Chapter 6

Elasticity: The Responsiveness of Demand and Supply

Chapter Outline

6.1 The Price Elasticity of Demand and Its Measurement

Learning Objective 1  Define the price elasticity of demand and understand how to measure it.

The price elasticity of demand is the responsiveness of the quantity demanded to a change in price, measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product’s price.

A. Measuring the Price Elasticity of Demand

The slope of the demand curve is not used to measure elasticity because the measurement of slope is sensitive to the units chosen for quantity and price.

The price elasticity of demand = \[ \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \].

The price elasticity of demand is always negative. Since we are usually interested in the relative size of elasticities, we often compare their absolute values.

B. Elastic and Inelastic Demand

Elastic demand refers to when the percentage change in quantity demanded is greater than the percentage change in price, so the price elasticity is greater than 1 in absolute value.

Inelastic demand refers to when the percentage change in quantity demanded is less than the percentage change in price, so the price elasticity is less than 1 in absolute value.

Unit-elastic demand refers to when the percentage change in quantity demanded is equal to the percentage change in price, so the price elasticity is equal to 1 in absolute value.

C. An Example of Computing Price Elasticities
In calculating the price elasticity between two points on a demand curve, we run into a problem because we get a different value for price increases than for price decreases.

D. The Midpoint Formula

We can use the midpoint formula to ensure that we have only one value of the price elasticity of demand between the same two points on the same demand curve. The midpoint formula uses the average of the initial and final quantity and the initial and final price. If \( Q_1 \) and \( P_1 \) are the initial quantity and price and \( Q_2 \) and \( P_2 \) are the final quantity and price, the midpoint formula is:

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

E. When Demand Curves Intersect, the Flatter Curve is More Elastic

If two demand curves intersect, the one with the smaller slope (in absolute value) is more elastic, and the one with the larger slope (in absolute value) is less elastic.

F. Polar Cases of Perfectly Elastic and Perfectly Inelastic Demand

If a demand curve is a vertical line, it is perfectly inelastic. Perfectly inelastic demand occurs when a change in price results in no change in quantity demanded. If a demand curve is a horizontal line, it is perfectly elastic. Perfectly elastic demand occurs when a change in price results in an infinite change in quantity demanded.

6.2 The Determinants of the Price Elasticity of Demand

Learning Objective 2  Understand the determinants of the price elasticity of demand.

There are five key determinants of the price elasticity of demand.

A. Availability of Close Substitutes

The availability of substitutes is the most important determinant of the price elasticity of demand. In general, if a product has more substitutes available, it will have a more elastic demand. If a product has fewer substitutes available, it will have a less elastic demand.

B. Passage of Time

Another determinant of elasticity is the passage of time. The more time that passes, the more elastic the demand for a product becomes.

C. Luxuries versus Necessities

A third determinant is whether the product is a necessity or a luxury. The demand curve for a luxury is more elastic than the demand curve for a necessity.
D. Definition of the Market

A fourth determinant is the definition of the market. The more narrowly we define a market, the more elastic demand will be.

E. Share of the Good in the Consumer’s Budget

The final determinant is the share of the good in the consumers’ budget. In general, the demand for a good will more elastic the larger the share of the good in the average consumer’s budget.

F. Is the Demand for Books Perfectly Elastic?

Despite what the publisher of Doubleday Books was quoted as saying in the opening of the chapter, it is unlikely that he believes the demand for books is perfectly inelastic. Specialized books have few substitutes, so the demand for them is likely to be relatively inelastic. Novels by popular authors have more good substitutes and are likely to have more elastic demand curves.

6.3 LEARNING OBJECTIVE

6.3 The Relationship Between Price Elasticity of Demand and Total Revenue

Learning Objective 3  Understand the relationship between the price elasticity of demand and total revenue.

A firm is interested in price elasticity because it allows the firm to calculate how changes in price will affect its total revenue. Total revenue is the total amount of funds received by the seller of a good or service, calculated by multiplying price per unit by the number of units sold. When demand is inelastic, price and total revenue move in the same direction: An increase in price raises total revenue, and a decrease in price reduces total revenue. When demand is elastic, price and total revenue move inversely: An increase in price reduces total revenue, and a decrease in price raises total revenue. A less common possibility is that demand is unit-elastic. In that case, a change in price is exactly offset by a proportional change in quantity demanded, leaving revenue unaffected.

