Economics for Managers
Ch#04 The Market forces of Supply and Demand

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BY THE END OF THIS CHAPTER, STUDENTS SHOULD UNDERSTAND:

- the meaning of the elasticity of demand.
- what determines the elasticity of demand.
- the meaning of the elasticity of supply.
- what determines the elasticity of supply.
- the concept of elasticity in three very different markets (the market for wheat, the market for oil, and the market for illegal drugs).

CONTEXT AND PURPOSE:

Chapter 5 is the second chapter of a three-chapter sequence that deals with supply and demand and how markets work. Chapter 4 introduced supply and demand. Chapter 5 shows how much buyers and sellers respond to changes in market conditions. Chapter 6 will address the impact of government policies on competitive markets.

The purpose of Chapter 5 is to add precision to the supply-and-demand model. We introduce the concept of elasticity, which measures the responsiveness of buyers and sellers to changes in economic variables such as prices and income. The concept of elasticity allows us to make quantitative observations about the impact of changes in supply and demand on equilibrium prices and quantities.

KEY POINTS:

1. The price elasticity of demand measures how much the quantity demanded responds to changes in the price. Demand tends to be more elastic if close substitutes are available, if the good is a luxury rather than a necessity, if the market is narrowly defined, or if buyers have substantial time to react to a price change.
2. The price elasticity of demand is calculated as the percentage change in quantity demanded divided by the percentage change in price. If the elasticity is less than one, so that quantity demanded moves proportionately less than the price, demand is said to be inelastic. If the elasticity is greater than one, so that quantity demanded moves proportionately more than the price, demand is said to be elastic.
3. Total revenue, the total amount paid for a good, equals the price of the good times the quantity sold. For inelastic demand curves, total revenue rises as price rises. For elastic demand curves, total revenue falls as price rises.
4. The income elasticity of demand measures how much the quantity demanded responds to changes in consumers' income. The cross-price elasticity of demand measures how much the quantity demanded of one good responds to the price of another good.
5. The price elasticity of supply measures how much the quantity supplied responds to changes in the price. This elasticity often depends on the time horizon under consideration. In most markets, supply is more elastic in the long run than in the short run.
6. The price elasticity of supply is calculated as the percentage change in quantity supplied divided by the percentage change in price. If the elasticity is less than one, so that quantity supplied moves proportionately less than the price, supply is said to be inelastic. If the elasticity is greater than one, so that quantity supplied moves proportionately more than the price, supply is said to be elastic.
7. The tools of supply and demand can be applied in many different kinds of markets. This chapter uses them to analyze the market for wheat, the market for oil, and the market for illegal drugs.

I. THE ELASTICITY OF DEMAND

A. Definition of **elasticity: a measure of the responsiveness of quantity demanded or quantity supplied to one of its determinants**.

B. The Price Elasticity of Demand and Its Determinants

1. Definition of **price elasticity of demand: a measure of how much the quantity demanded of a good responds to a change in the price of that good, computed as the percentage change in quantity demanded divided by the percentage change in price**.

2. Determinants of Price Elasticity of Demand
   a. Availability of Close Substitutes: the more substitutes a good has, the more elastic its demand.
   b. Necessities versus Luxuries: necessities are more price inelastic.
   c. Definition of the market: narrowly defined markets (ice cream) have more elastic demand than broadly defined markets (food).
   d. Time Horizon: goods tend to have more elastic demand over longer time horizons.

C. Computing the Price Elasticity of Demand

1. Formula

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

2. Example: the price of ice cream rises by 10% and quantity demanded falls by 20%.

   Price elasticity of demand = (20%)/(10%) = 2

3. Because there is an inverse relationship between price and quantity demanded (the price of ice cream rose by 10% and the quantity demanded fell by 20%), the price elasticity of demand is sometimes reported as a negative number. We will ignore the minus sign and concentrate on the absolute value of the elasticity.

D. The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

1. Because we use percentage changes in calculating the price elasticity of demand, the elasticity calculated by going from one point to another on a demand curve will be different from an elasticity calculated by going from the second point to the first. This difference arises because the percentage changes are calculated using a different base.
   a. A way around this problem is to use the midpoint method.
   b. Using the midpoint method involves calculating the percentage change in either price or quantity demanded by dividing the change in the variable by the midpoint between the initial and final levels rather than by the initial level itself.
   c. Example: the price rises from 4 to 6 and quantity demanded falls from 120 to 80.

