Elasticities of Demand and Supply

Chapter 5

CHAPTER CHECKLIST

1. **Define, explain the factors that influence, and calculate the price elasticity of demand.**
2. **Define, explain the factors that influence, and calculate the price elasticity of supply.**
3. **Define and explain the factors that influence the cross elasticity of demand and the income elasticity of demand.**

LECTURE TOPICS

- **The Price Elasticity of Demand**
- **The Price Elasticity of Supply**
- **Cross Elasticity and Income Elasticity**

5.1 THE PRICE ELASTICITY OF DEMAND

Price elasticity of demand

A measure of the extent to which the quantity demanded of a good changes when the price of the good changes.

To determine the price elasticity of demand, we compare the percentage change in the quantity demanded with the percentage change in price.

5.1 THE PRICE ELASTICITY OF DEMAND

■ **Percentage Change in Price**

Suppose Starbucks raises the price of a latte from \$3 to \$5 a cup. What is the percentage change in price?

$$\text{Percent change in price} = \left[\frac{\text{New price} - \text{Initial price}}{\text{Initial Price}}\right] \times 100$$

$$\text{Percent change in price} = \left[\frac{\$5 - \$3}{\$3}\right] \times 100 = 66.67 \text{ percent}$$

5.1 THE PRICE ELASTICITY OF DEMAND

Suppose Starbucks cuts the price of a latte from \$5 to \$3 a cup. What is the percentage change in price?

$$\text{Percent change in price} = \left[\frac{\text{New price} - \text{Initial price}}{\text{Initial Price}}\right] \times 100$$

$$\text{Percent change in price} = \left[\frac{\$3 - \$5}{\$5}\right] \times 100 = -40 \text{ percent}$$

5.1 THE PRICE ELASTICITY OF DEMAND

The same price change, \$2, over the same interval, \$3 to \$5, is a different percentage change depending on whether the price rises or falls.

We need a measure of percentage change that does not depend on the direction of the price change.

We use the average of the initial price and the new price to measure the percentage change.

5.1 THE PRICE ELASTICITY OF DEMAND

The Midpoint Method

To calculate the percentage change in the price divide the change in the price by the *average* price and then multiply by 100.

The average price is at the midpoint between the initial price and the new price, hence the name midpoint method.

$$\text{Percent change in price} = \left[\frac{\text{New price} - \text{Initial price}}{(\text{New Price} + \text{Initial Price}) \div 2}\right] \times 100$$

5.1 THE PRICE ELASTICITY OF DEMAND

$$\text{Percent change in price} = \left[\frac{\$3 - \$5}{(\$5 + \$3) \div 2}\right] \times 100 = 50 \text{ percent}$$

The percentage change in price calculated by the midpoint method is the same for a price rise and a price fall.

5.1 THE PRICE ELASTICITY OF DEMAND

■ **Percentage Change in Quantity Demanded**

If Starbucks raises the price of a latte, the quantity of latte demanded decreases.

$$\text{Percent change in quantity} = \left[\frac{\text{New quantity} - \text{Initial quantity}}{(\text{New quantity} + \text{Initial quantity}) \div 2}\right] \times 100$$

$$\text{Percent change in quantity} = \left[\frac{5 - 15}{(5 + 15) \div 2}\right] \times 100 = -100 \text{ Percent}$$

5.1 THE PRICE ELASTICITY OF DEMAND

Minus Sign

When the price rises, the quantity demanded decreases along the demand curve. Price and quantity always change in opposite directions.

So to compare the percentage change in the price and the percentage change in the quantity demanded, we ignore the minus sign and use the absolute values.

5.1 THE PRICE ELASTICITY OF DEMAND

■ **Elastic and Inelastic Demand**

Elastic demand

Demand is elastic if the percentage change in the quantity demanded exceeds the percentage change in price.

Unit elastic demand

If the percentage change in the quantity demanded equals the percentage change in price.

5.1 THE PRICE ELASTICITY OF DEMAND

Inelastic demand

If the percentage change in the quantity demanded is less than the percentage change in price.

Perfectly elastic demand

When the quantity demanded changes by a very large percentage in response to an almost zero percentage change in price.

Perfectly inelastic demand

When the quantity demanded remains constant as the price changes.

