

ECON2103 Microeconomics

Chapter 2 The Basics of Supply and Demand

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Outline

- 1 Supply and Demand
- 2 The Market Mechanism
- 3 Changes in Market Equilibrium
- 4 Elasticities of Supply and Demand
- 5 Short-Run versus Long-Run Elasticities
- 6 Quantitative Approach of Supply-Demand Analysis
- 7 Effects of Government Intervention
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Supply and Demand

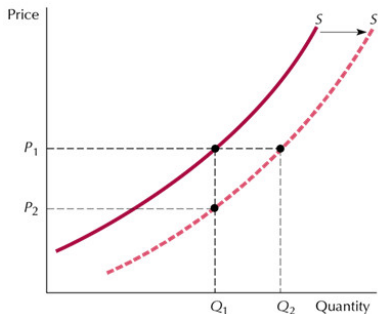
Supply-demand analysis is a fundamental and powerful tool that can be applied to a wide variety of interesting and important problems. To name a few:

- Understanding and predicting how changing world economic conditions affect market price and production
- Evaluating the impact of government price controls, minimum wages, price supports, and production incentives
- Determining how taxes, subsidies, tariffs, and import quotas affect consumers and producers

Supply Curve

supply curve - Relationship between the quantity of a good that producers are willing to sell and the price of the good.

$$Q_S = Q_S(P)$$



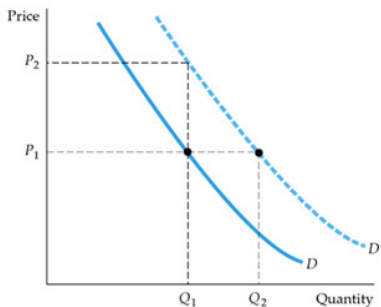
Supply Curve

- The quantity that producers are willing to sell depends not only on the price they receive but also on their production costs, including wages, interest charges, and the costs of raw materials.
 - If production costs fall, firms can produce the same quantity at a lower price or a larger quantity at the same price. The supply curve then shifts to the right (from S to S').
- Economists often use the phrase *change in supply* to refer to shifts in the supply curve, while reserving the phrase *change in the quantity supplied* to apply to movements along the supply curve.

Demand Curve

demand curve - Relationship between the quantity of a good that consumers are willing to buy and the price of the good.

$$Q_D = Q_D(P)$$



Demand Curve

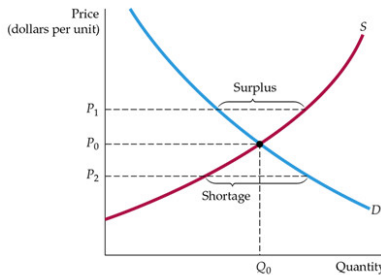
- The quantity demanded may also depend on other variables, such as income, the weather, and the prices of other goods.
 - For most products, the quantity demanded increases when income rises. A higher income level shifts the demand curve to the right (from D to D').
- We will use the phrase *change in demand* to refer to shifts in the demand curve, and reserve the phrase *change in the quantity demanded* to apply to movements along the demand curve.

Substitute and Complementary Goods

- **Substitutes** - Two goods for which an increase in the price of one leads to an increase in the quantity demanded of the other.
- **Complements** - Two goods for which an increase in the price of one leads to a decrease in the quantity demanded of the other.
- **Question:** A/An _____ (increase/decrease) in the price of a substitute good or a/an _____ (increase/decrease) in the price of a complementary good can also result in a shift to the right of the demand curve.

Equilibrium

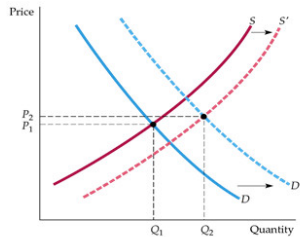
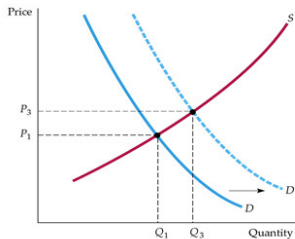
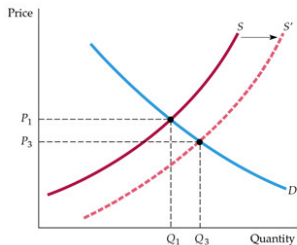
- **equilibrium (or market clearing) price** - Price that equates the quantity supplied to the quantity demanded.
- **market mechanism** - Tendency in a free market for price to change until the market clears.
- **surplus** - Situation in which the quantity supplied exceeds the quantity demanded.
- **shortage** - Situation in which the quantity demanded exceeds the quantity supplied.



