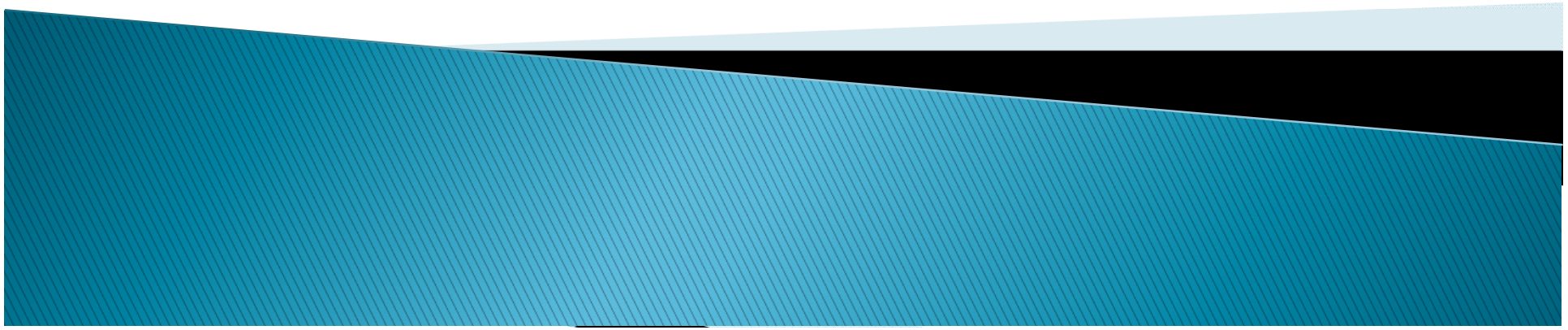
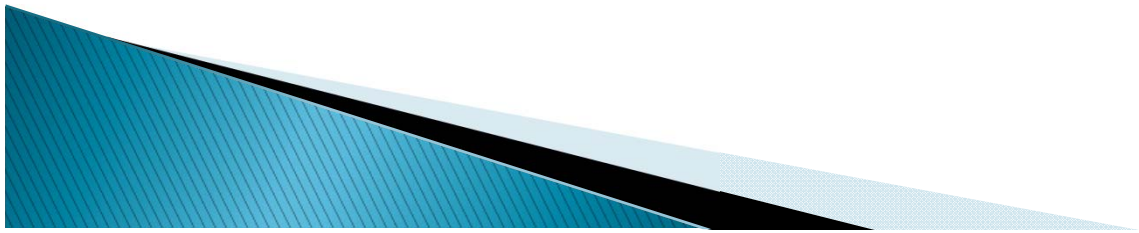
Demand, Supply, and Equilibrium

EE 211



- What factors affect buyers' demand for goods?
- What factors affect sellers' supply of goods?
- How do supply and demand determine the price of a good and the quantity sold?
- How do changes in the factors that affect demand or supply affect the market price and quantity of a good?
- How do markets allocate resources?

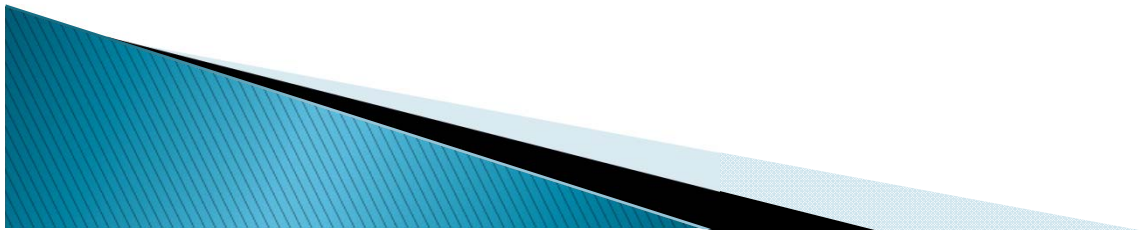


Markets and Competition

- A **market** is a group of buyers and sellers of a particular product.
- A **competitive market** is one with many buyers and sellers, each has a negligible effect on price.
- In a **perfectly competitive** market:
  - All goods exactly the same
  - Buyers & sellers so numerous that no one can affect market price—each is a "**price taker**"
- In this chapter, we assume markets are perfectly competitive.

Supply and Demand

- Five key elements:
  - Demand curve
  - Supply curve
  - Demand and supply curve shifts
  - Market equilibrium
  - Changes in the market equilibrium



Demand Schedules and Demand Curves

A demand schedule is a table that shows the relationship between quantity demanded and the price of a commodity, other things being equal.

A demand curve is the graphical representation of the relationship between quantity demanded and the price of a commodity, other things being equal.

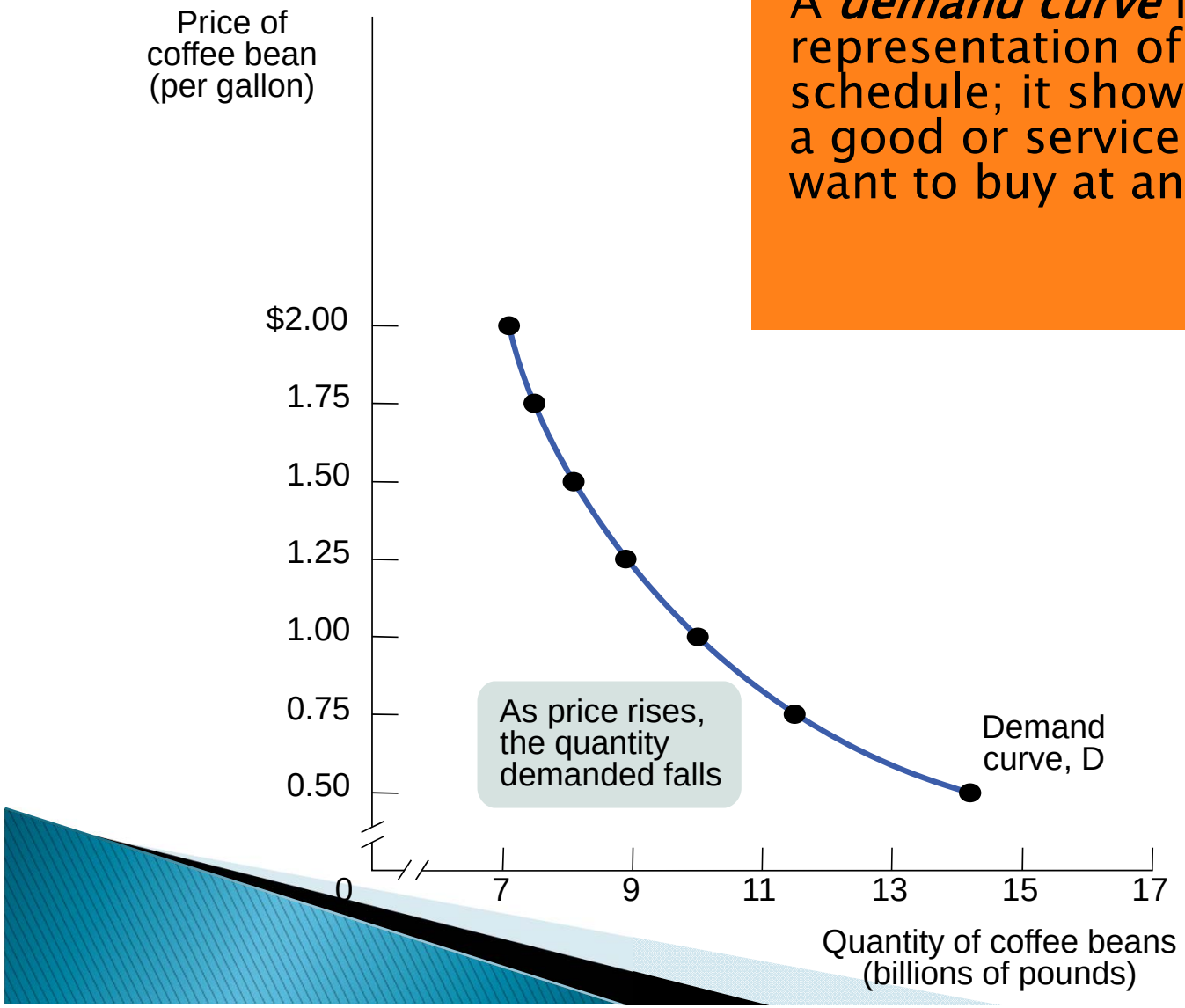
Demand Schedule

- A demand schedule shows how much of a good or service consumers will want to buy at different prices.

Demand Schedule for Coffee Beans	
Price of coffee beans (per pound)	Quantity of coffee beans demanded (billions of pounds)
$2.00	7.1
1.75	7.5
1.50	8.1
1.25	8.9
1.00	10.0
0.75	11.5
0.50	14.2

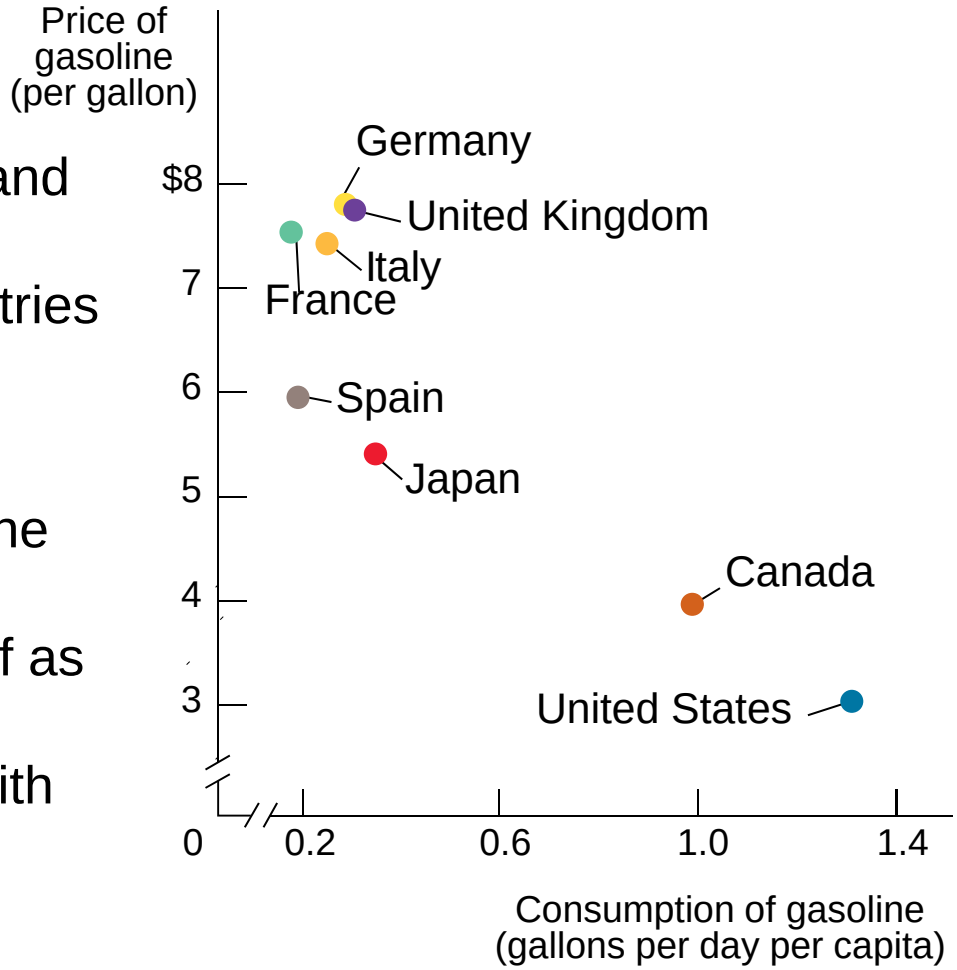
Demand Curve

A ***demand curve*** is the graphical representation of the demand schedule; it shows how much of a good or service consumers want to buy at any given price.



Pay More, Pump Less…

- Because of high taxes, gasoline and diesel fuel are more than twice as expensive in most European countries as in the United States.
- According to the law of demand: Europeans should buy less gasoline than Americans, and they do: Europeans consume less than half as much fuel as Americans, mainly because they drive smaller cars with better mileage.



Demand

What is "Quantity Demanded"?

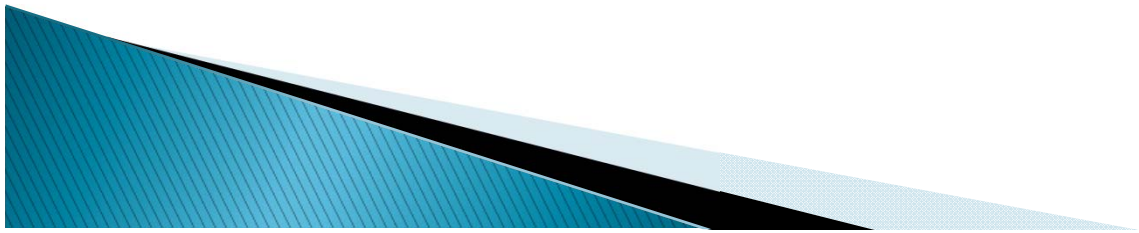
The amount that consumers desire to purchase in some time period is called the quantity demanded of a product.

Quantity bought (or exchanged) refers to actual purchases.

Quantity demanded is a flow, as opposed to a stock.

- The **quantity demanded** of any good is the amount of the good that buyers are willing and able to purchase.

- **Law of demand**: the claim that the quantity demanded of a good falls when the price of the good rises, other things equal



Quantity Demanded and Price

A basic hypothesis is that — *ceteris paribus* — the price of a product and the quantity demanded are negatively related.

Ceteris paribus (other things equal) implies that all factors other than the price of the good do not change.

Why? There are usually several products that can satisfy any given want or desire.

A reduction in the price of a product means that the specific desire can now be satisfied more cheaply by buying more of that product.

An Increase in Demand

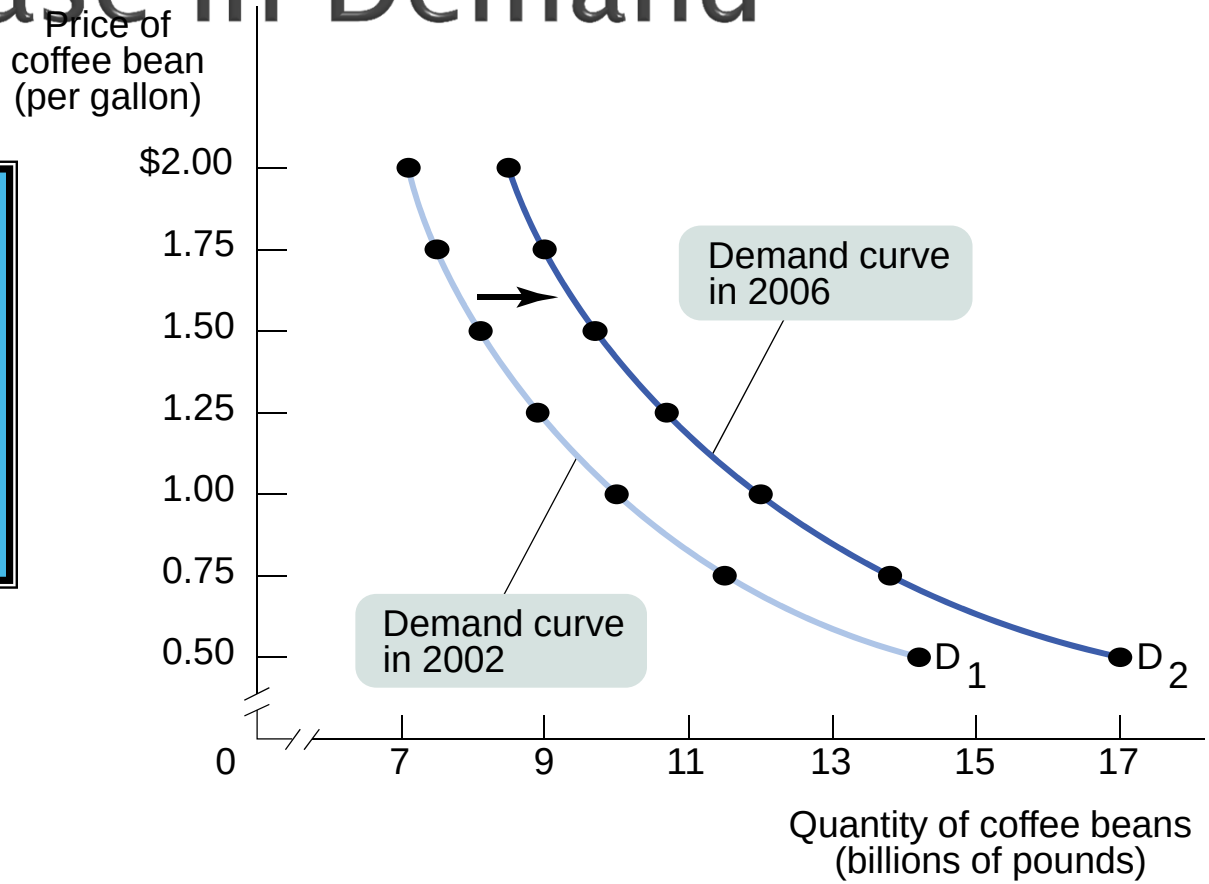
- An increase in the population and other factors generate an increase in demand – a rise in the quantity demanded at any given price.
- This is represented by the two demand schedules – one showing demand in 2002, before the rise in population, the other showing demand in 2006, after the rise in population.

Demand Schedules for Coffee Beans		
Price of coffee beans (per pound)	Quantity of coffee beans demanded (billions of pounds)	
	in 2002	in 2006
$2.00	7.1	8.5
1.75	7.5	9.0
1.50	8.1	9.7
1.25	8.9	10.7
1.00	10.0	12.0
0.75	11.5	13.8
0.50	14.2	17.0