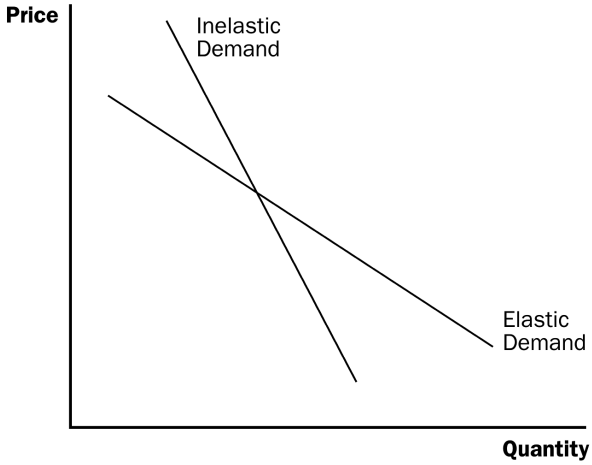
   % change in price = (6 - 4)/5 × 100% = 40%

   % change in quantity demanded = (120-80)/100 = 40%

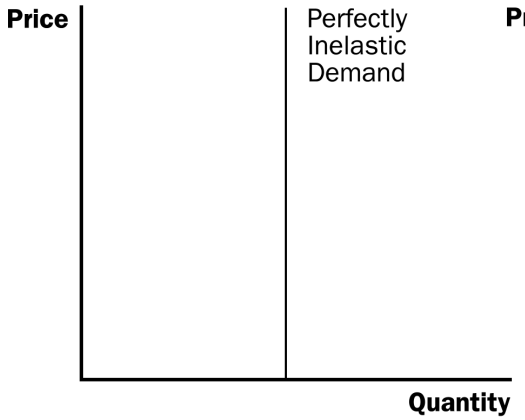
   price elasticity of demand = 40/40 = 1

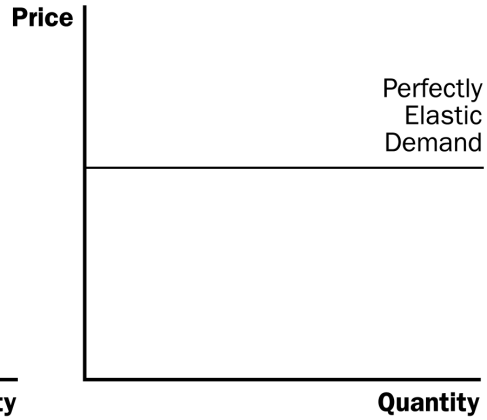
$$\text{Price elasticity of demand} = \frac{(Q_2 - Q_1)/[(Q_1 + Q_2)/2]}{(P_2 - P_1)/[(P_1 + P_2)/2]}$$

E. The Variety of Demand Curves



1. Classification of Elasticity
   a. When the price elasticity of demand is greater than one, demand is elastic.
   b. When the price elasticity of demand is less than one, the demand is inelastic.
   c. When the price elasticity of demand is equal to one, the demand has unit elasticity.
2. In general, the flatter the demand curve that passes through a given point, the more elastic the demand.
3. Extreme Cases
   a. When the price elasticity of demand is equal to zero, the demand is perfectly inelastic and is a vertical line.
   b. When the price elasticity of demand is infinite, the demand is perfectly elastic and is a horizontal line.





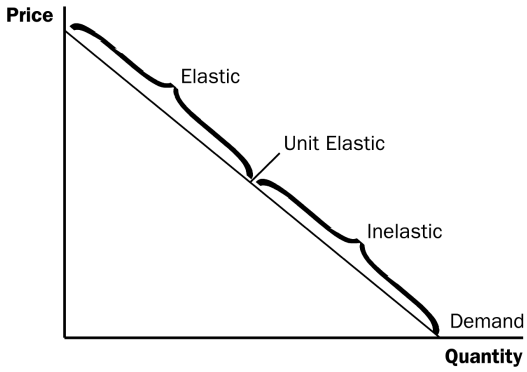
F. Elasticity and Total Revenue along a Linear Demand Curve

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

   a. At points with a low price and a high quantity demanded, demand is inelastic.

