3.1 — The Supply and Demand Model

ECON 306 • Microeconomic Analysis • Spring 2023

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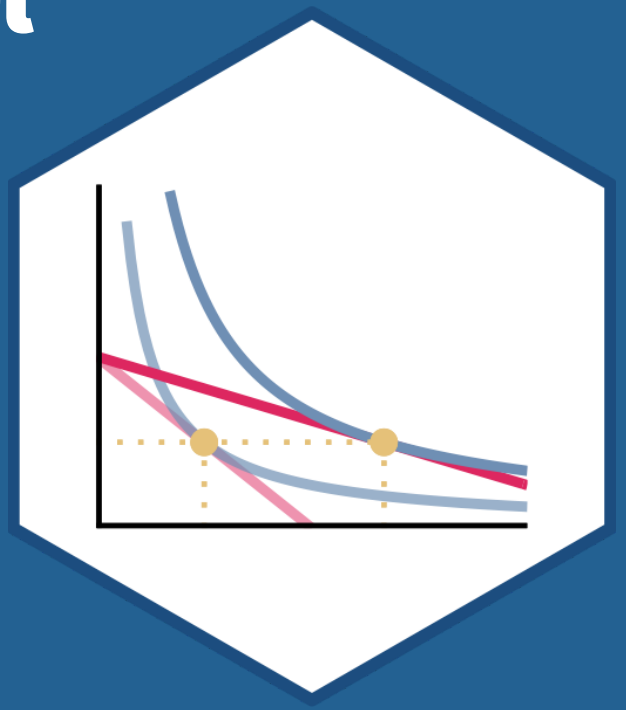
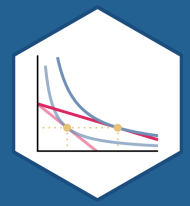
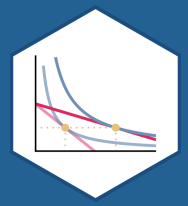


Outline





Equilibrium

Recall: 2 Major Models of Economics as a "Science"

Optimization

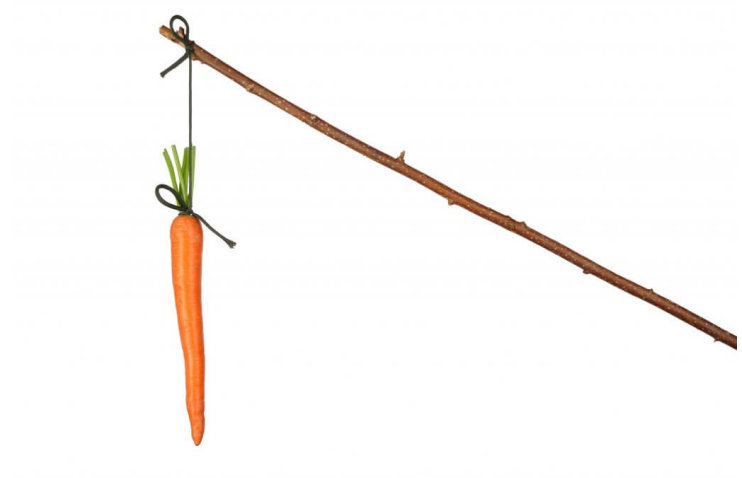
- Agents have **objectives** they value
- Agents face **constraints**
- Make **tradeoffs** to maximize objectives within constraints

Equilibrium

- Agents **compete** with others over **scarce** resources
- Agents **adjust** behaviors based on prices
- **Stable outcomes** when adjustments stop

Recall: Optimization and Equilibrium

- If people can *learn* and *change* their behavior, they will always switch to a higher-valued option
- If there are no alternatives that are better, people are at an *optimum*
- If everyone is at an optimum, the system is in *equilibrium*



Equilibrium Analysis & Price Theory

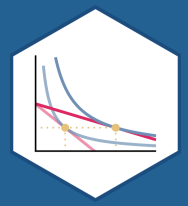
- Where do prices come from?
- *How* do they *change*?
- How consumers and producers to *respond* to changes?
- What *predictions* can we make about what we will see in the world?

Equilibrium Analysis

- An **equilibrium** is an allocation of resources such that no individual has an incentive to alter their behavior
- In markets: **"market-clearing"** prices where quantity supplied equals quantity demanded

Partial Equilibrium Analysis

- We will only look at "***partial* equilibrium"** for a single market
- Changes in *one* market often affect *other* markets, affecting the **"*general* equilibrium"**
    - **Example**: change in price of *corn* will affect the market for wheat, soybeans, flax, cereal, sugar, candy, ethanol, gasoline, automobiles, etc...
    - think of all of the *complements*, *substitutes*, upstream and downstream goods in production...
    - General equilibrium is too complicated for undergraduate courses...



Recall: Demand

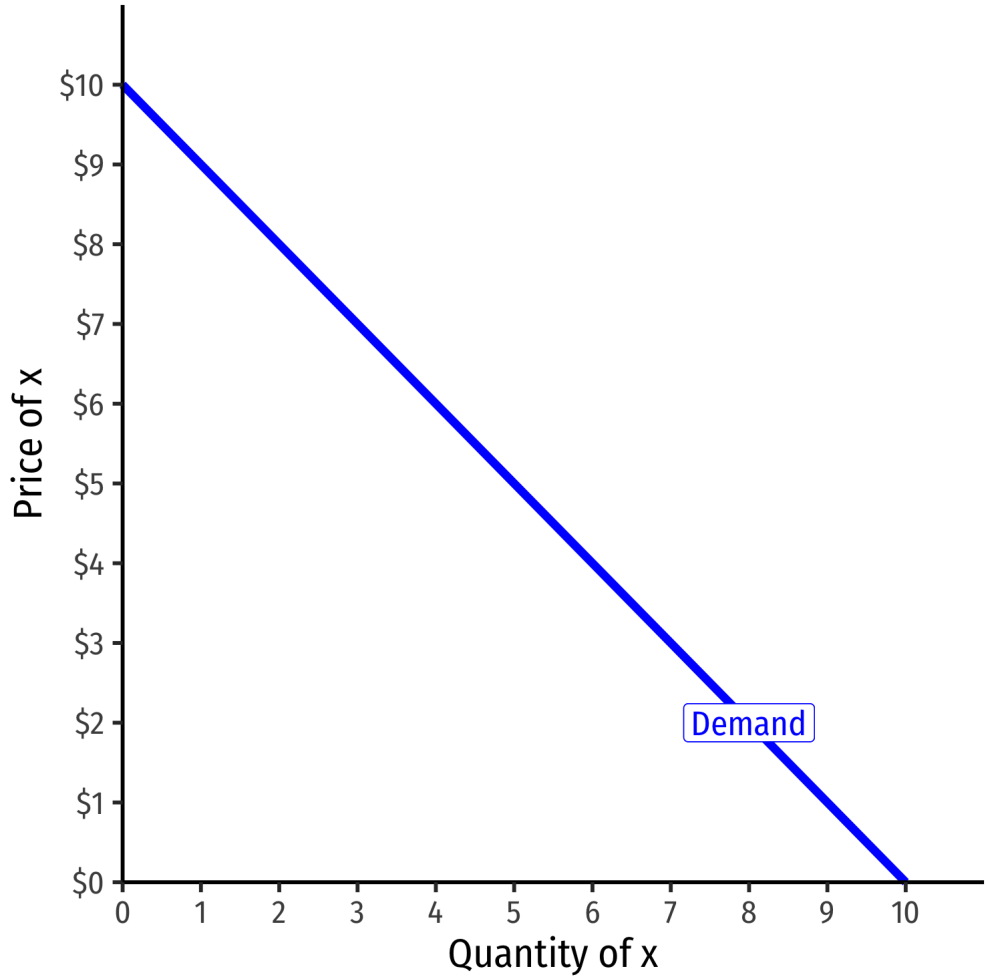
Demand Function

- **Demand function** relates quantity to price

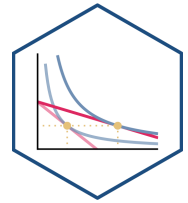
Example:

$$q = 10 - p$$

- Not graphable (wrong axes)!



Inverse Demand Function



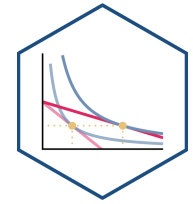
- ***Inverse* demand function** relates price to quantity
  - Take demand function and solve for p

Example:

$$p = 10 - q$$

- Graphable (price on vertical axis)!

Inverse Demand Function

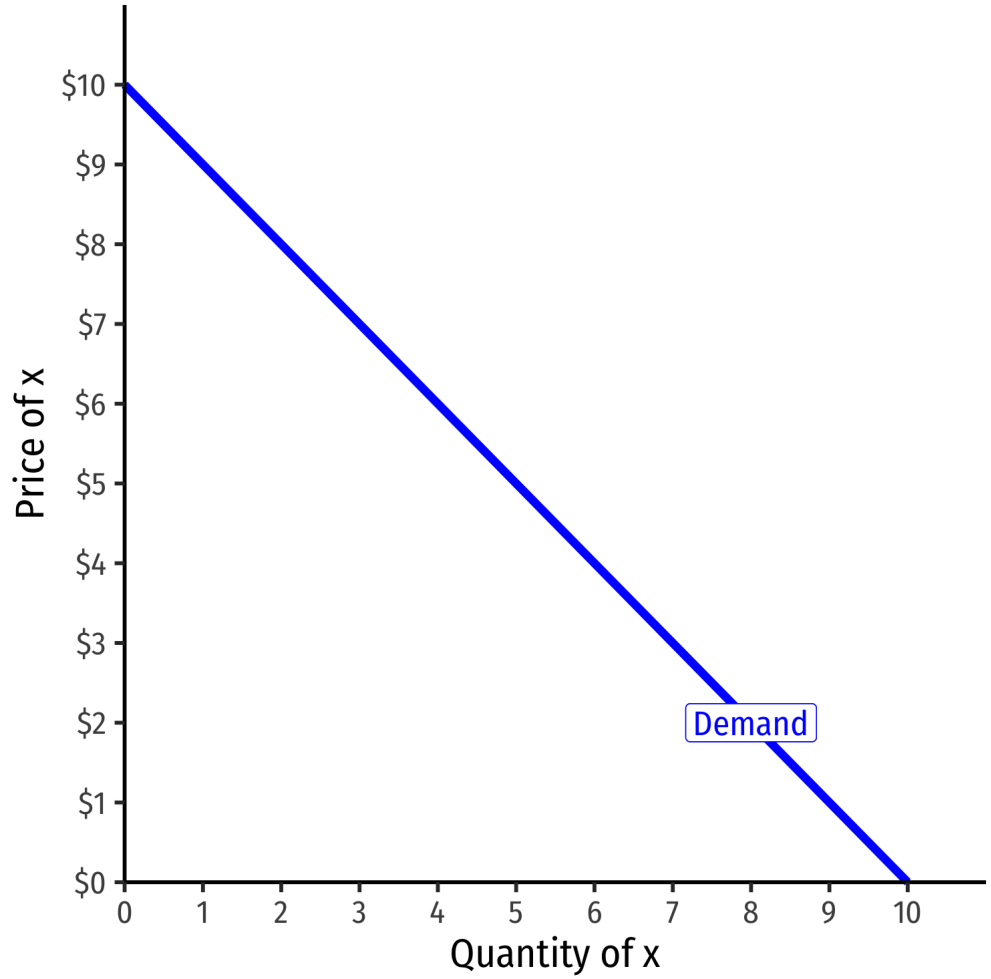


- ***Inverse* demand function** relates price to quantity
  - Take demand function and solve for p

Example:

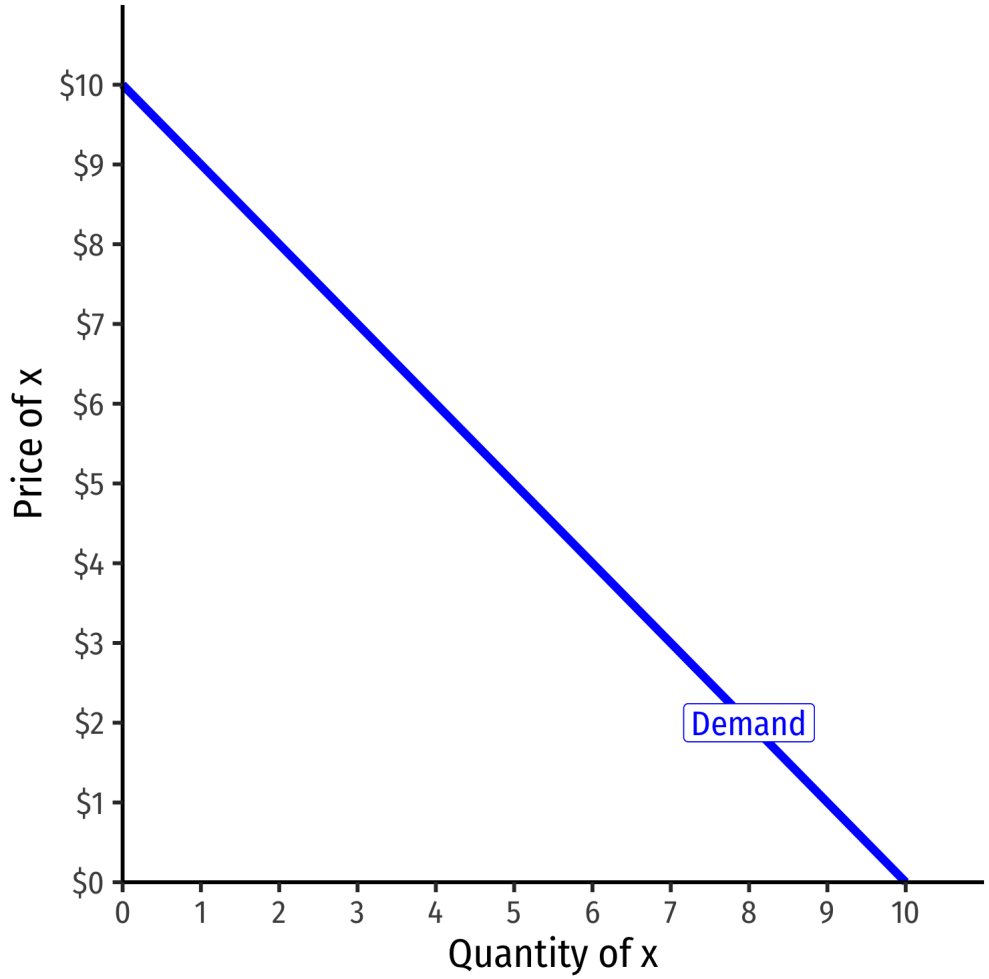
$$p = 10 - q$$

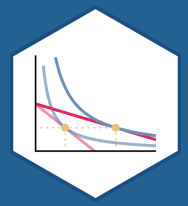
- Vertical intercept (**"Choke price"**): price where $q_D = 0$ ($10), just high enough to discourage *any* purchases



Inverse Demand Function

- Read two ways:
- Horizontally: at any given price, how many units person wants to buy
- Vertically: at any given quantity, the **maximum willingness to pay (WTP)** for that quantity
    - This way will be very useful later





