

Intermediate Microeconomics. Lecture 1

Review on Supply and Demand

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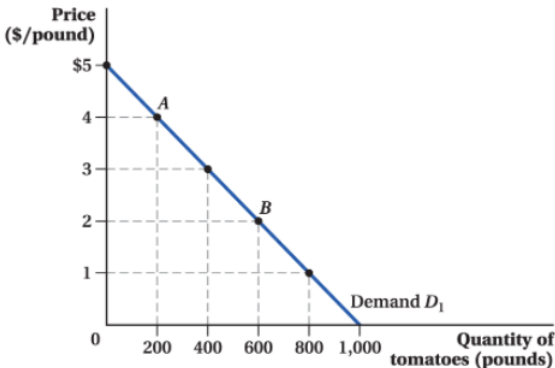
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Demand curve



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Figure: Demand for Tomatoes

► equation

Factors that influence demand

- Price
- Number of consumers
- Consumer income
- Consumer tastes
- Prices of other goods
 - ✓ substitutes
 - ✓ complements

Mathematical representation of the demand curve

Demand equation: ▶ demand curve

$$Q = 1,000 - 200 * P$$

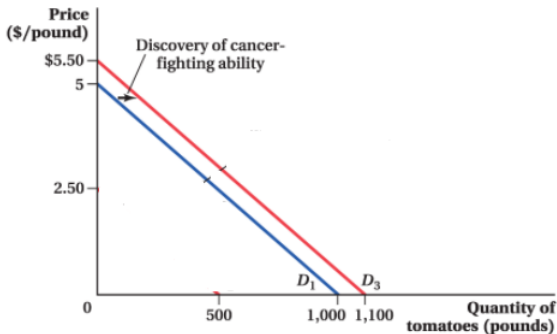
Inverse demand equation:

$$P = 5 - 0.005 * Q$$

Demand **choke price**: price at which no consumer is willing to buy a good

Shifts in the demand curve

$$Q = 1,100 - 200 * P$$

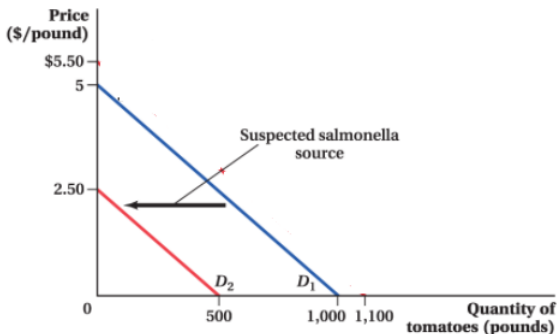


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Figure: Consumer tastes (positive)

Shifts in the demand curve

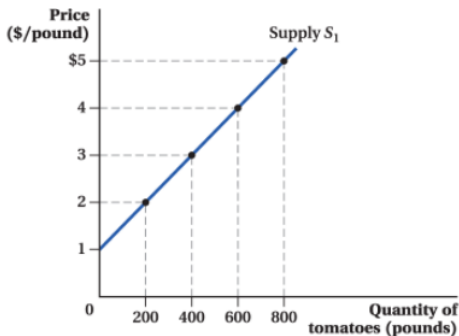
$$Q = 500 - 200 * P$$



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Figure: Consumer testes (negative)

Supply curve



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Figure: Supply for Tomatoes

» supply equation

Factors that influence supply

- Price
- Number of sellers
- Sellers outside option
- Suppliers' costs of production
 - ✓ input prices
 - ✓ production technology

Mathematical representation of the supply curve

Demand equation: [▶ supply curve](#)

$$Q = 200 * P - 200$$

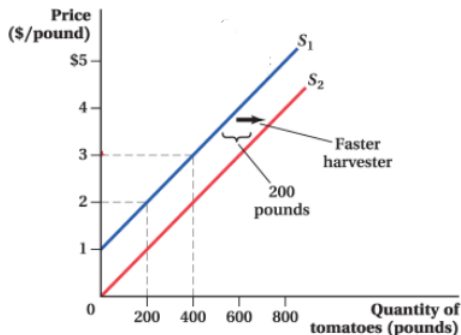
Inverse supply equation:

$$P = 0.005 * Q + 1$$

Supply **choke price**: price at which no firm is willing to produce a good and quantity supplied is zero