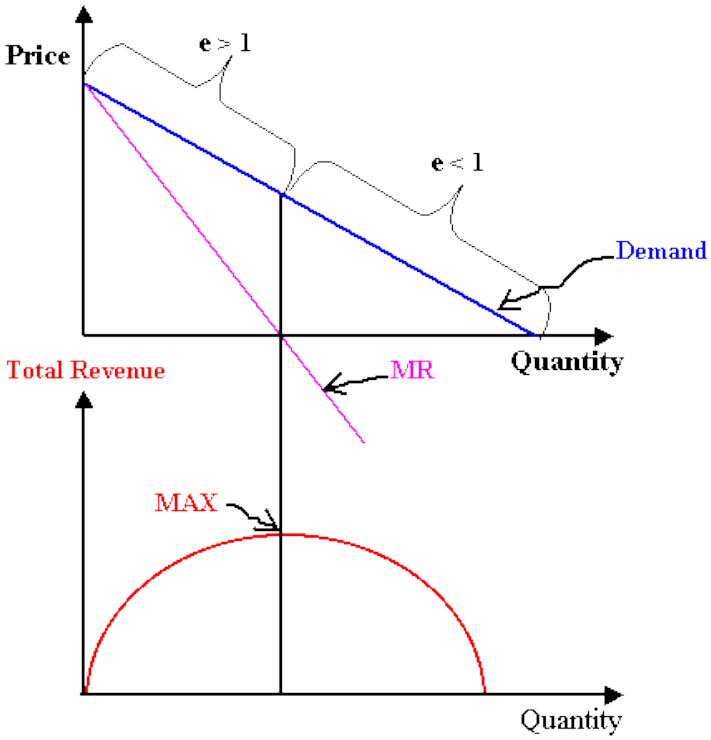
b. At points with a high price and a low quantity demanded, demand is elastic.

2. Total revenue also varies at each point along the demand curve.



G. Total Revenue and the Price Elasticity of Demand

1. Definition of **<u>total revenue</u>: the amount paid by buyers and received by sellers of a good, computed as the price of the good times the quantity sold**.



2. If demand is inelastic, the percentage change in price will be greater than the percentage change in quantity demanded.

a. If price rises, quantity demanded falls, and total revenue will rise (because the increase in price will be larger than the decrease in quantity demanded).

b. If price falls, quantity demanded rises, and total revenue will fall (because the fall in price will be larger than the increase in quantity demanded).

3. If demand is elastic, the percentage change in quantity demanded will be greater than the percentage change in price.
   a. If price rises, quantity demanded falls, and total revenue will fall (because the increase in price will be smaller than the decrease in quantity demanded).
   b. If price falls, quantity demanded rises, and total revenue will rise (because the fall in price will be smaller than the increase in quantity demanded).

3. If demand is unit elastic, the percentage change in price will be equal to the percentage change in quantity demanded.
   a. If price rises, quantity demanded falls, and total revenue will remain the same (because the increase in price will be equal to the decrease in quantity demanded).
   b. If price falls, quantity demanded rises, and total revenue will remain the same (because the fall in price will be equal to the increase in quantity demanded).

H. Other Demand Elasticities

1. Definition of **income elasticity of demand: a measure of how much the quantity demanded of a good responds to a change in consumers' income, computed as the percentage change in quantity demanded divided by the percentage change in income.**
   a. Formula

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

   b. Normal goods have positive income elasticities, while inferior goods have negative income elasticities.
   c. Necessities tend to have small income elasticities, while luxuries tend to have large income elasticities.

2. Definition of **cross-price elasticity of demand: a measure of how much the quantity demanded of one good responds to a change in the price of another good, computed as the percentage change in the quantity demanded of the first good divided by the percentage change in the price of the second good**.
   a. Formula

$$\text{Cross-price elasticity of demand} = \frac{\%\text{ change in quantity demanded of good 1}}{\%\text{ change in price of good 2}}$$

   b. Substitutes have positive cross-price elasticities, while complements have negative cross-price elasticities.