An Increase in Demand

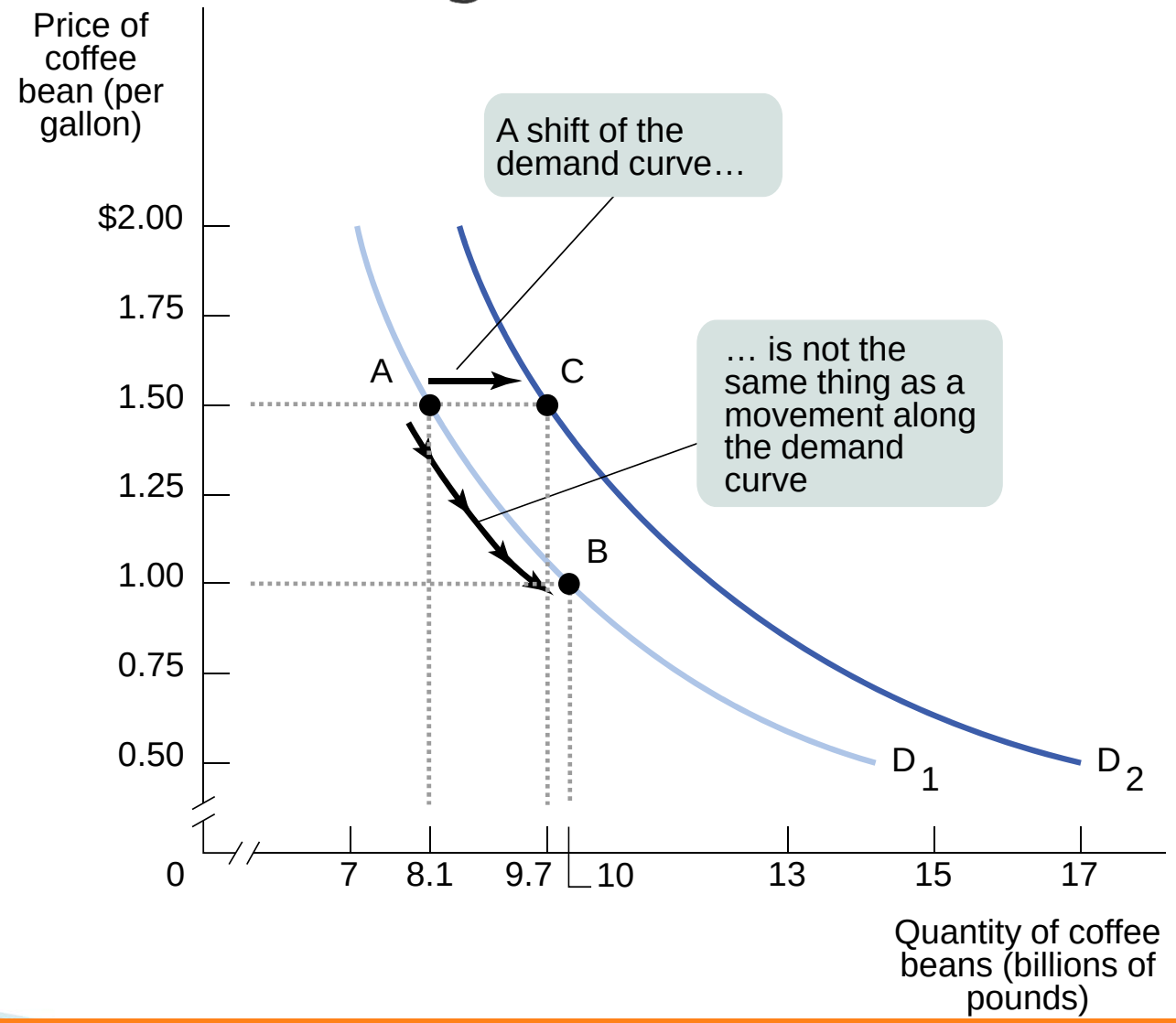
Increase in population →

More coffee drinkers



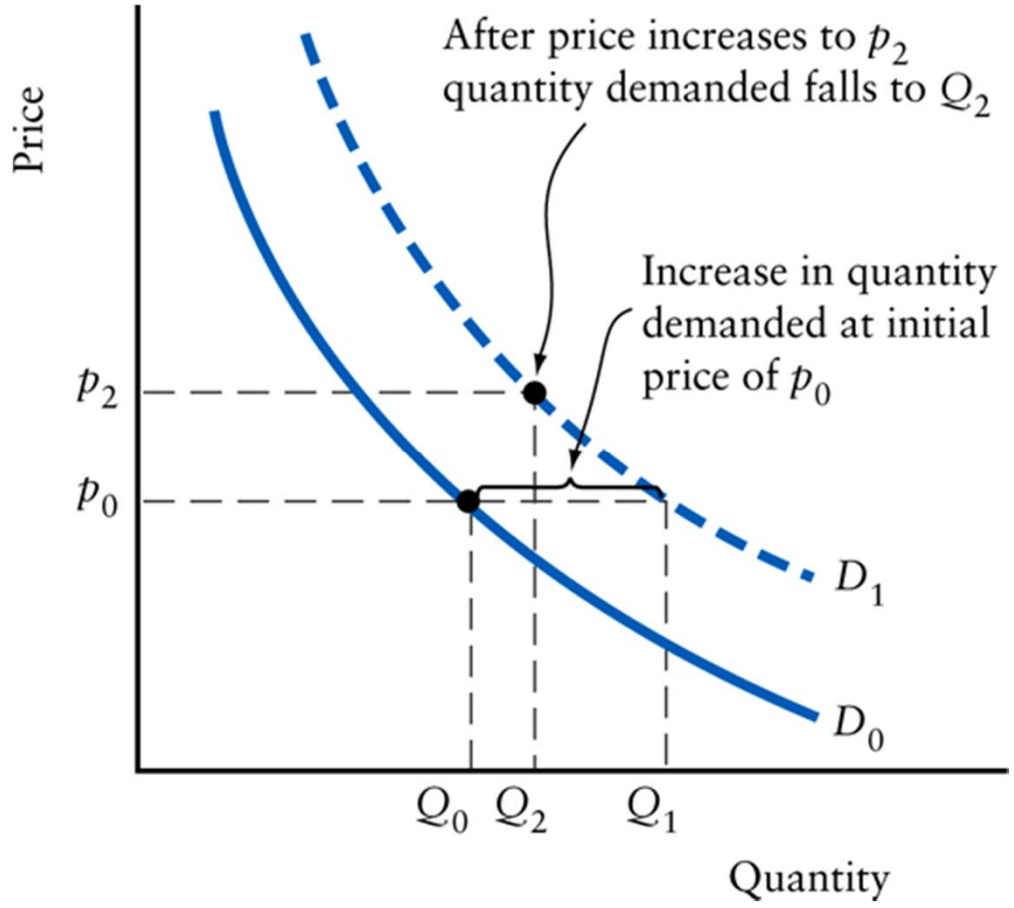
- A **shift of the demand curve** is a change in the quantity demanded at any given price, represented by the change of the original demand curve to a new position, denoted by a new demand curve.

Movement Along the Demand Curve

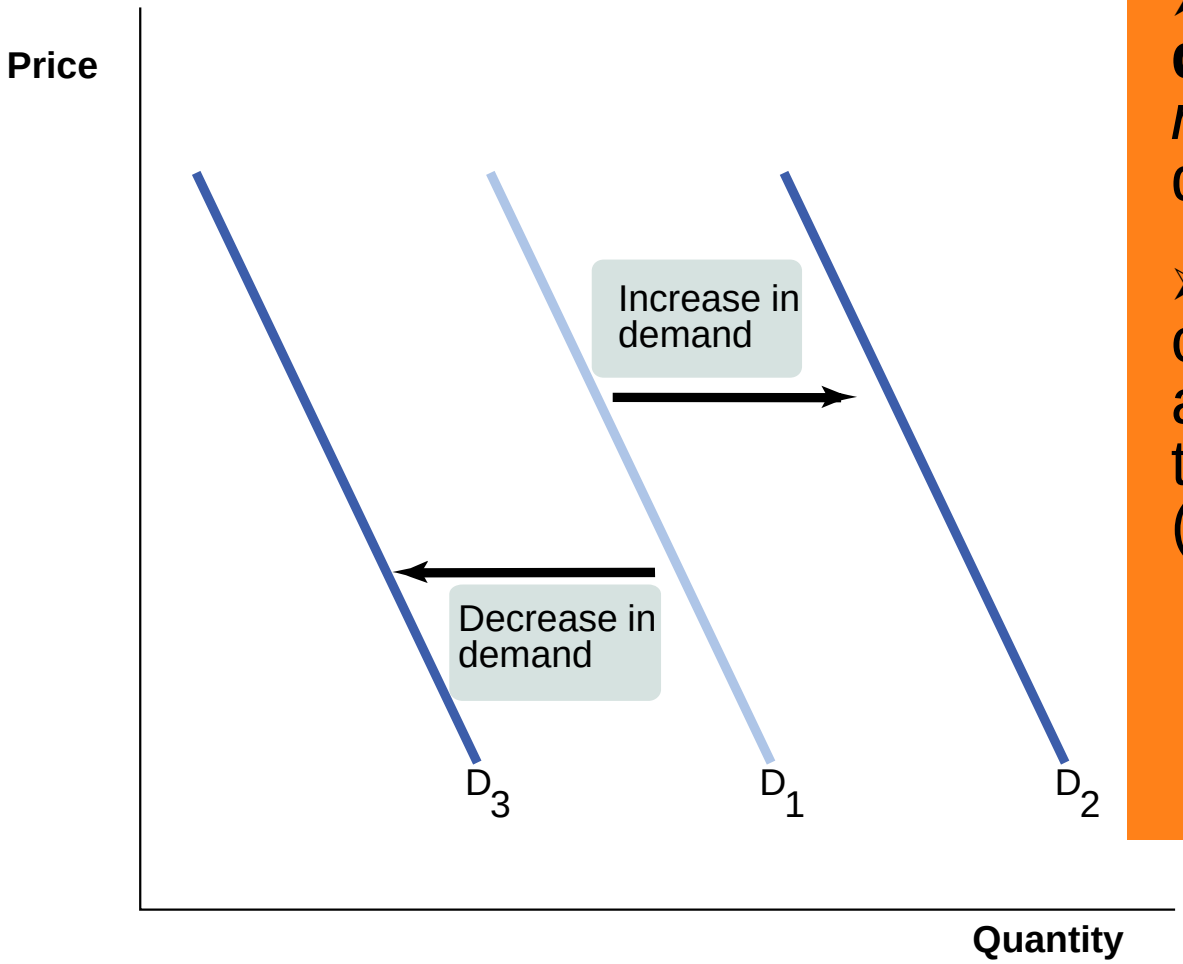


A movement along the demand curve is a change in the quantity demanded of a good that is the result of a change in that good's price.

Shifts of and Movements along the Demand Curve



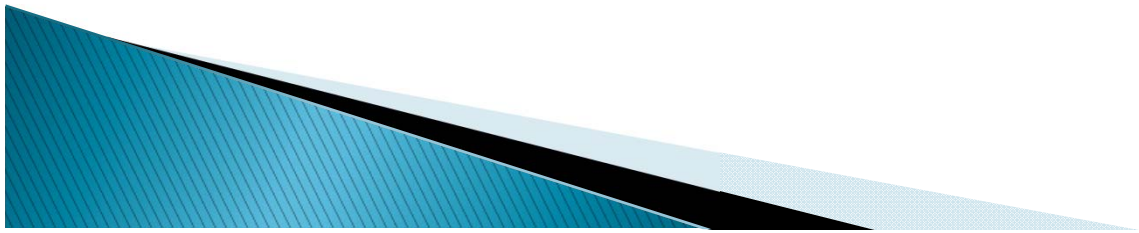
Shifts of the Demand Curve



- an "**increase in demand**", means a *rightward* shift of the demand curve:
- at any given price, consumers demand a larger quantity than before. (D1→D2)

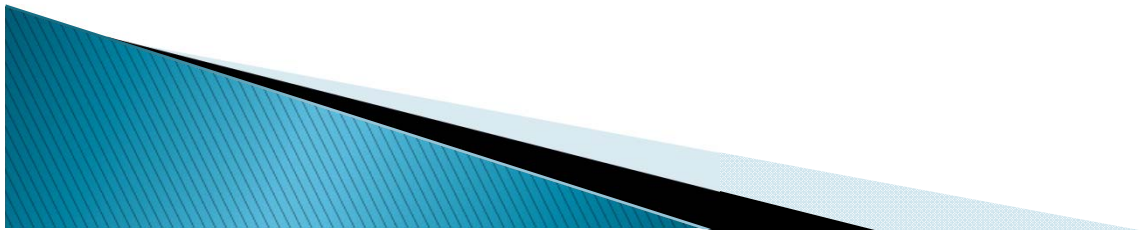
Demand Curve Shifters

- The demand curve shows how price affects quantity demanded, *other things being equal*.
- These “other things” are non-price determinants of demand (i.e., things that determine buyers’ demand for a good, other than the good’s price).
- Changes in them shift the ***D*** curve…



What causes a demand curve to shift?

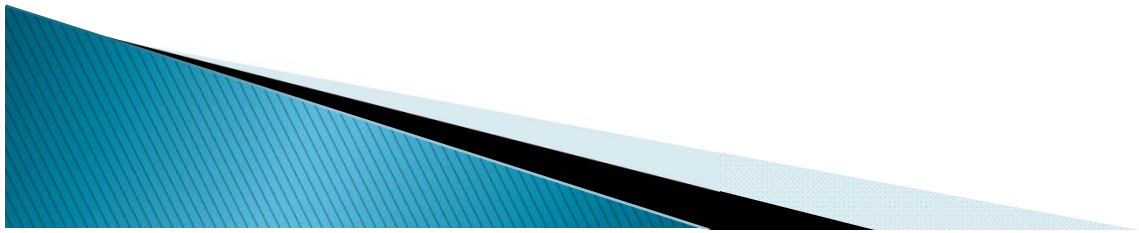
- Changes in the prices of related goods and services
- Changes in income
- Changes in tastes
- Changes in expectations
- Changes in the number of consumers



Changes in the Prices of Related Goods

- **Substitutes**: *Two goods are **substitutes** if a fall in the price of one of the goods makes consumers less willing to buy the other good*.

- **Complements**: *Two goods are **complements** if a fall in the price of one good makes people more willing to buy the other good*.



- Two goods are **substitutes** if
  an increase in the price of one
  causes an increase in demand for the other.

- Example: pizza and hamburgers.
  An increase in the price of pizza
  increases demand for hamburgers,
  shifting hamburger demand curve to the right.

- Other examples: Coke and Pepsi,
  laptops and desktop computers,
  CDs and music downloads

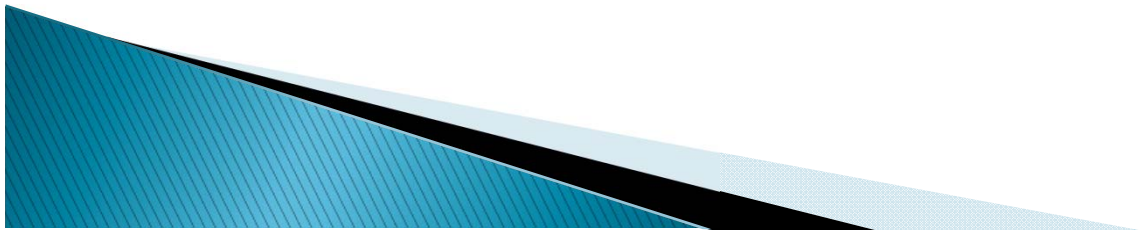
- Two goods are **complements** if
  an increase in the price of one
  causes a fall in demand for the other.

- Example: computers and software.
  If price of computers rises,
  people buy fewer computers,
  and therefore less software.
  Software demand curve shifts left.

- Other examples: college tuition and textbooks,
  bagels and cream cheese, eggs and bacon

Changes in Income

- **Normal Goods**: *When a rise in income increases the demand for a good – the normal case – we say that the good is a* ***normal good****.*
- **Inferior Goods**: *When a rise in income decreases the demand for a good, it is an* ***inferior good*****.**



- Demand for a **normal good** is positively related to income.
  - Increase in income causes increase in quantity demanded at each price, shifts ***D*** curve to the right.

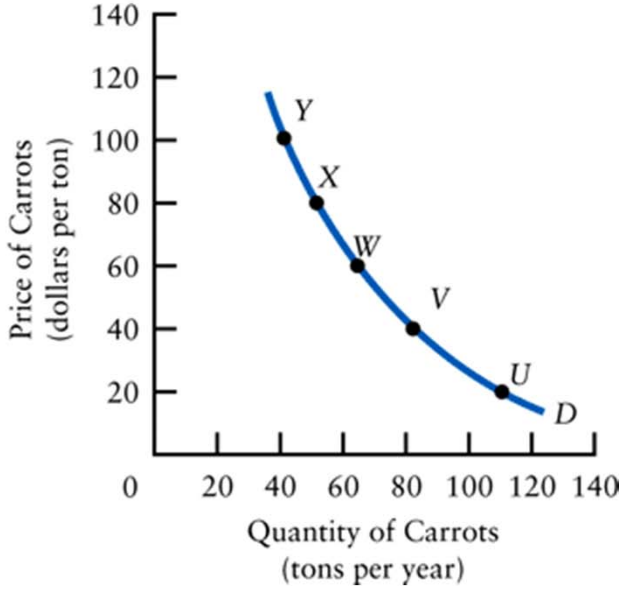
(Demand for an **inferior good** is negatively related to income. An increase in income shifts ***D*** curves for inferior goods to the left.)

The Demand for Carrots

A Demand Schedule for Carrots

Reference Point	Price per Ton ($)	Quantity Demanded When Average Household Income Is $50,000 per Year (tons per year)
U	20	110
V	40	85
W	60	65
X	80	50
Y	100	40

A Demand Curve for Carrots

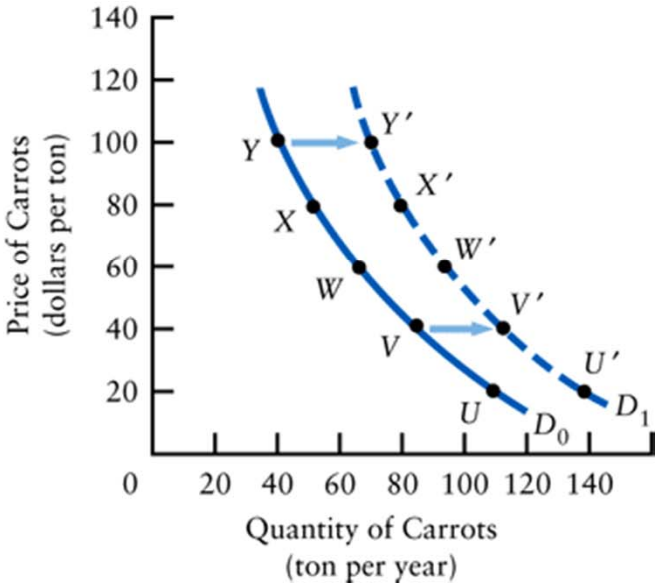


An Increase in the Demand for Carrots

Demand Schedules

Price per Ton ($) p	Quantity Demanded When Average Household Income Is $50,000 per Year (tons per year) D_0	Quantity Demanded When Average Household Income Is $60,000 per Year (tons per year) D_1
20	110 U	140 U'
40	85 V	115 V'
60	65 W	95 W'
80	50 X	80 X'
100	40 Y	70 Y'

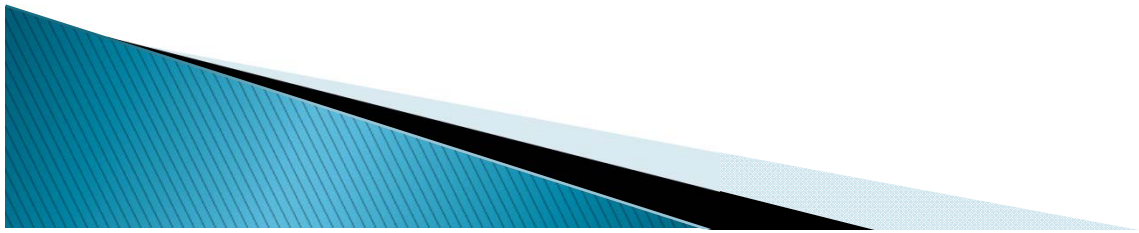
Demand Curves



Changes in tastes

- Anything that causes a shift in tastes *toward* a good will increase demand for that good
  and shift its ***D*** curve to the right.

- Example:
  The Atkins diet became popular in the ’90s,
  caused an increase in demand for eggs,
  shifted the egg demand curve to the right.



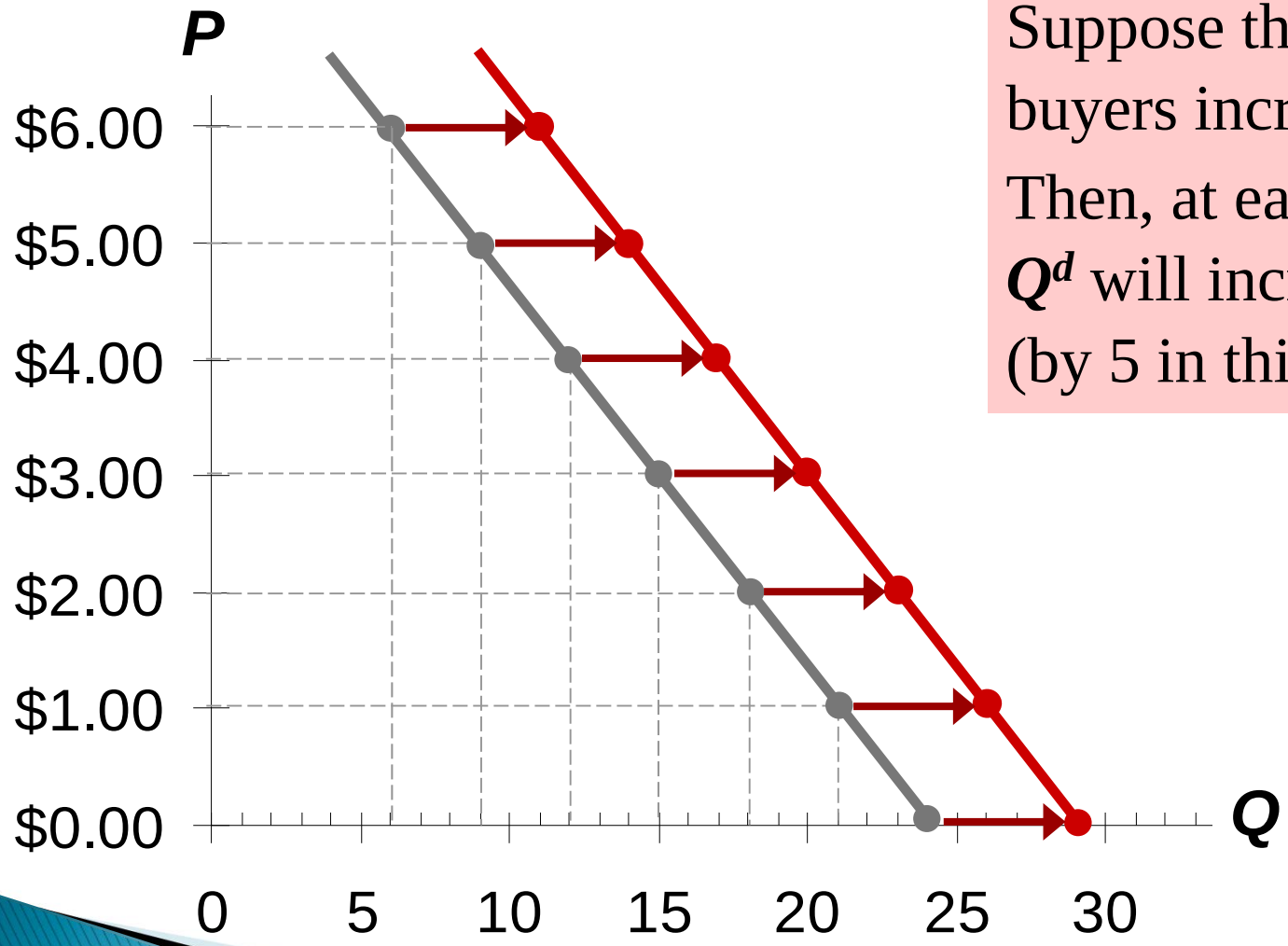
Changes in expectations

- Expectations affect consumers' buying decisions.
- Examples:
  - If people expect their incomes to rise, their demand for meals at expensive restaurants may increase now.
  - If the economy sours and people worry about their future job security, demand for new autos may fall now.