Recall: Supply

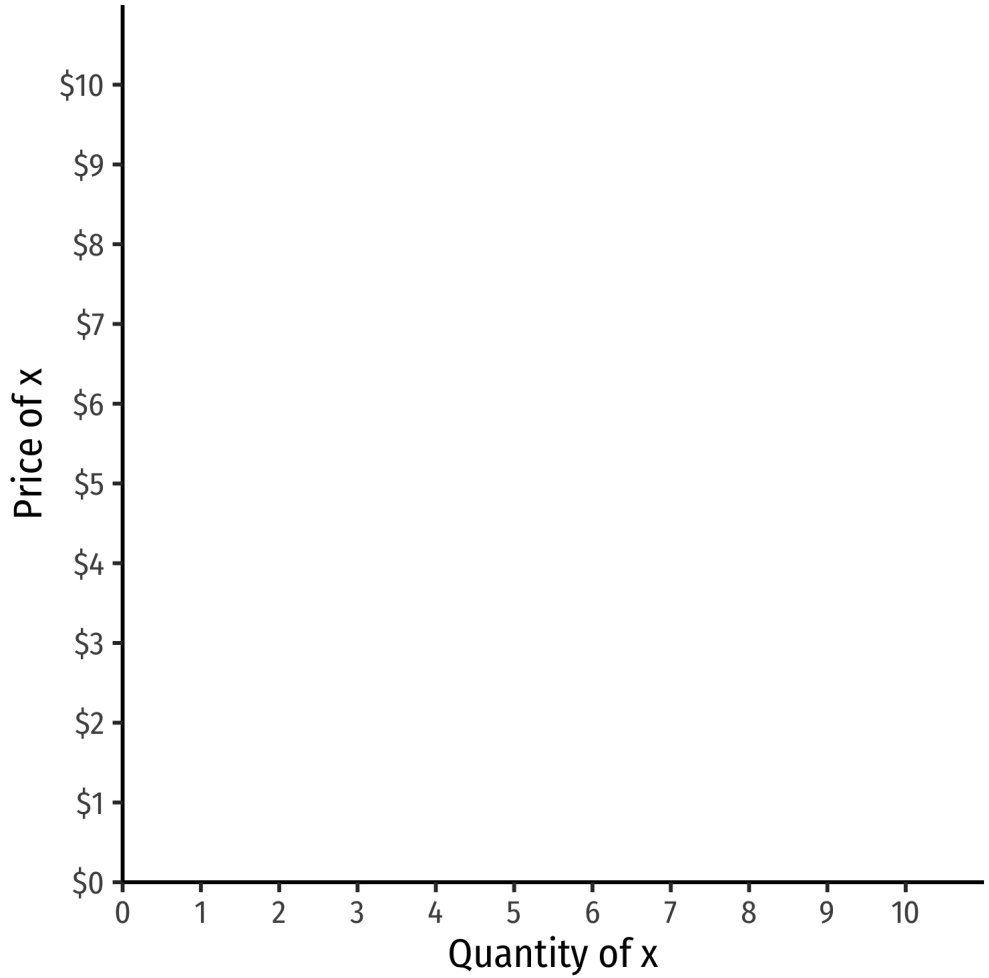
Supply Function

- **Supply function** relates quantity to price

Example:

$$q = 2p - 8$$

- Not graphable (wrong axes)!



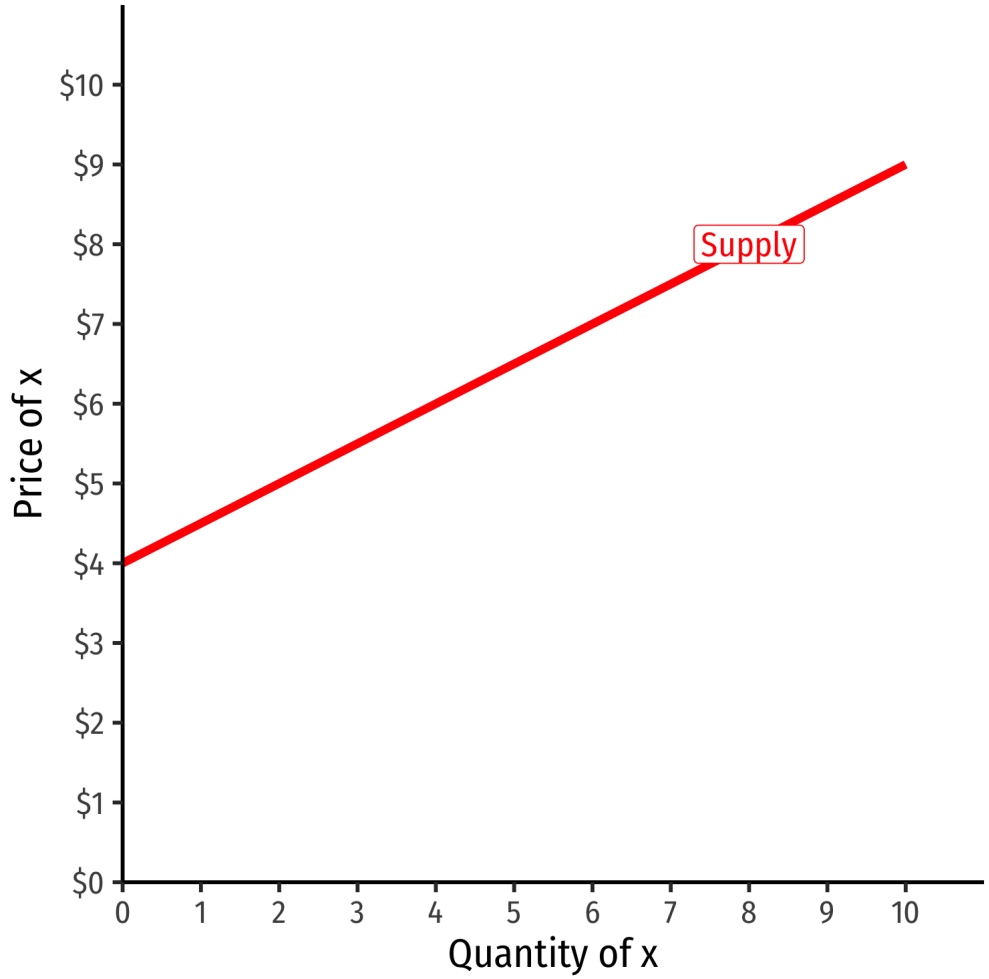
Inverse Supply Function

- ***Inverse* supply function** relates price to quantity
  - Take supply function, solve for p

Example:

$$p = 4 + 0.5q$$

- Graphable (price on vertical axis)!

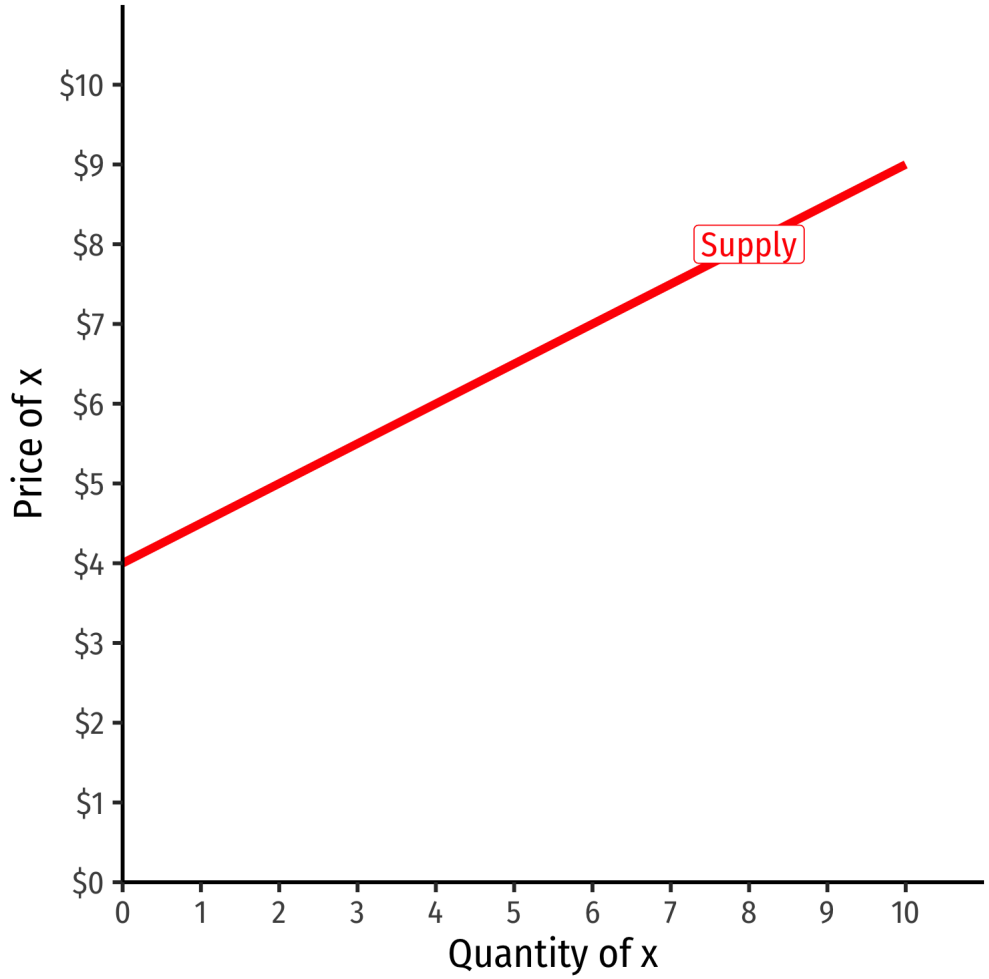


Inverse Supply Function

Example:

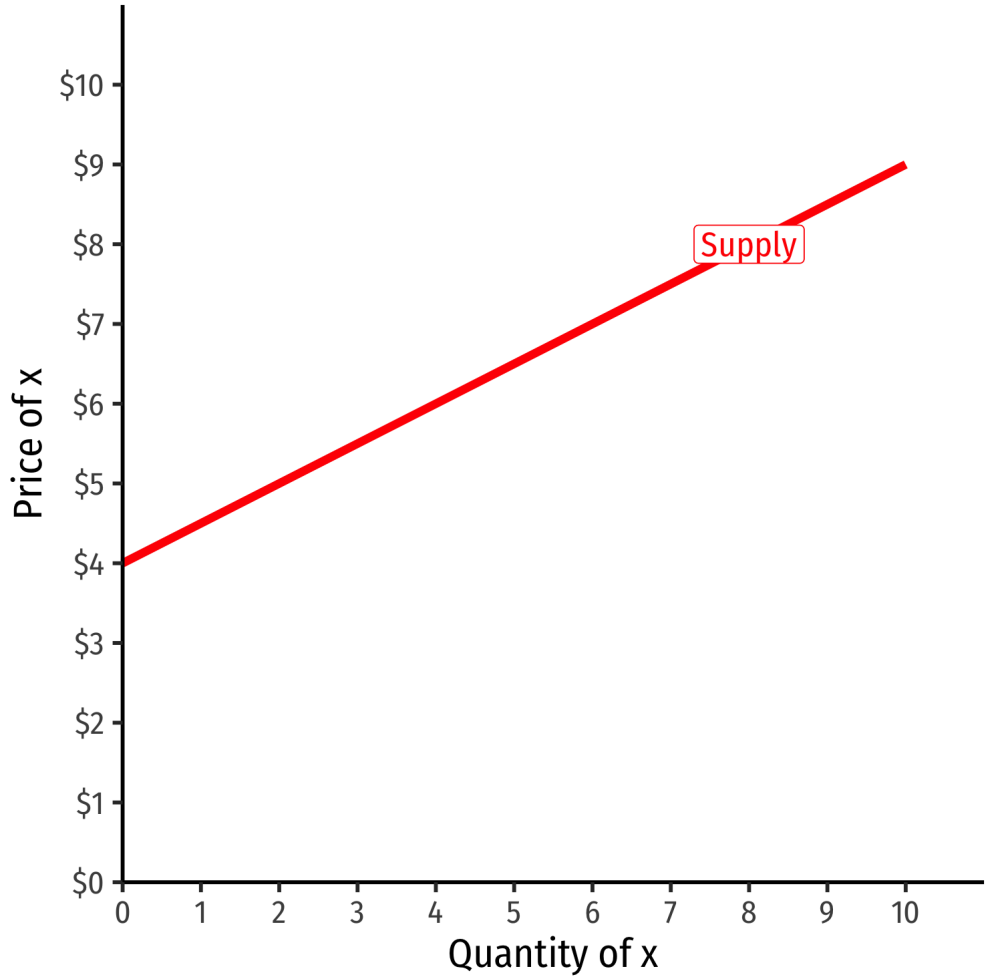
$$p = 4 + 0.5q$$

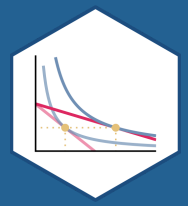
- Slope: 0.5
- Vertical intercept called the **"Choke price"**: price where $q_S = 0$ ($4), just low enough to discourage *any* sales



Inverse Supply Function

- Read two ways:
- Horizontally: at any given price, how many units firm wants to sell
- Vertically: at any given quantity, the **minimum willingness to accept (WTA)** for that quantity

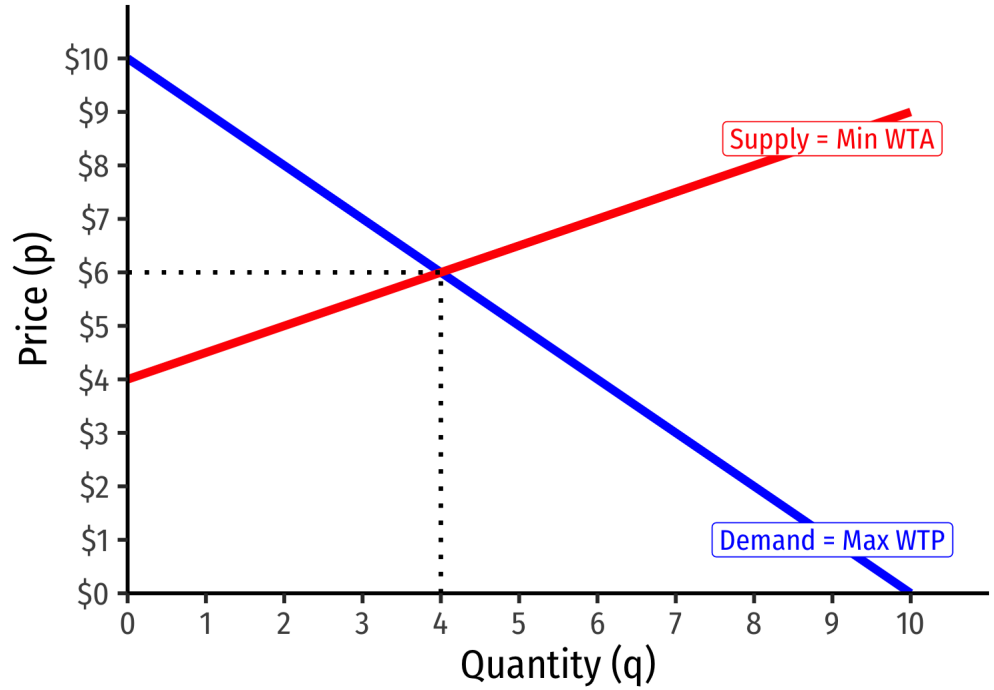


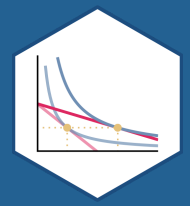


Market Equilibrium

Market Equilibrium

- **Market-clearing (equilibrium) price** $(p^\star)$: \$6.00
- **Market-clearing (equilibrium) quantity exchanged** $(q^\star)$: 4 units



