# Lecture 1: Supply and Demand

September 1, 2020

# Overview

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week
2. Online quiz – don't worry, we keep best 8 of 13

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week
2. Online quiz – don't worry, we keep best 8 of 13
3. Review Syllabus

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week
2. Online quiz – don't worry, we keep best 8 of 13
3. Review Syllabus
4. Introductions: tell us your name, and what you want to do when you're done

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week
2. Online quiz – don't worry, we keep best 8 of 13
3. Review Syllabus
4. Introductions: tell us your name, and what you want to do when you're done
5. Ripped from Headlines Assignment

# Welcome to Microeconomics

1. Expectations
   - Call me Leah
   - Class should be hard, but not impossible
   - What we learn should be clearly applicable
   - Come prepared to give examples, as I will call on you or your group
   - Understand that no class can satisfy all students
   - Is this the right class for you?
   - Math assessment
   - If you have a disability requiring accommodation, please let me know this week
2. Online quiz – don't worry, we keep best 8 of 13
3. Review Syllabus
4. Introductions: tell us your name, and what you want to do when you're done
5. Ripped from Headlines Assignment
6. What we'll do synchronously and a-synchronously

# Synchronous and Asynchronous Plan

Before Class – asynchronous

- You revise your problem notes from the previous class
- I post lectures Thursday by 5 pm (updated)
- You review the chapter assigned
  - read the chapter
  - listen to the lectures

# Synchronous and Asynchronous Plan

Before Class – asynchronous

- You revise your problem notes from the previous class
- I post lectures Thursday by 5 pm (updated)
- You review the chapter assigned
  - read the chapter
  - listen to the lectures

During Class – synchronous

We are recording! For within class use **only**

# Synchronous and Asynchronous Plan

Before Class – asynchronous

- You revise your problem notes from the previous class
- I post lectures Thursday by 5 pm (updated)
- You review the chapter assigned
  - read the chapter
  - listen to the lectures

During Class – synchronous

We are recording! For within class use **only**

- First thing: reading quiz.
- Administrative notes
- Ripped from the Headlines presentation
- **Short** review of concepts, maybe through example
- Work through in-class problems

# Synchronous and Asynchronous Plan

Before Class – asynchronous

- You revise your problem notes from the previous class
- I post lectures Thursday by 5 pm (updated)
- You review the chapter assigned
  - read the chapter
  - listen to the lectures

During Class – synchronous

We are recording! For within class use **only**

- First thing: reading quiz.
- Administrative notes
- Ripped from the Headlines presentation
- **Short** review of concepts, maybe through example
- Work through in-class problems

Please advise with suggestions on implementation, technical and otherwise.

# Vanilla and Supply and Demand

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive
2. And then synthetic vanilla is invented
   - fewer people want natural vanilla

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive
2. And then synthetic vanilla is invented
   - fewer people want natural vanilla
3. Producers change behavior
   - some producers switch to making other things

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive
2. And then synthetic vanilla is invented
   - fewer people want natural vanilla
3. Producers change behavior
   - some producers switch to making other things
4. Then people don't like synthetic vanilla
   - $\rightarrow$ more people want natural vanilla
   - it takes a farmer three years to get a vanilla bean after he decides you want one

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive
2. And then synthetic vanilla is invented
   - fewer people want natural vanilla
3. Producers change behavior
   - some producers switch to making other things
4. Then people don't like synthetic vanilla
   - $\rightarrow$ more people want natural vanilla
   - it takes a farmer three years to get a vanilla bean after he decides you want one
5. Finally, more beans arrive
   - farmers are finally able to make more
   - see here (July 2020) and here (Dec 2019)

# Supply and Demand in the Market for Natural Vanilla

1. In the "beginning"
   - no substitutes for natural vanilla
   - creating vanilla is incredibly labor-intensive
2. And then synthetic vanilla is invented
   - fewer people want natural vanilla
3. Producers change behavior
   - some producers switch to making other things
4. Then people don't like synthetic vanilla
   - $\rightarrow$ more people want natural vanilla
   - it takes a farmer three years to get a vanilla bean after he decides you want one
5. Finally, more beans arrive
   - farmers are finally able to make more
   - see here (July 2020) and here (Dec 2019)

Let's work through a set of supply and demand diagrams about what this means for price and quantity

# In-Class Problems

- Problems are on lectures tab: http://www.leahbrooks.org/leahweb/teaching/pppa6007/2020/subpages/lectures.html
- "During class" column for lecture 1
- We'll work online with a "notebook"
- I will post the notebook after both sections are done, under the "in-class problems" heading
- We will probably never get through all the problems, so you'll need to continue on your own
- Remind me if you don't see them by tomorrow morning!