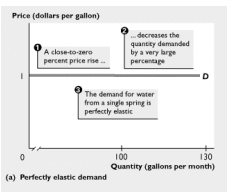
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.1(a) shows a perfectly elastic demand.

1. For a small change in the price of spring water,

2. The quantity demanded of spring water changes by a large amount.

3. The demand for spring water is perfectly elastic.



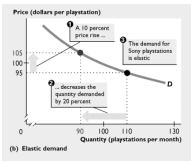
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.1(b) shows an elastic demand.

1. When the price of a Sony Playstation rises by 10%,

2. The quantity demanded decreases by 20%.

3. Demand for Sony Playstations is elastic.



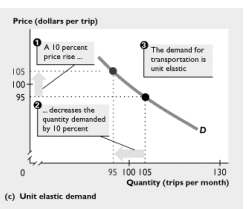
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.1(c) shows a unit elastic demand.

1. When the price of a trip rises by 10%,

2. The quantity demand of decreases by 10%.

3. The demand for trips is unit elastic.



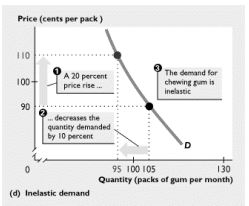
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.1(d) shows an inelastic demand.

1. When the price of gum rises by 20%,

2. The quantity demanded decreases by 10%.

3. The demand for gum is inelastic.



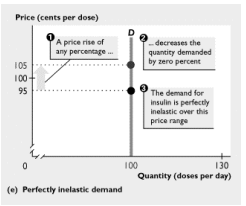
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.1(e) shows a perfectly inelastic demand.

1. When the price rises,

2. The quantity demanded does not decrease.

3. Demand is perfectly inelastic.



5.1 THE PRICE ELASTICITY OF DEMAND

■ Influences on the Price Elasticity of Demand

Influences on the price elasticity of demand fall into:

- Substitution effects
- Income effects

Substitution Effects

The demand for a good is elastic if a substitute for it is easy to find.

The demand for a good is inelastic if a substitute for it is hard to find.

5.1 THE PRICE ELASTICITY OF DEMAND

Three main factors influence the ability to find a substitute for a good:

Luxury Versus Necessity

- A necessity has poor substitutes, so the demand for a necessity is inelastic. Food is a *necessity*.
- A luxury has many substitutes, so the demand for a luxury is elastic. Exotic vacations *luxuries.*

Narrowness of Definition

- The demand for a narrowly defined good is elastic.
- The demand for a broadly defined good is inelastic.

5.1 THE PRICE ELASTICITY OF DEMAND

Time Elapsed Since Price Changed

The longer the time elapsed since the price change, the more elastic is the demand for the good.

Income Effects

The greater the proportion of income spent on a good, the more elastic is the demand for the good.

5.1 THE PRICE ELASTICITY OF DEMAND

■ **Computing the Price Elasticity of Demand**

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in quantity price}}$$

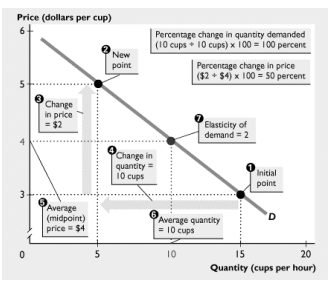
- If the price elasticity of demand is greater than 1, demand is elastic.
- If the price elasticity of demand equals 1, demand is unit elastic.
- If the price elasticity of demand is less than 1, demand is inelastic.

5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.2 shows the price elasticity of demand calculation.

By using the formula, the price elasticity of demand equals 100% divided by 50%.

The price elasticity of demand is 2.



5.1 THE PRICE ELASTICITY OF DEMAND

■ **Computing the Price Elasticity of Demand**

$$\text{Price elasticity of demand} = \frac{\text{~~Percentage change in quantity demanded~~}}{\text{Percentage change in quantity price}}$$

We can use this formula to calculate the price elasticity of demand for a Starbucks latte:

$$\text{Price elasticity of demand} = \frac{\text{~~100%~~}}{50\%} = 2$$

5.1 THE PRICE ELASTICITY OF DEMAND

Slope and Elasticity

Slope and elasticity are *not* the same thing!