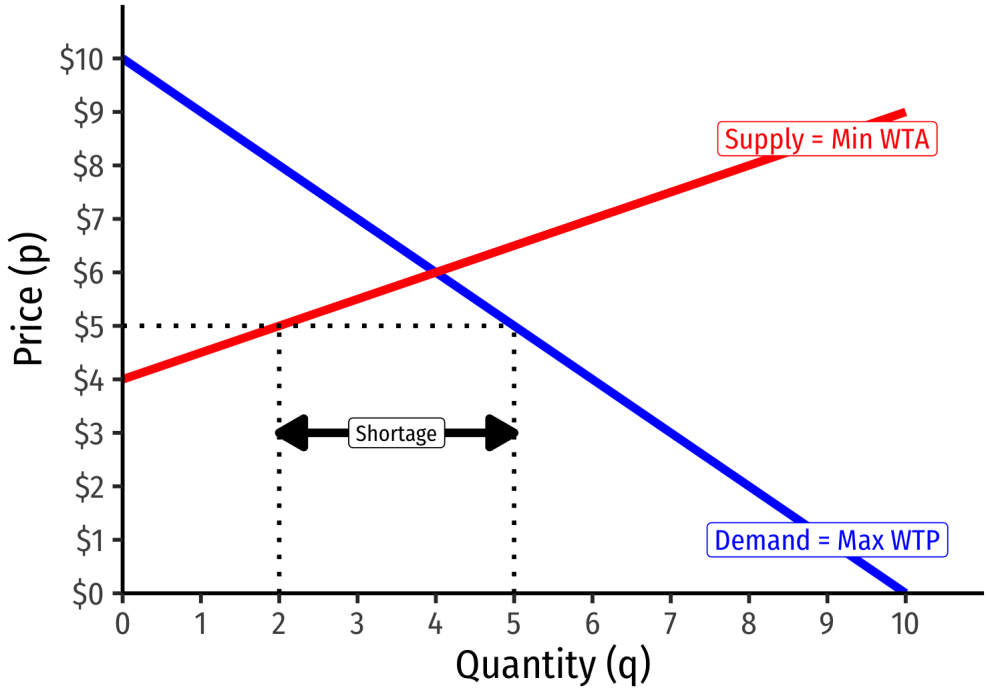


Why Markets Tend to Equilibrate

Excess Demand I

Example: Consider *any* price below \$6, such as \$5:

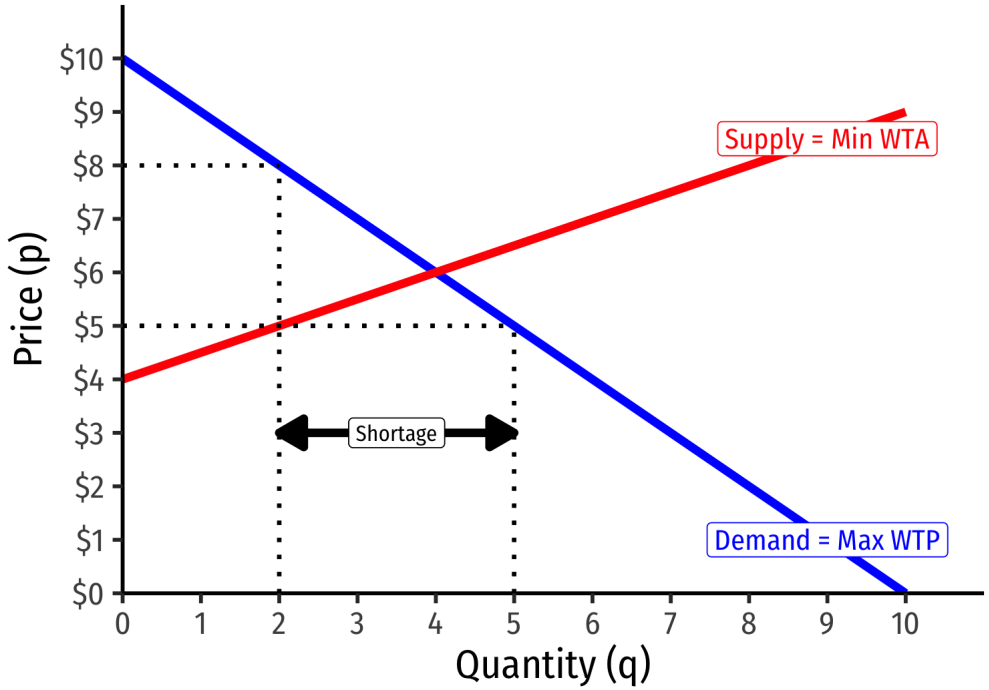
- $Q_d = 5 \quad Q_s = 2$
- $Q_d > Q_s$: **excess demand**
- A **shortage** of 3 units



Excess Demand II

Example: Consider *any* price below \$6, such as \$5:

- $Q_d = 5 \quad Q_s = 2$
- $Q_d > Q_s$: **excess demand**
- A **shortage** of 3 units



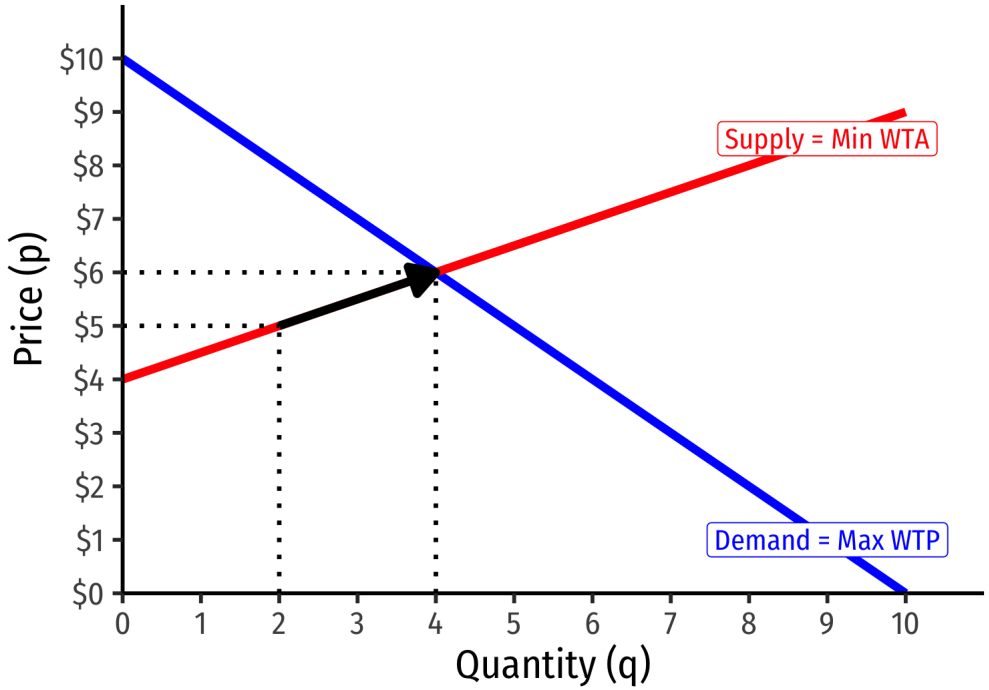
- Sellers will not supply more than 2 units
- For 2 units, some buyers are willing to pay more than \$5

Excess Demand II

Excess Demand III

Example: Consider *any* price below \$6, such as \$5:

- $Q_d = 5 \quad Q_s = 2$
- $Q_d > Q_s$: **excess demand**
- A **shortage** of 3 units

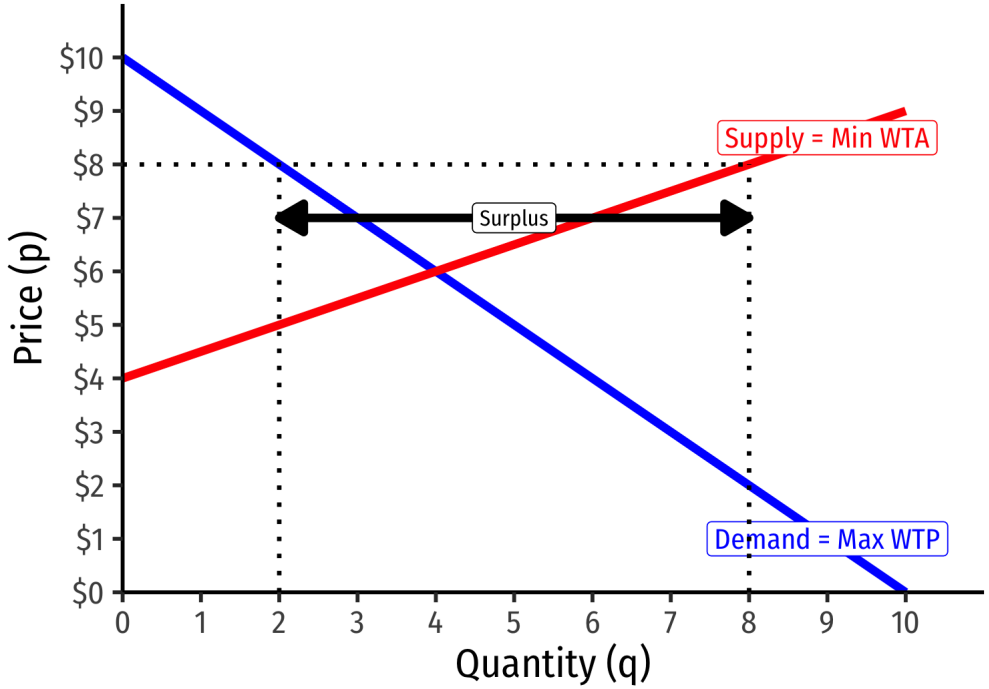


- Buyers will **raise their bids** against one another, raising the price
- At higher prices, sellers willing to sell more!
- Until equilibrium, no pressure for change.

Excess Supply I

Example: Consider *any* price above \$6, such as \$7:

- $Q_d = 2 \quad Q_s = 8$
- $Q_d < Q_s$: **excess supply**
- A **surplus** of 6 units



Excess Supply II

Example: Consider *any* price above \$6, such as \$7:

- $Q_d = 2 \quad Q_s = 8$
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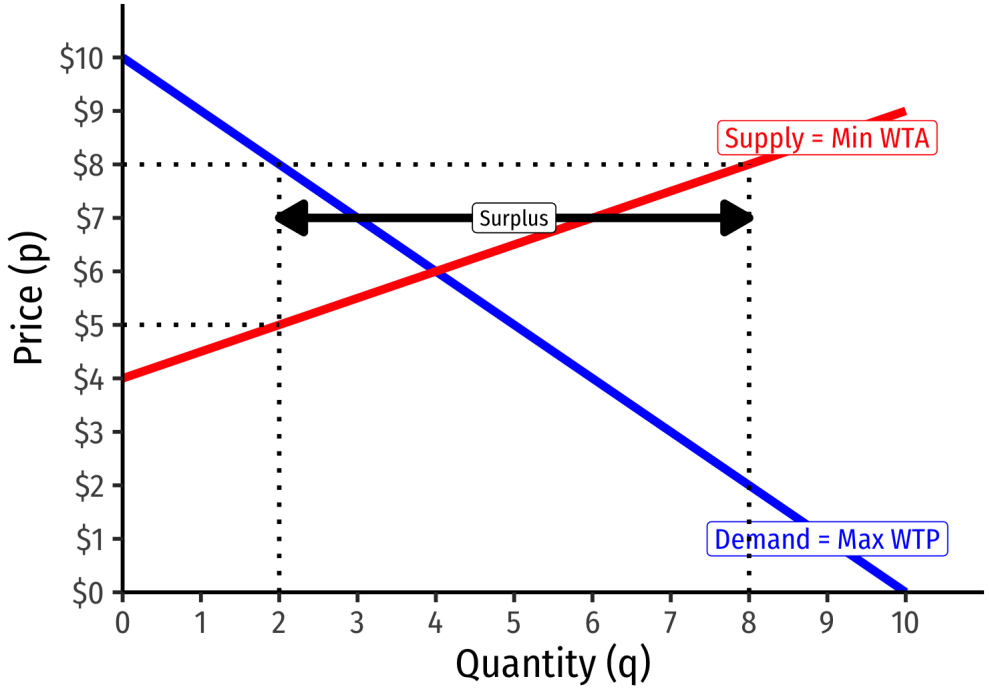


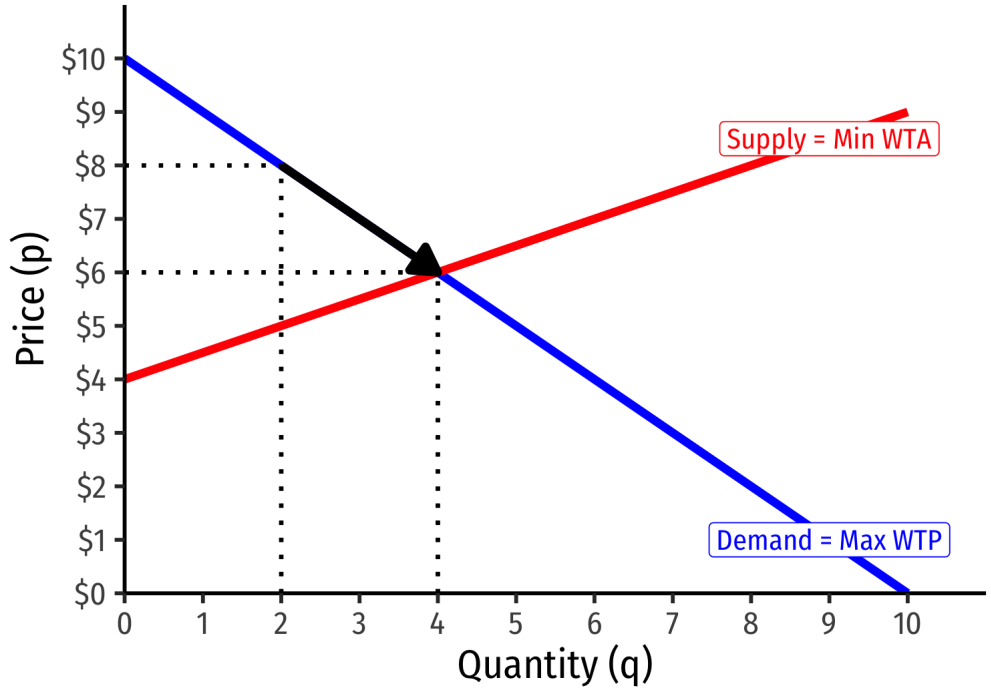
- Buyers will not buy more than 2 units
- For 2 units, some sellers willing to accept less than \$8

Excess Supply II

Excess Supply III

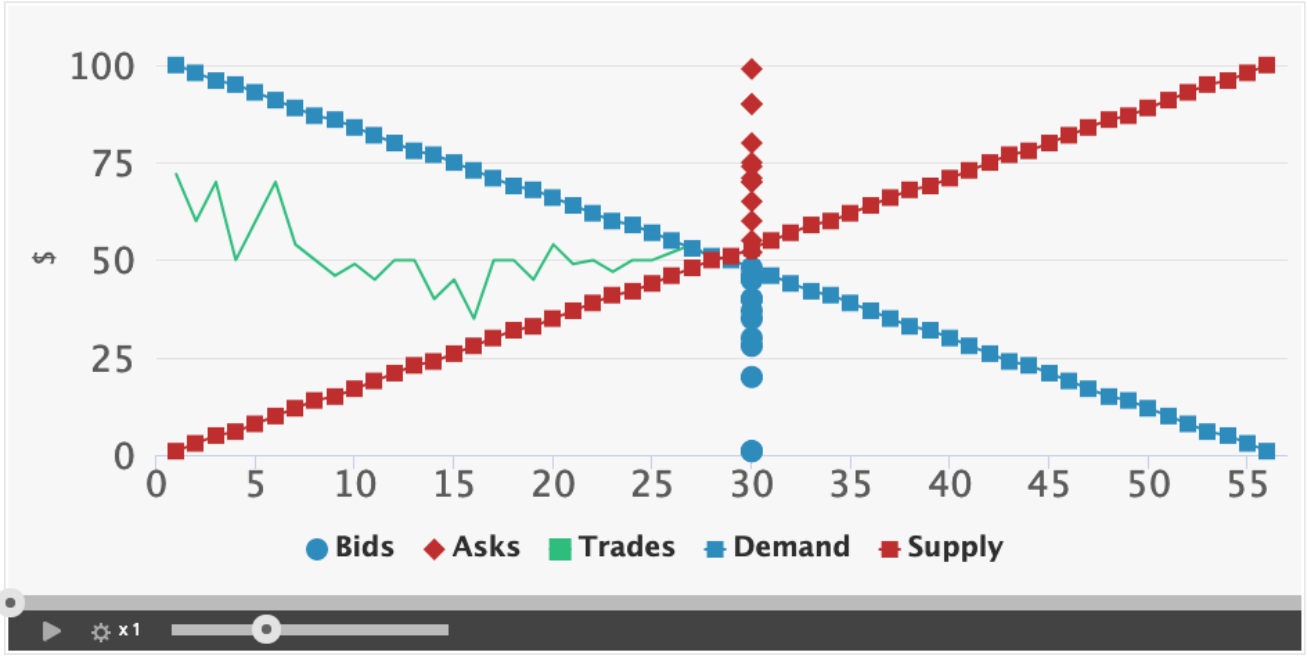
Example: Consider *any* price above \$6, such as \$7:

- $Q_d = 2 \quad Q_s = 8$
- $Q_d < Q_s$: **excess supply**
- A **surplus** of 6 units



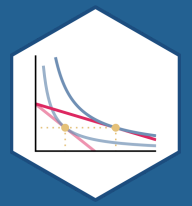
- Sellers will **lower their asking prices** against one another, lowering the price
- At lower prices, buyers willing to buy more!
- Until equilibrium, no pressure for change.

