

# Intermediate Microeconomics. Lecture 1

## Review on Supply and Demand

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# Contents

1 Demand

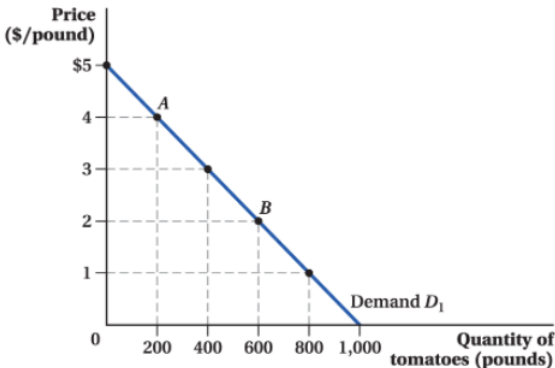
2 Supply

3 The Market

4 Elasticity



# 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

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

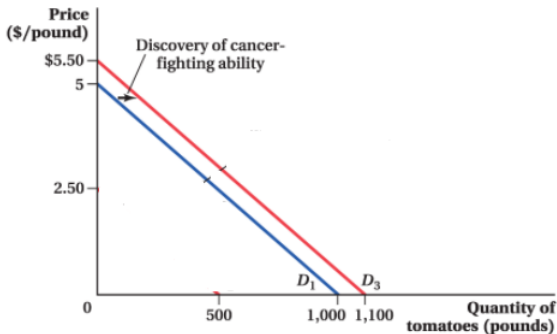
Inverse demand equation:

$$P = 5 - 0.005 * Q$$

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

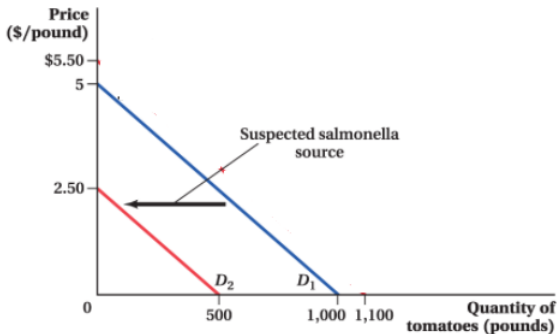
# Shifts in the demand curve

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



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**Figure:** Consumer tastes (positive)

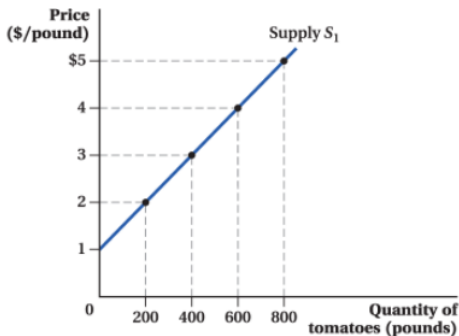
$$Q = 500 - 200 * P$$


**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

Supply equation: » supply curve

$$Q = 200 * P - 200$$

Inverse supply equation:

$$P = 0.005 * Q + 1$$

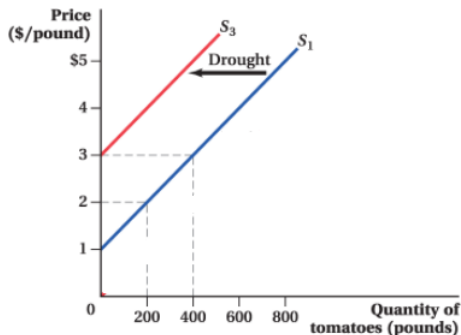
Supply **choke price**: price at which no firm is willing to produce a good and quantity supplied is zero

$$Q = 200 * P$$


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## Shifts in the demand curve

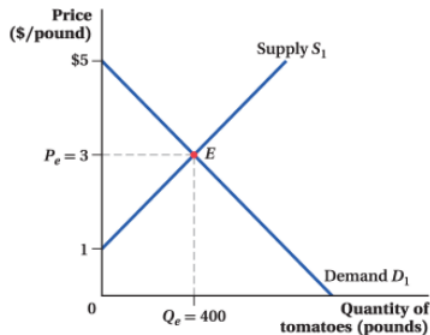
$$Q = 200 * P - 600$$

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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:

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

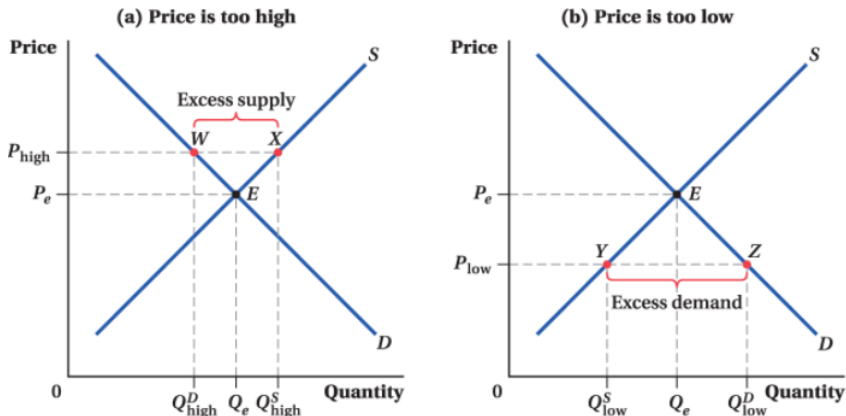
$$Q^S = 200 * P - 200$$

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

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

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

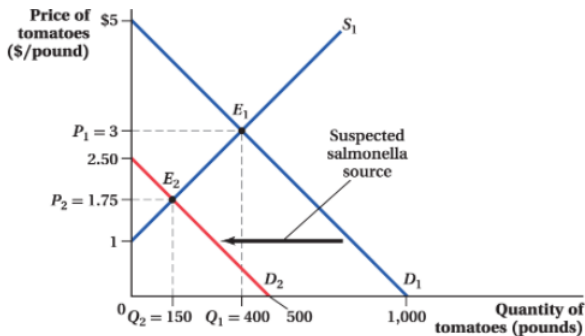
Because quantity demanded is greater than quantity supplied, we can tell that there is excess demand in the market. In equilibrium, we should have

$$Q^D = Q^S$$

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

$$P = 50$$

# 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:

$$Q^D = Q^S$$

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

$$800 = 400 * P$$

$$P = 2$$

# Contents

1 Demand

2 Supply

3 The Market

4 Elasticity

# 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

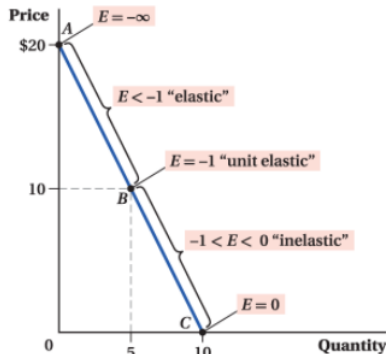
$$E = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{1}{\text{slope}} \cdot \frac{P}{Q}$$

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

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

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

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:  $E_{XY}^D > 0$