When Can We Use the Supply-Demand Model?

- We are assuming that at any given price, a given quantity will be produced and sold.
- The assumption makes sense only if the market is at least roughly *competitive* - both sellers and buyers should have little *market power*, i.e., little ability *individually* to affect the market price.

New Equilibria

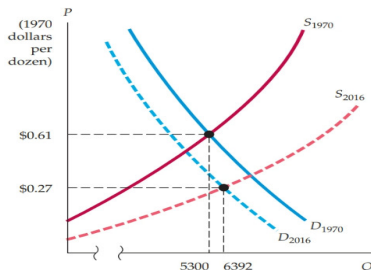


Example: Eggs and College Education

From 1970 to 2016, the real price of eggs fell by 55% percent, while the real price of a college education rose by 82%.

Market for Eggs

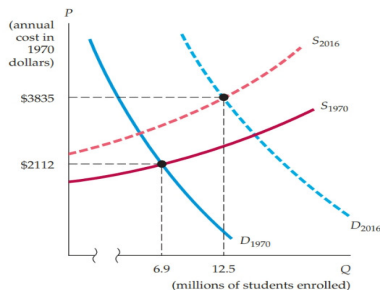
- The supply curve for eggs shifted downward as production costs fell; the demand curve shifted to the left as consumers preferences changed.
- As a result, the real price of eggs fell sharply and egg consumption rose.



Example: Eggs and College Education (Con't)

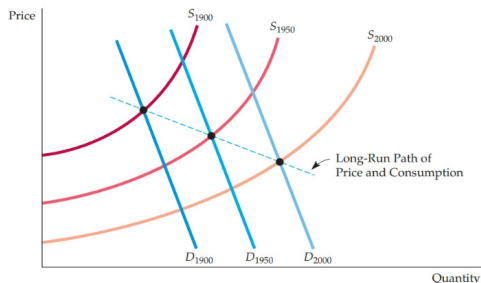
Market for College Education

- The supply curve for a college education shifted up as the costs of equipment, maintenance, and staffing rose.
- The demand curve shifted to the right as a growing number of high school graduates desired a college education.
- As a result, both price and enrollments rose sharply.



Example: Natural Resource Prices

Although demand for most resources has increased dramatically over the past century, prices have fallen or risen only slightly in real terms because cost reductions have shifted the supply curve to the right just as dramatically.



Price Elasticity of Demand

- **elasticity** - Percentage change in one variable resulting from a 1-percent increase in another.
- **price elasticity of demand** - Percentage change in quantity demanded of a good resulting from a 1-percent increase in its price.

$$E_p = (\% \Delta Q) / (\% \Delta P)$$

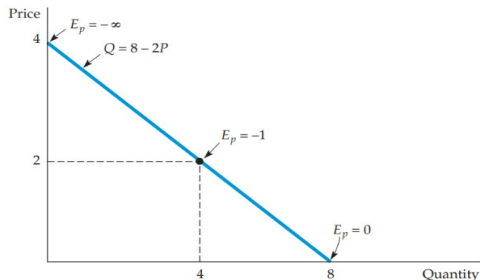
$$E_p = \frac{\Delta Q / Q}{\Delta P / P} = \frac{P \Delta Q}{Q \Delta P}$$

- In terms of infinitesimal changes, $E_p = (P/Q)(dQ/dP)$.
- Demand is *price elastic* (*price inelastic*) if $E_p > 1$ ($E_p < 1$) in magnitude.

Linear Demand Curve

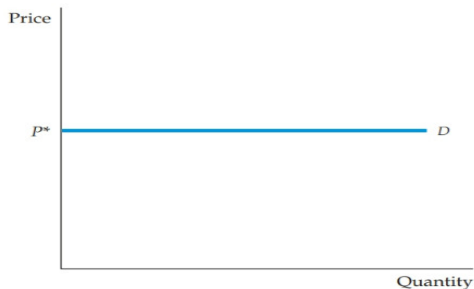
Linear demand curve is a straight line.

$$Q = a - bP$$



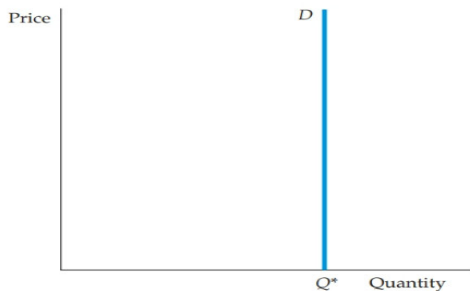
- Slope is constant.
- The elasticity varies along the curve.