Why Markets Tend to Equilibrate



STATS

TOTAL EARNINGS:	POSSIBLE EARNINGS:	EFFICIENCY
$ 1243	$ 1410	88.16%



Comparative Statics

Ceterus Paribus I

- Supply function and demand function *only* relate **quantity** (supplied or demanded) to **price**
    - Describes how buyers/sellers respond to changes in market price
- Certainly there are many *other* factors that influence how much a buyer or seller will purchase at a particular price!
    - income, preferences, prices of other goods, costs, expectations, etc.
- A supply or demand function (or graph) requires **"ceterus paribus"** (all else equal)

Recall (for example), Demand I

- A consumer's **demand** (for good x) depends on current prices & income:

$$q_x^D = q_x^D(m, p_x, p_y)$$

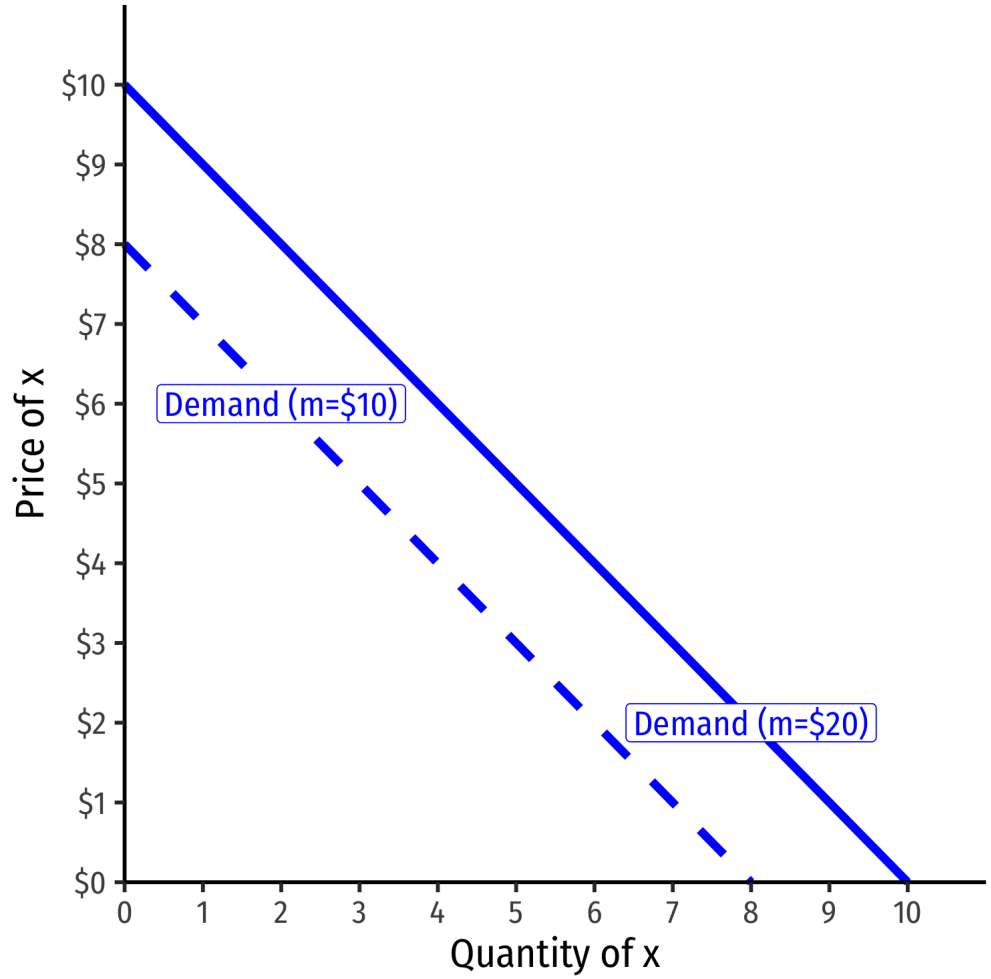
- How does **demand for x** change?

1. **Income effects** $\left(\frac{\Delta q_x^D}{\Delta m}\right)$: how q_x^D changes with changes in income
2. **Cross-price effects** $\left(\frac{\Delta q_x^D}{\Delta p_y}\right)$: how q_x^D changes with changes in prices of *other* goods (e.g. y)
3. **(Own) Price effects** $\left(\frac{\Delta q_x^D}{\Delta p_x}\right)$: how q_x^D changes with changes in price (of x)

See Class 1.5 for a reminder.

Recall (for example), Demand II

- A change in one of the "determinants of demand" will **shift** demand curve!
  - Change in **income** m
  - Change in **price of other goods** p_y (substitutes or complements)
  - Change in **preferences** or **expectations** about good x
  - Change in **number of buyers**
- Shows up in (inverse) demand function by a **change in intercept (choke price)**!
- Again, see my Visualizing Demand Shifters



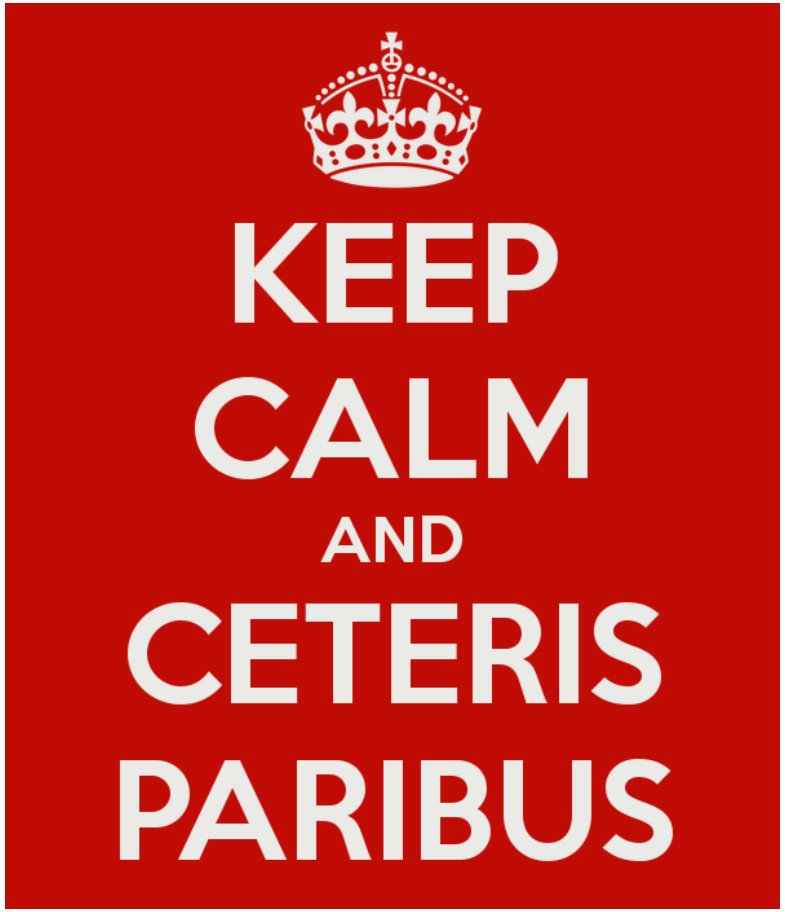
See Class 1.5 for a reminder.

Ceterus Paribus II

- Consider our demand function:

$$q_D = 10 - p$$

- If the **market price changes** (perhaps because supply changes), that results in a **change in *quantity demanded***
    - We move **along** the existing demand curve
- *Ceterus paribus* has not been violated



Ceterus Paribus III

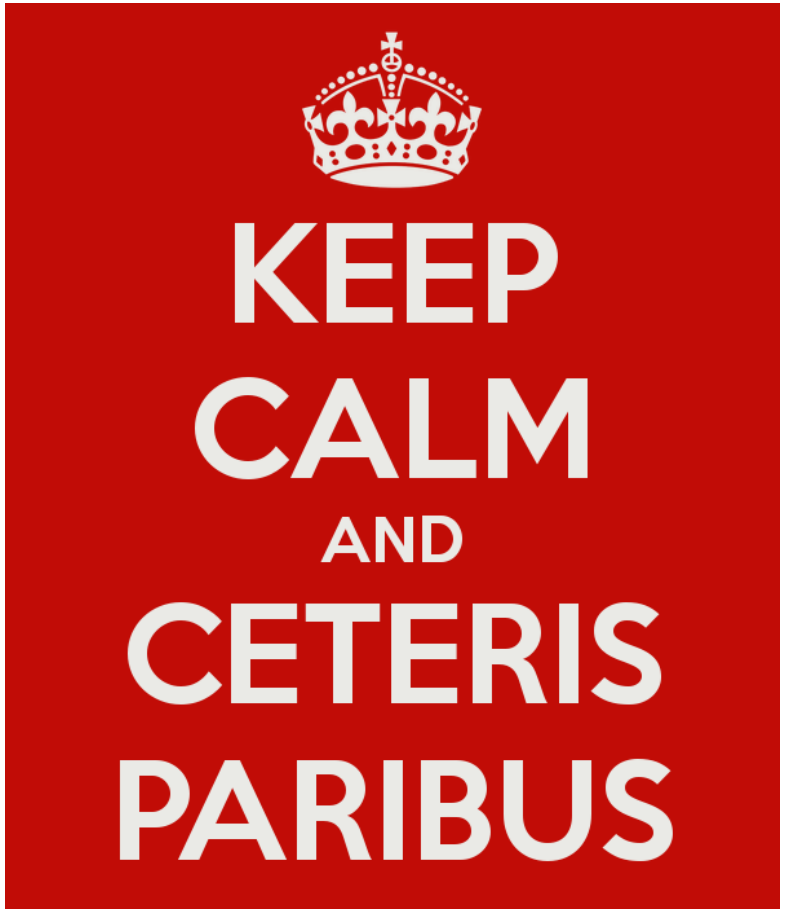
- Consider our demand function:

$$q_D = 10 - p$$

- If the **something *other* than price changes** (income, preferences, price of a complement, etc), that results in a **change in *demand***
  - A whole *new* demand function/graph:

$$q_D = 12 - p$$

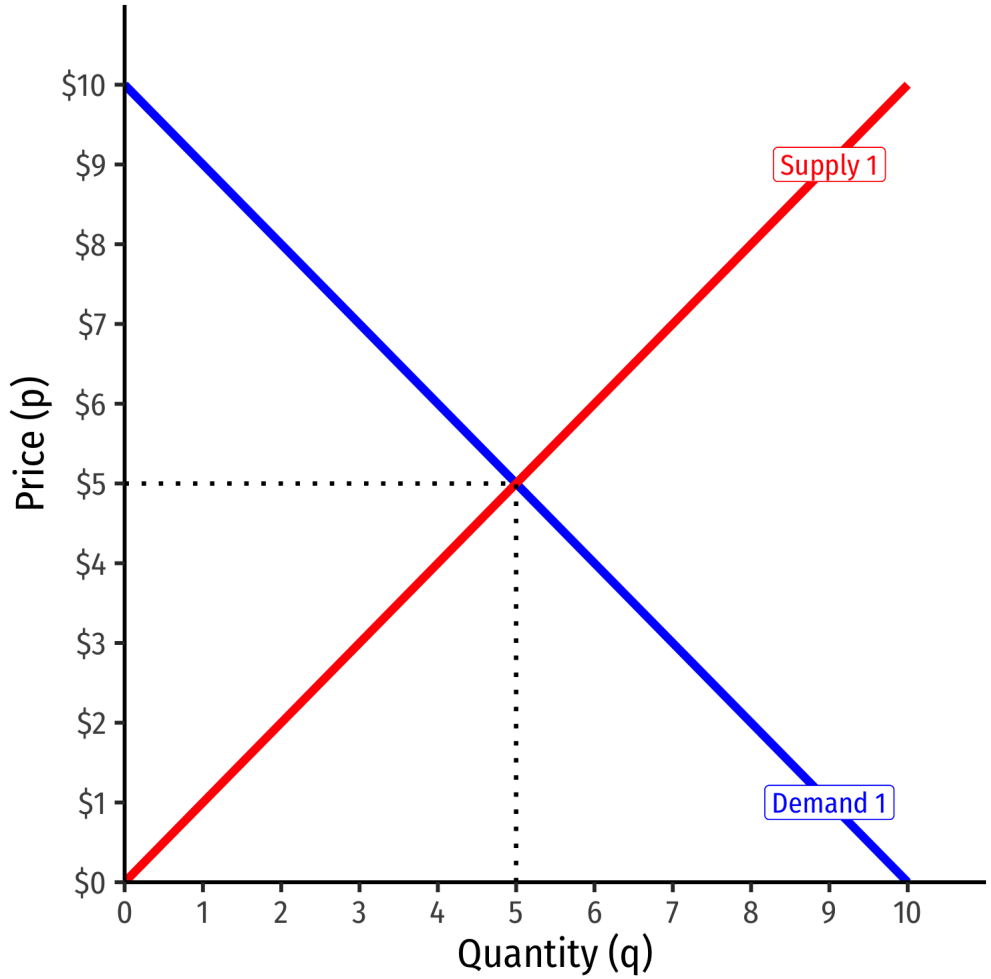
- *Ceterus paribus* has been violated



Ceterus Paribus IV

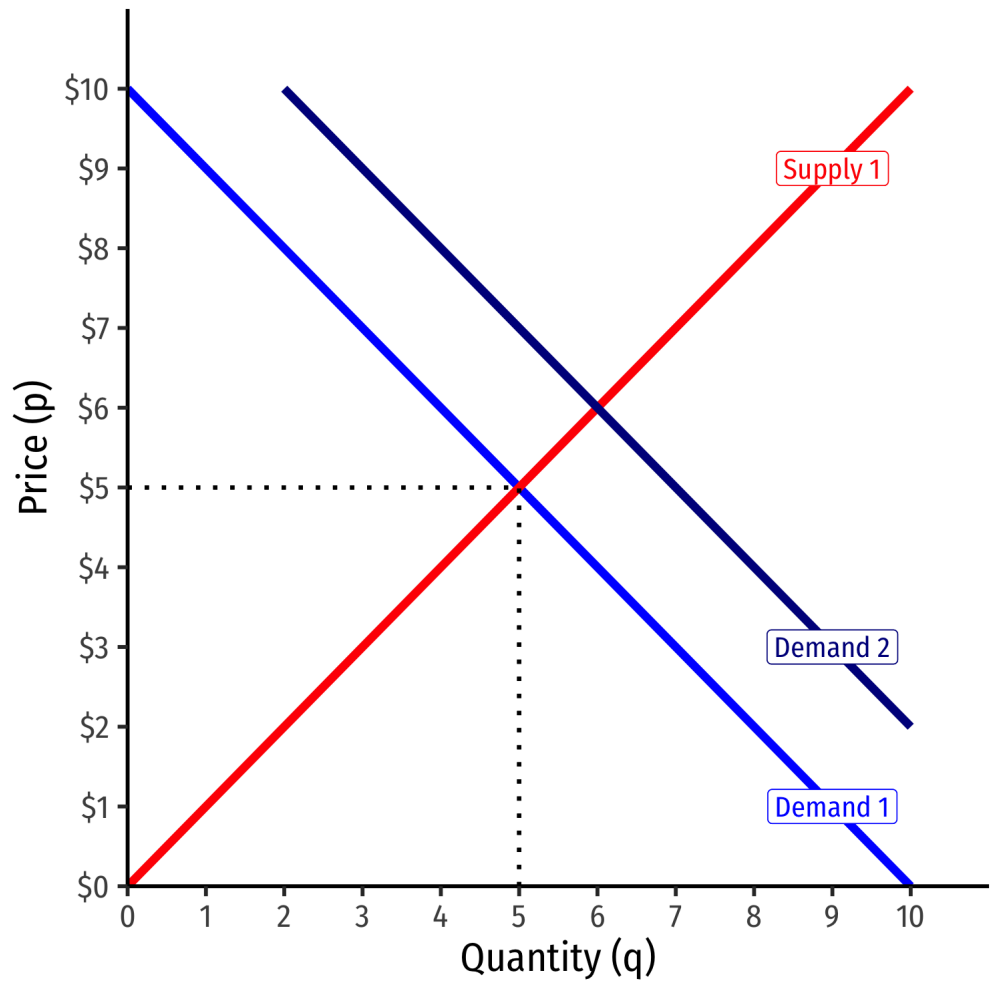
- There is a big difference between a change in "quantity demanded" and a change in "demand"!