# For Next Class

- Work through all problems and write up notes
- Work with classmates, me or TAs on problems
- Sign up for Piazza
- Sign up for Ripped from Headlines
- Article finders email me by Wednesday midnight
- Read Chapter 3

# For Next Class

- Work through all problems and write up notes
- Work with classmates, me or TAs on problems
- Sign up for Piazza
- Sign up for Ripped from Headlines
- Article finders email me by Wednesday midnight
- Read Chapter 3

I will

- post these lecture notes, lecture recording, notebook from class
- anything else?

# Online Lecture: Lecture 1

# Chapters 1 and 2

1. Why Economics?
2. Supply and Demand
   - Markets and Models
   - Demand
   - Supply
   - Market Equilibrium
   - An elasticity preview; much more in Lecture 3

# Why Economics?

- An important language for policy makers
- A shared set of assumptions about how the world works
- Understand the assumptions and logic if you want to challenge it
- Learn the power of models

# Markets and Models: Supply and Demand

# What is a Market?

A set of many things

- type of product sold
- location
- point in time

# Markets Policy Aside: Antitrust

- Federal anti-trust policy prohibits monopolies and "excessive" market concentration
- Whether or not a market is concentrated depends on how you define the market
- Expedia / Orbitz propsed merger
  - Expedia owns Travelocity, wants to buy Orbitz
  - Hotel owners say market is online bookings, and merger would give new company 75% of all online bookings
  - Expedia says market is hotel reservations, and merged company will account for 17% of hotel bookings[1]

[1] Full story here and a different interesting example here.

# Key Assumptions of Supply and Demand Model

1. We restrict our focus to one single market
   Supply $\equiv$ total amount of a good that all producers are willing to sell
   Demand $\equiv$ total amount of a good that all consumers are willing to buy
2. All goods bought and sold in the market are identical
3. All goods sold in the market sell for the same prices and everyone has the same information about prices and quality
4. There are many buyers and sellers in the market

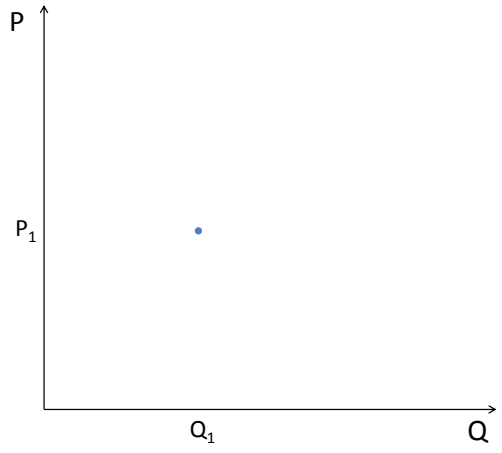
# Demand

# Demand Curves

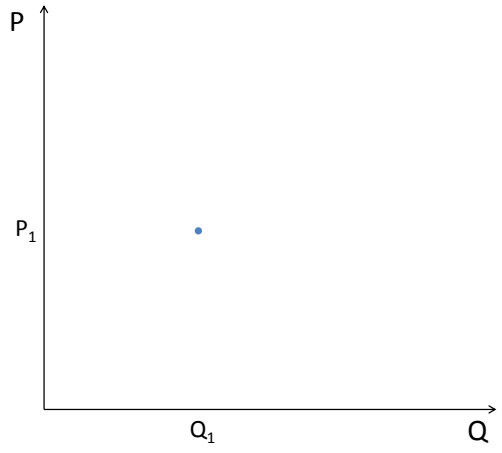
We want a way to summarize everyone's demand in the market

- Demand curve $\equiv$ relationship between the quantity of a good demanded and the price consumers are willing to pay, holding all else constant
- Demand curves almost always slope downward