Shifts in the supply curve

$$Q = 200 * P$$

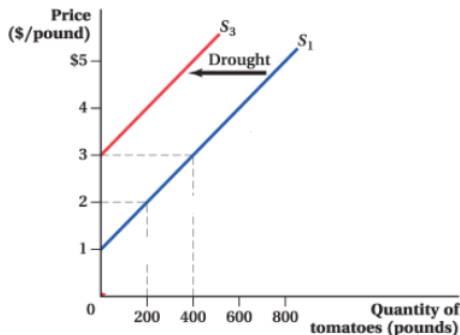


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Figure: Better technology

Shifts in the demand curve

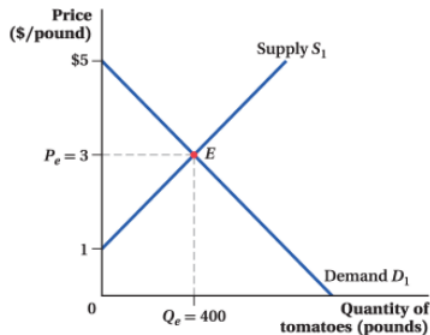
$$Q = 200 * P - 600$$



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Figure: Drought

Market Equilibrium



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Figure: Market Equilibrium

Mathematics of Equilibrium

$$Q^D = 1,000 - 200 * P$$

$$Q^S = 200 * P - 200$$

We know that at market equilibrium, quantity demanded equals quantity supplied:

$$Q^D = Q^S$$

$$1,000 - 200 * P = 200 * P - 200$$

$$1,200 = 400 * P$$

$$P = 3$$

Mathematics of Equilibrium

To find the equilibrium quantity, substitute the equilibrium price either in demand or supply equation:

$$Q^D = 1,000 - 200 * P$$

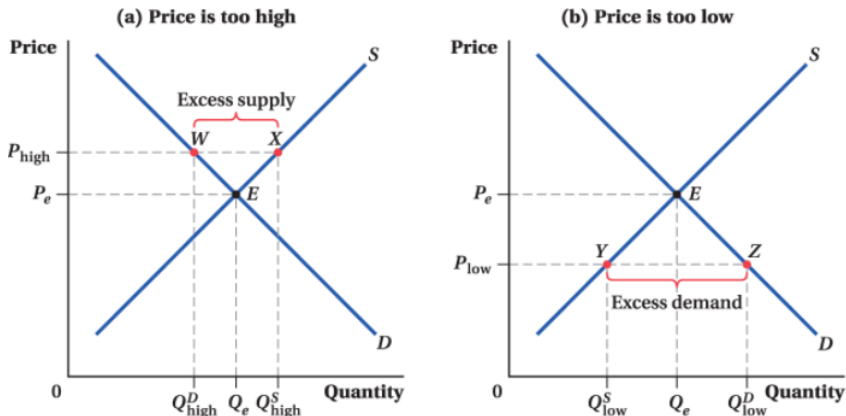
$$Q^S = 200 * P - 200$$

You can also find the equilibrium price and quantity using the inverse demand and supply equations:

$$P = 5 - 0.005 * Q^D$$

$$P = 0.005 * Q^S + 1$$

Why Markets Move toward Equilibrium



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Figure: Equilibrium Price

Example of excess demand

Suppose that the demand and supply curves for a monthly cell phone plan can be represented by

$$Q^D = 50 - 0.5 * P$$

$$Q^S = -25 + P$$

The current price of these plans in the market is \$40 per month.

- Is this market in equilibrium?
- Would you expect the price to rise or fall?
- If so, by how much?

Example of excess demand

First, calculate the quantity demanded and quantity supplied at the current market price of \$40

$$Q^D = 50 - 0.5 * P = 50 - 0.5 * (40) = 30$$

$$Q^S = -25 + P = -25 + 40 = 15$$

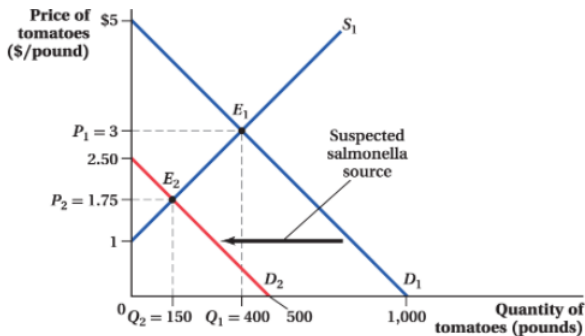
Because quantity demanded is greater than quantity supplied, we can tell that there is excess demand in the market. In equilibrium, we should have

$$Q^D = Q^S$$

$$50 - 0.5 * P = -25 + P$$

$$P = 50$$

The Effects of Demand Shifts



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Figure: Fall in the Demand for Tomatoes