Increase in Demand



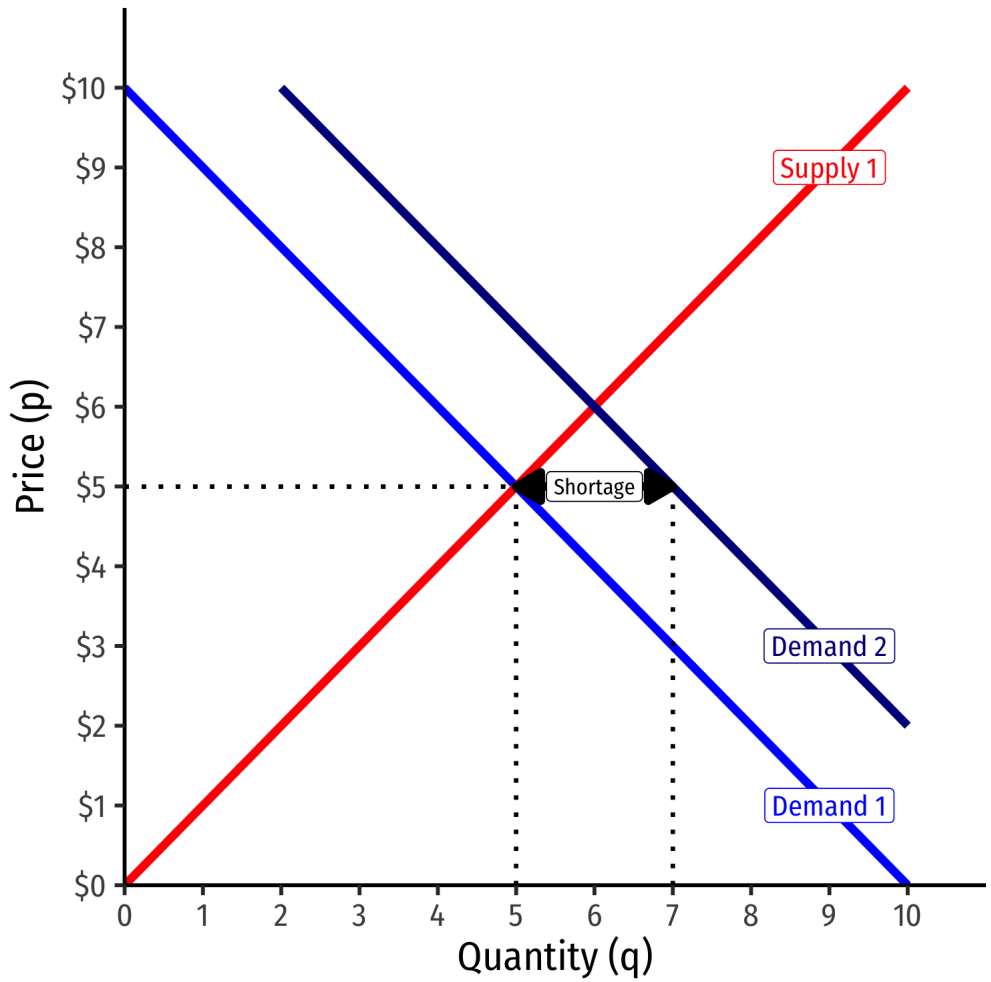
Increase in Demand

- More individuals want to buy more of the good at *every* price
- Entire demand curve shifts to the *right*



Increase in Demand

- More individuals want to buy more of the good at *every* price
- Entire demand curve shifts to the *right*
- At the original market price, a **shortage!** $(q_D > q_S)$



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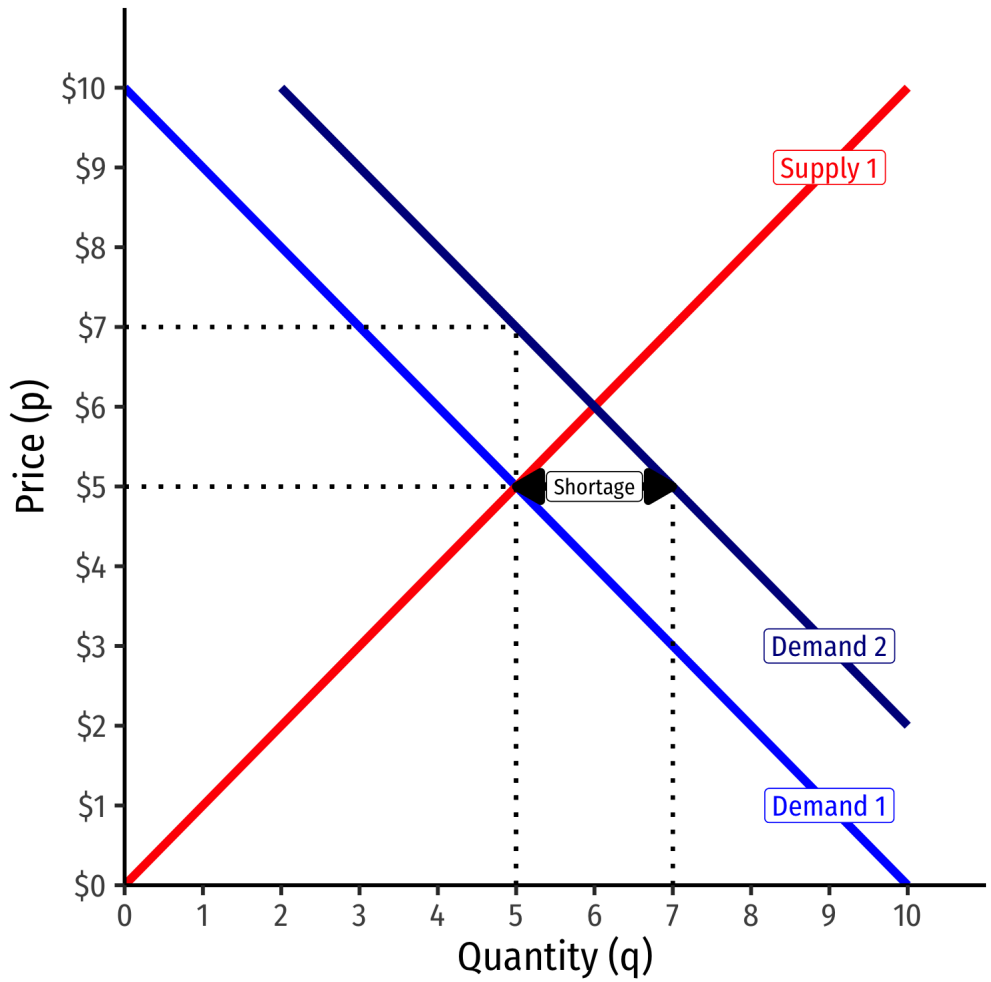
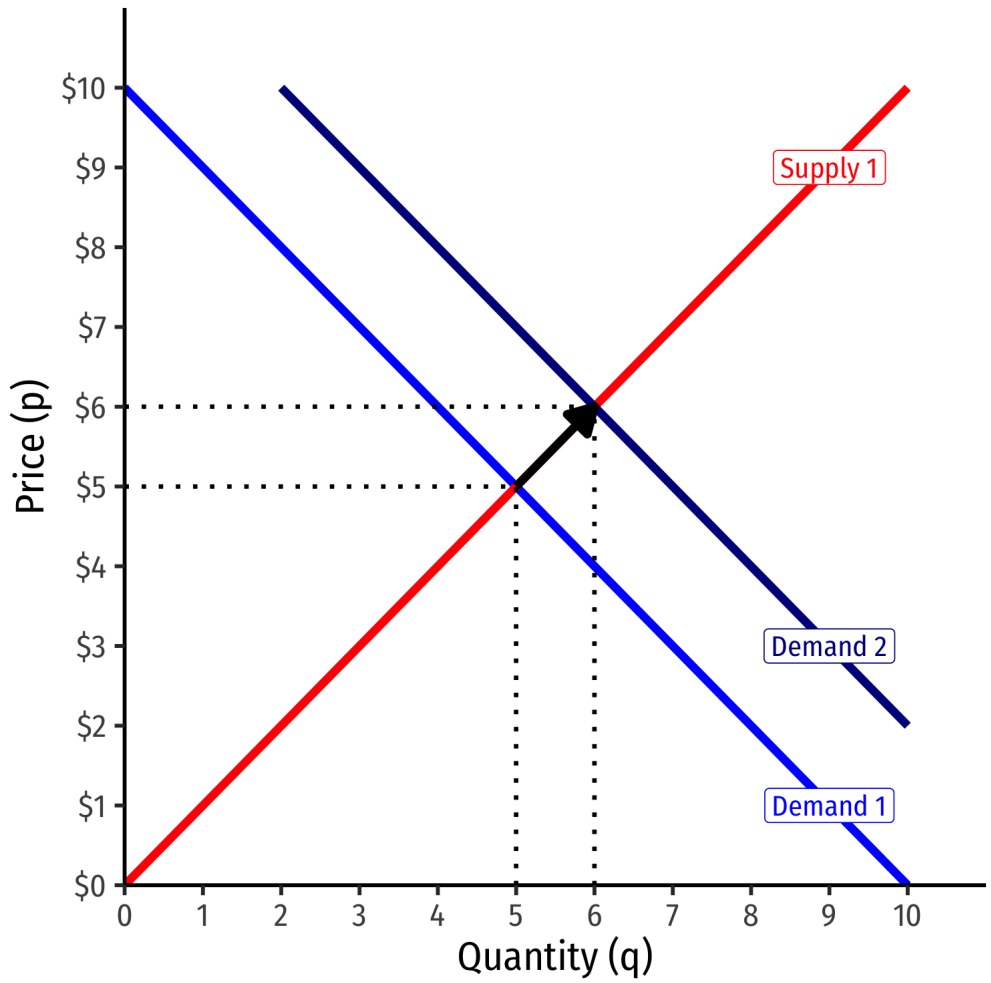
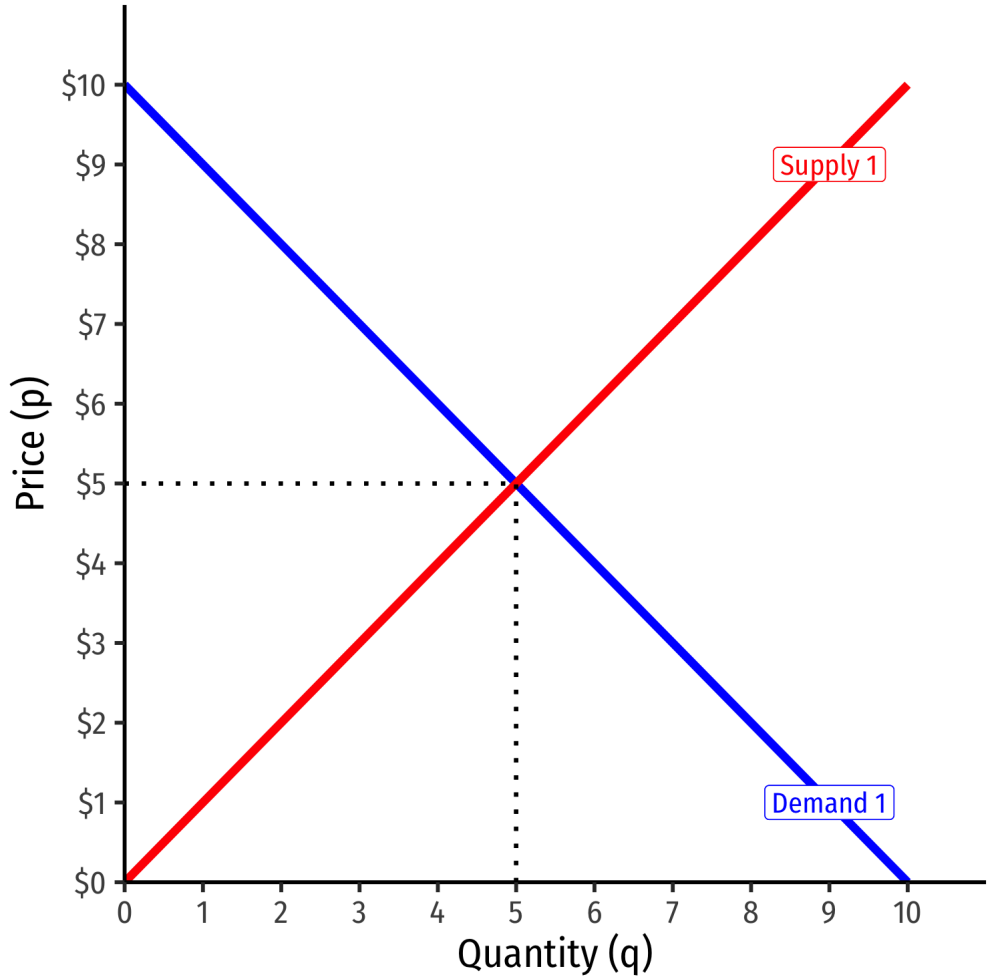


Increase in Demand

- More individuals want to buy more of the good at *every* price
- Entire demand curve shifts to the *right*
- At the original market price, a **shortage!** $(q_D > q_S)$
- Some buyers willing to pay more at this quantity
- Buyers raise bids, inducing sellers to sell more
- Reach new equilibrium with:
  - **higher market-clearing price**
  - **larger market-clearing quantity exchanged**