# Picturing Demand for a Product You Know

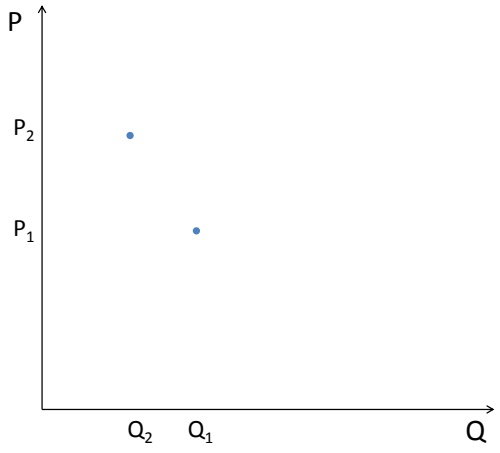


# Picturing Demand for a Product You Know

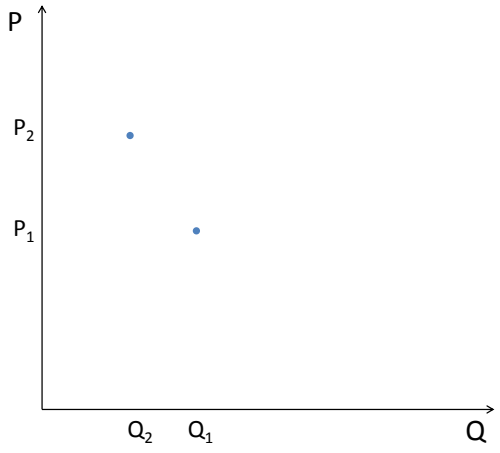



Then, what if the price increases?

# Quantity Demanded at an Increased Price

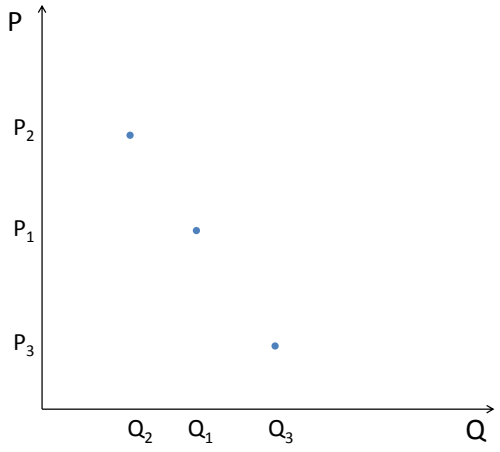


# Quantity Demanded at an Increased Price

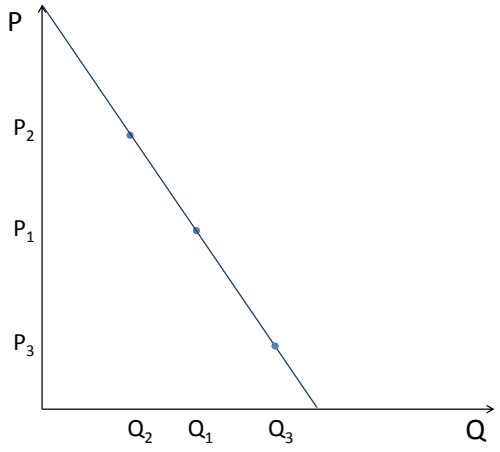



What if the price had instead decreased?

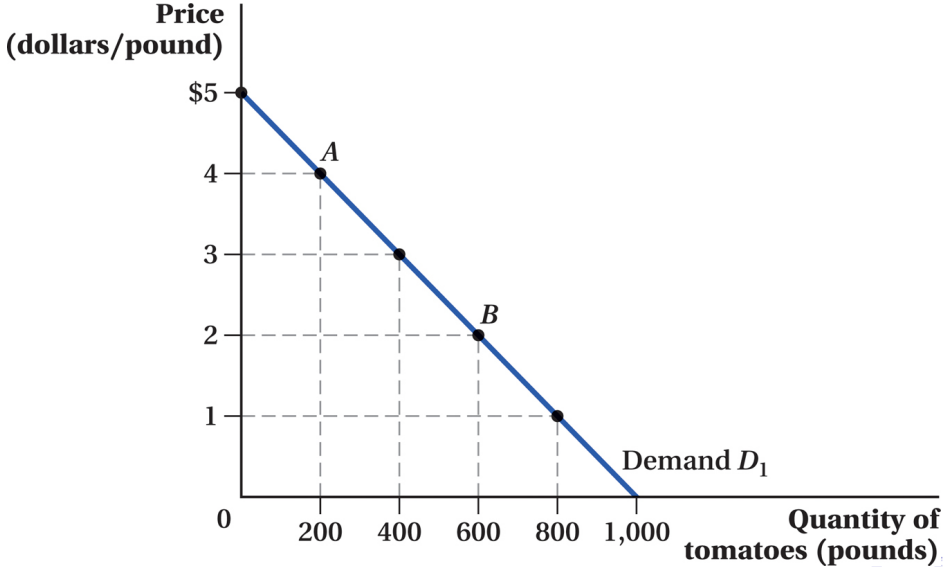
# Quantity Demanded at a Decreased Price



# Think about a $Q$ for any $P$



# The Textbook's Demand Curve



# Demand Curve: Graph to Algebra

- If you can draw it in a graph, you can write an equation for it
- We can write the previous picture's line as $Q^D = 1000 - 200P$
  - This is a function of $Q$ in terms of $P$, which we can write in general as $Q = f(P)$