Infinitely Elastic Demand



infinitely elastic demand - Principle that consumers will buy as much of a good as they can get at a single price, but for any higher price the quantity demanded drops to zero, while for any lower price the quantity demanded increases without limit.

Completely Inelastic Demand



completely inelastic demand - Principle that consumers will buy a fixed quantity of a good regardless of its price.

Other Demand Elasticities

- **income elasticity of demand** - Percentage change in the quantity demanded resulting from a 1-percent increase in income.

$$E_I = \frac{\Delta Q/Q}{\Delta I/I} = \frac{I}{Q} \frac{\Delta Q}{\Delta I}$$

- **cross-price elasticity of demand** - Percentage change in the quantity demanded of one good resulting from a 1-percent increase in the price of another.

$$E_{Q_b P_m} = \frac{\Delta Q_b/Q_b}{\Delta P_m/P_m} = \frac{P_m}{Q_b} \frac{\Delta Q_b}{\Delta P_m}$$

- What is the sign of $E_{Q_b P_m}$ for substitutes? For complements?

Price Elasticity of Supply

- **price elasticity of supply** - Percentage change in quantity supplied resulting from a 1-percent increase in price.
- We can also refer to elasticities of supply with respect to such variables as interest rates, wage rates, and the prices of raw materials and other intermediate goods

Point versus Arc Elasticities

- **point elasticity of demand** - Price elasticity at a particular point on the demand curve.
- **arc elasticity of demand** - Price elasticity calculated over a range of prices.

$$E_p = (\Delta Q / \Delta P)(\bar{P} / \bar{Q})$$

Example: The Market for Wheat

Suppose the supply and demand curves for wheat are:

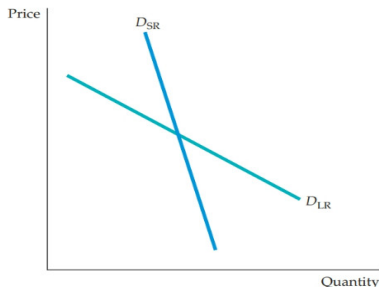
$$\text{Supply: } Q_S = 1800 + 240P$$

$$\text{Demand: } Q_D = 3550 - 266P$$

- Find the market-clearing price and quantity.
- Find the price elasticity of demand and price elasticity of supply at the market-clearing point.
- Suppose that a drought pushed the price up to \$4.00 per bushel. What is the elasticity of demand in this case?

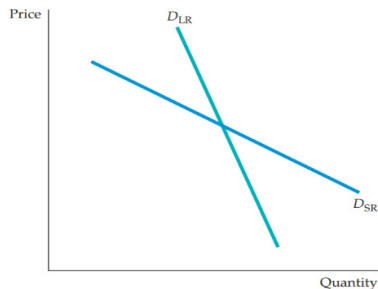
Demand: Gasoline

- In the short run, an increase in price has only a small effect on the quantity of gasoline demanded.
- In the longer run, smaller and more fuel-efficient cars will be needed. Thus, the effect of the price increase will be larger.



Demand and Durability: Automobiles

- In the short run, consumers will defer buying new cars if price increases.
- In the longer run, old cars wear out and must be replaced, thus annual quantity demanded picks up.

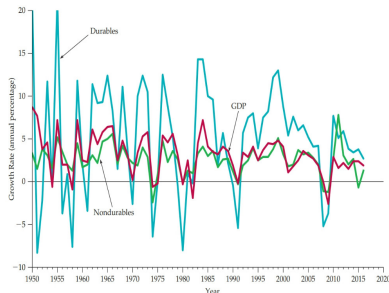
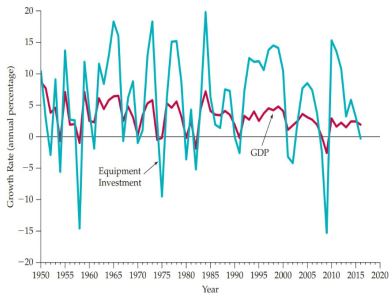


Income Elasticities

- For most goods and services - foods, beverages, fuel, entertainment, and so on - the income elasticity of demand is larger in the long run than in the short run.
 - For example, gasoline or electricity.
- For a durable good, the short-run income elasticity of demand will be much larger than the long-run elasticity.
 - For example, automobiles.