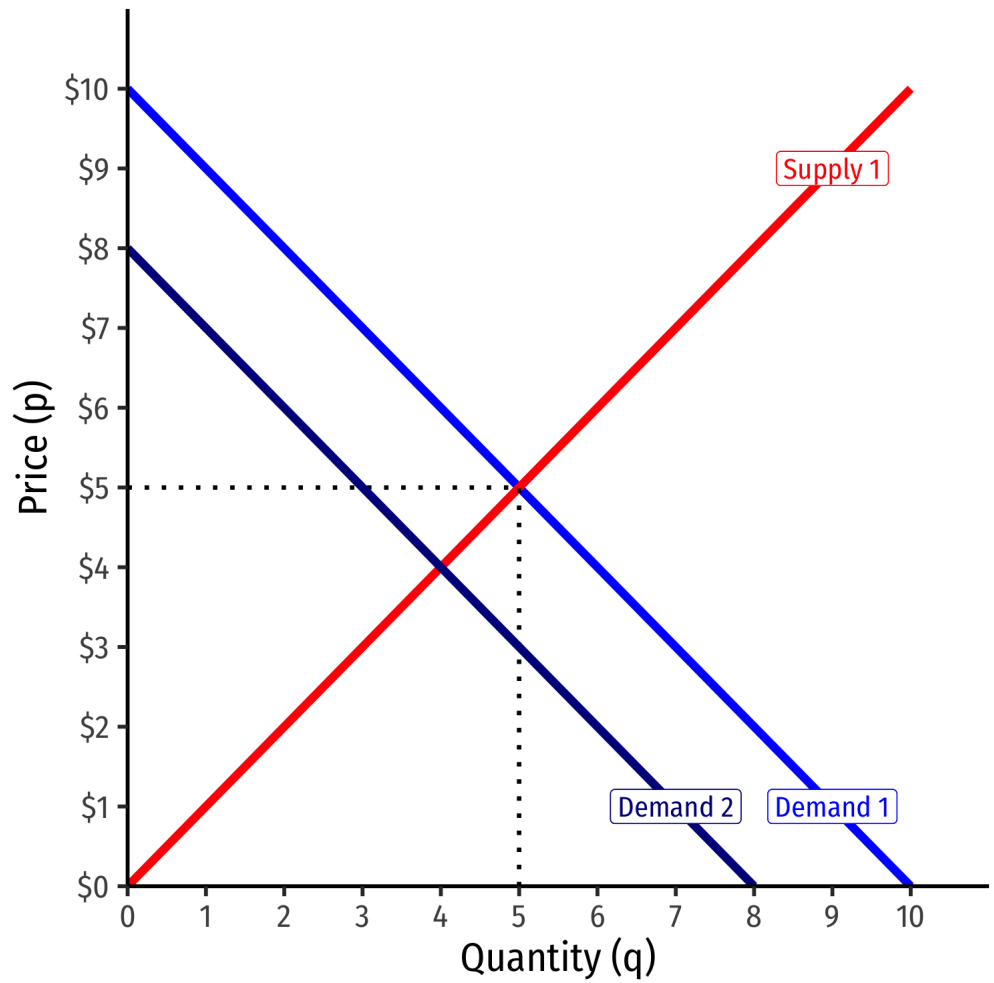


Decrease in Demand



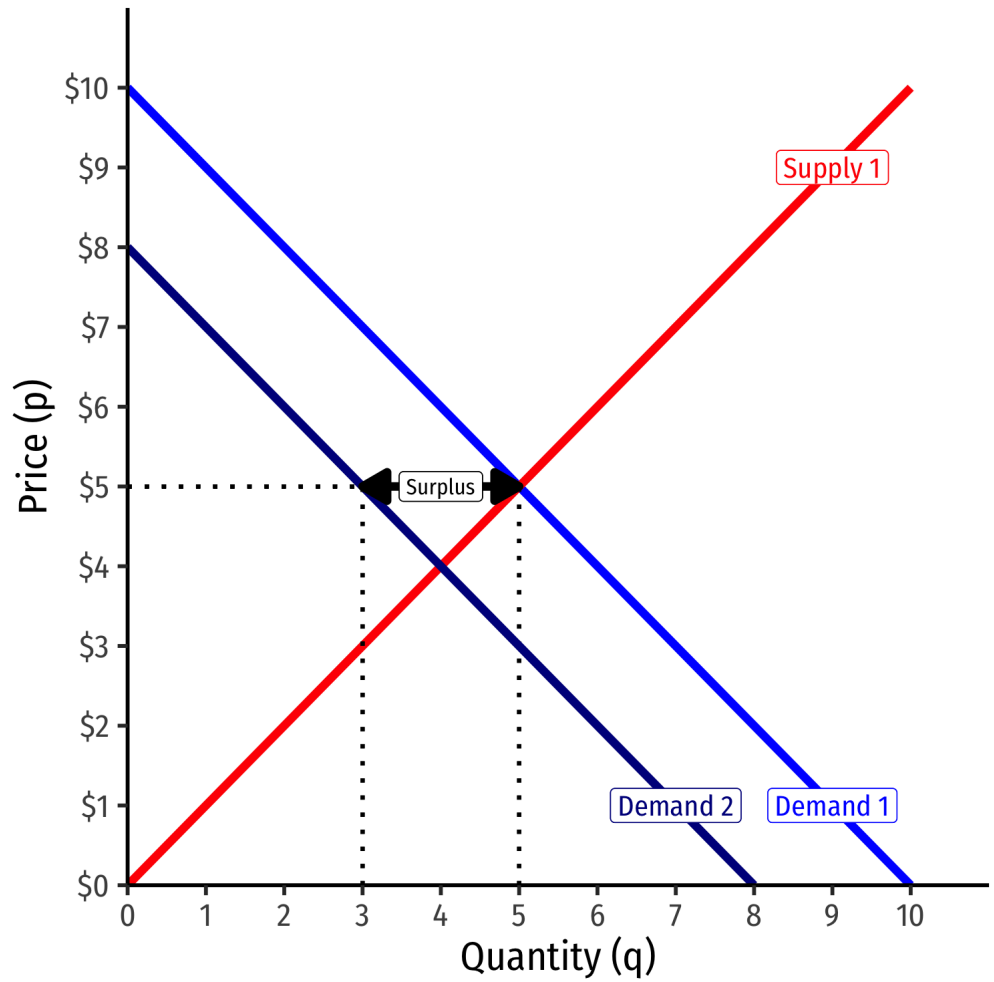
Decrease in Demand

- Fewer individuals want to buy less of the good at *every* price
- Entire demand curve shifts to the *left*



Decrease in Demand

- Fewer individuals want to buy less of the good at *every* price
- Entire demand curve shifts to the *left*
- At the original market price, a **surplus!** $(q_D < q_S)$



Decrease in Demand

- Fewer individuals want to buy less of the good at *every* price
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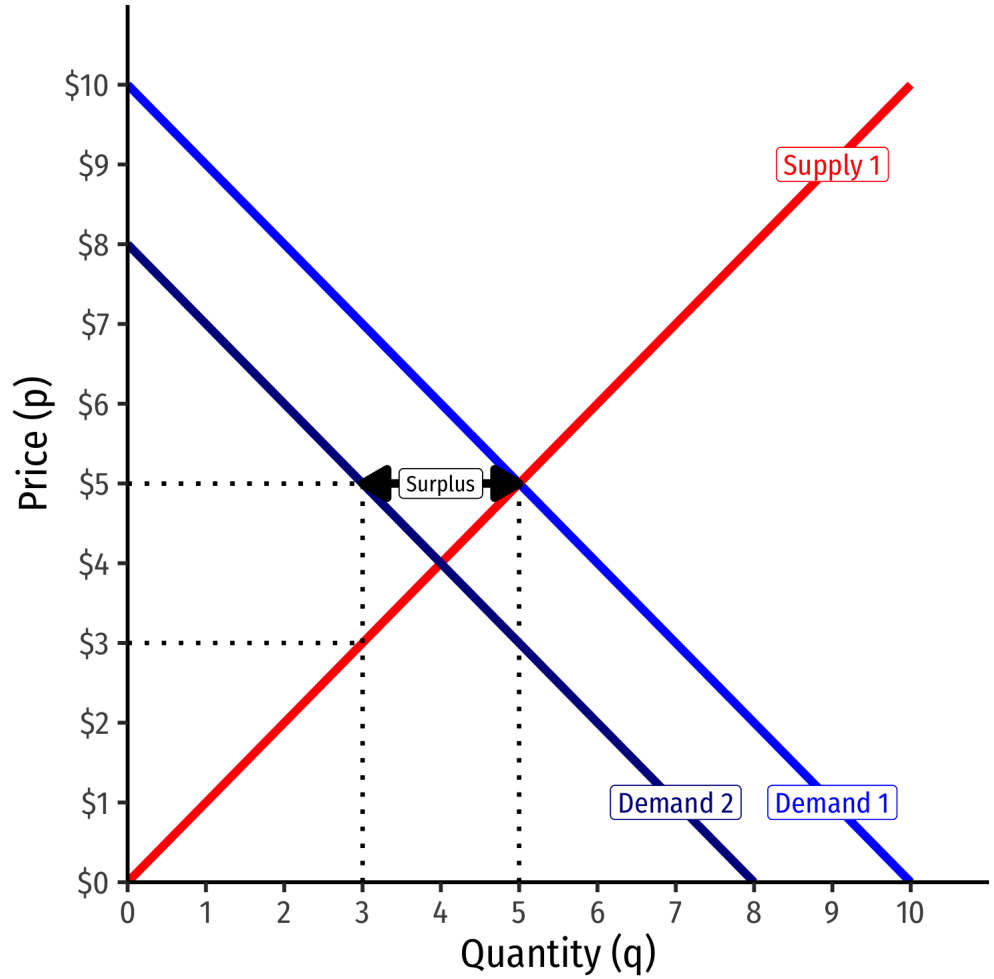
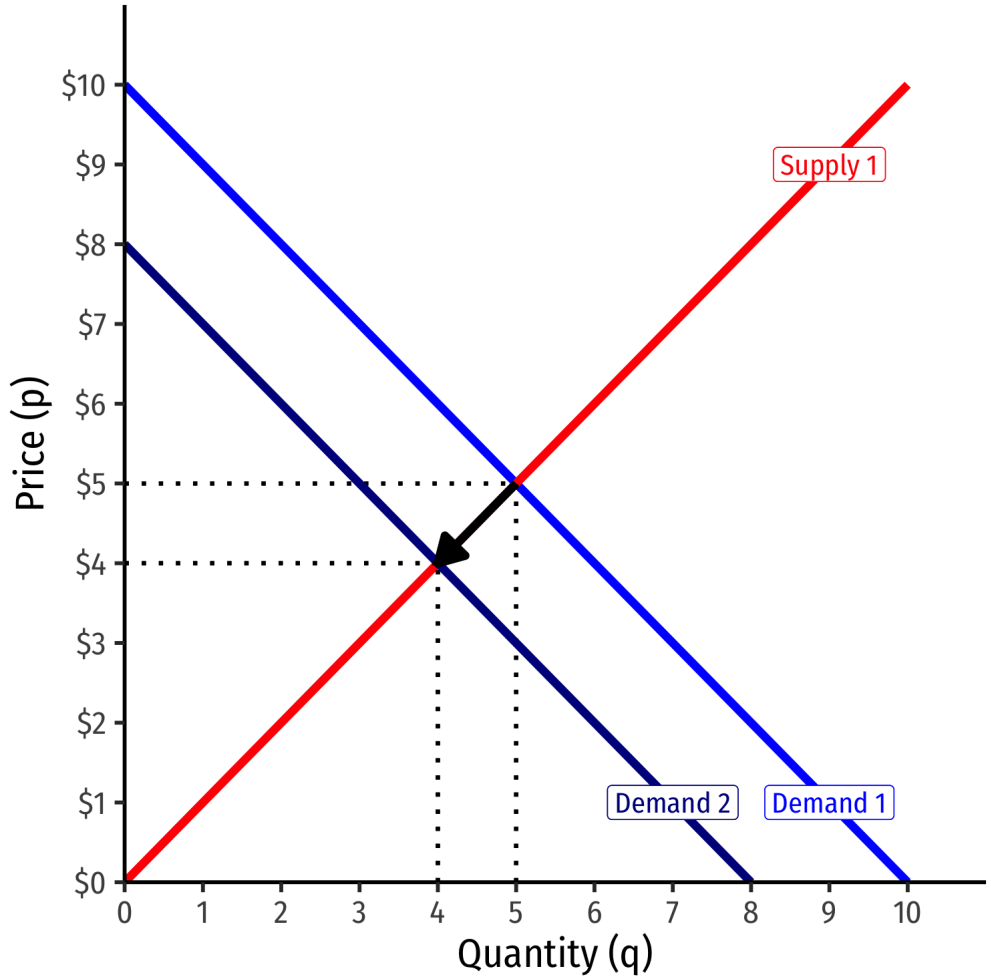
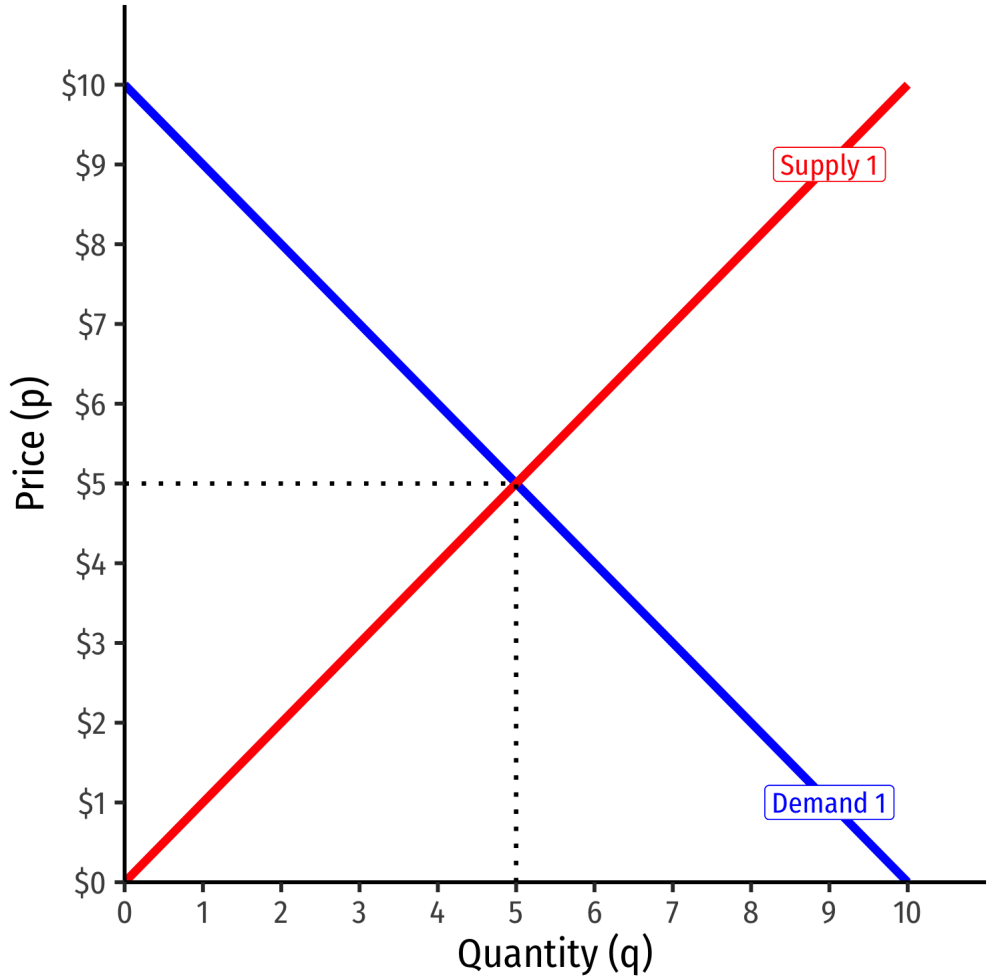


Decrease in Demand

- Fewer individuals want to buy less of the good at *every* price
- Entire demand curve shifts to the *left*
- At the original market price, a **surplus!** $(q_D < q_S)$
- Some sellers willing to accept less at this quantity
- Sellers lower asks, inducing buyers to buy more
- Reach new equilibrium with:
  - **lower market-clearing price**
  - **smaller market-clearing quantity**