A. Elasticity and Revenue with a Linear Demand Curve

Along most demand curves, elasticity is not constant at every point. When the price is high and the quantity demanded is low, demand is elastic. When the price is low and the quantity demanded is high, demand is inelastic.

B. Estimating Price Elasticity of Demand

To estimate the price elasticity of demand, economists need to know the demand curve for a product. To calculate the price elasticity of demand for new products, firms often rely on market experiments, where firms will try different prices and observe the change in quantity demanded that results.
6.4 Other Demand Elasticities

Learning Objective 4 Define the cross-price elasticity of demand and the income elasticity of demand, and understand their determinants and how they are measured.

In addition to price elasticity, two other demand elasticities are important: the cross-price elasticity of demand and the income elasticity of demand.

A. Cross-Price Elasticity of Demand

The formula for the cross-price elasticity of demand is:

\[
\text{Cross-price elasticity of demand} = \frac{\text{Percentage change in quantity demanded of one good}}{\text{Percentage change in price of another good}}.
\]

The cross price elasticity of demand is the percentage change in the quantity demanded of one good divided by the percentage change in price of another good. The cross-price elasticity of demand will be positive or negative depending on whether the two products are substitutes or complements. An increase in the price of a substitute will lead to an increase in quantity demanded, so the cross-price elasticity of demand will be positive. An increase in the price of a complement will lead to a decrease in the quantity demanded, so the cross-price elasticity of demand will be negative. The cross-price elasticity allows managers to measure whether products sold by other firms are close substitutes for their products.

B. Income Elasticity of Demand

The income elasticity of demand measures the responsiveness of quantity demanded to changes in income. It is calculated as follows:

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

The income elasticity of demand is a measure of the responsiveness of quantity demanded to changes in income, measured by the percentage change in quantity demanded divided by the percentage change in income. If the quantity demanded of a good increases as income increases, then the good is a normal good. Normal goods are often subdivided into luxury goods and necessity goods. The income elasticity of demand for a necessity is positive but less than 1. The income elasticity of demand for a luxury is greater than 1. A good is inferior if the quantity demanded falls as income increases.

6.5 Using Elasticity to Analyze the Disappearing Family Farm

Learning Objective 5 Use price elasticity and income elasticity to analyze economic issues.

From 1950 to 2004 the number of farms decreased from 5 million to 2 million, and the number of people who lived on farms fell from 23 million to fewer than 3 million. Rapid growth in farm production has combined with low price and income elasticities to make family farming difficult in the United States. Productivity has grown very rapidly in U.S. agriculture. In 1950, the average U.S. wheat farmer harvested
about 17 bushels from each acre. By 2006, the average U.S. farmer harvested 42 bushels per acre. This increase in wheat production resulted in a substantial decline in prices because: (1) the demand for wheat is inelastic and (2) the income elasticity of demand for wheat is low.

6.6 The Price Elasticity of Supply and Its Measurement

Learning Objective 6 Define the price elasticity of supply, and understand its main determinants and how it is measured.

To measure how much quantity supplied increases when price increases, we use the price elasticity of supply.

A. Measuring the Price Elasticity of Supply

We calculate the price elasticity of supply using percentage changes:

\[
\frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}
\]

The price elasticity of supply is the responsiveness of the quantity supplied to a change in price, measured by dividing the percentage change in the quantity supplied of a product by the percentage change in the product’s price. Because of the law of supply, price elasticity of supply will be a positive number. If the price elasticity of supply is less than 1, then supply is inelastic. If the price elasticity of supply is greater than 1, then supply is elastic. If the price elasticity of supply is equal to 1, then supply is unit-elastic.

B. Determinants of the Price Elasticity of Supply

The supply curve for most products will be inelastic if we measure it over a short period of time, but increasingly elastic the longer the period of time over which we measure it.

C. Polar Cases of Perfectly Elastic and Perfectly Inelastic Supply

Although it occurs infrequently, it is possible for supply to fall into one of the polar cases of price elasticity. If a supply curve is a vertical line, it is perfectly inelastic. If a supply curve is a horizontal line, it is perfectly elastic.

D. Using Price Elasticity of Supply to Predict Changes in Price

When demand increases, the amount that price increases depends on the price elasticity of supply. When the supply is inelastic, a change in demand results in a larger increase in price than when the supply is elastic.