Changes in the number of consumers

- Increase in # of buyers
  increases quantity demanded at each price, shifts ***D*** curve to the right.

Increase in # of buyers

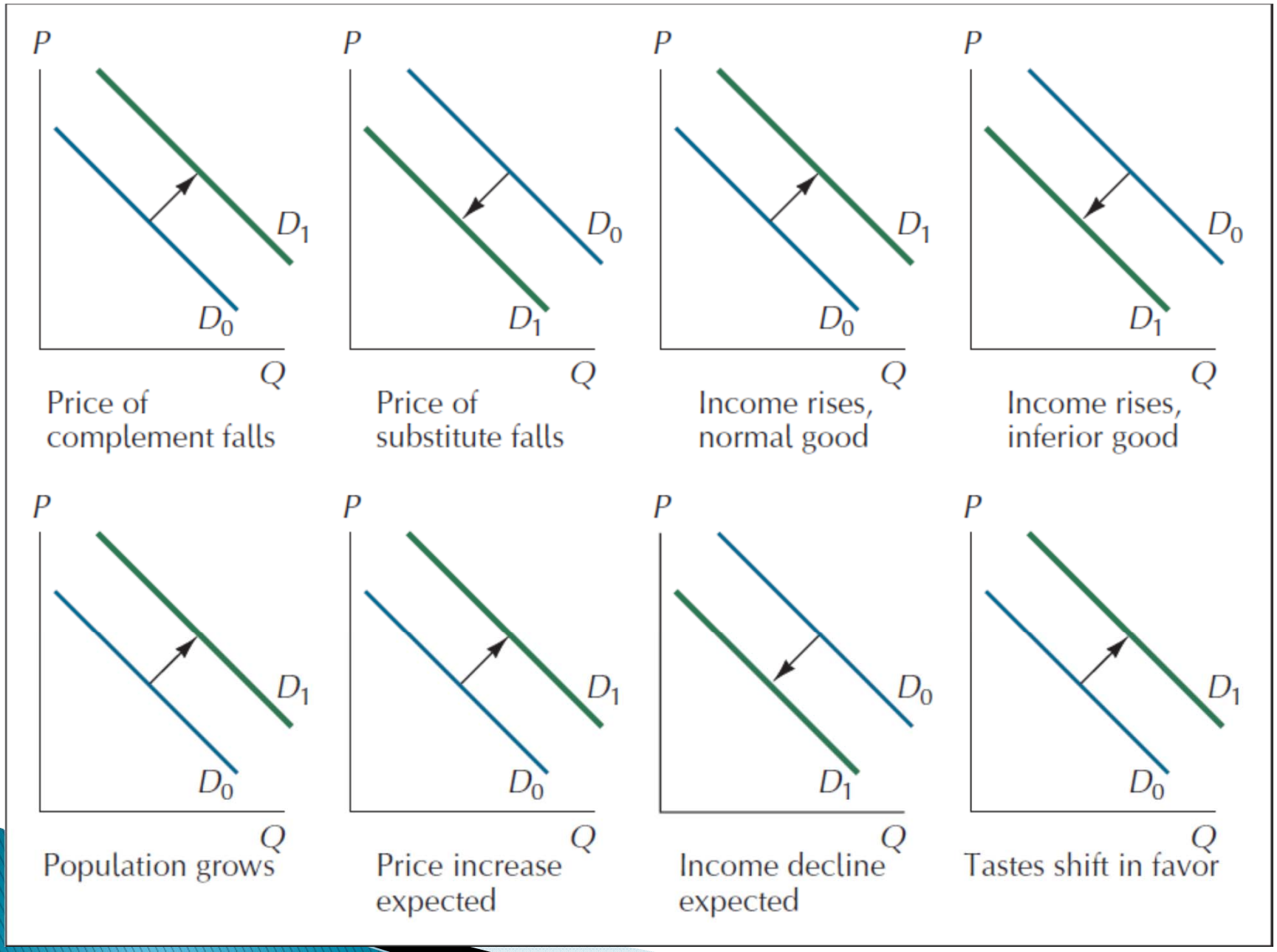


Suppose the number of buyers increases.

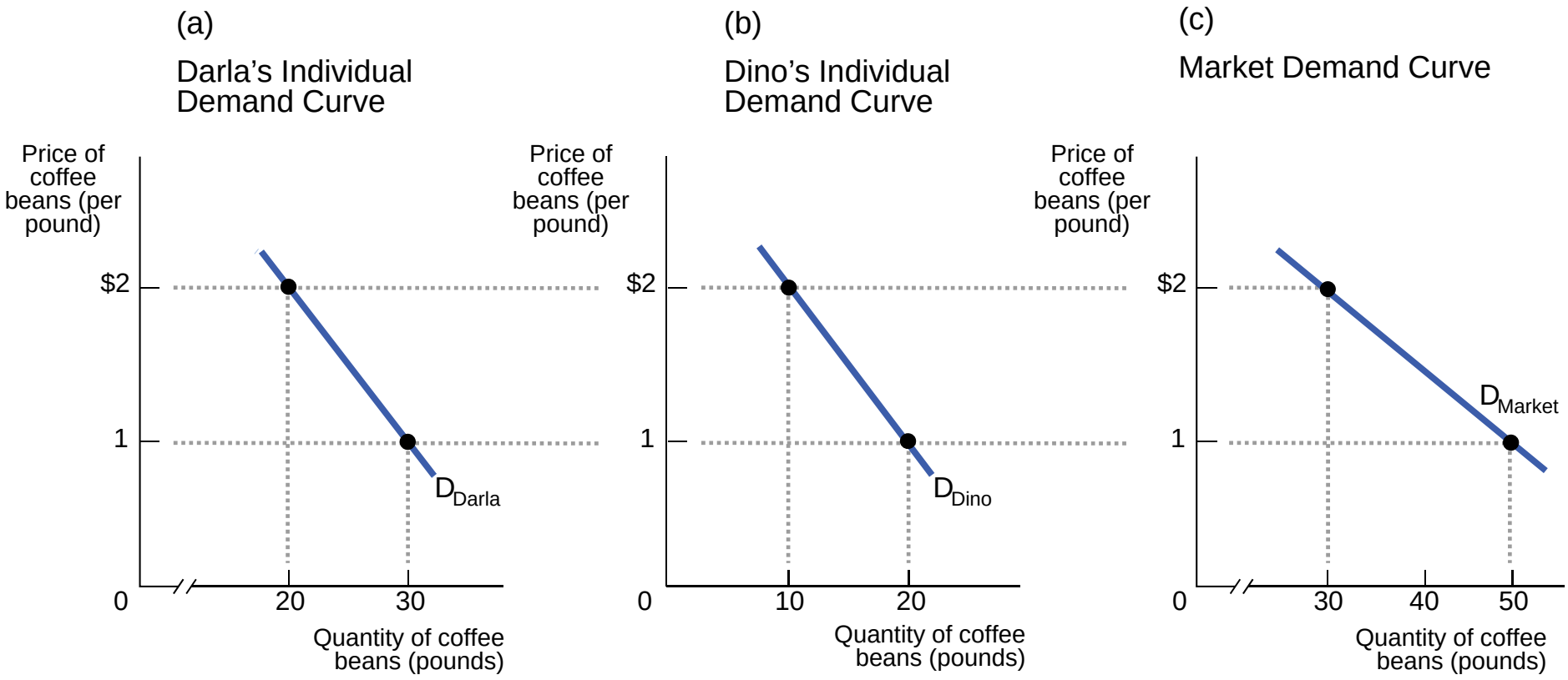
Then, at each ***P***, Q^d will increase (by 5 in this example).

Summary: Variables That Influence Buyers

Variable	A change in this variable…
Price	…causes a movement along the ***D*** curve
# of buyers	…shifts the ***D*** curve
Income	…shifts the ***D*** curve
Price of related goods	…shifts the ***D*** curve
Tastes	…shifts the ***D*** curve
Expectations	…shifts the ***D*** curve


P
Q
D_0
D_1
Price of complement falls
Price of substitute falls
Income rises, normal good
Income rises, inferior good
Population grows
Price increase expected
Income decline expected
Tastes shift in favor

Individual Demand Curve and the Market Demand Curve

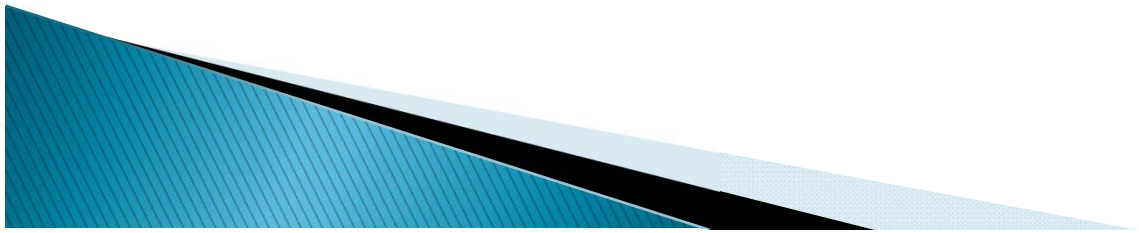


The market demand curve is the *horizontal sum* of the individual demand curves of all consumers in that market.

Supply

- The **quantity supplied** of any good is the amount that sellers are willing and able to sell.

- **Law of supply**: the claim that the quantity supplied of a good rises when the price of the good rises, other things equal

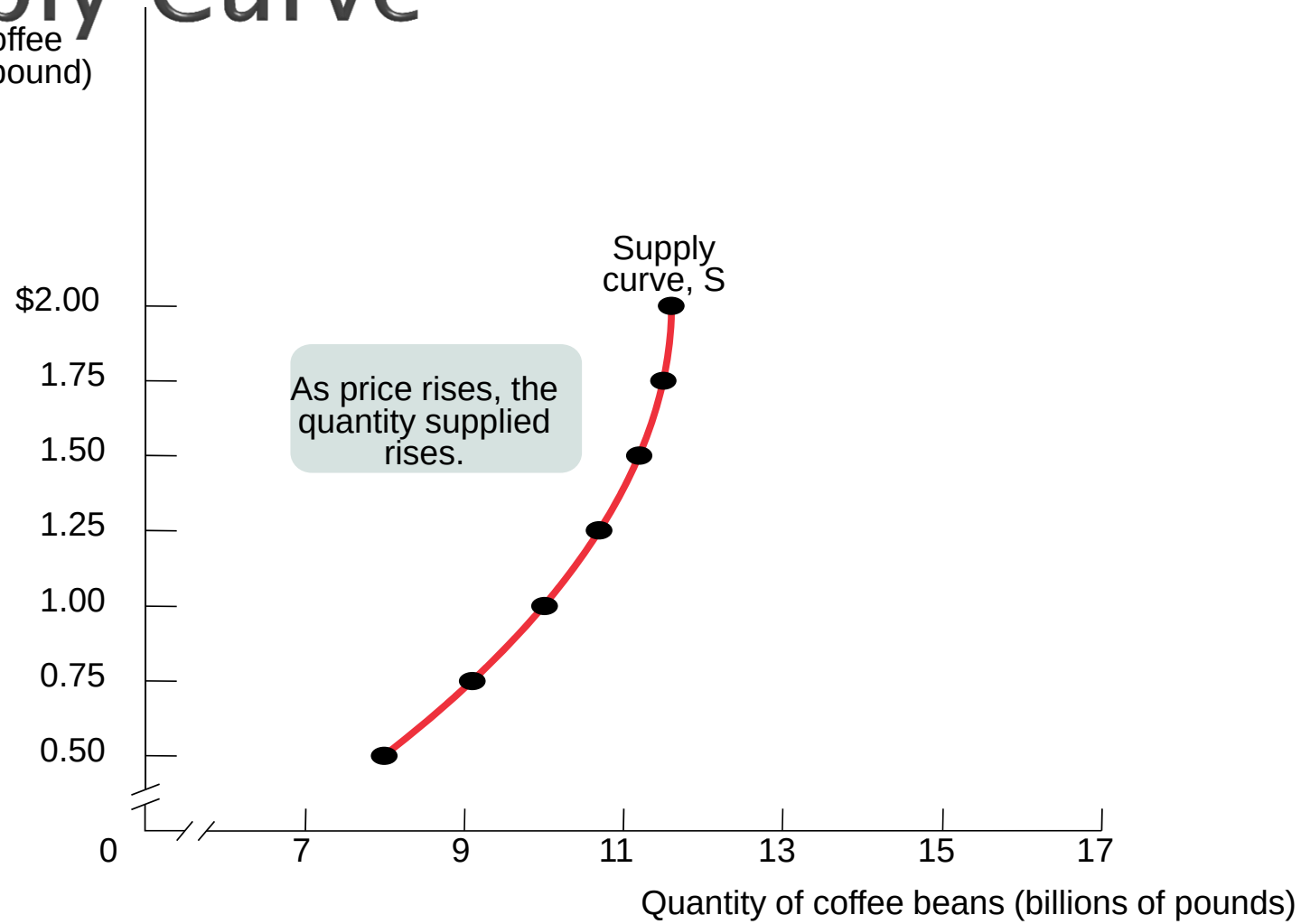


Supply Schedule

- A supply schedule shows how much of a good or service would be supplied at different prices.

Supply Schedule for Coffee Beans	
Price of coffee beans (per pound)	Quantity of coffee beans supplied (billions of pounds)
$2.00	11.6
1.75	11.5
1.50	11.2
1.25	10.7
1.00	10.0
0.75	9.1
0.50	8.0

Supply Curve



A **supply curve** shows graphically how much of a good or service people are willing to sell at any given price.

Supply

What is "Quantity Supplied"?

The amount of a commodity that producers wish to sell in some time period is called quantity supplied.

Quantity supplied is the amount that firms are willing to offer for sale and not necessarily the quantity actually sold.

Quantity supplied is a flow as opposed to a stock.

Quantity Supplied and Price

Another basic economic hypothesis is that — *ceteris paribus* — the price of the product and the quantity supplied are positively related.

Why? Producers are interested in making profits. If the price of a particular product rises, then the production and sale of this product is more profitable.

An Increase in Supply

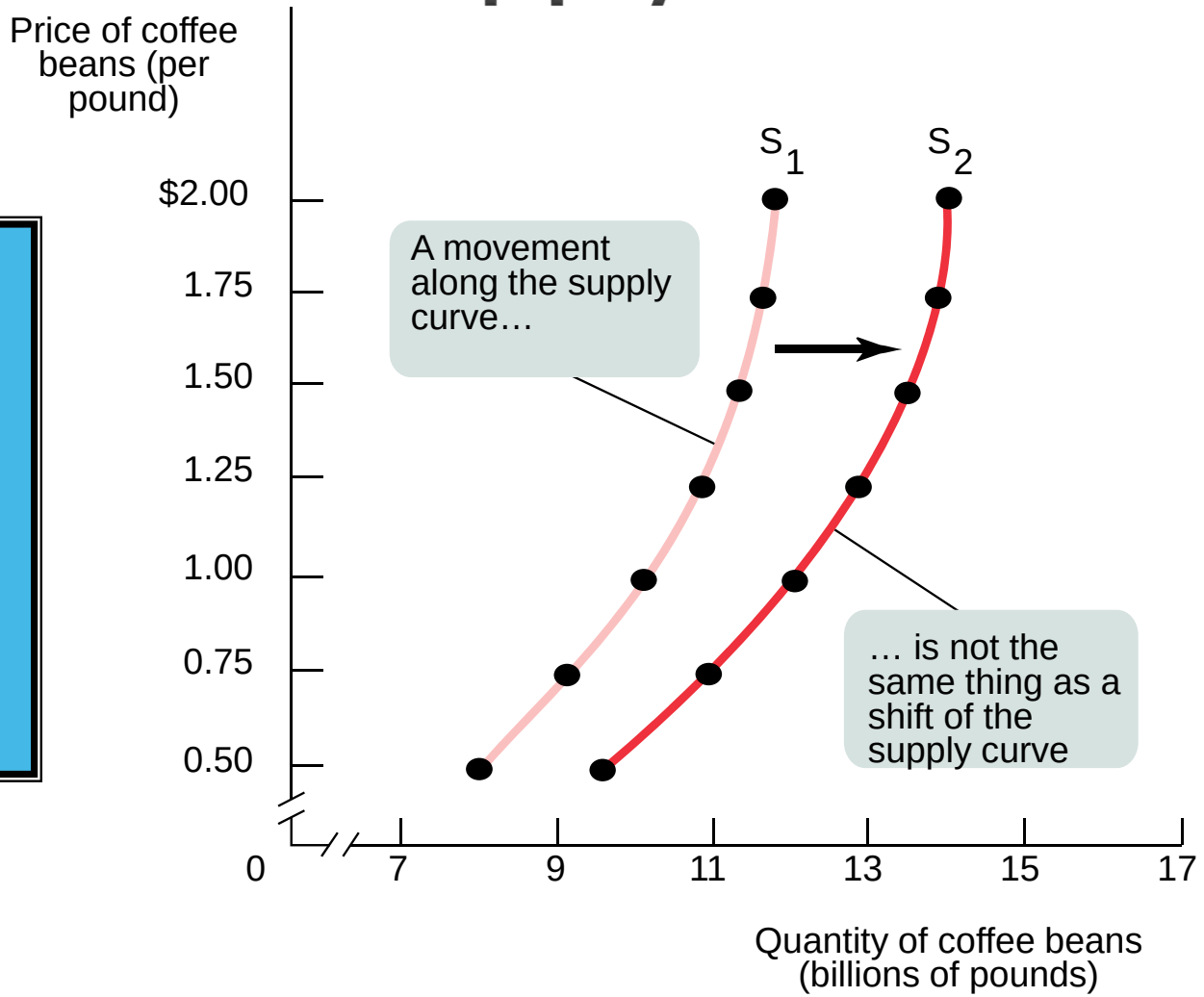
- The entry of Vietnam into the coffee bean business generated an increase in supply—a rise in the quantity supplied at any given price.
- This event is represented by the two supply schedules—one showing supply before Vietnam's entry, the other showing supply after Vietnam came in.