# Inverse Demand Curve

$Q^D = 1000 - 200P$ is entirely the same as $P = 5 - Q^D/200$

- This is a function of $P$ in terms of $Q$, which we can write $P = g(Q)$ – call it the inverse demand curve
- The $P = g(Q)$ version matches the previous graph
- You can read the negative slope ($-1/200$) from the equation

# Factors that Influence Demand

# Factors that Influence Demand

1. Price
2. Number of consumers
3. Consumer income or wealth
4. Consumer tastes
5. Prices of other goods

# How Do Other Goods Influence the Price of the Good We're Considering?

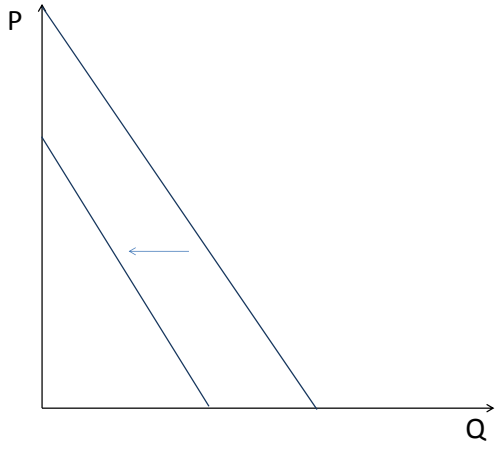
- Substitute $\equiv$ a good that could replace the good under consideration
- Complement $\equiv$ a good that you consume with the good under consideration

If the price of a perfect substitute decreases, what happens to your demand for the main good?

# Demand Curve Shifts

- If we want to understand how the market demand changes when price changes, we move **along** the demand curve
- When there is a change in any other determinant of demand, the demand curve **shifts**

# What Could Make a Demand Curve Shift Inward?



# Supply

# Factors that Influence Supply

# Factors that Influence Supply

- Price
- Suppliers' costs of production
- Number of sellers
- Sellers' outside options

# Factors that Influence Supply

- Price
- Suppliers' costs of production
- Number of sellers
- Sellers' outside options

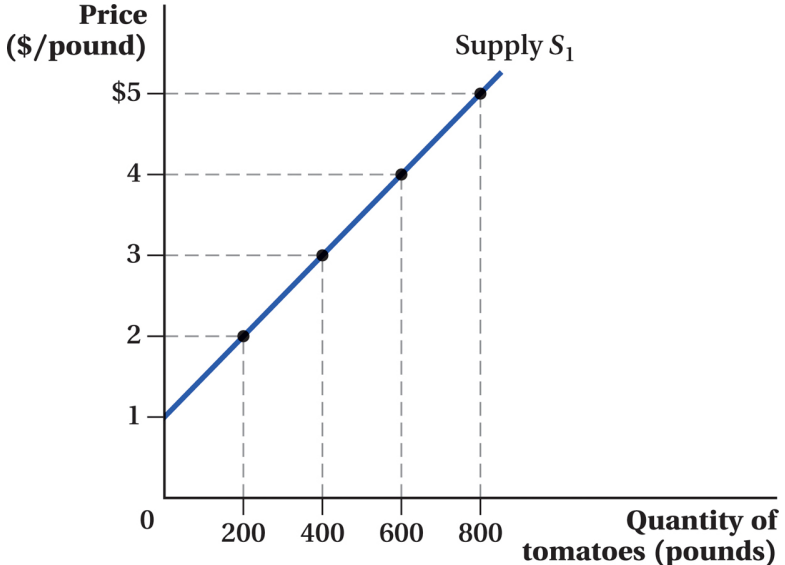
So what does a supply curve look like?

# Factors that Influence Supply

- Price
- Suppliers' costs of production
- Number of sellers
- Sellers' outside options

So what does a supply curve look like? Upward sloping.

# Textbook's Supply Curve



# An Equation for the Supply Curve

- Just like demand, we can write an equation for supply
- $Q^S = 200P - 200$

# An Equation for the Supply Curve

- Just like demand, we can write an equation for supply
- $Q^S = 200P - 200$
  - this is $Q = f(P)$

# An Equation for the Supply Curve

- Just like demand, we can write an equation for supply
- $Q^S = 200P - 200$
  - this is $Q = f(P)$
- We can also write $P = \frac{Q}{200} + 1$
  - this is $P = g(Q)$
  - entirely equivalent to first equation

# Shifts in the Supply Curve

- Does a price change shift the supply curve or move along the supply curve?