The Effects of Demand Shifts

The new demand equation is

$$Q^D = 500 - 200 * P$$

We know that at market equilibrium, quantity demanded equals quantity supplied:

$$Q^D = Q^S$$

$$500 - 200 * P = 200 * P - 200$$

$$700 = 400 * P$$

$$P = 1.75$$

The Effects of Supply Shifts

The new supply equation is

$$Q^S = 200 * P + 200$$

We know that at market equilibrium, quantity demanded equals quantity supplied:

$$Q^D = Q^S$$

$$1,000 - 200 * P = 200 * P + 200$$

$$800 = 400 * P$$

$$P = 2$$

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Elasticity

The elasticity formula is

$$E = \frac{\% \Delta Q}{\% \Delta P} = \frac{\Delta Q / Q}{\Delta P / P}$$

where E is a demand or supply elasticity, depending on whether Q denotes quantity demanded or supplied.

Rearranging terms yields

$$E = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Elasticity

We can also express the elasticity as

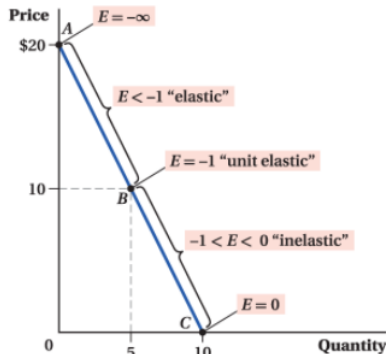
$$E = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{1}{\text{slope}} \cdot \frac{P}{Q}$$

where “slope” refers to $\frac{\Delta P}{\Delta Q}$, the slope of the demand or supply curve in the standard price-versus-quantity space

Types of Elasticity

- Perfectly inelastic: $|E| = 0$
- Inelastic: $|E| < 1$
- Unit elastic: $|E| = 1$
- Elastic: $|E| > 1$
- Perfectly elastic: $|E| \rightarrow \infty$

Elasticity of a Linear Demand Curve



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Figure: Elasticity of a Linear Demand Curve

Example: Elasticity of Demand

The demand for gym memberships is

$$Q = 360 - 2 * P$$

Calculate the price elasticity of demand for gym memberships when the price is \$50 per month

$$E = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{1}{slope} \cdot \frac{P}{Q}$$

First let us compute the slope of the inverse demand

$$P = 180 - 0.5 * Q$$

Then, the quantity demanded at $P = 50$

$$Q = 360 - 2 * (50) = 260$$

Example: Elasticity of Demand

Finally, substitute in the elasticity formula

$$E = \frac{1}{\text{slope}} \cdot \frac{P}{Q} = \frac{1}{-0.5} \cdot \frac{50}{260}$$

$$E = -2 \cdot \frac{-50}{260} = \frac{-100}{260} = \frac{-50}{130} = -0.385$$

Calculate the price elasticity of demand for gym memberships when the price is \$100 per month

$$E = -2 \cdot \frac{-100}{160} = \frac{-200}{160} = \frac{-50}{40} = -1.25$$

Income Elasticity of Demand

$$E_I^D = \frac{\% \Delta Q^D}{\% \Delta I} = \frac{\Delta Q^D}{\Delta I} \cdot \frac{I}{Q^D}$$

- Inferior goods: $E_I^D < 0$
- Normal goods: $E_I^D > 0$
- Luxury goods: $E_I^D > 1$

Cross-Price Elasticity of Demand

$$E_{XY}^D = \frac{\% \Delta Q_X^D}{\% \Delta P_Y} = \frac{\Delta Q_X^D}{\Delta P_Y} \cdot \frac{P_Y}{Q_X^D}$$

- Complement goods: $E_{XY}^D < 0$
- Substitute goods: $E_{XY}^D > 0$