Supply Schedule for Coffee Beans		
Price of coffee beans (per pound)	Quantity of beans supplied (billions of pounds)	
	Before entry	After entry
$2.00	11.6	13.9
1.75	11.5	13.8
1.50	11.2	13.4
1.25	10.7	12.8
1.00	10.0	12.0
0.75	9.1	10.9
0.50	8.0	9.6

An Increase in Supply

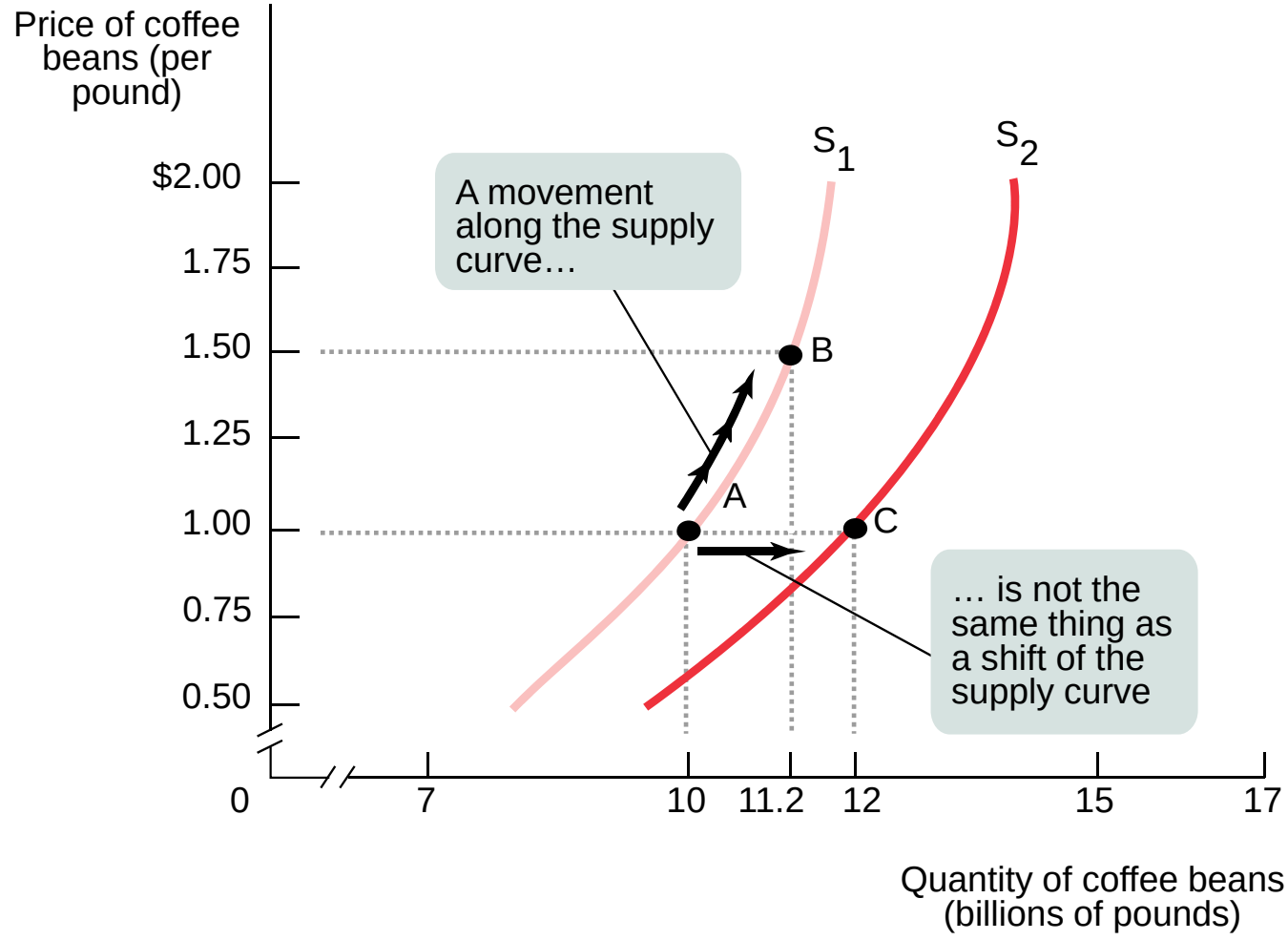
Vietnam enters coffee bean business →

More coffee producers



A shift of the supply curve is a change in the quantity supplied of a good at any given price.

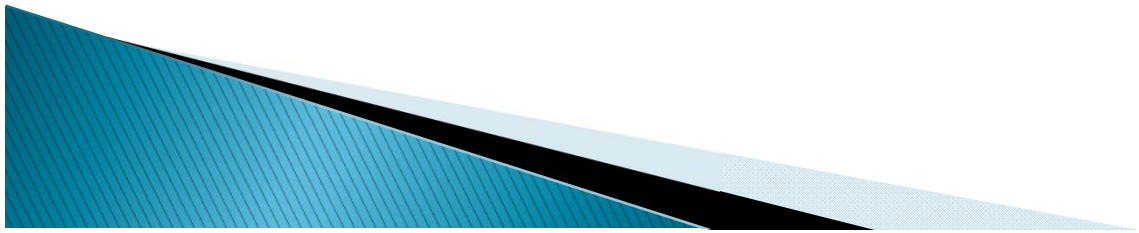
Movement Along the Supply Curve



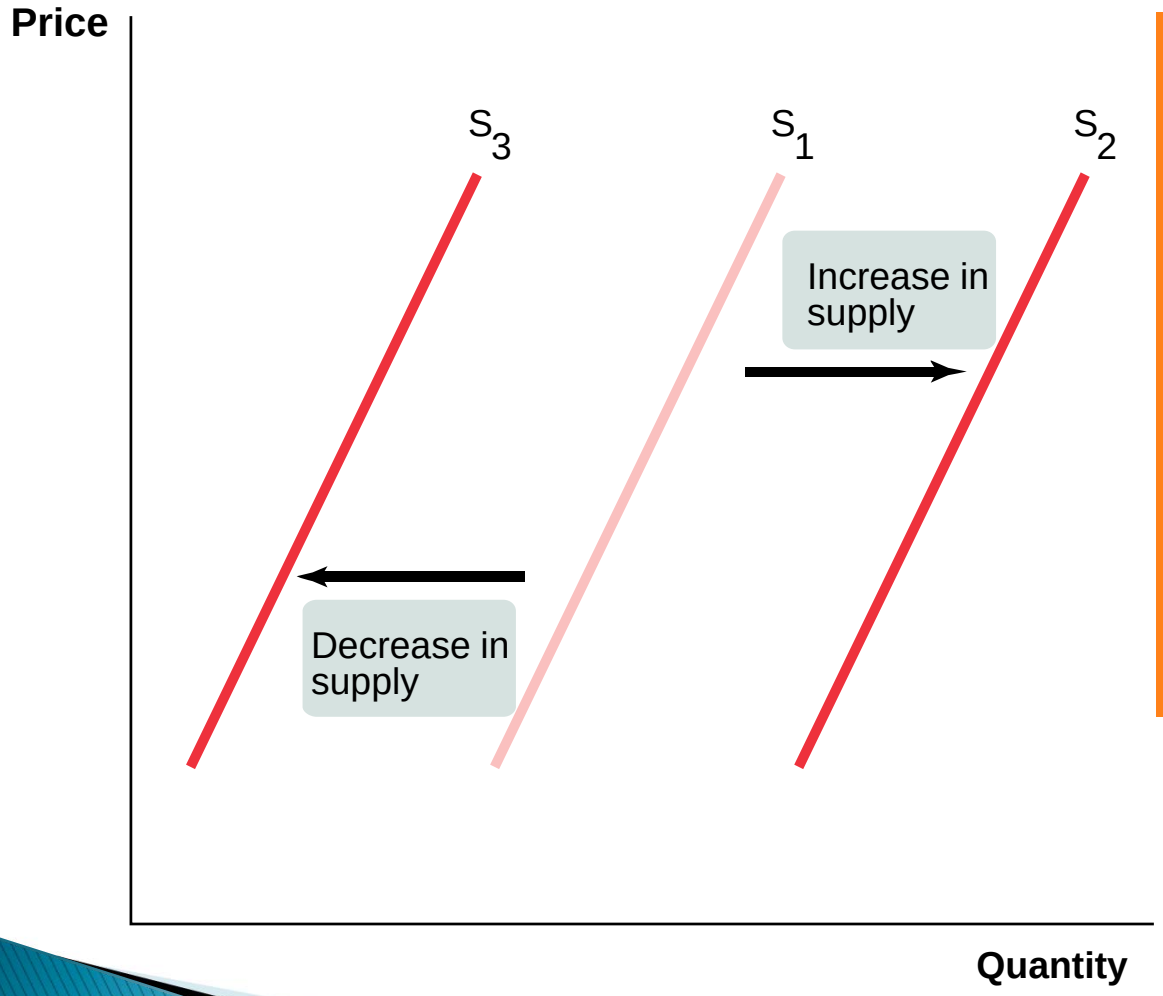
A movement along the supply curve is a change in the quantity supplied of a good that is the result of a change in that good's price.

Supply Curve Shifters

- The supply curve shows how price affects quantity supplied, *other things being equal*.
- These “other things” are non-price determinants of supply.
- Changes in them shift the ***S*** curve…



Shifts of the Supply Curve



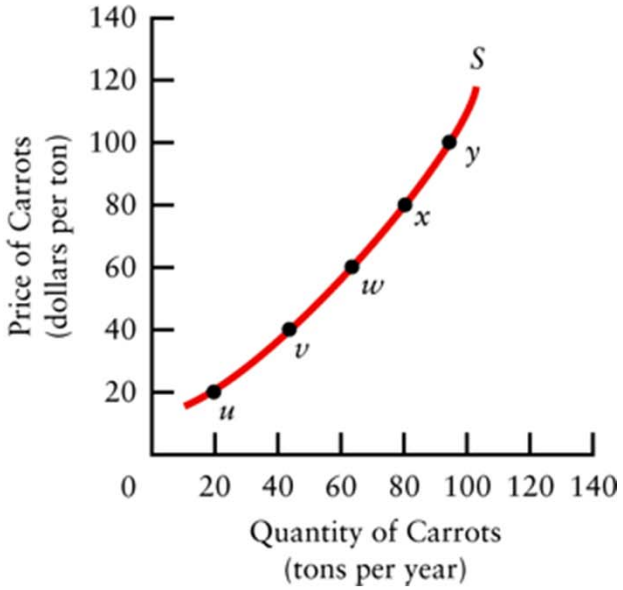
- Any "**decrease in supply**" means a *left*ward shift of the supply curve:
- at any given price, there is a decrease in the quantity supplied. (S1→ S3)

The Supply of Carrots

A Supply Schedule for Carrots

Reference Point	Price per Ton ($)	Quantity Supplied (tons per year)
u	20	20
v	40	45
w	60	65
x	80	80
y	100	95

A Supply Curve for Carrots

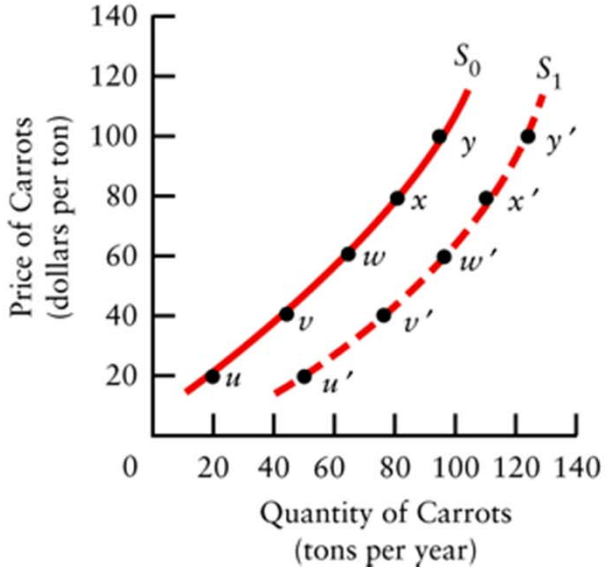


An increase in the Supply of Carrots

Supply Schedules

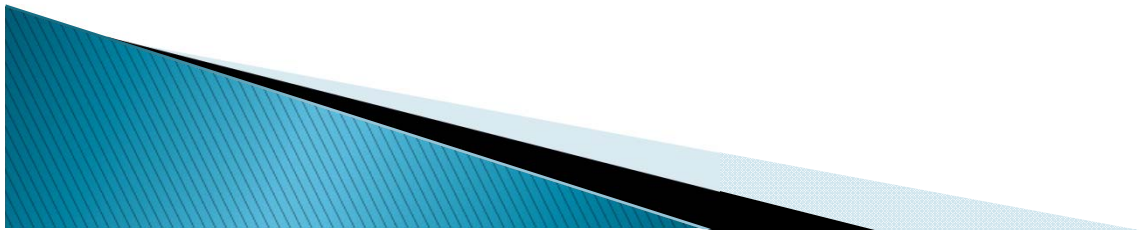
Price per Ton ($) p	Quantity Supplied before Cost-Saving Innovation (tons per year) S_0	Quantity Supplied after Innovation (tons per year) S_1
20	20 u	50 u'
40	45 v	75 v'
60	65 w	95 w'
80	80 x	110 x'
100	95 y	125 y'

Supply Curves



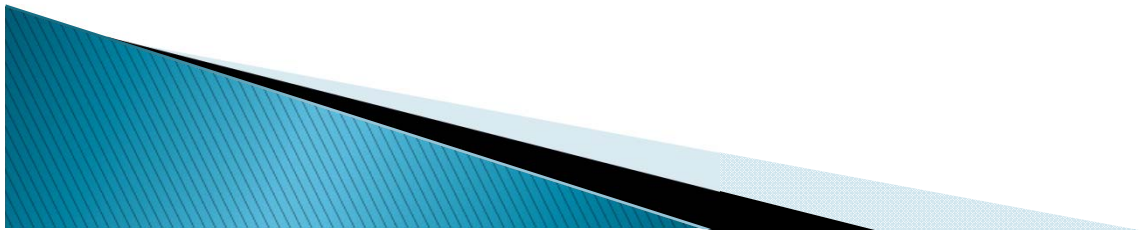
What causes a supply curve to shift?

- Changes in Input Prices
  - *An **input** is a good that is used to produce another good.*
- Changes in the prices of related goods and services
- Changes in Technology
- Changes in Income
- Changes in Expectations

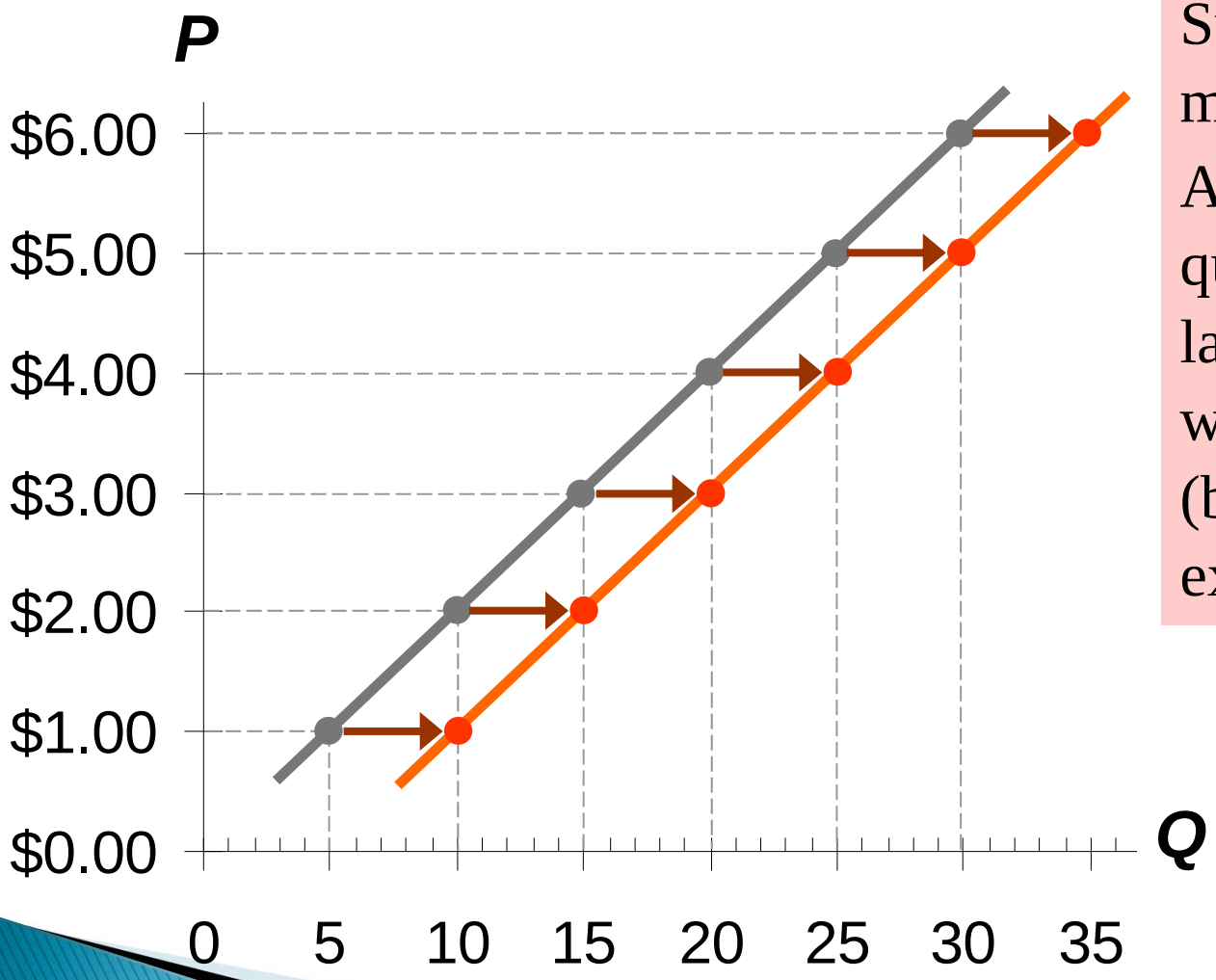


Changes in input prices

- Examples of input prices:
  wages, prices of raw materials.
- A fall in input prices makes production more profitable at each output price, so firms supply a larger quantity at each price, and the ***S*** curve shifts to the right.



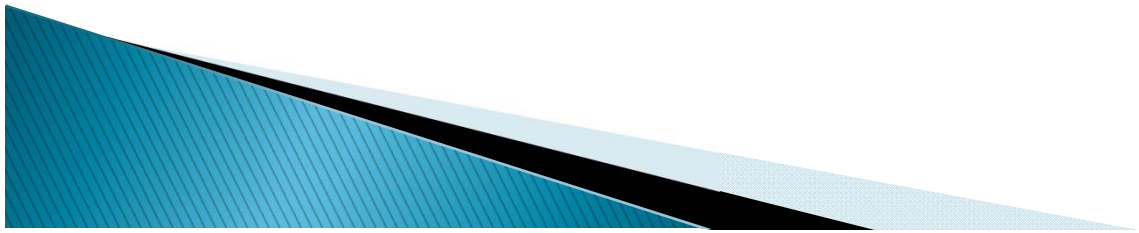
Decline in input prices



Suppose the price of milk falls.

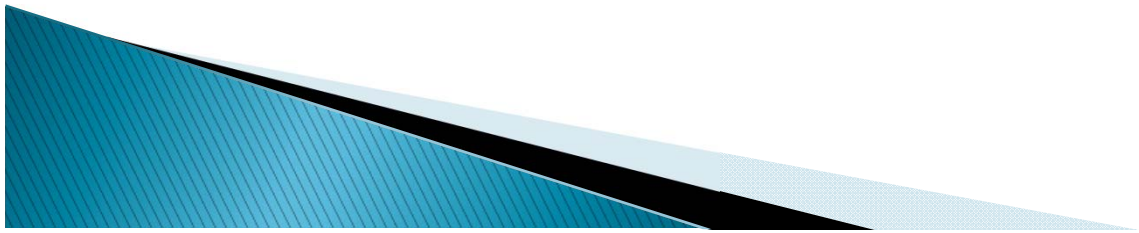
At each price, the quantity of lattes supplied will increase (by 5 in this example).

- If the price of an input used to produce A rises, supply of A decreases.
- If the price of an input used to produce A falls, supply of A increases.



Changes in the prices of related goods and services

- If A and B are substitutes in production
  - the price of B rises, supply of A decreases
  - the price of B falls, supply of A increases
- If A and B are complements in production
  - the price of B rises, supply of A increases
  - The price of B falls, supply of A decreases

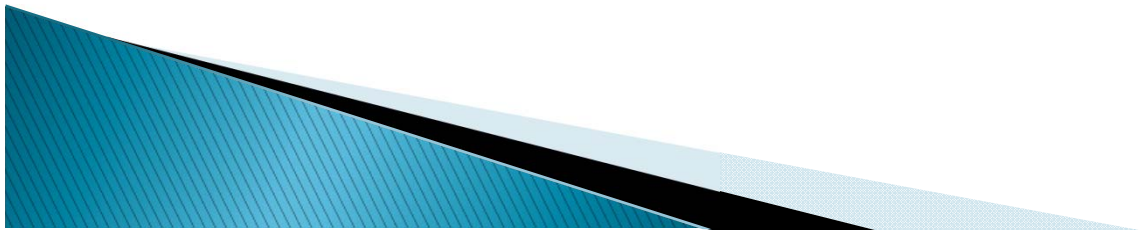


Example

- An oil refinery produces gasoline from crude oil, but it also produces heating oil from the same material
- An oil refiner will supply less gasoline at any given price when the price of heating oil rises, shifting the supply curve for gasoline to the left.
- Gasoline and heating oil are **substitutes** in production for refiners.

- Producers of crude oil –oil well drillers – often find that oil wells also produce natural gas as a by-product of oil extraction. The higher the price at which a driller can sell its natural gas, the more oil wells it will drill and the more oil it will supply at any given price for oil.