II. THE ELASTICITY OF SUPPLY

A. The Price Elasticity of Supply and Its Determinants

1. Definition of **price elasticity of supply: a measure of how much the quantity supplied of a good responds to a change in the price of that good, computed as**

the percentage change in quantity supplied divided by the percentage change in price.

2. Determinants of the Price Elasticity of Supply
   a. Flexibility of sellers: goods that are somewhat fixed in supply (beachfront property) have inelastic supplies.
   b. Time horizon: supply is usually more inelastic in the short run than in the long run.

B. Computing the Price Elasticity of Supply

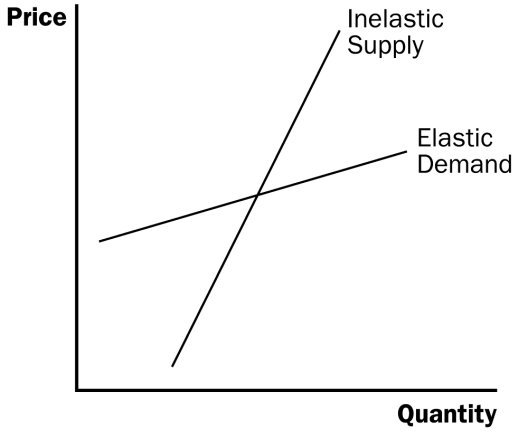
1. Formula

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

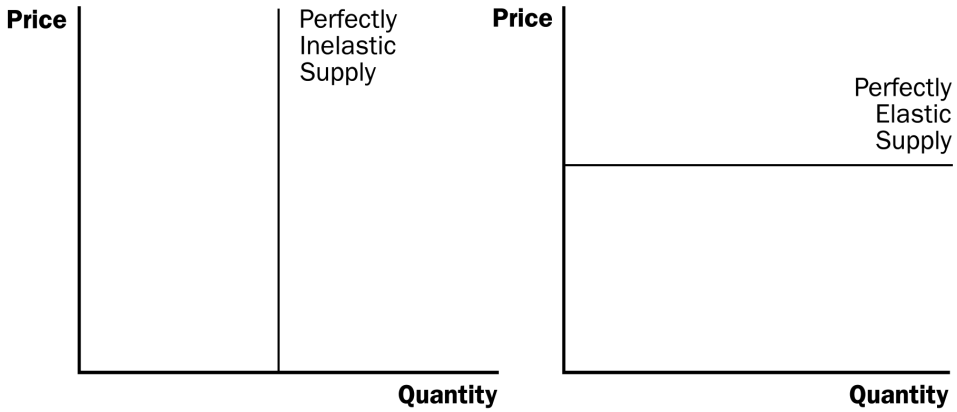
2. Example: the price of milk increases from 2.85 per gallon to 3.15 per gallon and the quantity supplied rises from 9,000 to 11,000 gallons per month.

% change in price = (3.15 – 2.85)/3.00 × 100% = 10%
% change in quantity supplied = (11,000 - 9,000)/10,000 × 100% = 20%
Price elasticity of supply = (20%)/(10%) = 2

C. The Variety of Supply Curves



1. In general, the flatter the supply curve that passes through a given point, the more elastic the supply.
2. Extreme Cases

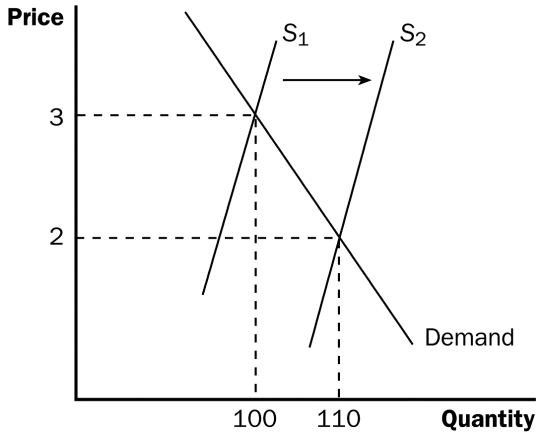


   a. When the elasticity is equal to zero, the supply is perfectly inelastic and is a vertical line.
   b. When the elasticity is infinite, the supply is perfectly elastic and is a horizontal line.

3. Because firms often have a maximum capacity for production, the elasticity of supply may be very high at low levels of quantity supplied and very low at high levels of quantity supplied.