Slope measures how the quantity demanded changes when the price changes.

Slope depends on the units of measurement of price and quantity. For example, the slope of the demand curve for latte has the units dollars per cup.

Slope cannot be used to compare the demands for different goods.

5.1 THE PRICE ELASTICITY OF DEMAND

A Units-Free Measure

Elasticity is independent of the units used to measure price and quantity.

Elasticity of demand is the ratio of two percentages and so elasticity is a number with no units. For example, the elasticity of demand for latte is 2.

Elasticity allows us to compare the demands for different goods. For example, we can compare the demands for latte and baseball tickets.

5.1 THE PRICE ELASTICITY OF DEMAND

Elasticity Along a Linear Demand Curve

Along a linear (straight-line) demand curve, the slope is constant but the elasticity varies.

Along a linear demand curve, demand is:

- Unit elastic *at* the midpoint of the curve.
- Elastic *above* the midpoint of the curve.
- Inelastic *below* the midpoint of the curve.

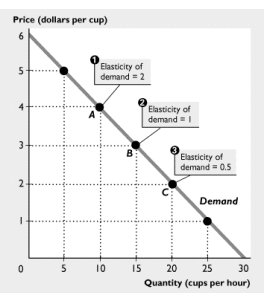
5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.3 shows that the elasticity decreases along a linear demand curve as the price falls.

1. At any price above the midpoint, demand is elastic.

2. At the midpoint, demand is unit elastic.

3. At any price below the midpoint, demand is inelastic.



5.1 THE PRICE ELASTICITY OF DEMAND

■ Total Revenue and Price Elasticity of Demand

Total revenue

The amount spent on a good and received by its sellers and equals the price of the good multiplied by the quantity of the good sold.

Total revenue test

A method of estimating the price elasticity of demand by observing the change in total revenue that results from a price change.

5.1 THE PRICE ELASTICITY OF DEMAND

If demand is elastic:

- A given percentage rise in price brings a *larger* percentage decrease in the quantity demanded.
- And total revenue *decreases*.

If demand is inelastic:

- A given percentage rise in price brings a *smaller* percentage decrease in the quantity demanded.
- And total revenue *increases*.

5.1 THE PRICE ELASTICITY OF DEMAND

Total revenue test:

- If price and total revenue change in the *opposite* directions, demand is *elastic*.
- If a price change leaves total revenue *unchanged*, demand is *unit elastic*.
- If price and total revenue change in the *same* direction, demand is *elastic*.

5.1 THE PRICE ELASTICITY OF DEMAND

■ *Your* Expenditure and *Your* Elasticity of Demand

When the price of a good rises, your demand for that good is:

- Elastic if your expenditure on it decreases.
- Unit elastic if your expenditure on it remains constant.
- Inelastic if your expenditure on it increases.

5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.4(a) shows total revenue and elastic demand.

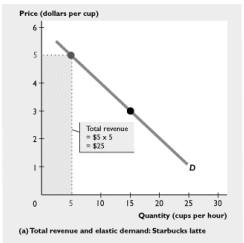
At $3 a cup, the quantity demanded is 15 cups an hour.

Total revenue is $45 an hour.

When the price rises to $5 a cup, the quantity demanded decreases to 5 cups an hour.

Total revenue decreases to $25 an hour.

Demand is elastic.



(a) Total revenue and elastic demand: Starbucks latte

5.1 THE PRICE ELASTICITY OF DEMAND

Figure 5.4(b) shows total revenue and elastic demand.

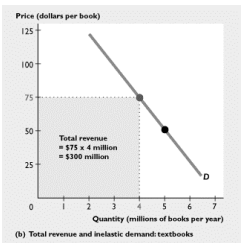
At $50 a book, the quantity demanded is 5 million books.

Total revenue is $250 million.

When the price rises to $75 a book, the quantity demanded decreases to 4 million books.

Total revenue increases to $300 million.

Demand is inelastic.



(b) Total revenue and inelastic demand: textbooks

5.1 THE PRICE ELASTICITY OF DEMAND

■ **Applications of Price Elasticity of Demand**

Farm Prices and Total Revenue

Price elasticity of demand for agricultural products is 0.4.