# Shifts in the Supply Curve

- Does a price change shift the supply curve or move along the supply curve?
- Do non-price changes cause shifts or moves along the supply curve?

# Market Equilibrium

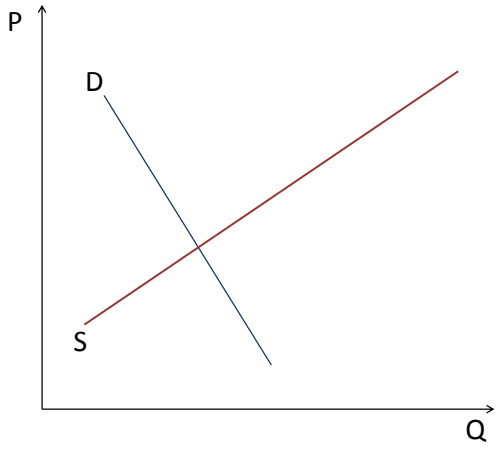
# Defining Market Equilibrium

- Point at which consumers' quantity demanded equals producers' quantity supplied
  - $Q^D = Q^S$
- Equilibrium price $\equiv$ price at which quantity supplied equals quantity demanded
  - $P$ such that $Q^D = Q^S$

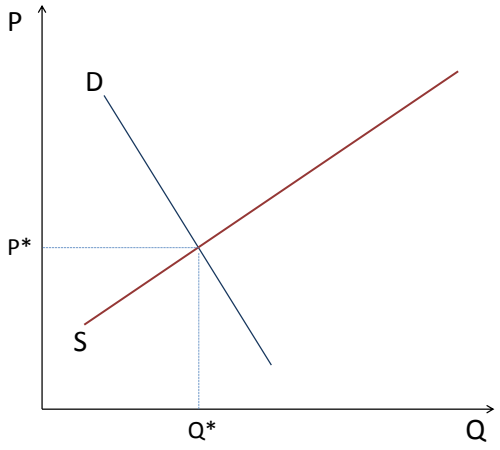
# Defining Market Equilibrium

- Point at which consumers' quantity demanded equals producers' quantity supplied
  - $Q^D = Q^S$
- Equilibrium price $\equiv$ price at which quantity supplied equals quantity demanded
  - $P$ such that $Q^D = Q^S$
- Getting to equilibrium is the work of Adam Smith's invisible hand

# Equilibrium in a Graph



# Equilibrium in a Graph



# Equilibrium in Algebra: Price

Using our tomato example

$$Q^D = Q^S$$

# Equilibrium in Algebra: Price

Using our tomato example

$$\begin{aligned} Q^D &= Q^S \\ 1000 - 200P &= 200P - 200 \end{aligned}$$

# Equilibrium in Algebra: Price

Using our tomato example

$$\begin{aligned} Q^D &= Q^S \\ 1000 - 200P &= 200P - 200 \\ P &= 3 \end{aligned}$$

# Equilibrium in Algebra: Quantity

- Before putting pencil to paper, are $Q_S$ and $Q_D$ equal or different?

# Equilibrium in Algebra: Quantity

- Before putting pencil to paper, are $Q_S$ and $Q_D$ equal or different? They must be the same.

# Equilibrium in Algebra: Quantity

- Before putting pencil to paper, are $Q_S$ and $Q_D$ equal or different? They must be the same.
- How do you find them?
- Using our tomato example

$$Q^D = 1000 - 200P = 1000 - 200(3) = 400$$

# Equilibrium in Algebra: Quantity

- Before putting pencil to paper, are $Q_S$ and $Q_D$ equal or different? They must be the same.
- How do you find them?
- Using our tomato example

$$\begin{aligned} Q^D &= 1000 - 200P = 1000 - 200(3) = 400 \\ Q^S &= 200P - 200 = 200(3) - 200 = 400 \end{aligned}$$

# Getting to Equilibrium

That's just the math. The magic is getting there!

- Suppose we are out of equilibrium and $Q^D > Q^S$

# Getting to Equilibrium

That's just the math. The magic is getting there!

- Suppose we are out of equilibrium and $Q^D > Q^S$
  - Seems like a shortage
  - Price increases until we reach equilibrium
- Suppose we are out of equilibrium and $Q^S > Q^D$

# Getting to Equilibrium

That's just the math. The magic is getting there!

- Suppose we are out of equilibrium and $Q^D > Q^S$
  - Seems like a shortage
  - Price increases until we reach equilibrium
- Suppose we are out of equilibrium and $Q^S > Q^D$
  - Seems like a surplus
  - Price falls until we reach equilibrium

# Getting to Equilibrium

That's just the math. The magic is getting there!