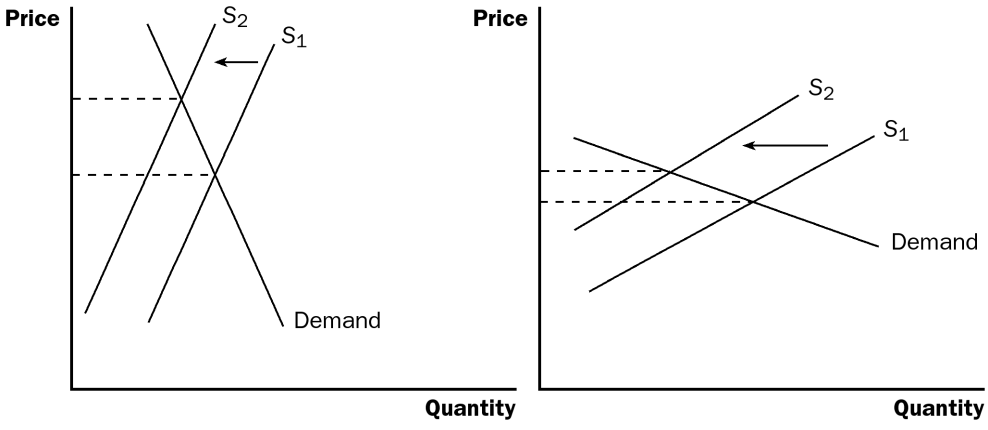
III. THREE APPLICATIONS OF SUPPLY, DEMAND, AND ELASTICITY

A. Can Good News for Farming Be Bad News for Farmers?



1. A new hybrid of wheat is developed that is more productive than those used in the past. What happens?
2. Supply increases, price falls, and quantity demanded rises.
3. If demand is inelastic, the fall in price is greater than the increase in quantity demanded and total revenue falls.
4. If demand is elastic, the fall in price is smaller than the rise in quantity demanded and total revenue rises.
5. In practice, the demand for basic foodstuffs (like wheat) is usually inelastic which means less revenue for farmers..

B. Why Did OPEC Fail to Keep the Price of Oil High?

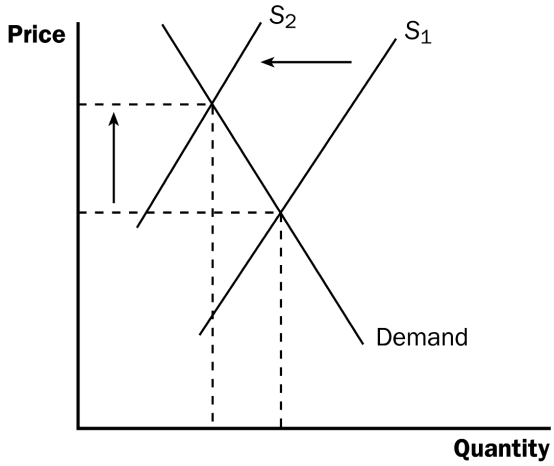


Short Run **Long Run**

1. In the 1970s and 1980s, OPEC reduced the amount of oil it was willing to supply to world markets. The decrease in supply led to an increase in the price of oil and a decrease in quantity demanded. The increase in price was much larger in the short run than the long run. Why?
2. The demand and supply of oil are much more inelastic in the short run than the long run. The demand is more elastic in the long run because consumers can adjust to the higher price of oil by carpooling or buying a vehicle that gets better mileage. The supply is more elastic in the long run because non-OPEC producers will respond to the higher price of oil by producing more.

C. **Does Drug prohibition Increase or Decrease Drug-Related Crime?**

1. The government increases the number of agents devoted to the war on drugs. What happens?
   a. The supply of drugs decreases, which raises the price and leads to a reduction in quantity demanded. If demand is inelastic, total expenditure on drugs (equal to total revenue) will increase. If demand is elastic, total expenditure will fall.
   b. Thus, because the demand for drugs is likely to be inelastic, drug-related crime may rise.



2. What happens if the government instead pursued a policy of drug education?
   a. The demand for drugs decreases, which lowers price and quantity supplied. Total expenditure must fall (because both price and quantity fall).
   b. Thus, drug education should not increase drug-related crime.