So a 1 percent decrease in the quantity harvested will lead to a 2.5 percent rise in the price.

Demand is inelastic and farmers' total revenue will increase.

5.1 THE PRICE ELASTICITY OF DEMAND

Addiction and Elasticity

Nonusers' demand for addictive substances is *elastic*.

So a moderately higher price leads to a substantially smaller number of people trying a drug.

Existing users' demand for addictive substances is *inelastic*.

So even a substantial price rise brings only a modest decrease in the quantity demanded.

5.1 THE PRICE ELASTICITY OF DEMAND

High taxes on cigarettes and alcohol limit the number of young people who become habitual users of these products.

High taxes have only a modest effect on the quantities consumed by established users.

5.2 THE PRICE ELASTICITY OF SUPPLY

Price elasticity of supply

A measure of the extent to which the quantity supplied of a good changes when the price of the good changes.

To determine the price elasticity of supply, we compare the percentage change in the quantity supplied with the percentage change in price.

5.2 THE PRICE ELASTICITY OF SUPPLY

- **Elastic and Inelastic Supply**

Perfectly elastic supply

An almost zero percentage change in price brings a very large percentage change in the quantity supplied.

Elastic supply

The percentage change in the quantity supplied exceeds the percentage change in price.

5.2 THE PRICE ELASTICITY OF SUPPLY

Unit elastic supply

The percentage change in the quantity supplied equals the percentage change in price.

Inelastic supply

The percentage change in the quantity supplied is less than the percentage change in price.

Perfectly inelastic supply

The percentage change in the quantity supplied is zero when the price changes.

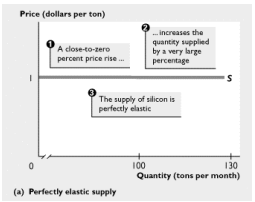
5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.5(a) shows perfectly elastic supply.

1. A small rise in the the price,

2. Decreases the quantity supplied by a very large amount,

3. Supply is perfectly elastic.



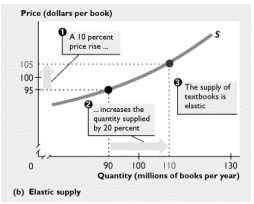
5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.5 (b) shows an elastic supply.

1. A 10% rise in the price of a book,

2. Increases the quantity supplied by 20%.

3. The supply of books is elastic.



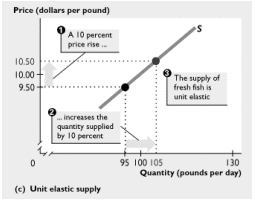
5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.5(c) shows a unit elastic supply.

1. A 10 % rise in the price of fish,

2. Increases the quantity supplied of fish by 10%.

3. The supply of fish is unit elastic.



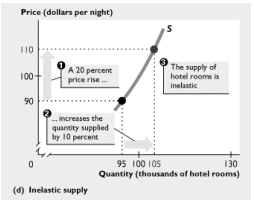
5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.5(d) shows an inelastic supply.

1. A 20% rise in the price of a hotel room,

2. Increases the quantity supplied of hotel rooms by 10%.

3. The supply of hotel rooms is inelastic.



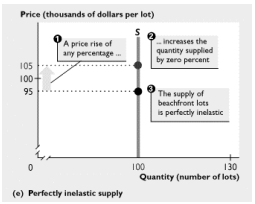
5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.5(e) shows a perfectly inelastic supply.

1. A small rise in the price of a beachfront lot,

2. Increases the quantity supplied by 0%.

3. The supply of beachfront lots is perfectly inelastic.



5.2 THE PRICE ELASTICITY OF SUPPLY

■ Influences on the Price Elasticity of Supply

The two main influences are:

- Production possibilities
- Storage possibilities

Production Possibilities

Goods that can be produced at a constant (or very gently rising) opportunity cost have an elastic supply.

Goods that can be produced in only a fixed quantity have a perfectly inelastic supply.

5.2 THE PRICE ELASTICITY OF SUPPLY

Time Elapsed Since Price Change

As time passes after a price change, producers find it easier to change their production plans, so supply becomes more elastic.

Storage Possibilities

The supply of a storable good is highly elastic.

The cost of storage is the main influence on the elasticity of supply of a storable good.