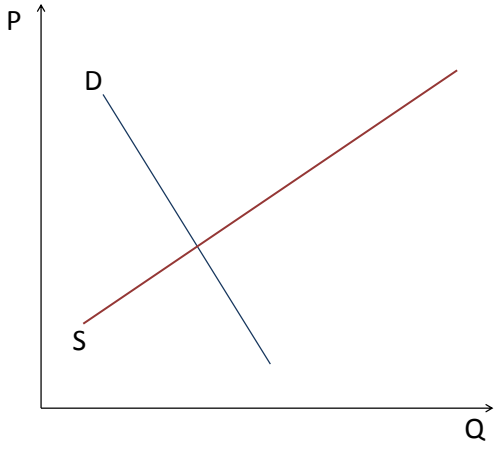
- Suppose we are out of equilibrium and $Q^D > Q^S$
  - Seems like a shortage
  - Price increases until we reach equilibrium
- Suppose we are out of equilibrium and $Q^S > Q^D$
  - Seems like a surplus
  - Price falls until we reach equilibrium

Note that these are all movements along existing curves.

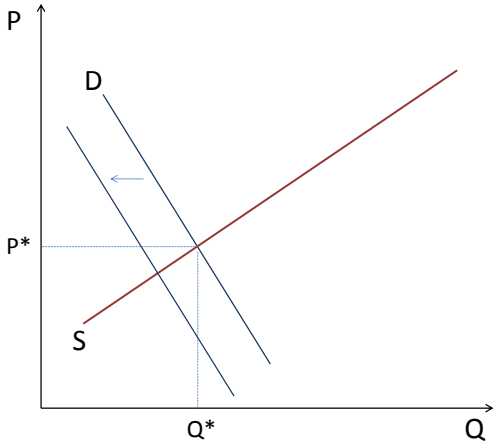
# Impact of Shift in Demand

- Suppose that we learn that tomatoes ruin the fluoride on your teeth
- What happens to the demand curve?

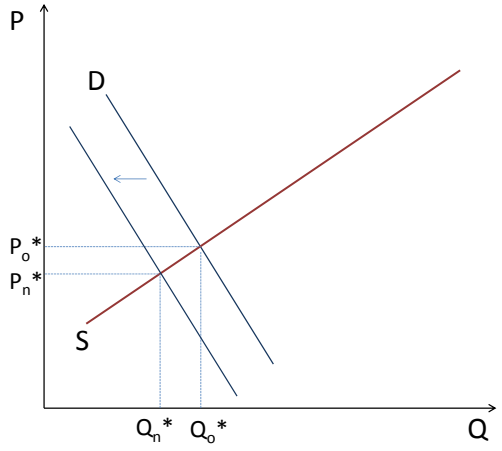
# Where Does Demand Curve Go?



# Where Does Demand Curve Go?



# Where Does Demand Curve Go?



# What does this mean for equilibrium?

## New Demand Curve

- Assume that for any price, the quantity demanded of tomatoes falls by 500
- $Q^{D,original} = 1000 - 200P$

$$Q^{D,new} =$$

# What does this mean for equilibrium?

## New Demand Curve

- Assume that for any price, the quantity demanded of tomatoes falls by 500
- $Q^{D,original} = 1000 - 200P$

$$Q^{D,new} = Q^{D,original} - 500$$

# What does this mean for equilibrium?

## New Demand Curve

- Assume that for any price, the quantity demanded of tomatoes falls by 500
- $Q^{D,original} = 1000 - 200P$

$$\begin{aligned} Q^{D,new} &= Q^{D,original} - 500 \\ &= 1000 - 200P - 500 \end{aligned}$$

# What does this mean for equilibrium?

## New Demand Curve

- Assume that for any price, the quantity demanded of tomatoes falls by 500
- $Q^{D,original} = 1000 - 200P$

$$\begin{aligned} Q^{D,new} &= Q^{D,original} - 500 \\ &= 1000 - 200P - 500 \\ &= 500 - 200P \end{aligned}$$

# What does this mean for equilibrium?

## Find new equilibrium

- Again: $Q^S = Q^{D,new}$
  - Some algebra... $P_2 = 1.75$
  - And new equilibrium quantities?