- Natural gas is a **complement** in production for crude oil



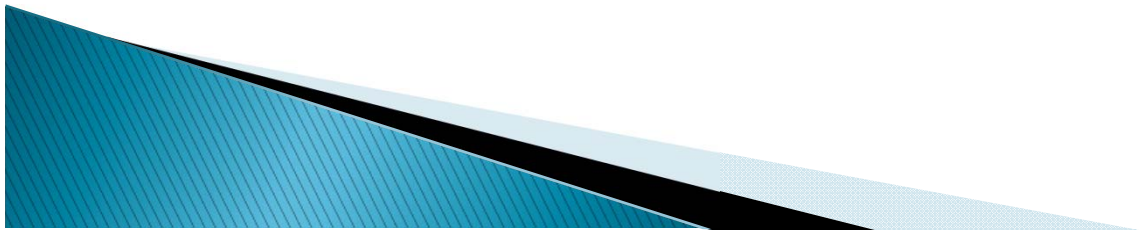
Changes in Technology

- Technology determines how much inputs are required to produce a unit of output.
- A cost-saving technological improvement has the same effect as a fall in input prices, shifts ***S*** curve to the right.

Changes in the number of producers

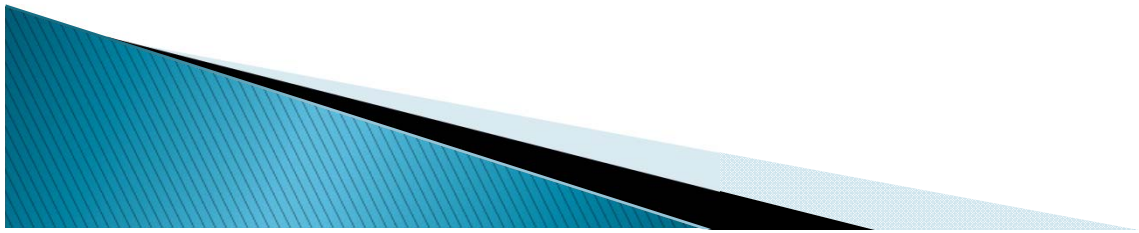
- An increase in the number of sellers increases the quantity supplied at each price,

  shifts ***S*** curve to the right.



Changes in expectations

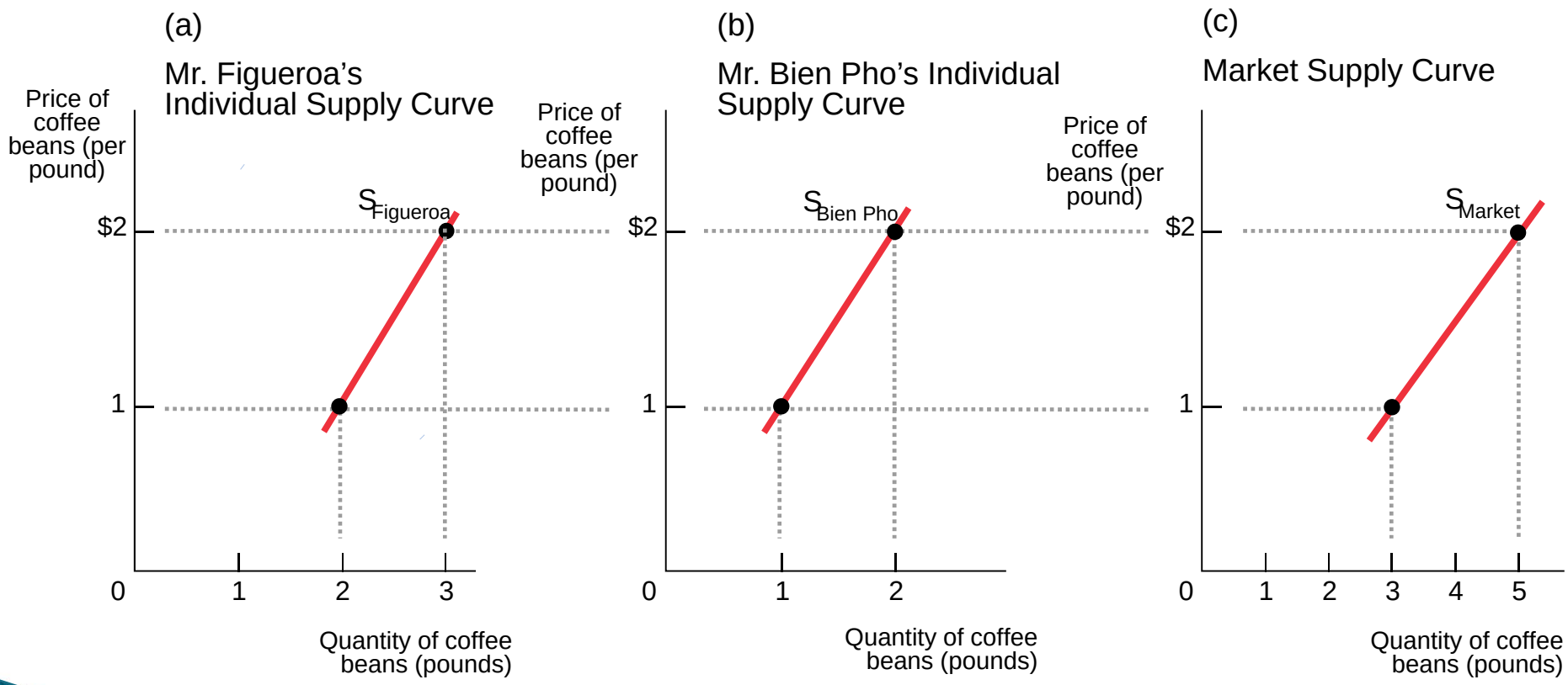
- Example:
  - Events in the Middle East lead to expectations of higher oil prices.
  - In response, owners of Texas oilfields reduce supply now, save some inventory to sell later at the higher price.
  - ***S*** curve shifts left.
- In general, sellers may adjust supply* when their expectations of future prices change.
  (**If good not perishable*)



Summary: Variables that Influence Sellers

Variable	A change in this variable…
Price	…causes a movement along the ***S*** curve
Input Prices	…shifts the ***S*** curve
Technology	…shifts the ***S*** curve
# of Sellers	…shifts the ***S*** curve
Expectations	…shifts the ***S*** curve

Individual Supply Curve and the Market Supply Curve



The market supply curve is the *horizontal sum* of the individual supply curves of all firms in that market.

The Determination of Price

The Concept of a Market

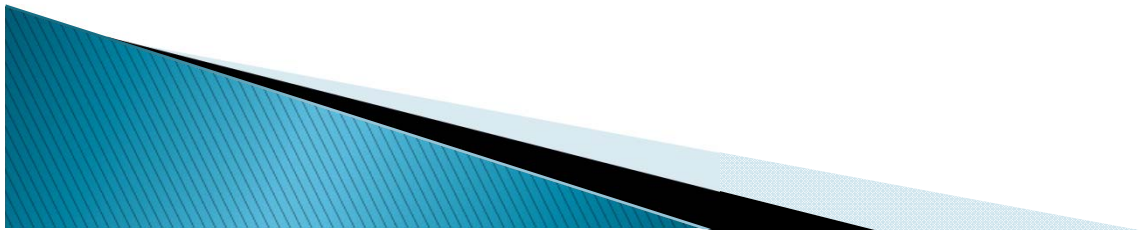
A market may be defined as any situation in which buyers and sellers negotiate the transaction of some goods or services.

Markets may differ in the degree of competition among various buyers and sellers.

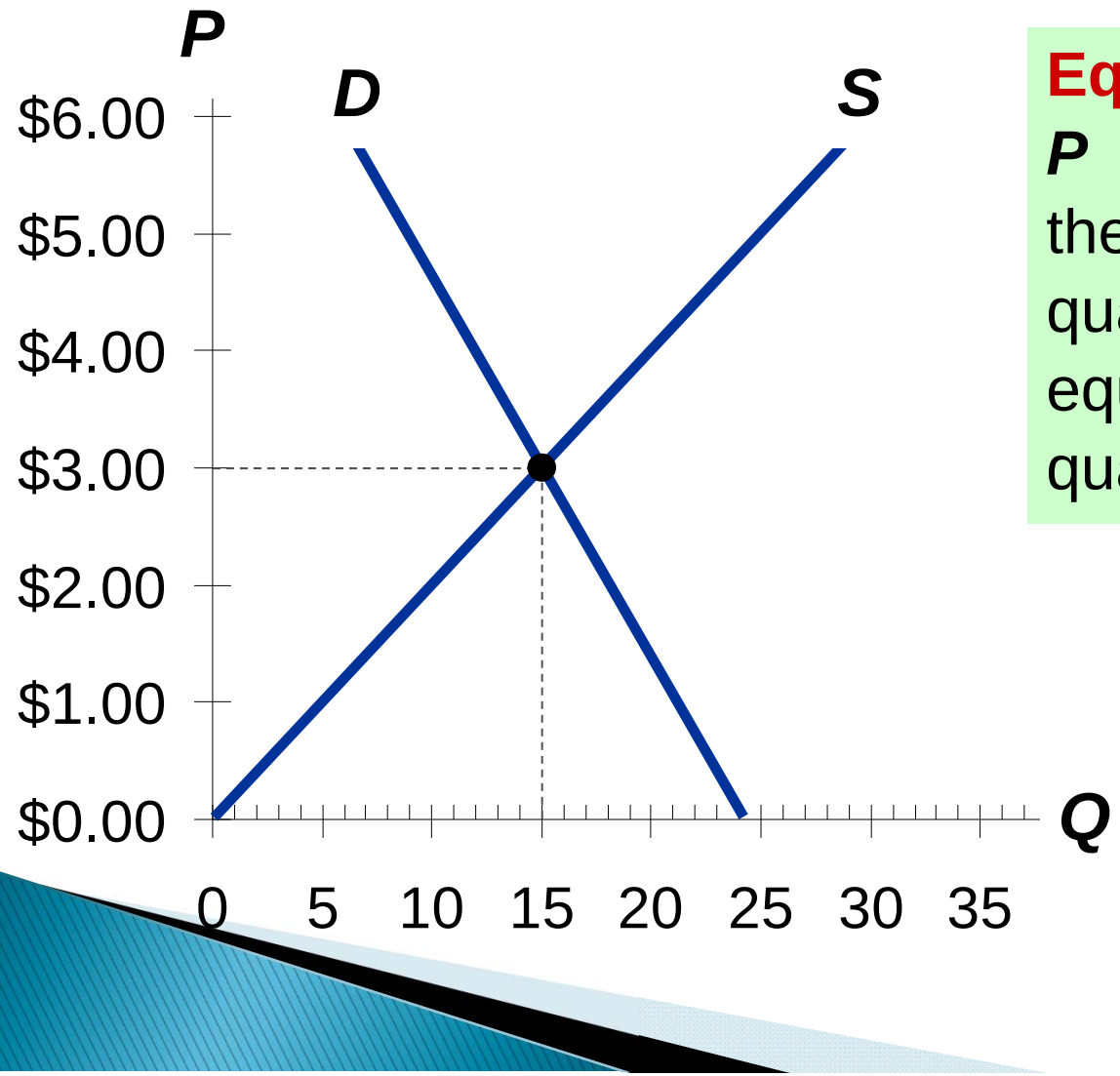
In a perfectly competitive market buyers and sellers are price takers.

Supply, Demand and Equilibrium

- **Equilibrium** in a competitive market: when the quantity demanded of a good equals the quantity supplied of that good.
  - The price at which this takes place is the **equilibrium price** (a.k.a. *market-clearing price*):
  - every buyer finds a seller and vice versa.
  - The quantity of the good bought and sold at that price is the **equilibrium quantity.**



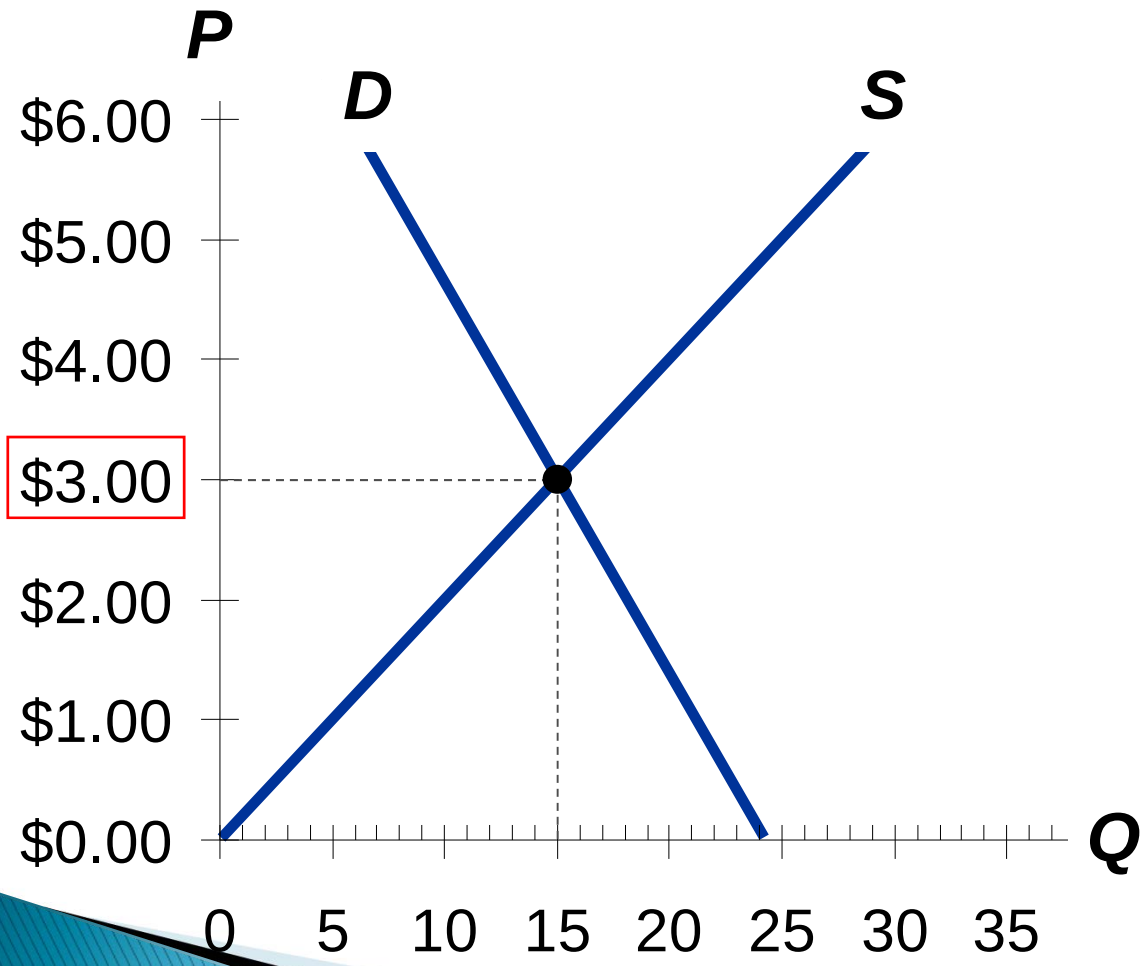
Supply and Demand Together



Equilibrium:
P has reached the level where quantity supplied equals quantity demanded

Equilibrium price:

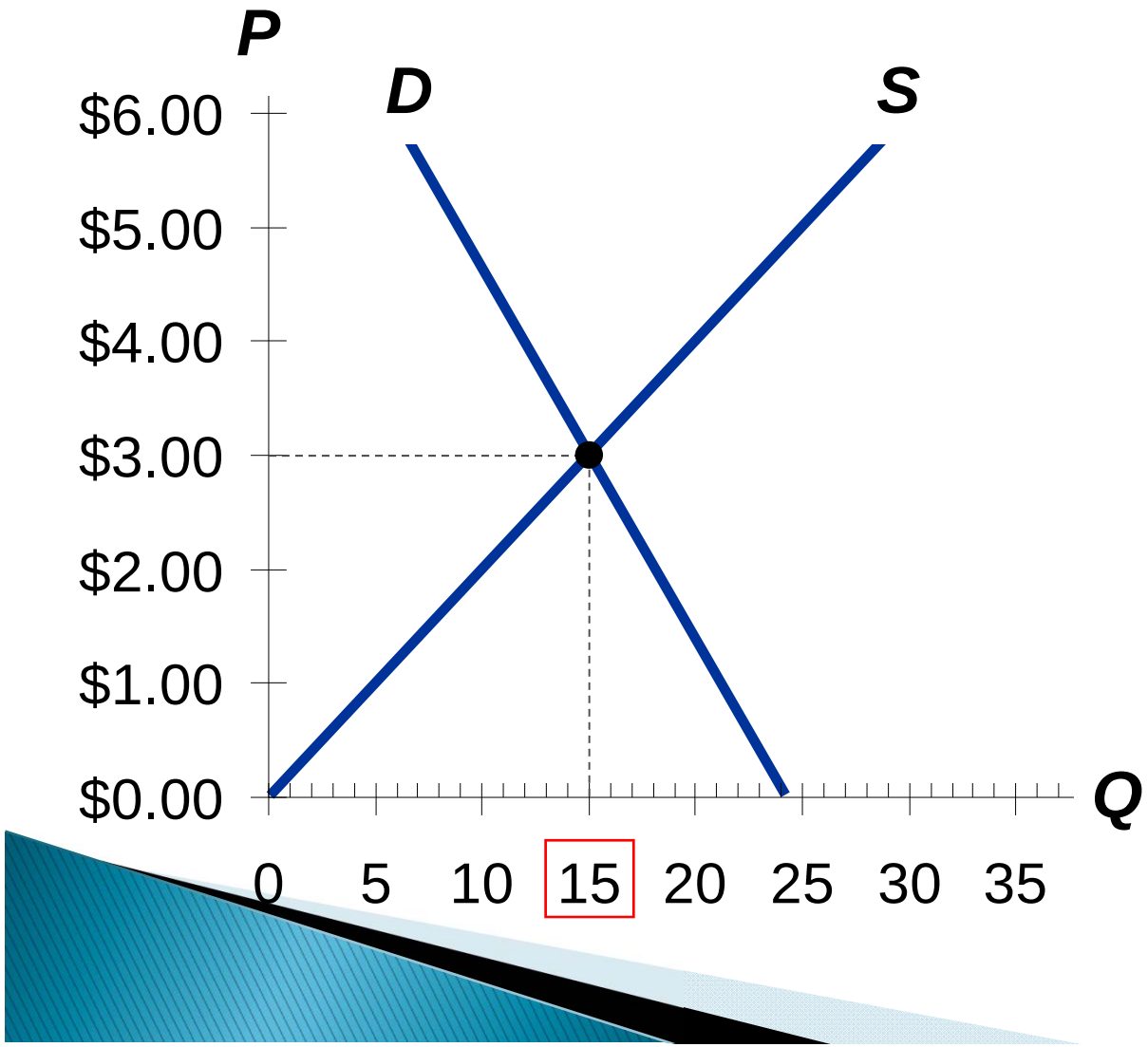
the price that equates quantity supplied with quantity demanded



P	Q^D	Q^S
$0	24	0
1	21	5
2	18	10
3	15	15
4	12	20
5	9	25
6	6	30

Equilibrium quantity:

the quantity supplied and quantity demanded at the equilibrium price



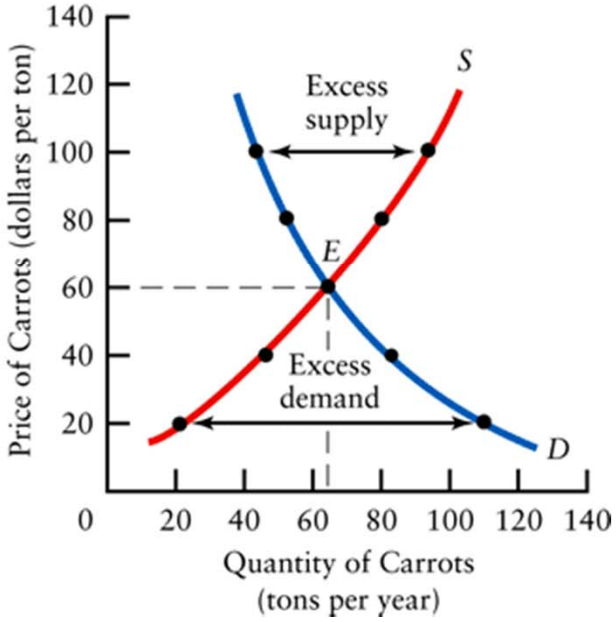
P	Q^D	Q^S
$0	24	0
1	21	5
2	18	10
3	15	15
4	12	20
5	9	25
6	6	30