5.2 THE PRICE ELASTICITY OF SUPPLY

■ Computing the Price Elasticity of Supply

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in quantity price}}$$

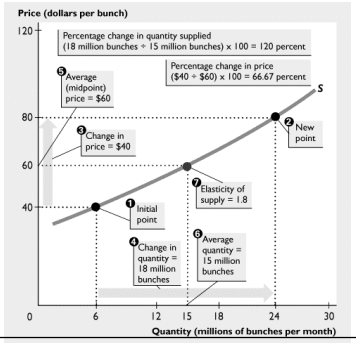
- If the price elasticity of supply is greater than 1, supply is elastic.
- If the price elasticity of supply equals 1, supply is unit elastic.
- If the price elasticity of supply is less than 1, supply is inelastic.

5.2 THE PRICE ELASTICITY OF SUPPLY

Figure 5.6 shows how to calculate the price elasticity of supply.

By using the formula, the price elasticity of supply equals 120% divided by 66.67%.

The price elasticity of supply is 1.8.



5.3 CROSS ELASTICITY AND INCOME ELASTICITY

Cross Elasticity of Demand

Cross elasticity of demand

A measure of the extent to which the demand for a good changes when the price of a substitute or complement changes, other things remaining the same

$$\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded of a good}}{\text{Percentage change in the price of one of its substitutes or complements}}$$

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

Suppose that when the price of a burger falls by 10 percent, the quantity of pizza demanded decreases by 5 percent.

$$\text{Cross elasticity of demand} = \frac{-5 \text{ percent}}{-10 \text{ percent}} = 0.5$$

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

The cross elasticity of demand for a substitute is positive.

- A *fall* in the price of a substitute brings a *decrease* in the quantity demanded of the good.
- The quantity demanded of a good and the price of its substitute change in the *same* direction.

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

The cross elasticity of demand for a complement is negative.

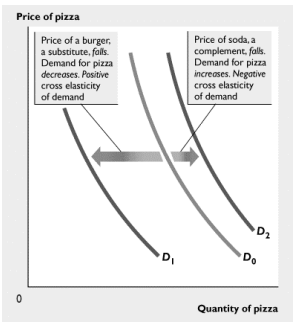
- A *fall* in the price of a complement brings an *increase* in the quantity demanded of the good.
- The quantity demanded of a good and the price of one of its complements change in *opposite* directions.

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

Figure 5.7 shows cross elasticity of demand.

Pizzas and burgers are substitutes. Cross elasticity is positive.

Pizzas and soda are complements. Cross elasticity is negative.



5.3 CROSS ELASTICITY AND INCOME ELASTICITY

■ **Income Elasticity of Demand**

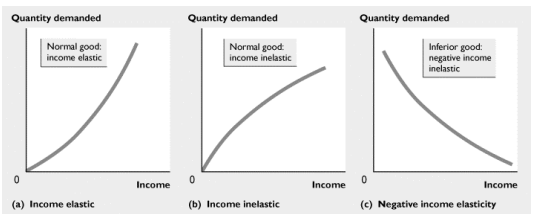
Income elasticity of demand

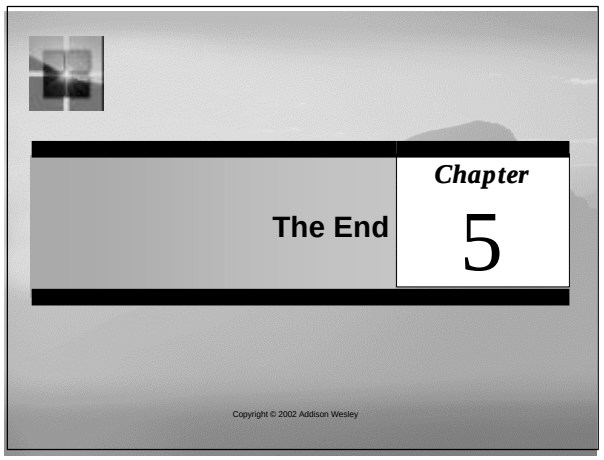
A measure of the extent to which the demand for a good changes when income changes, other things remaining the same

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

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

Figure 5.8 shows the ranges of income elasticity of demand.




Chapter
The End
5
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