# What does this mean for equilibrium?

## Find new equilibrium

- Again: $Q^S = Q^{D,new}$
  - Some algebra... $P_2 = 1.75$
  - And new equilibrium quantities?
  - $Q^{D,new} = 500 - 200P = 500 - 200(1.75) = 150$

# What does this mean for equilibrium?

## Find new equilibrium

- Again: $Q^S = Q^{D,new}$
  - Some algebra... $P_2 = 1.75$
  - And new equilibrium quantities?
  - $Q^{D,new} = 500 - 200P = 500 - 200(1.75) = 150$
  - $Q^S = 200P - 200 = 200(1.75) - 200 = 150$

# What does this mean for equilibrium?

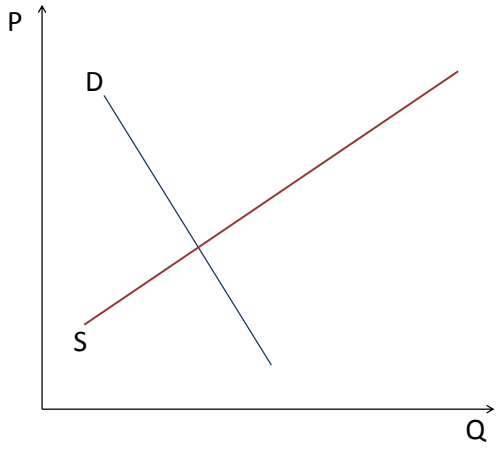
## Find new equilibrium

- Again: $Q^S = Q^{D,new}$
  - Some algebra... $P_2 = 1.75$
  - And new equilibrium quantities?
  - $Q^{D,new} = 500 - 200P = 500 - 200(1.75) = 150$
  - $Q^S = 200P - 200 = 200(1.75) - 200 = 150$
- We find
  - Price falls
  - Equilibrium quantity falls

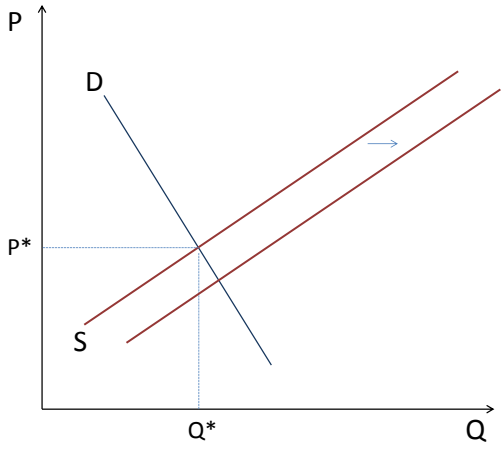
# Impact of Shift in Supply

- Suppose that the drought in California ends, and California can now produce more tomatoes
- What happens to the supply curve?

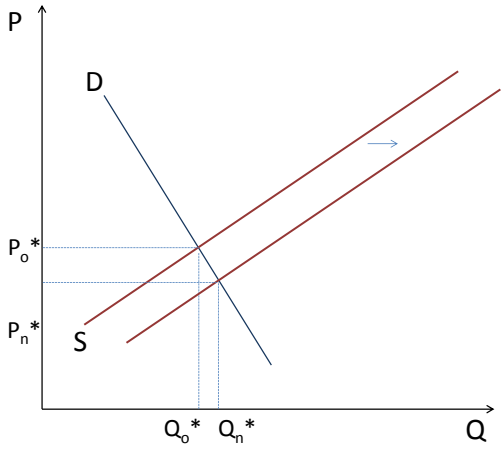
# Where Does Supply Curve Go?



# Where Does Supply Curve Go?



# Where Does Supply Curve Go?



# Algebra: Impact of Shift in Supply

- Suppose that we learn that ADM develops a tomato that ripens more quickly, increasing yields
- For any price, the quantity supplied of tomatoes increases by 400
- Recall $Q^{S,original} = 200P - 200$
- Then

$$Q^{S,new}$$

# Algebra: Impact of Shift in Supply

- Suppose that we learn that ADM develops a tomato that ripens more quickly, increasing yields
- For any price, the quantity supplied of tomatoes increases by 400
- Recall $Q^{S,original} = 200P - 200$
- Then

$$Q^{S,new} = Q^{S,original} + 400$$

# Algebra: Impact of Shift in Supply

- Suppose that we learn that ADM develops a tomato that ripens more quickly, increasing yields
- For any price, the quantity supplied of tomatoes increases by 400
- Recall $Q^{S,original} = 200P - 200$
- Then

$$\begin{aligned} Q^{S,new} &= Q^{S,original} + 400 \\ &= 200P - 200 + 400 \end{aligned}$$

# Algebra: Impact of Shift in Supply

- Suppose that we learn that ADM develops a tomato that ripens more quickly, increasing yields
- For any price, the quantity supplied of tomatoes increases by 400
- Recall $Q^{S,original} = 200P - 200$
- Then

$$\begin{aligned} Q^{S,new} &= Q^{S,original} + 400 \\ &= 200P - 200 + 400 \\ &= 200P + 200 \end{aligned}$$

# Equilibrium: Impact of Shift in Supply

- How do we find the new equilibrium?