Determination of the Equilibrium Price of Carrots

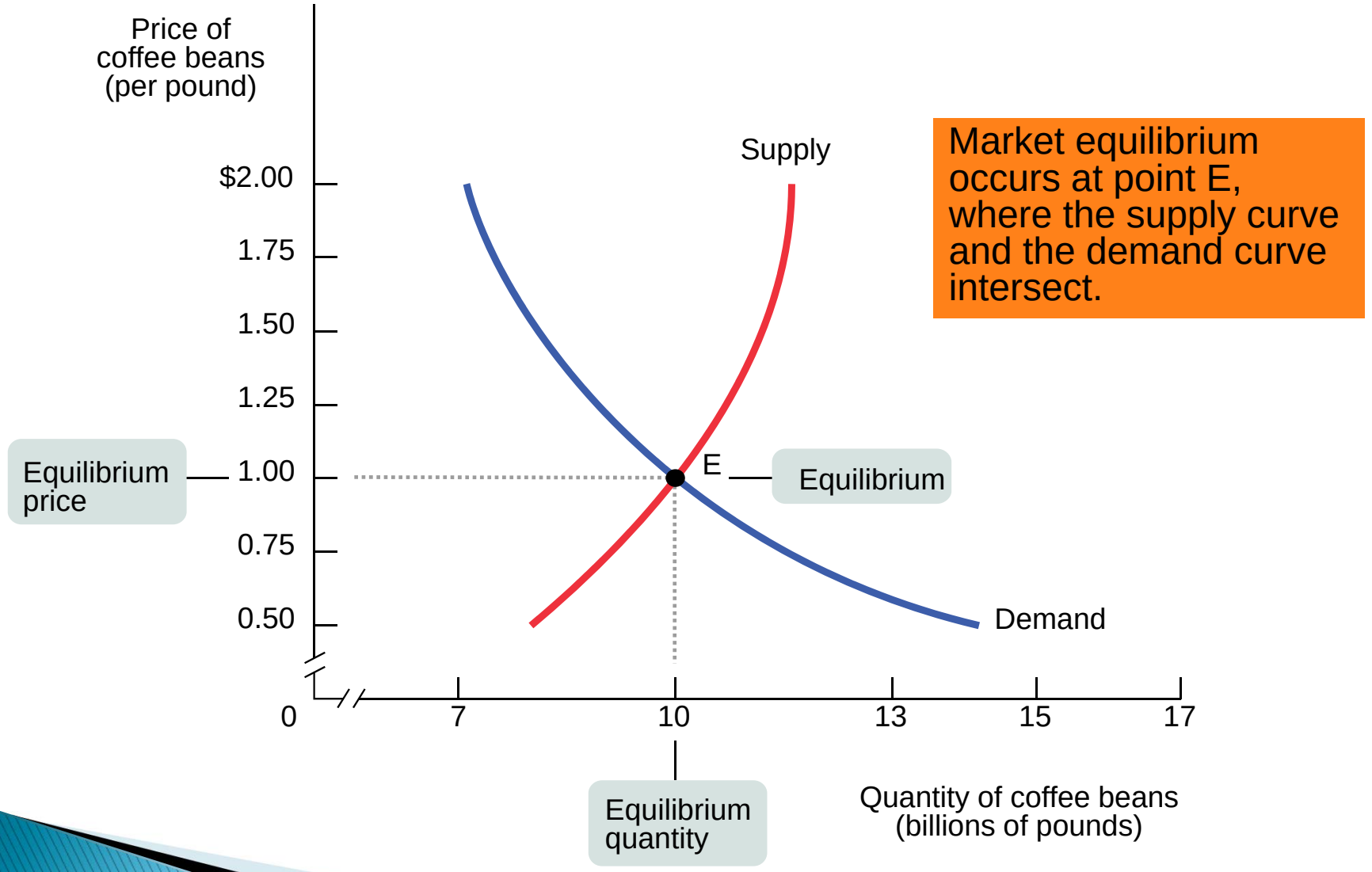
Demand and Supply Schedules

Price per Ton ($) p	Quantity Demanded (tons per year) D	Quantity Supplied (tons per year) S	Excess Demand (+) or Excess Supply (–) (tons per year) $D - S$
20	110	20	+90
40	85	45	+40
60	65	65	0
80	50	80	−30
100	40	95	−55

Demand and Supply Curves

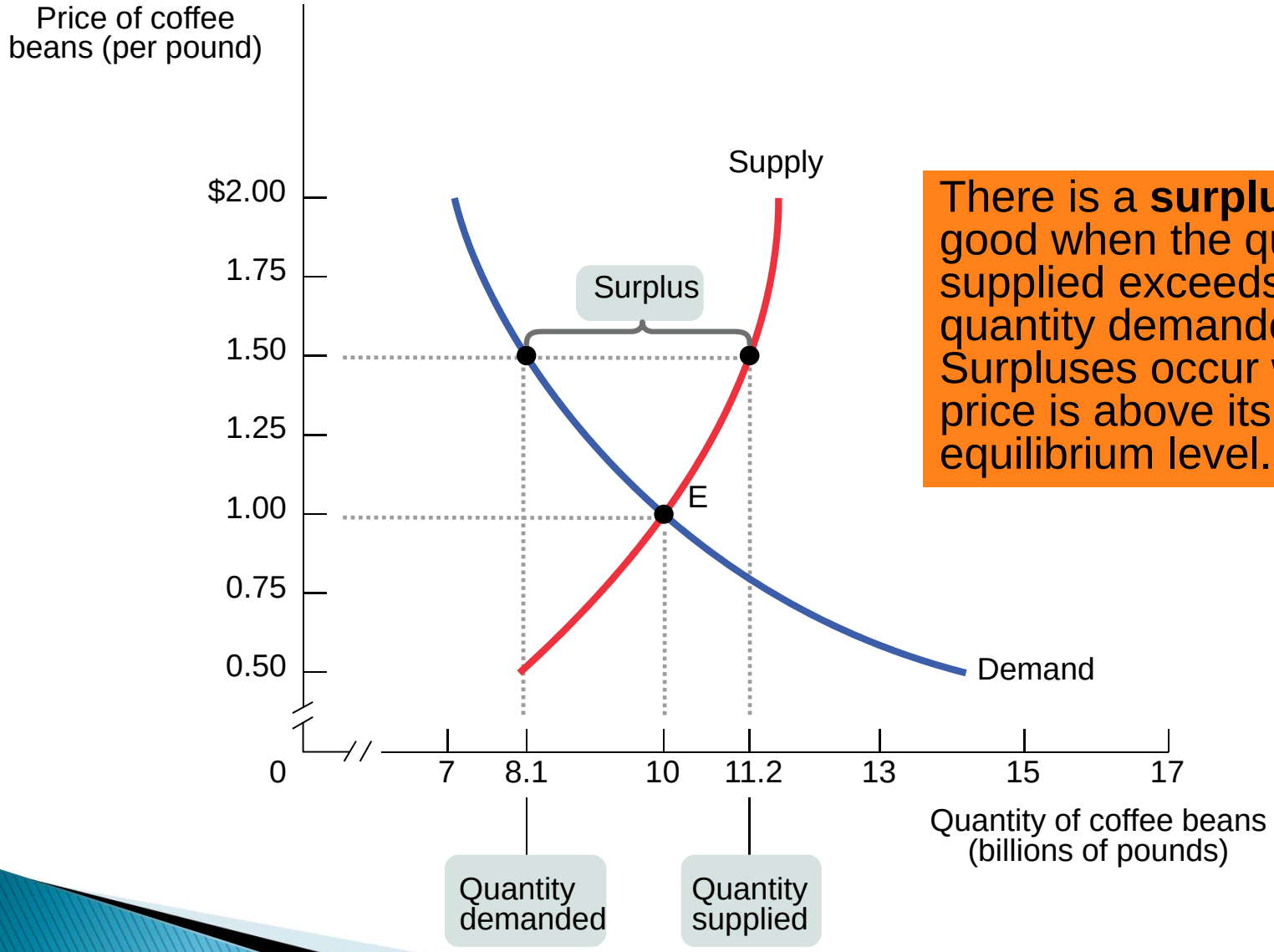


Market Equilibrium



Market equilibrium occurs at point E, where the supply curve and the demand curve intersect.

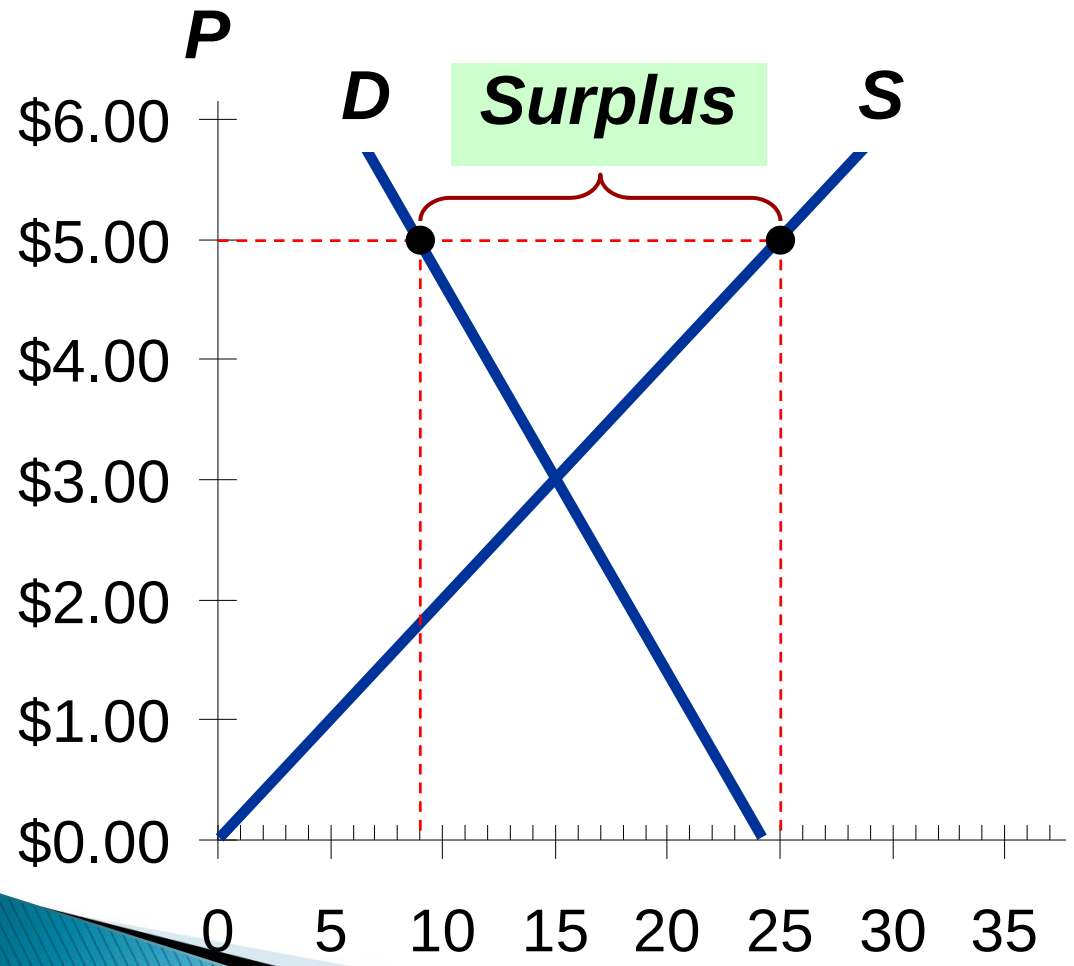
Surplus



There is a **surplus** of a good when the quantity supplied exceeds the quantity demanded. Surpluses occur when the price is above its equilibrium level.

Surplus

when quantity supplied is greater than quantity demanded



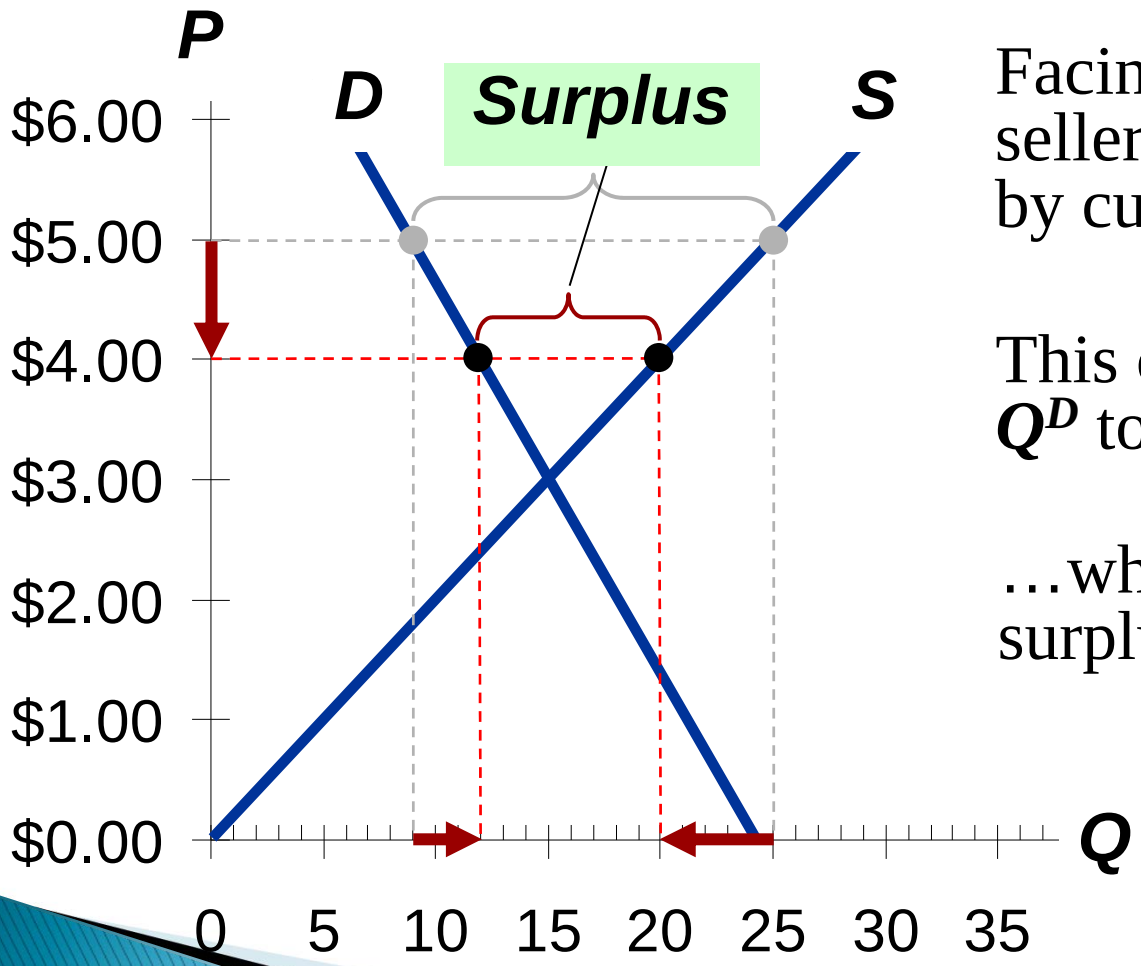
Example:
If P = \$5,

then
Q^D = 9 lattes

and
Q^S = 25 lattes

resulting in a surplus of 16 lattes

Surplus

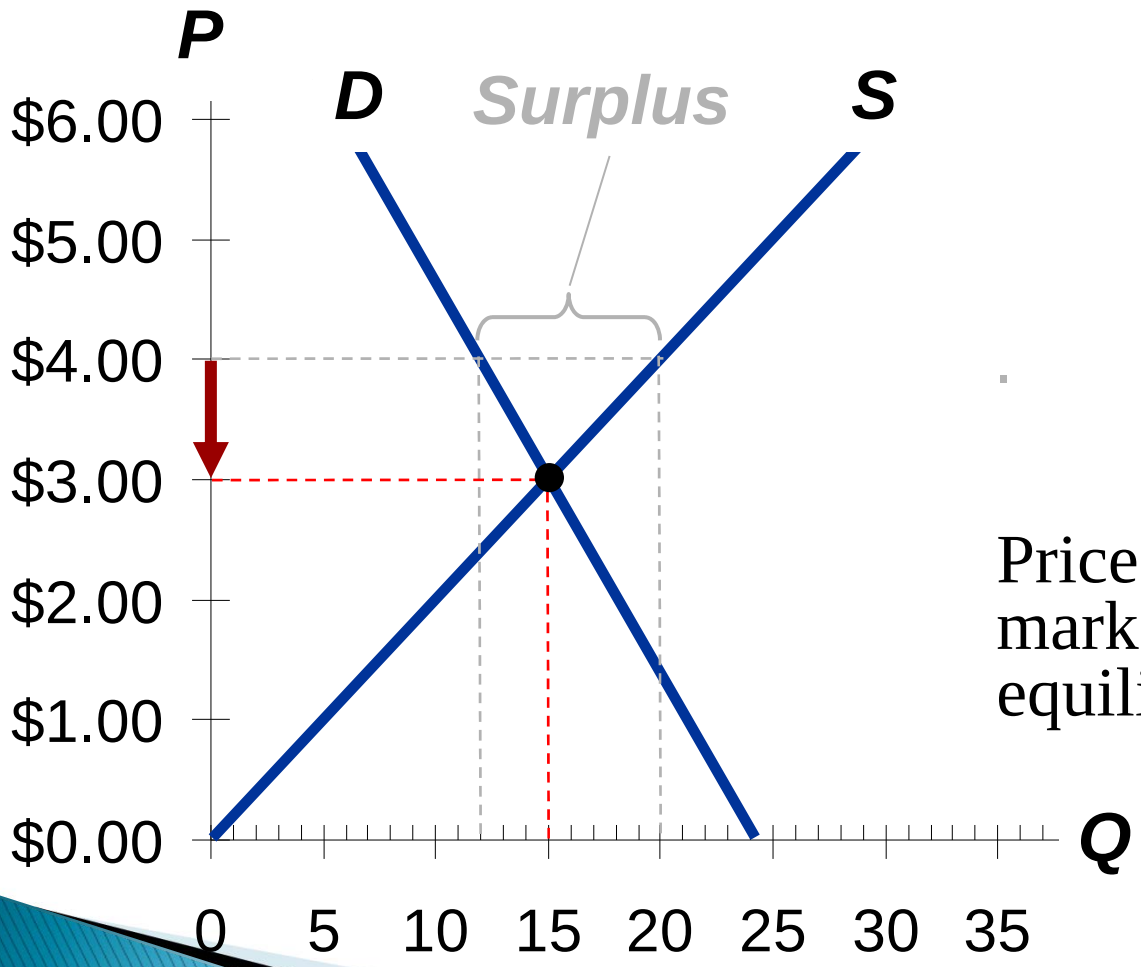


Facing a surplus, sellers try to increase sales by cutting price.