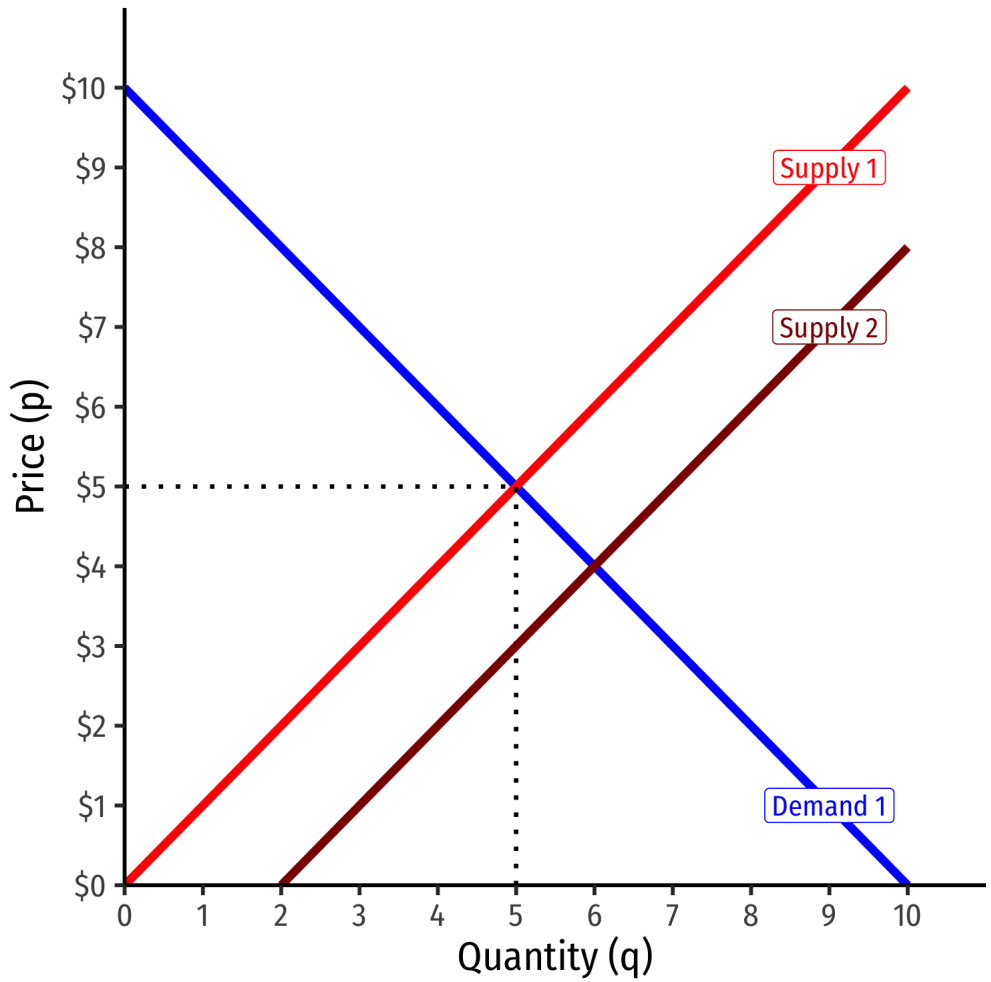


Increase in Supply



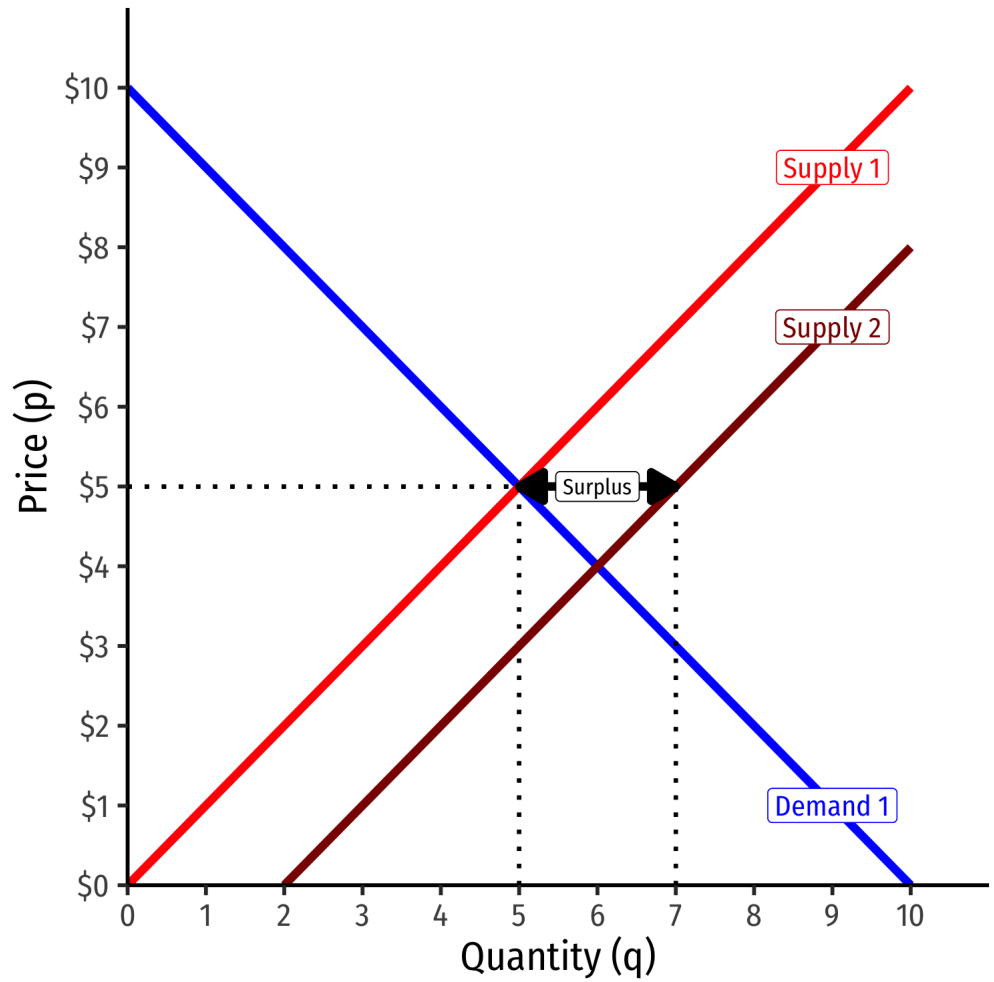
Increase in Supply

- More individuals want to sell more of the good at *every* price
- Entire supply curve shifts to the *right*



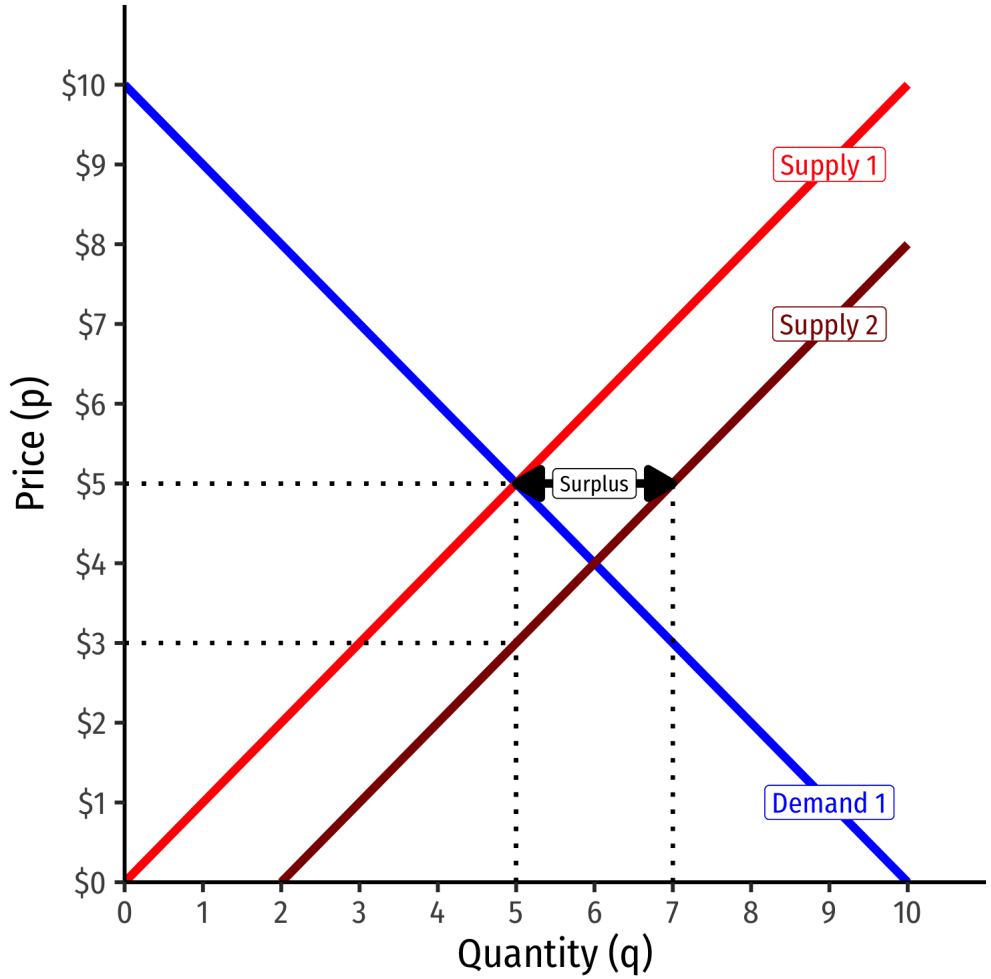
Increase in Supply

- More individuals want to sell more of the good at *every* price
- Entire supply curve shifts to the *right*
- At the original market price, a **surplus!** $(q_D < q_S)$



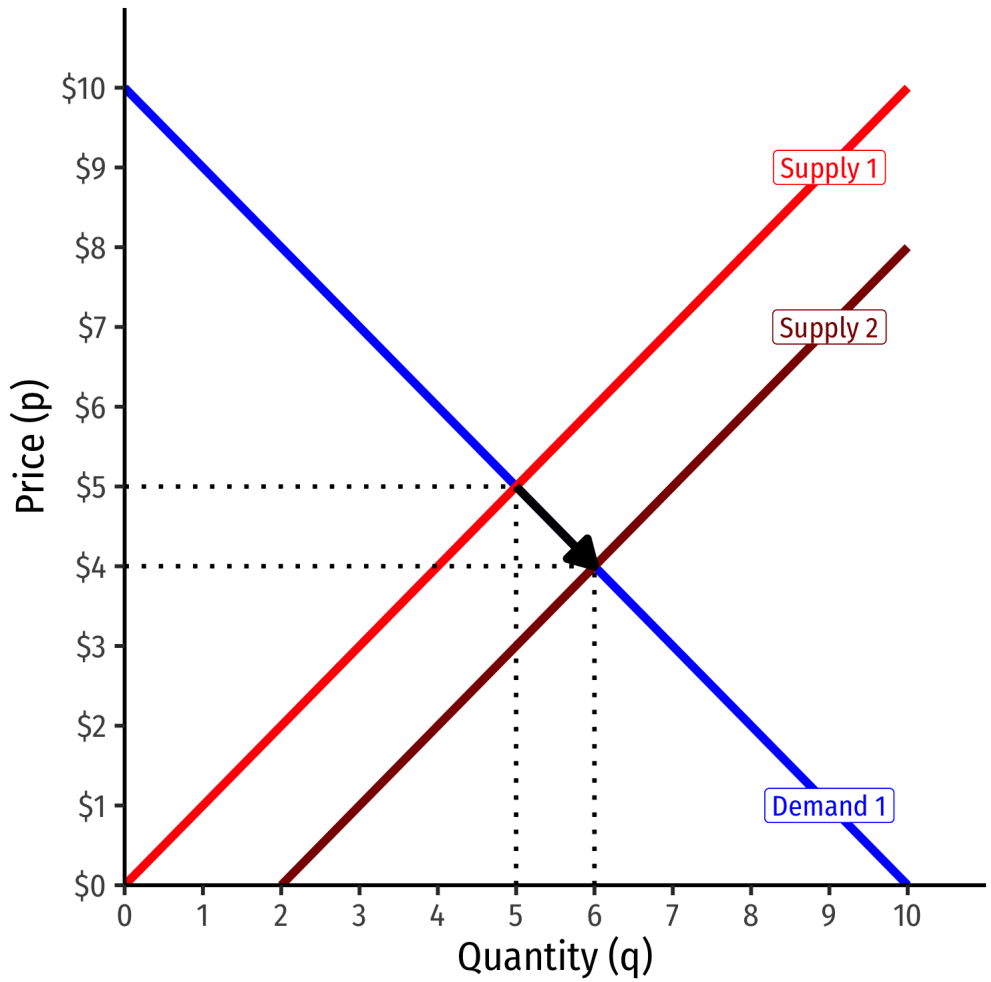
Increase in Supply

- More individuals want to sell more of the good at *every* price
- Entire supply curve shifts to the *right*
- At the original market price, a **surplus!** $(q_D < q_S)$
- Some sellers willing to accept less at this quantity

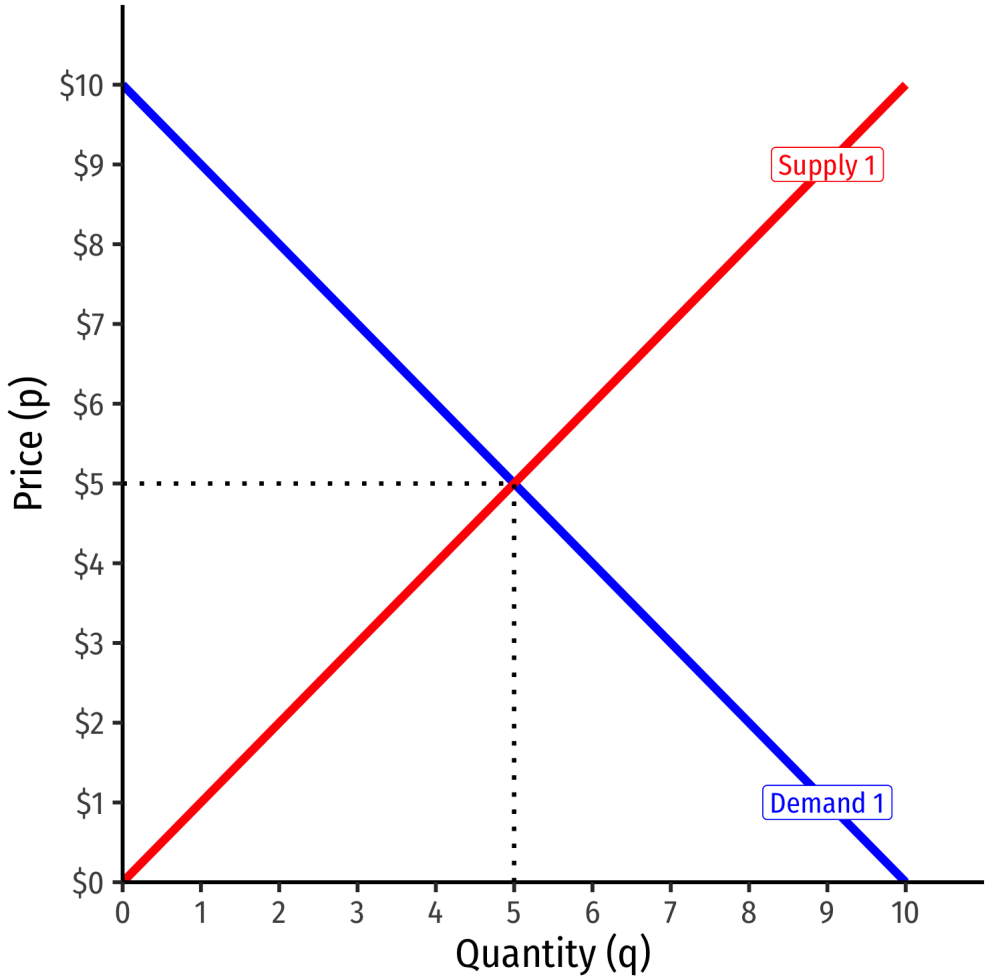


Increase in Supply

- More individuals want to sell more of the good at *every* price
- Entire supply curve shifts to the *right*
- At the original market price, a **surplus!** $(q_D < q_S)$
- Some sellers willing to accept less at this quantity
- Sellers lower asks, inducing buyers to buy more
- Reach new equilibrium with:
  - **lower market-clearing price**
  - **larger market-clearing quantity exchanged**

