product, the greater the price elasticity of demand for the product.
 2. Its relative importance in the consumer's budget. The higher the price of product relative to consumers' incomes, the greater the price elasticity of demand.
 3. Whether it is a necessity or a luxury. Luxuries typically have a greater price elasticity of demand than necessities.
 4. The period of time under consideration. The longer the time period, the greater the elasticity of demand for a product.
 - g. Price elasticity of demand has practical applications to public policy and business decisions. The concept is relevant to bumper crops in agriculture, excise taxes, and the decriminalization of illegal drugs.

2. **Price elasticity of supply** is a measure of the sensitivity of quantity supplied to changes in the price of a product. Both the general formula and the midpoint formula for price elasticity of supply are similar to those for the price elasticity of demand,

but "quantity supplied" replaces "quantity demanded." This means that the price elasticity of supply is the percentage change in quantity supplied of a product divided by the percentage change in the price of the product. There is a midpoint formula that is an average of quantities and prices and is used for calculating the elasticity of supply across quantity or price ranges. The price elasticity of supply depends primarily on the amount of time sellers have to adjust to a price change. The easier and faster suppliers can respond to changes in price, the greater the price elasticity of supply.

- a. In the *immediate market period*, there is too little time for producers to change output in response to a change in price. As a consequence, supply is perfectly inelastic. Graphically, this means that the supply curve is vertical at that market level of output.
 - b. In the *short run*, producers have less flexibility to change output in response to a change in price because they have fixed inputs that they cannot change. They have only a limited control over the range in which they can vary their output. As a consequence, supply is *price inelastic* in the short run.
 - c. In the *long run*, producers can make adjustments to all inputs to vary production. As a consequence, supply is *price elastic* in the long run. There is no total-revenue test for price elasticity of supply because price and total revenue move in the same direction regardless of the degree of price elasticity of supply.
 - d. Price elasticity of supply has many practical applications for explaining price volatility. The concept is relevant to the pricing of antiques and gold, for which the supply is perfectly inelastic.
 - e. **Consider This (Elasticity and College Costs).** From the end of World War II through the 1970s, the supply of places for students in higher education had increased and kept pace with the increase in demand from population growth. In the 1980s, the increase in supply slowed, but demand continued to rise because the increase in student loans and subsidies helped students finance their education. With the supply of places in higher education relatively fixed, further increases in demand lead to price increases in the cost of a college education.
3. Two other elasticity concepts are important.
- a. The *cross elasticity of demand* measures the degree to which the quantity demanded of one product is affected by a change in the price of another product.

Cross elasticities of demand are

1. positive for products that are substitutes;
2. negative for products that are complements; and
3. zero or near zero for products that are unrelated or independent.

- b. The *income elasticity of demand* measures the effect of a change in income on the quantity demanded of a product. Income elasticities of demand are
 1. positive for normal or superior products, which means that more of them are demanded as income rises; and
 2. negative for inferior products, which means that less of them are demanded as income rises.

 4. (*Last Word*). There are many examples of dual or multiple pricing of products. The main reason for the differences is differences in the price elasticity of demand among groups. Business travelers have a more inelastic demand for travel than leisure travelers and thus can be charged more for an airline ticket. Prices for children are often lower than prices for adults for the same service (for example, movie tickets or restaurant meals) because children have more elastic demand for the service. Low-income groups have a more elastic demand for higher education than high-income groups, so high-income groups are charged the full tuition price and lower-income groups get more financial aid to offset the tuition price.
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■ HINTS AND TIPS

1. This chapter is an extension of the material presented in Chapter 3. Be sure you thoroughly read and study Chapter 3 again before you read and do the self-test exercises for this chapter.

2. You should **not judge** the price elasticity of demand based on the slope of the demand curve unless it is horizontal (*perfectly elastic*) or vertical (*perfectly inelastic*). Remember that elasticity varies from elastic to inelastic along a downsloping, linear demand curve. The price elasticity equals 1 at the midpoint of a downsloping linear demand curve.

3. Master the **total-revenue test** for assessing the price elasticity of demand (review Table 6.2). For many problems, the total-revenue test is easier to use than the midpoint formula for identifying the type of elasticity (elastic, inelastic, unit), and the test has many practical applications.

4. Do not just memorize the elasticity formulas in this chapter. Instead, work on understanding what they mean and how they are used for economic decisions. The

elasticity formulas simply measure the *responsiveness* of a percentage change in *quantity* to a percentage change in some other characteristic (price or income). The elasticity formulas each has a similar structure: A percentage change in some type of *quantity* (demanded, supplied) is divided by a percentage change in the other variable. The price elasticity of demand measures the responsiveness of a percentage change in *quantity demanded* for a product to a percentage change in its *price* . The cross elasticity of demand measures the percentage change in the *quantity demanded of product X* to a percentage change in the *price of product Y*. The income elasticity of demand is the percentage change in *quantity demanded* for a product to a percentage change in *income*. The price elasticity of supply is the percentage change in the *quantity supplied* of a product to a percentage change in its price.

■ IMPORTANT TERMS

price elasticity of demand

midpoint formula

elastic demand

inelastic demand

unit elasticity

perfectly inelastic demand

perfectly elastic demand

total revenue (TR)

total-revenue test

price elasticity of supply

immediate market period

short run

long run

cross elasticity of demand

income elasticity of demand