This causes Q^D to rise and Q^S to fall…

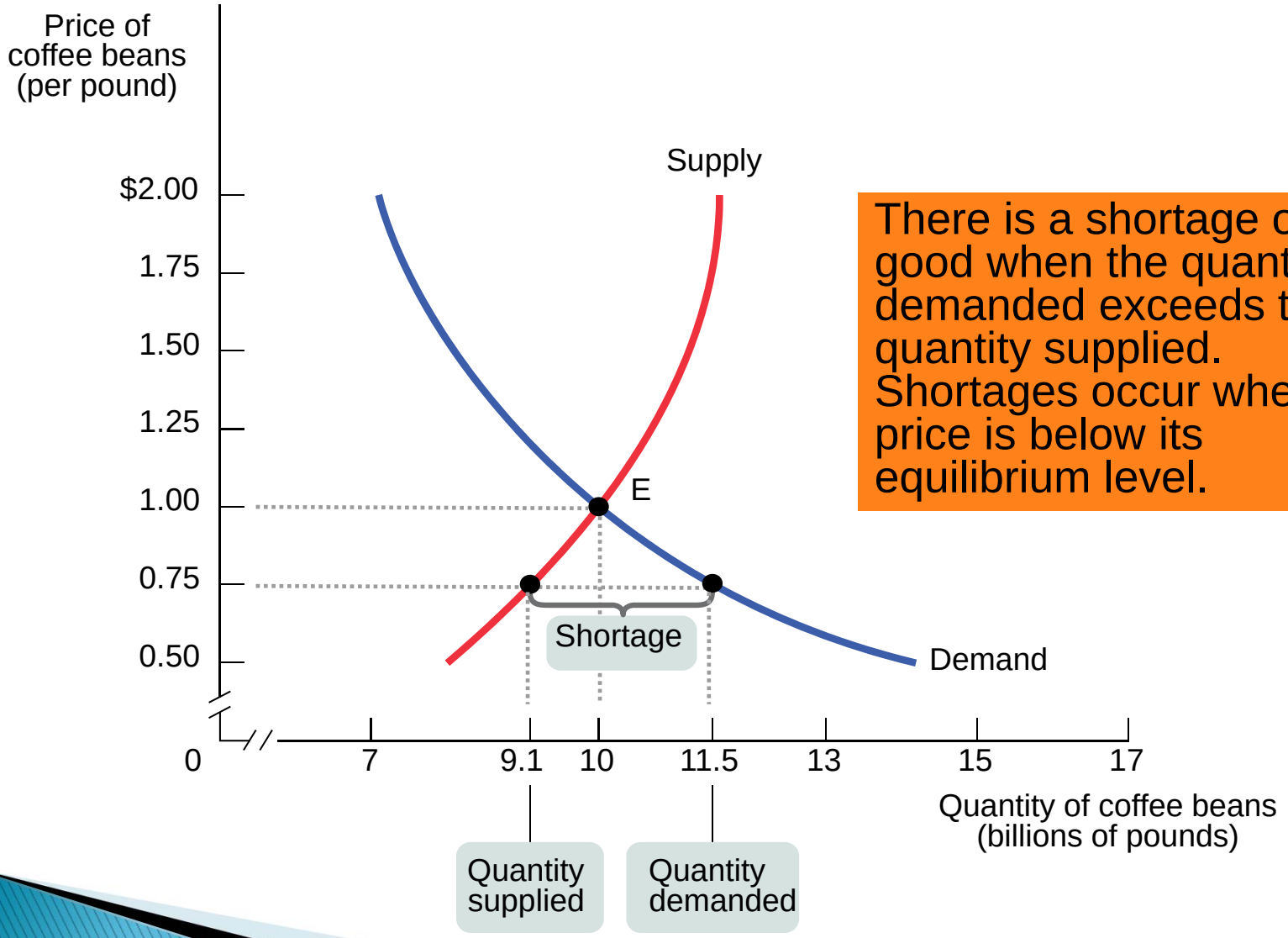
…which reduces the surplus.

Surplus



Prices continue to fall until market reaches equilibrium.

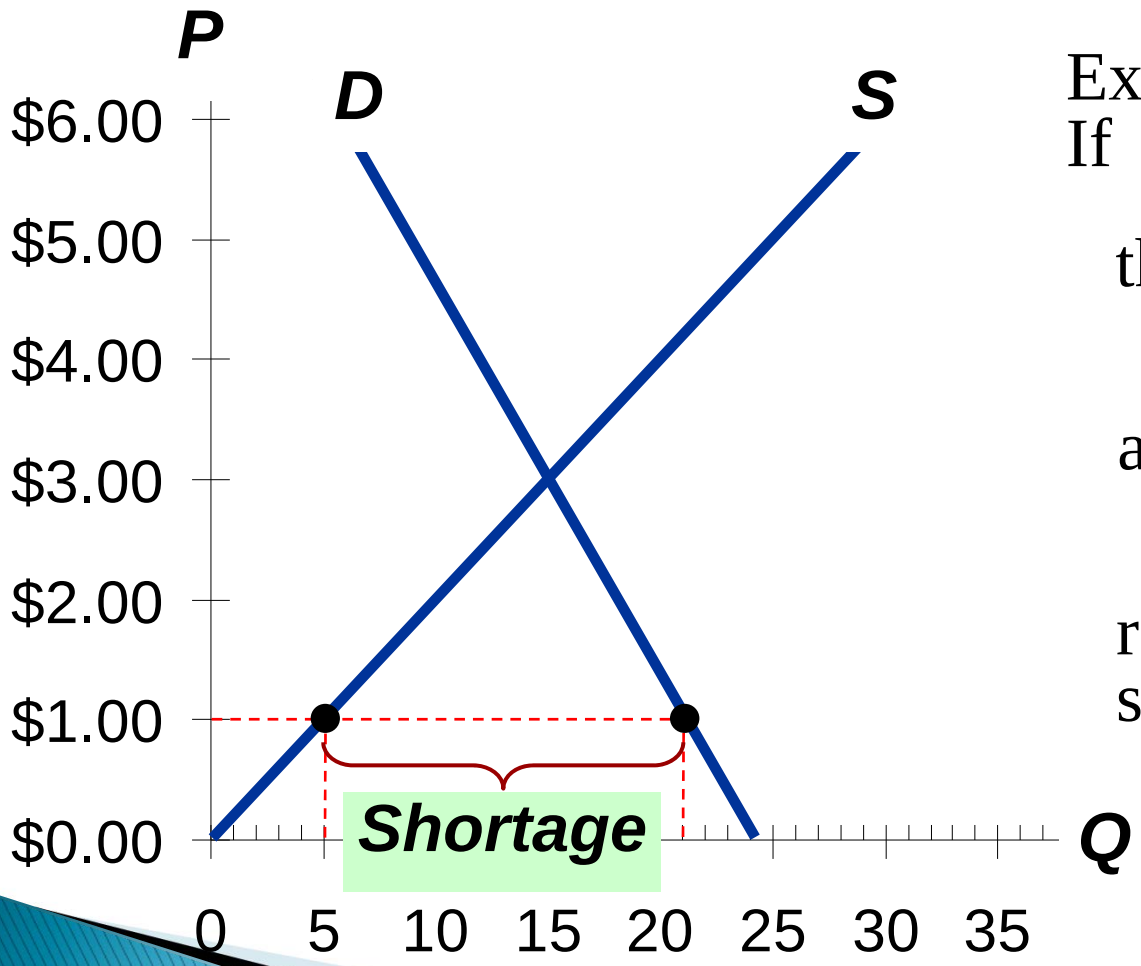
Shortage



There is a shortage of a good when the quantity demanded exceeds the quantity supplied. Shortages occur when the price is below its equilibrium level.

Shortage

when quantity demanded is greater than quantity supplied



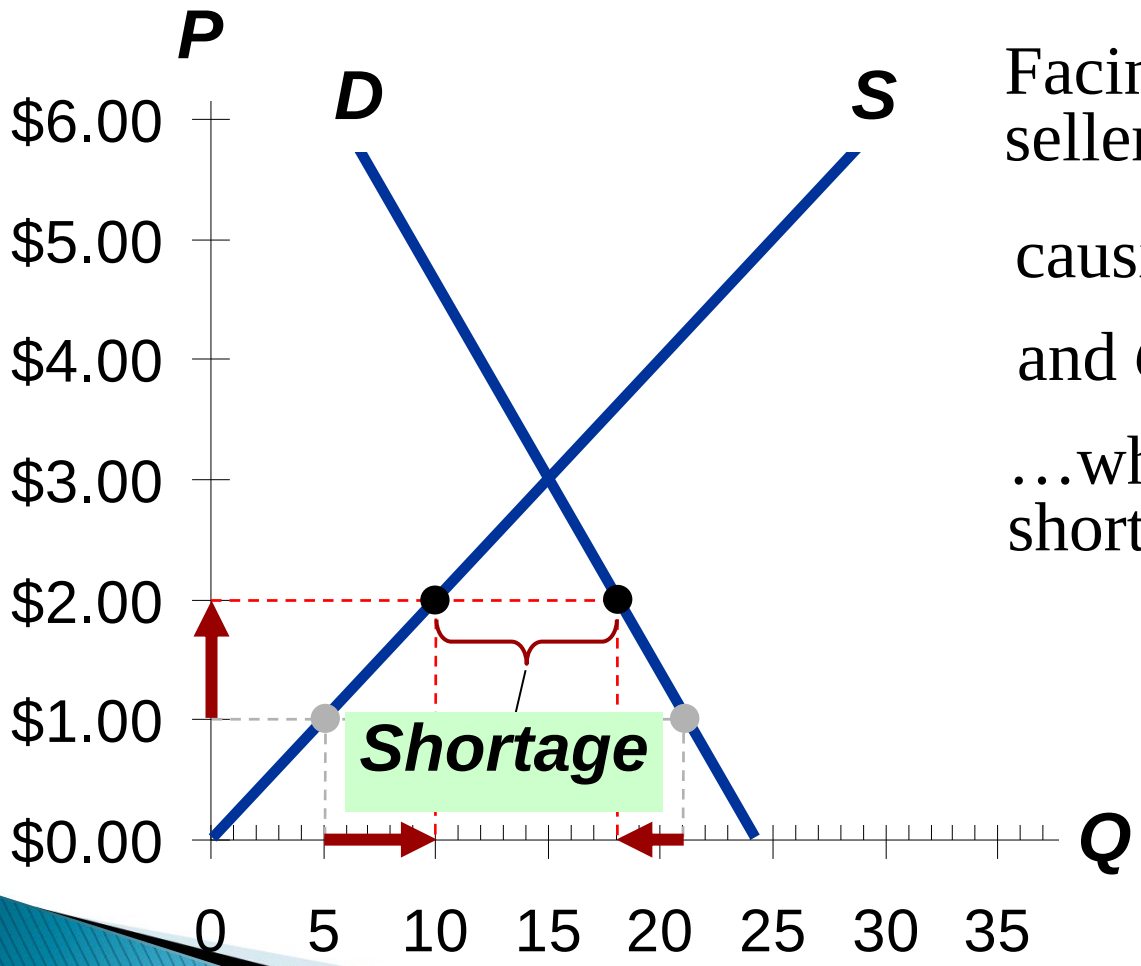
Example:
If P = \$1,

then
Q^D = 21 lattes

and
Q^S = 5 lattes

resulting in a shortage of 16 lattes

Shortage



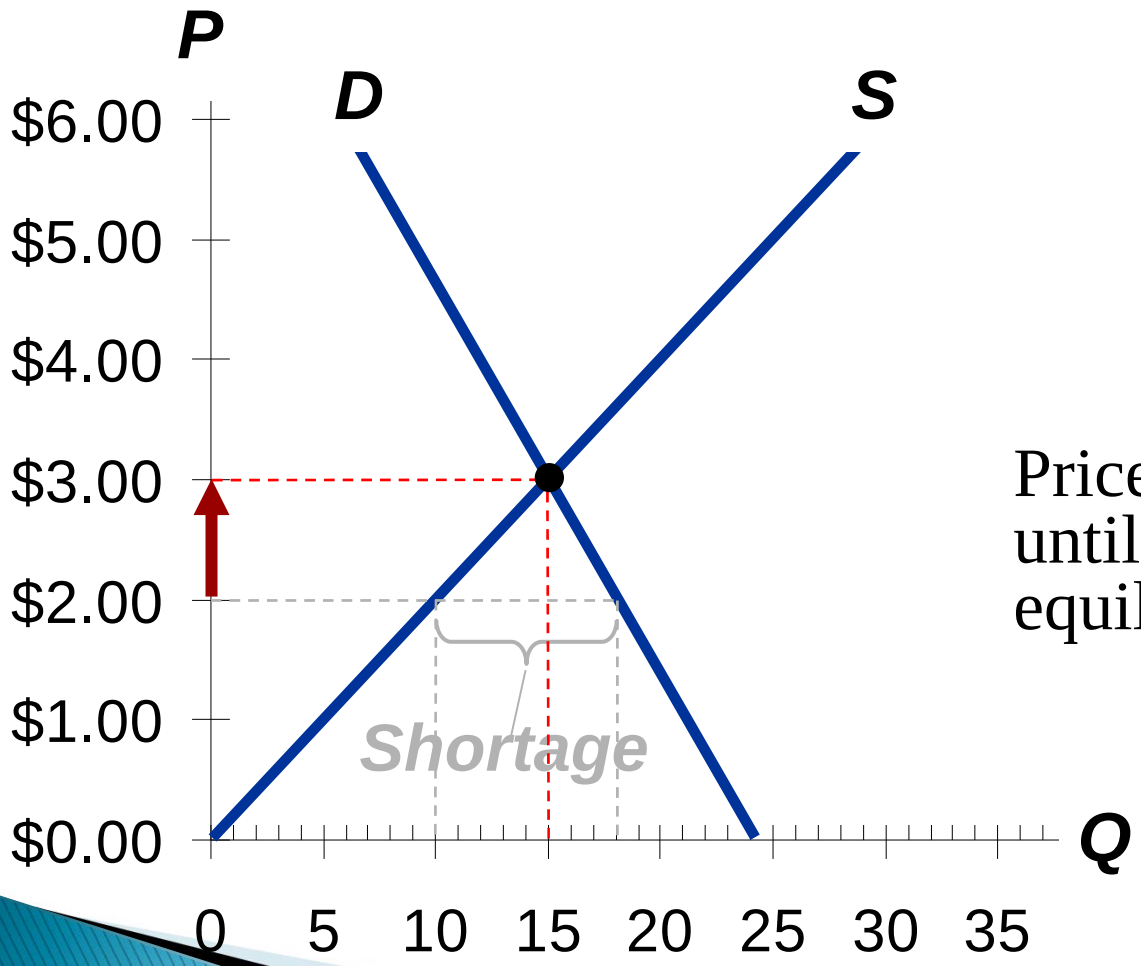
Facing a shortage, sellers raise the price,

causing Q^D to fall

and Q^S to rise,

…which reduces the shortage.

Shortage



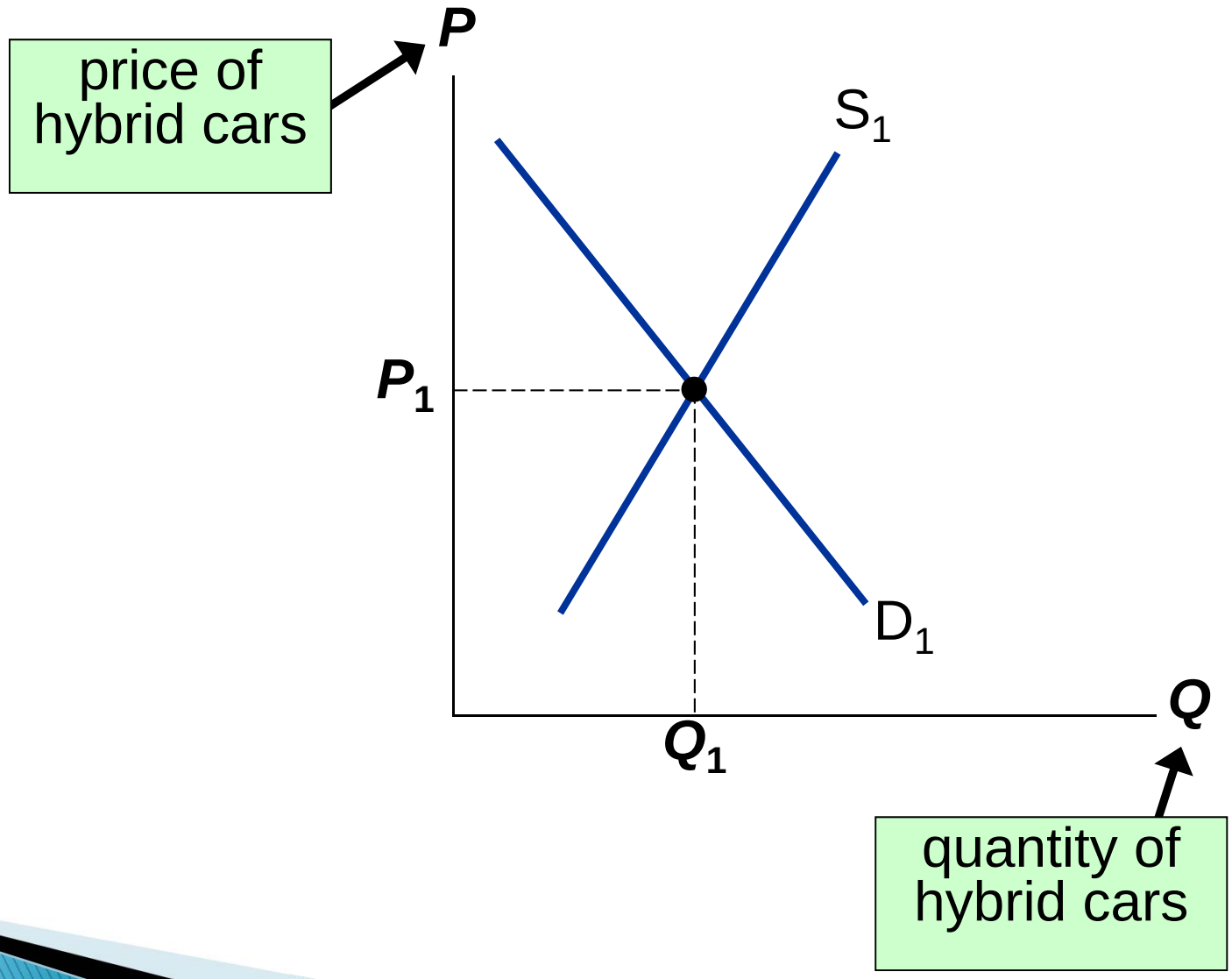
Prices continue to rise until market reaches equilibrium.

Three Steps to Analyzing Changes in Eq'm

To determine the effects of any event,

1. Decide whether event shifts ***S*** curve, ***D*** curve, or both.
2. Decide in which direction curve shifts.
3. Use supply—demand diagram to see how the shift changes eq'm ***P*** and ***Q***.

EXAMPLE: The Market for Hybrid Cars



EXAMPLE 1: A Shift in Demand

EVENT TO BE ANALYZED:
Increase in price of gas.

STEP 1:

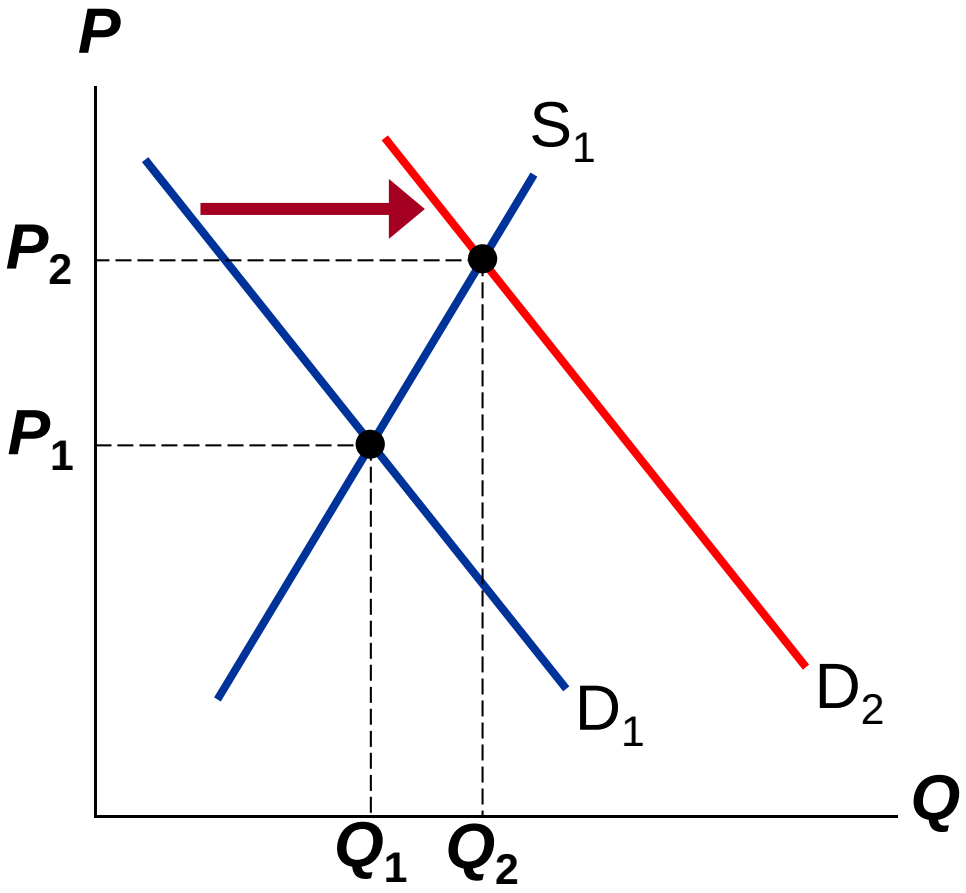
D curve shifts

STEP 2:

D shifts right

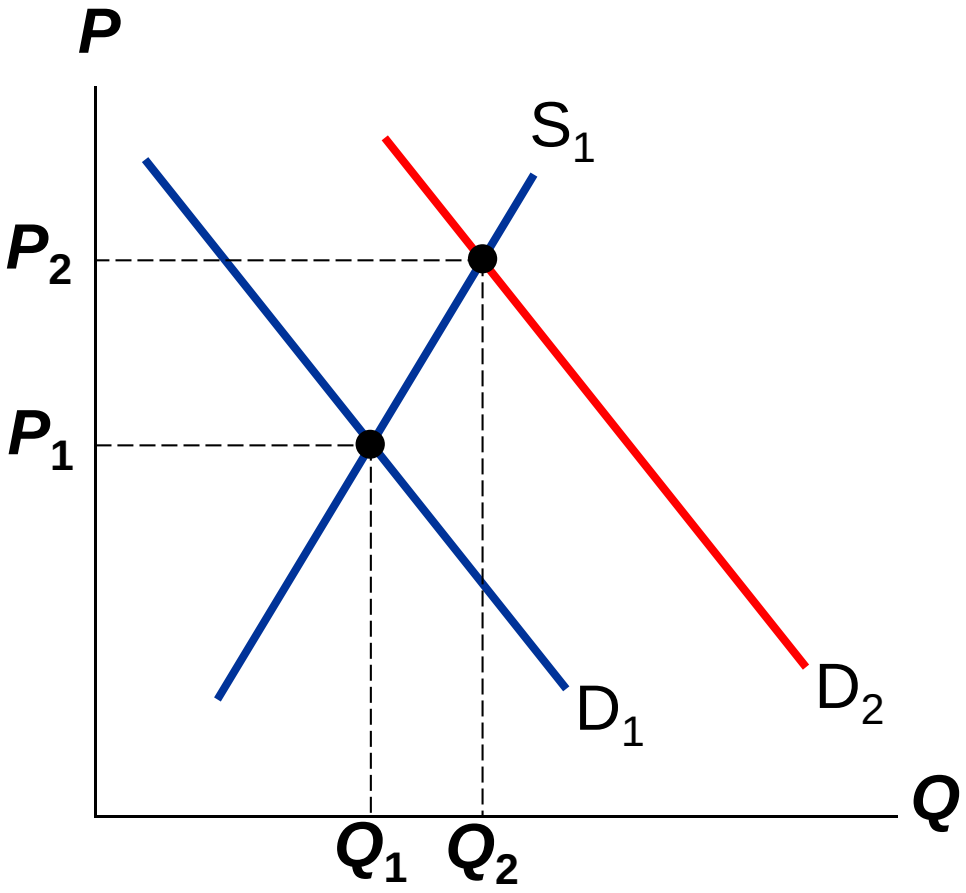
STEP 3:

The shift causes an increase in price and quantity of hybrid cars.