# Equilibrium: Impact of Shift in Supply

- How do we find the new equilibrium? $Q^{S,new} = Q^D$
- Some algebra... $P_3 = 2$
- And new equilibrium quantities?

# Equilibrium: Impact of Shift in Supply

- How do we find the new equilibrium? $Q^{S,new} = Q^D$
- Some algebra... $P_3 = 2$
- And new equilibrium quantities?
- $Q^D = 1000 - 200P = 1000 - 200(2) = 600$

# Equilibrium: Impact of Shift in Supply

- How do we find the new equilibrium? $Q^{S,new} = Q^D$
- Some algebra... $P_3 = 2$
- And new equilibrium quantities?
- $Q^D = 1000 - 200P = 1000 - 200(2) = 600$
- $Q^{S,new} = 200P + 200 = 200(2) + 200 = 600$

# Equilibrium: Impact of Shift in Supply

- How do we find the new equilibrium? $Q^{S,new} = Q^D$
- Some algebra... $P_3 = 2$
- And new equilibrium quantities?
- $Q^D = 1000 - 200P = 1000 - 200(2) = 600$
- $Q^{S,new} = 200P + 200 = 200(2) + 200 = 600$

Therefore

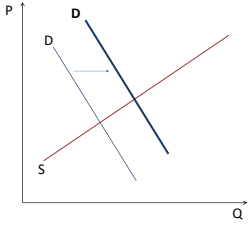
- Price falls
- Equilibrium quantity increases

# Deducing Changes to Supply and Demand from Changes in $P$ and $Q$

- Assume only supply or demand changes
- Suppose that we observe a decrease in prices for coffee
- And suppose that we also observe an increase in the quantity of coffee consumed
- What can we assume happened to supply and demand?
- Work through problem step-by-step

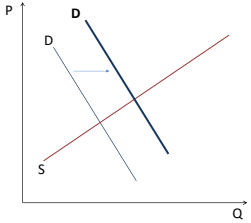
# All Four Different Cases

(a) Demand increases

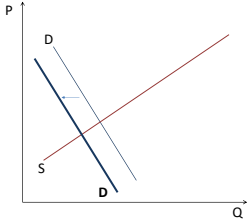


# All Four Different Cases

(a) Demand increases

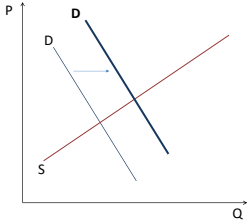



(b) Demand decreases

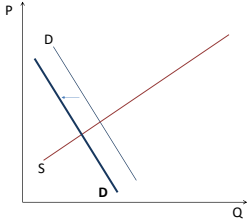


# All Four Different Cases

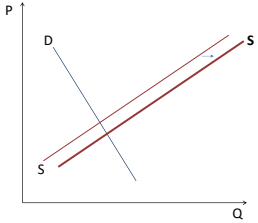
(a) Demand increases




(b) Demand decreases

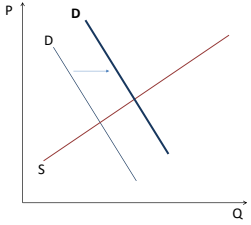



(c) Supply increases

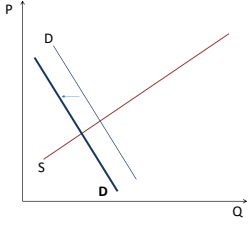


# All Four Different Cases

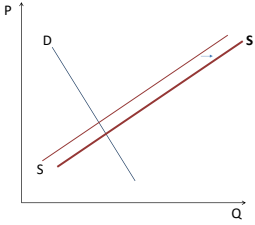
(a) Demand increases



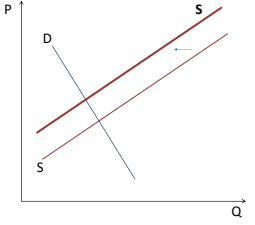

(b) Demand decreases




(c) Supply increases




(d) Supply decreases



# Deducing Changes to Supply and Demand from Changes in $P$ and $Q$

Assume only supply or demand changes and that (1) prices decrease and (2) quantity of vanilla increases

- Prices decrease
  - Consistent with decrease in demand
  - Consistent with increase in supply
- Quantity increases
  - Consistent with increase in demand
  - Consistent with increase in supply
- $\rightarrow$ Demand constant, supply increased.