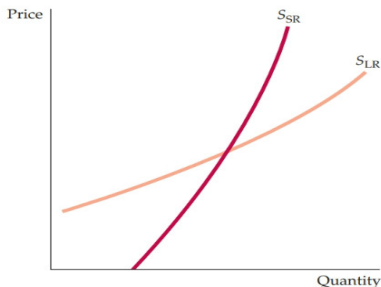
Cyclical Industries

cyclical industries - Industries in which sales tend to magnify cyclical changes in gross domestic product (GDP) and national income.



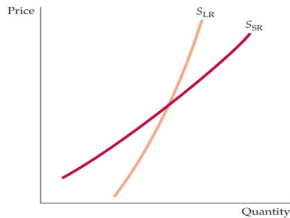
Supply

- For most products, long-run supply is much more price elastic than short-run supply.
- If price increases, firms would like to produce more but are limited by capacity constraints in the short run.
- In the longer run, they can add to capacity and produce more.



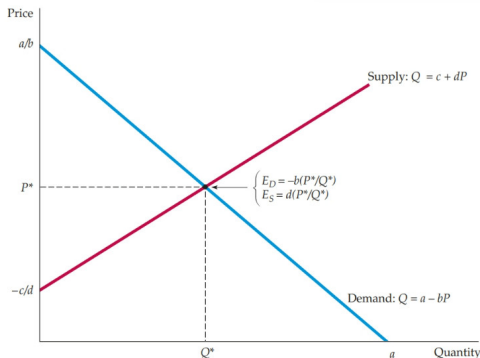
Supply and Durability

- For some goods, supply is more elastic in the short run than in the long run. Such goods are durable and can be recycled as part of supply if price goes up. For example, secondary copper.
- If the price increases, there is a greater incentive to convert scrap copper into new supply. Initially, secondary supply increases sharply. Later, as the stock of scrap falls, secondary supply contracts.



Fitting Linear Supply and Demand Curves

Our goal is to find the values of the constants a , b , c , and d based on the known values for E_S , E_D , P^* , and Q^* .



Fitting Linear Supply and Demand Curves (Con't)

<i>Demand: $Q = a - bP$ (2.5a)</i>	Demand equation
<i>Supply: $Q = c + dP$ (2.5b)</i>	Supply equation
<i>$E = (P/Q)(\Delta Q/\Delta P)$</i>	Elasticity
<i>For supply: $\Delta Q/\Delta P = d$</i>	Slope of supply
<i>For demand: $\Delta Q/\Delta P = -b$</i>	Slope of demand
<i>$E_D = -b(P^*/Q^*)$ (2.6a)</i>	Substitute with known values (*)
<i>$E_S = d(P^*/Q^*)$ (2.6b)</i>	
<i>$a = Q^* + bP^*$</i>	Solve for a

<i>$Q^* = 18$ $P^* = \\$3.00$ $E_S = 1.5$ $E_D = -0.5$</i>	Known values (*)
<i>$1.5 = d(3/18) = d/6$ $d = (1.5)(6) = 9$</i>	Solve for d
<i>$18 = c + (9)(3.00) = c + 27$ $c = 18 - 27 = -9$ <i>Supply: $Q = -9 + 9p$</i></i>	Solve for c Supply equation
<i>$-0.5 = -b(3/18) = -b/6$ $18 = a - (3)(3) = a - 9$ <i>Demand: $Q = 27 - 3P$</i></i>	Demand equation

<i>$Q = a - bP + fI$ $E_I = (I/Q)(\Delta Q/\Delta I)$ $E_I = 1.3$ $I = 1.0$</i>	Demand depends also on income (I) Income elasticity
<i>$1.3 = (1.0/18)(f)$ $f = (1.3)(18)/(1.0) = 23.4$</i>	Index of aggregate income, or GDP Find the value of f
<i>$b = 3; f = 23.4; P^* = 3.00; Q^* = 18$ $18 = a - (3)(3) + (23.4)(1.0) \Rightarrow a = 3.6$</i>	Find the value of a

Example: Upheaval in the World Oil Market

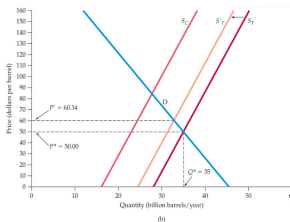
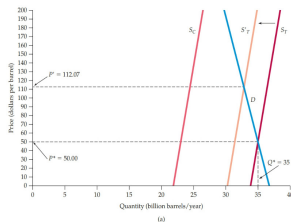
Because this example is set in 2015-2016, all prices are measured in 2015 dollars.