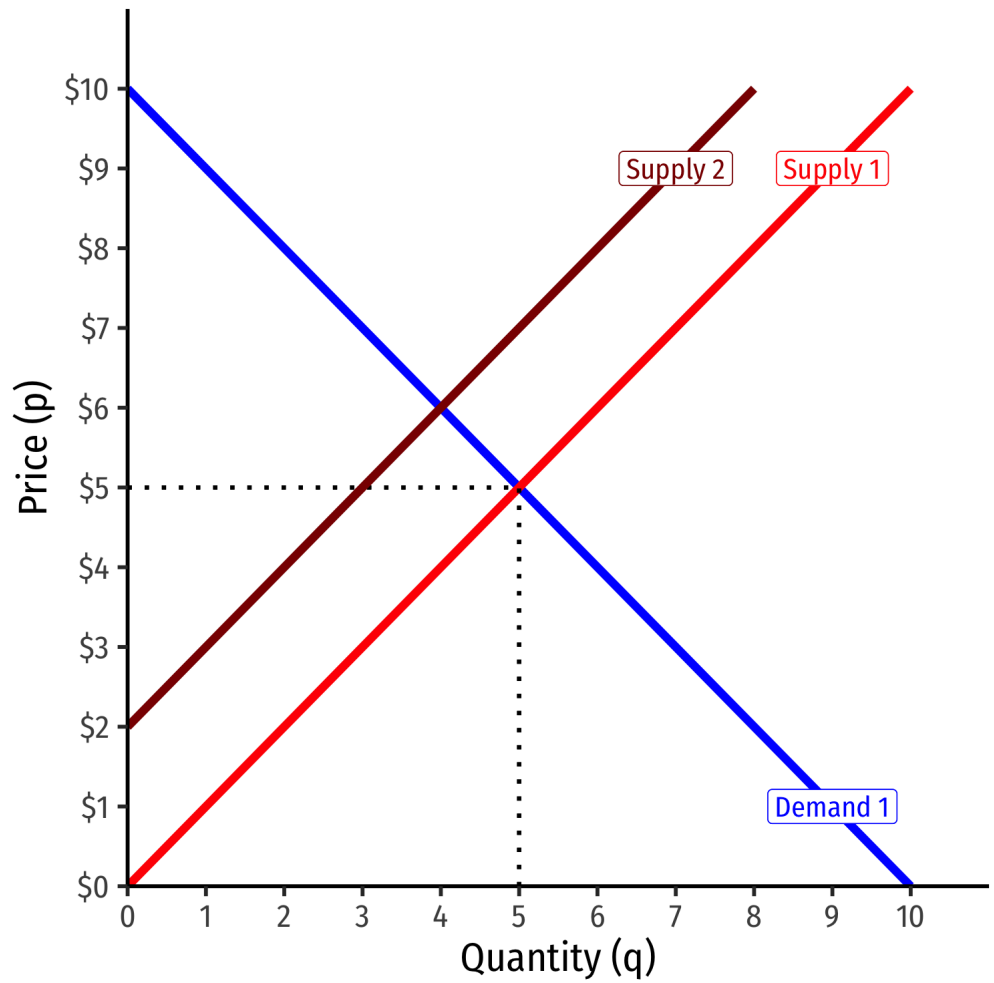


Decrease in Supply



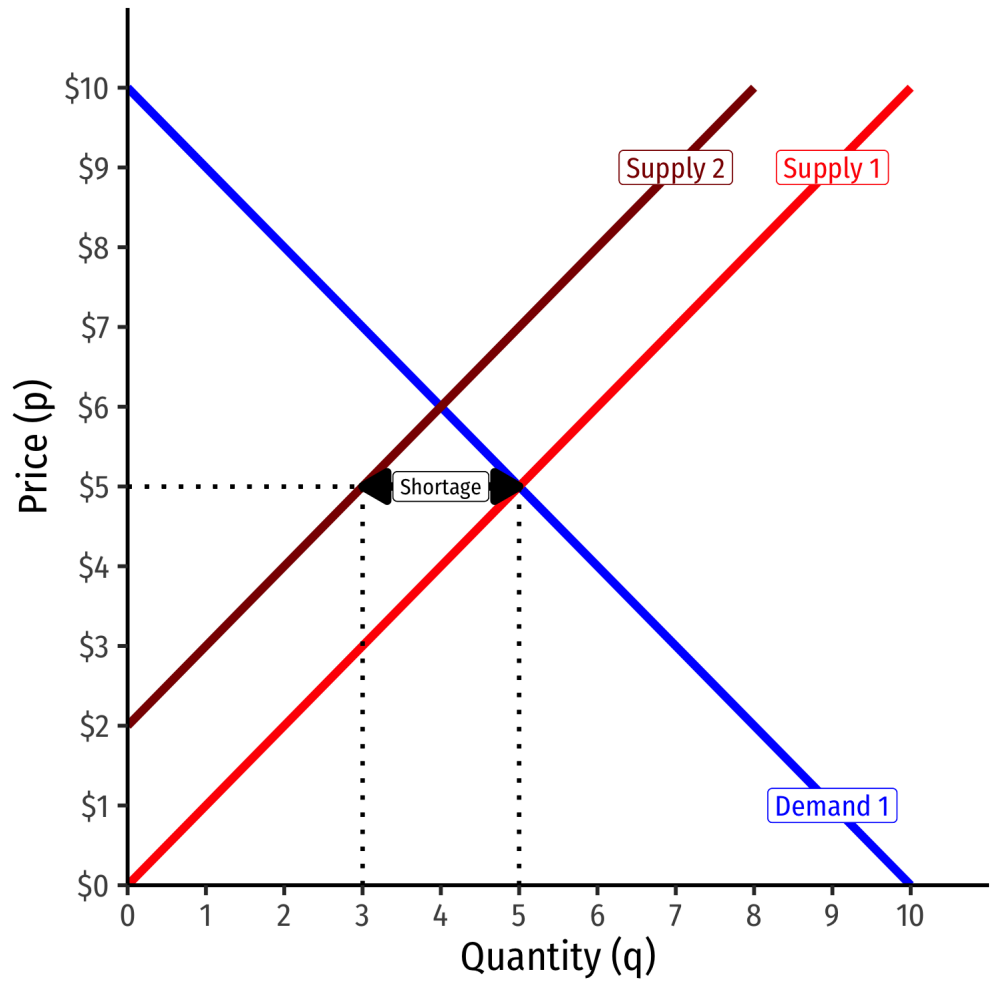
Decrease in Supply

- Fewer individuals want to sell less of the good at *every* price
- Entire supply curve shifts to the *left*



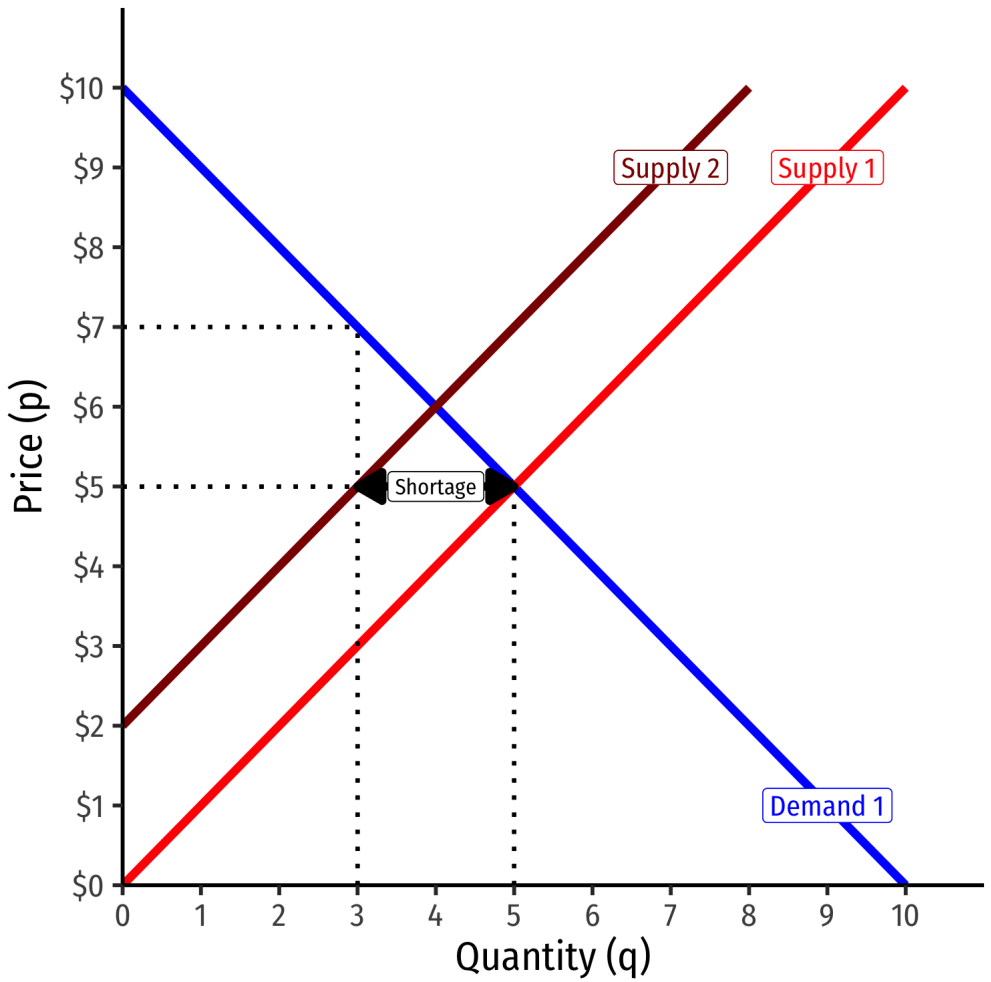
Decrease in Supply

- Fewer individuals want to sell less of the good at *every* price
- Entire supply curve shifts to the *left*
- At the original market price, a **shortage!** $(q_D > q_S)$



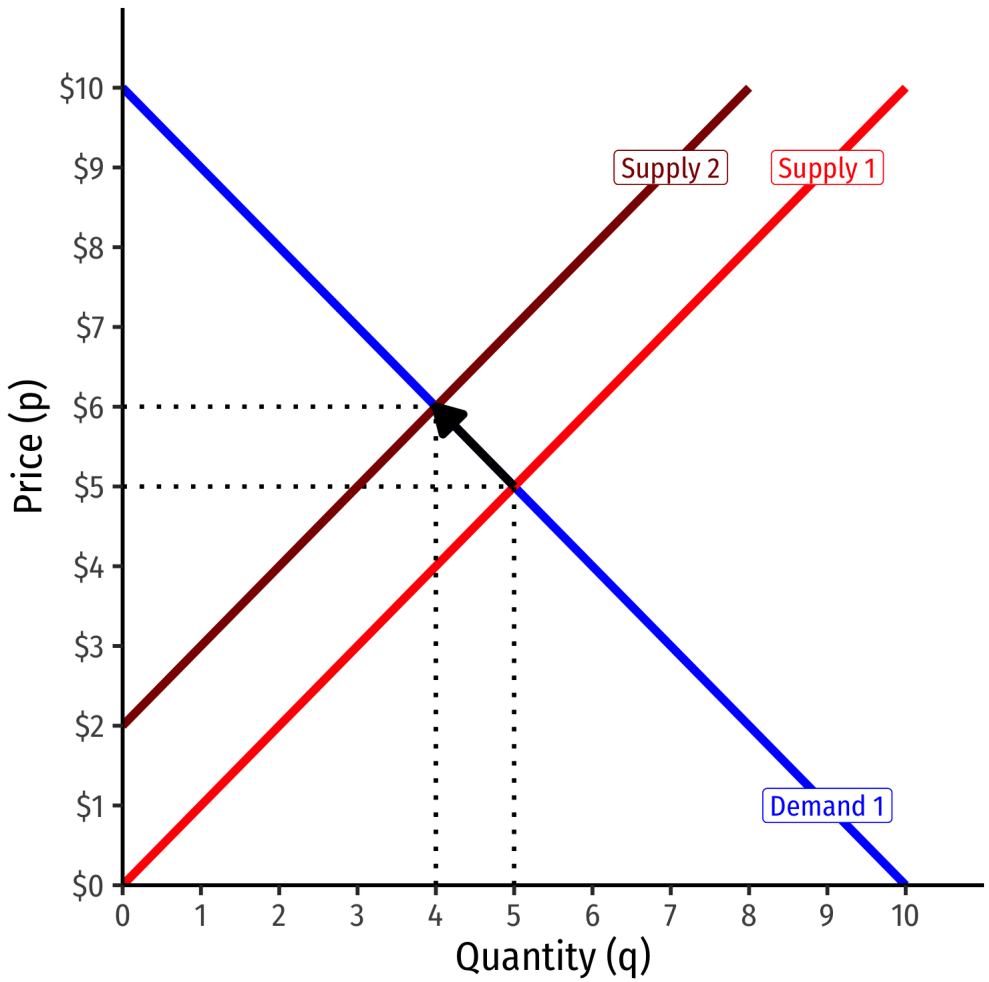
Decrease in Supply

- Fewer individuals want to sell less of the good at *every* price
- Entire supply curve shifts to the *left*
- At the original market price, a **shortage!** $(q_D > q_S)$
- Some buyers willing to pay more at this quantity

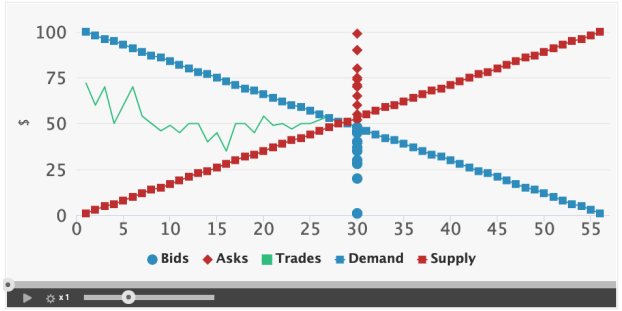


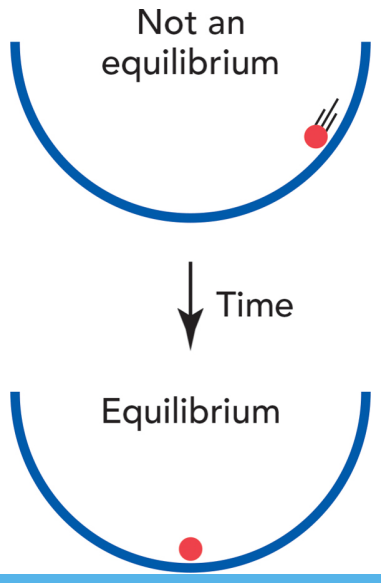
Decrease in Supply

- Fewer individuals want to sell less of the good at *every* price
- Entire supply curve shifts to the *left*
- At the original market price, a **shortage!** $(q_D > q_S)$
- Some buyers willing to pay more at this quantity
- Buyers raise bids, inducing sellers to sell more
- Reach new equilibrium with:
  - **higher market-clearing price**
  - **smaller market-clearing quantity exchanged**



Equilibrium Tendencies





- Equilibrium is a *tendency* we can *predict* with our models
- Buyers and sellers raise and lower their bids and asks to adjust to competition from other buyers and sellers, moving the market price
- *Ceterus paribus*, market prices will settle on an equilibrium given existing conditions
- But conditions are always changing (and so are prices)!