- 2015-2016 world price = \$50 per barrel
- World demand and total supply = 35 billion barrels per year (bb/yr)
- OPEC supply = 12 bb/yr
- Competitive (non-OPEC) supply = 23 bb/yr
- Saudi production = 3.6 bb/yr (part of OPEC)
- Price elasticity estimates for oil supply and demand:

	SHORT RUN	LONG RUN
World demand:	-0.05	-0.30
Competitive supply:	0.05	0.30

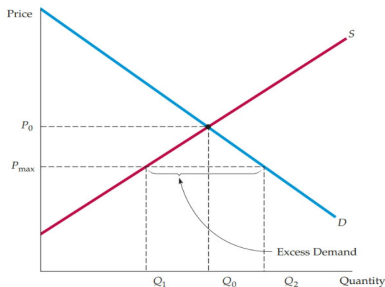
Example: Upheaval in the World Oil Market(Con't)

- Plot (a) shows the short-run supply and demand curves. If Saudi Arabia stops producing, the supply curve will shift to the left by 3.6 bb/yr. In the short-run, price will increase sharply.
- Plot (b) shows long-run curves. In the long run, because demand and competitive supply are much more elastic, the impact on price will be much smaller.



Effects of Price Controls

Suppose price is regulated to be no higher than P_{max} . Demand exceeds supply, and a shortage develops - i.e., there is *excess demand*.



Who will gain from the price controls? Who will lose?

Example: Price of Natural Gas

- The (free-market) wholesale price of natural gas was \$6.40 per mcf (thousand cubic feet);
- Production and consumption of gas were 23 Tcf (trillion cubic feet);
- The average price of crude oil (which affects the supply and demand for natural gas) was about \$50 per barrel.

$$\text{Supply: } Q = 15.90 + 0.72P_G + 0.05P_O$$

$$\text{Demand: } Q = 0.02 - 1.8P_G + 0.69P_O$$

Suppose the government decides to impose price controls and sets a maximum price of \$3.00 per mcf. What impact would this have on the quantity of gas supplied and the quantity demanded?

Summary

- supply-demand analysis
- elasticities
- short-run and long-run elasticities

Exercises

- ① Sugar can be refined from sugar beets. When the price of those beets falls, (c)
- Ⓐ the demand curve for sugar would shift right.
 - Ⓑ the the demand curve for sugar would shift left.
 - Ⓒ the supply curve for sugar would shift right.
 - Ⓓ the supply curve for sugar would shift left.
- ② When the current price is above the market-clearing level we would expect: (b)
- Ⓐ quantity demanded to exceed quantity supplied.
 - Ⓑ quantity supplied to exceed quantity demanded.
 - Ⓒ a shortage.
 - Ⓓ greater production to occur during the next period.

Exercises (Con't)

- 3 From 1970 to 2017, the real price of a college education increased, and total enrollment increased. Which of the following *could* have caused this increase in price and enrollment? (b)
- a A shift to the right in the supply curve for college education and a shift to the left in the demand curve for college education.
 - b A shift to the left in the supply curve for college education and a shift to the right in the demand curve for college education.
 - c A shift to the left in the supply curve for college education and a shift to the left in the demand curve for college education
 - d None of the above.

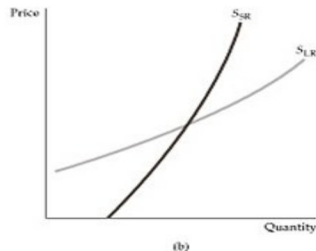
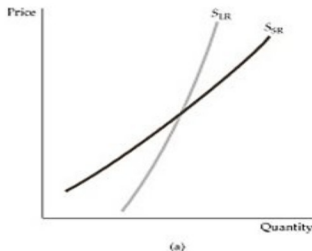
Exercises (Con't)

- 4 If two goods are substitutes, the cross-price elasticity of demand must be: (b)
- a negative.
 - b positive.
 - c zero.
 - d infinite.

Exercises (Con't)

- 5 The figure depicts the supply curves in the short run (SR) and long run (LR) for two types of copper: primary and secondary. Which panel best resembles the supply curves for primary copper? (b)

- a A
- b B
- c Both.
- d Neither.



Exercises (Con't)

- 6 When the government controls the price of a product, causing the market price to be below the free market equilibrium price: (a)
- a some consumers gain from the price controls and other consumers lose.
 - b all producers gain from the price controls.
 - c both producers and consumers gain.
 - d all consumers are better off.