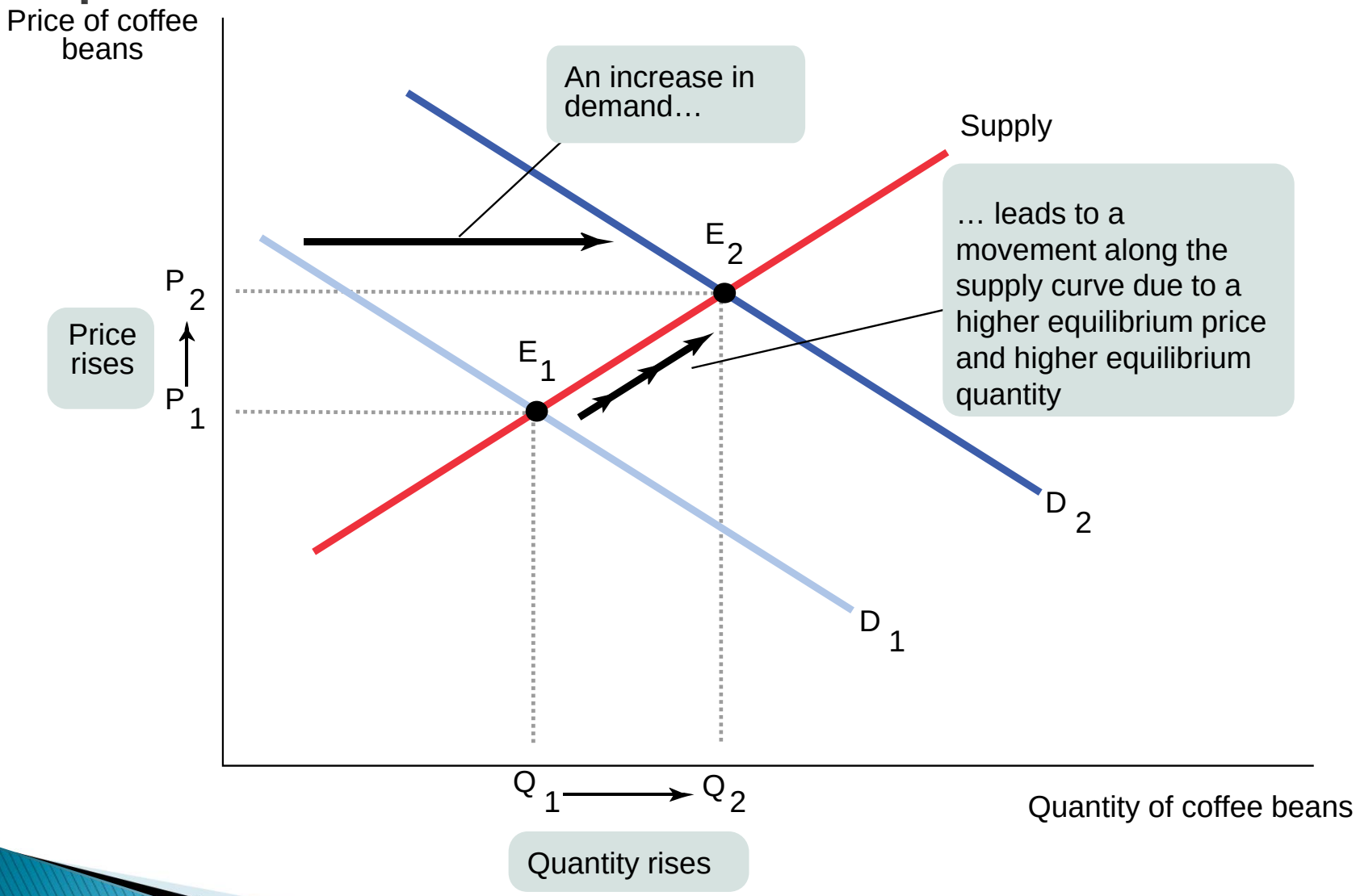
EXAMPLE 1: A Shift in Demand

Notice:
When ***P*** rises, producers supply a larger quantity of hybrids, even though the ***S*** curve has not shifted.



Always be careful to distinguish b/w a shift in a curve and a movement along the curve.

Equilibrium and Shifts of the Demand Curve



EXAMPLE 2: A Shift in Supply

EVENT: New technology reduces cost of producing hybrid cars.

STEP 1:

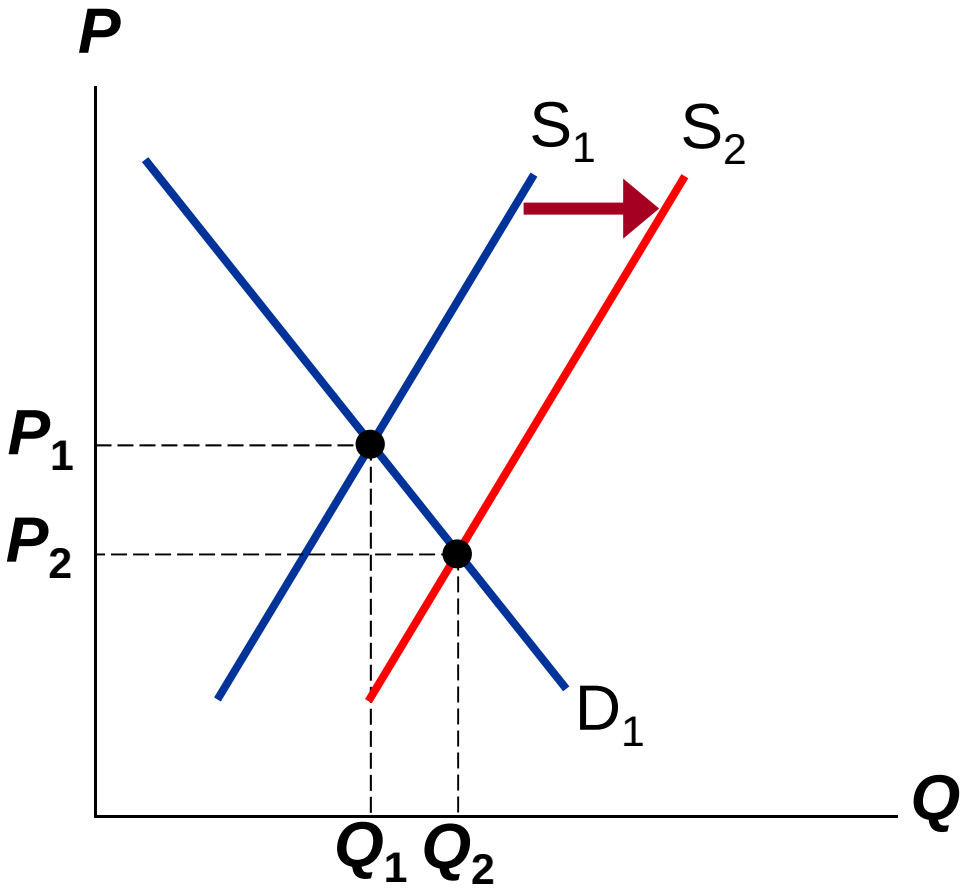
S curve shifts

STEP 2:

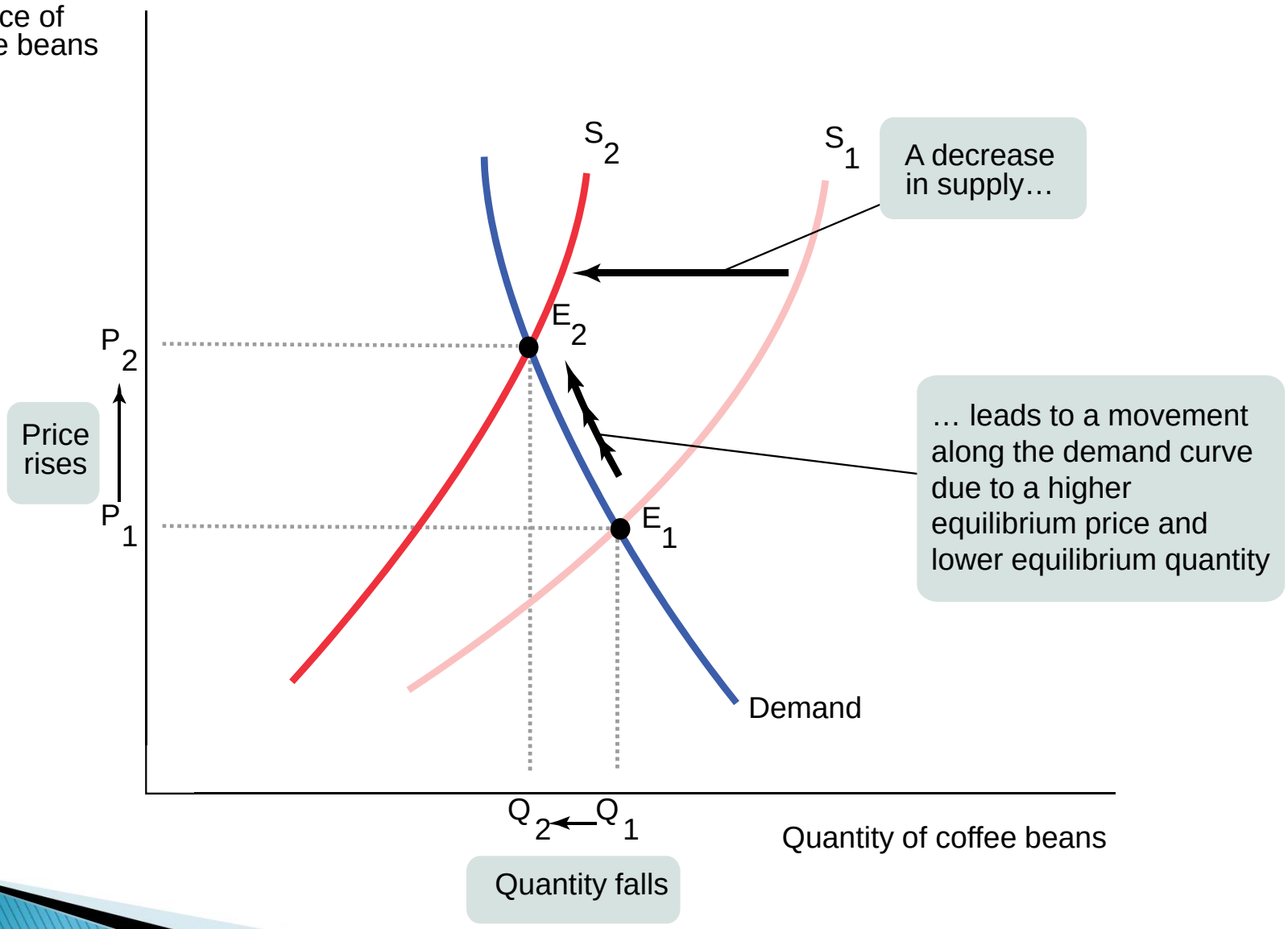
S shifts right

STEP 3:

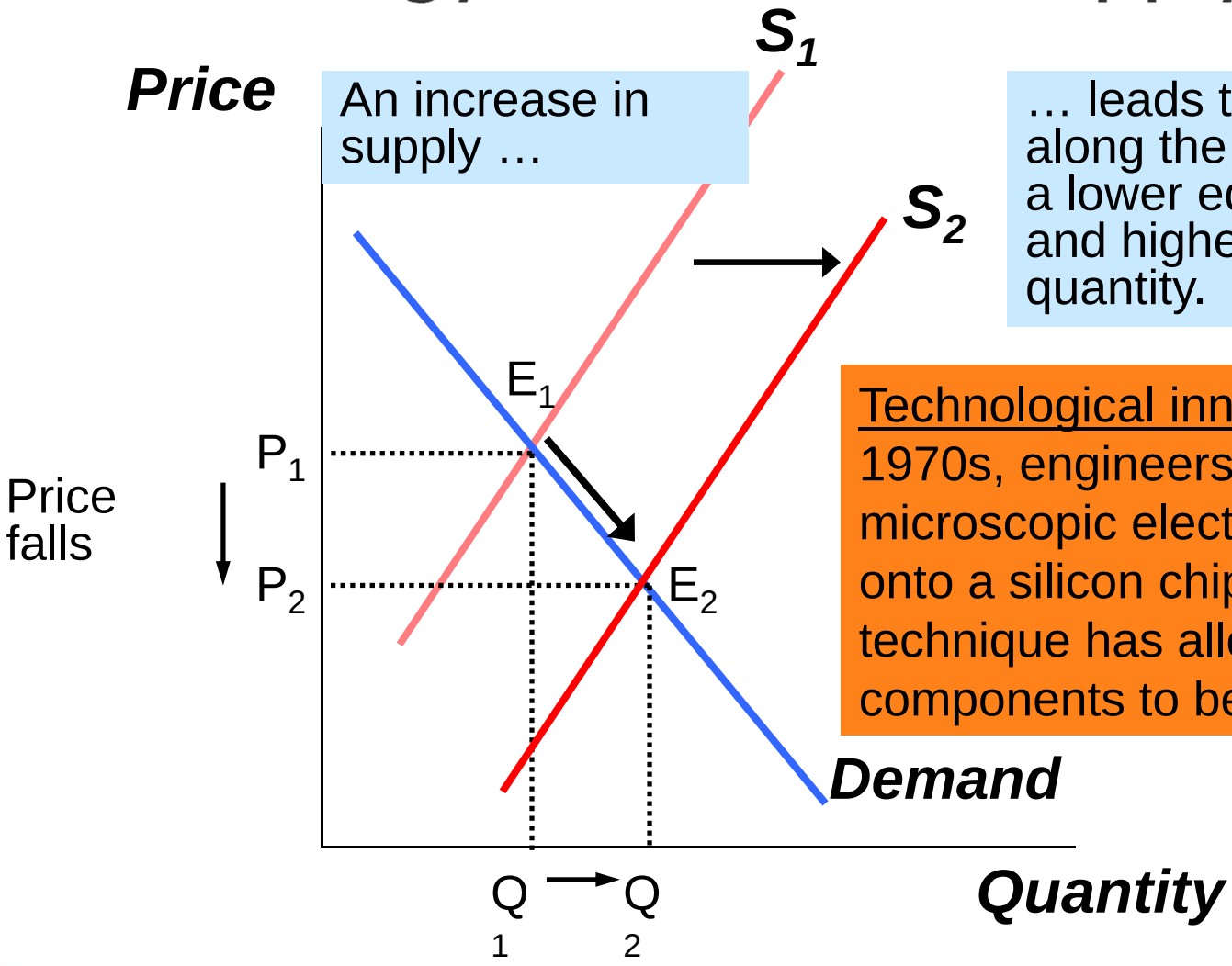
The shift causes price to fall
and quantity to rise.



Equilibrium and Shifts of the Supply Curve



Technology Shifts of the Supply Curve



… leads to a movement along the demand curve to a lower equilibrium price and higher equilibrium quantity.

Technological innovation: In the early 1970s, engineers learned how to put microscopic electronic components onto a silicon chip; progress in the technique has allowed ever more components to be put on each chip.

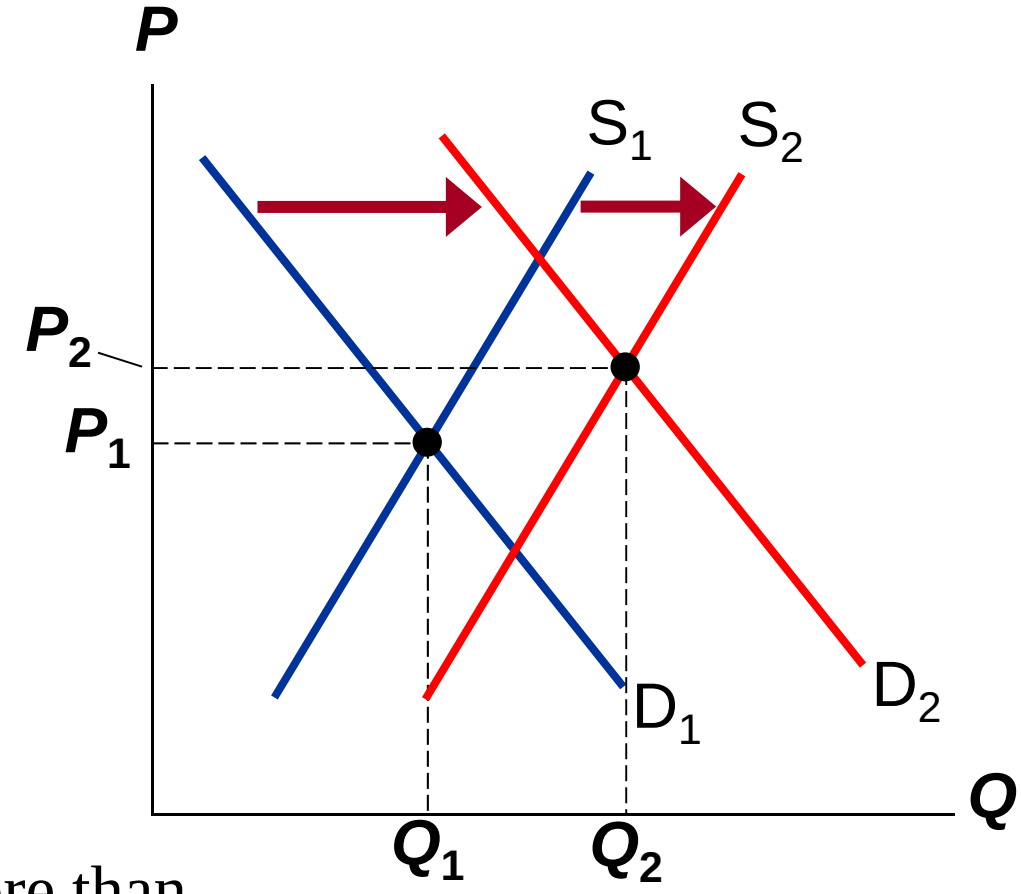
EXAMPLE 3: A Shift in Both Supply and Demand

EVENTS:
Price of gas rises AND new technology reduces production costs

STEP 1:
Both curves shift.

STEP 2:
Both shift to the right.

STEP 3:
Q rises, but effect on ***P*** is ambiguous:
If demand increases more than supply, ***P*** rises.

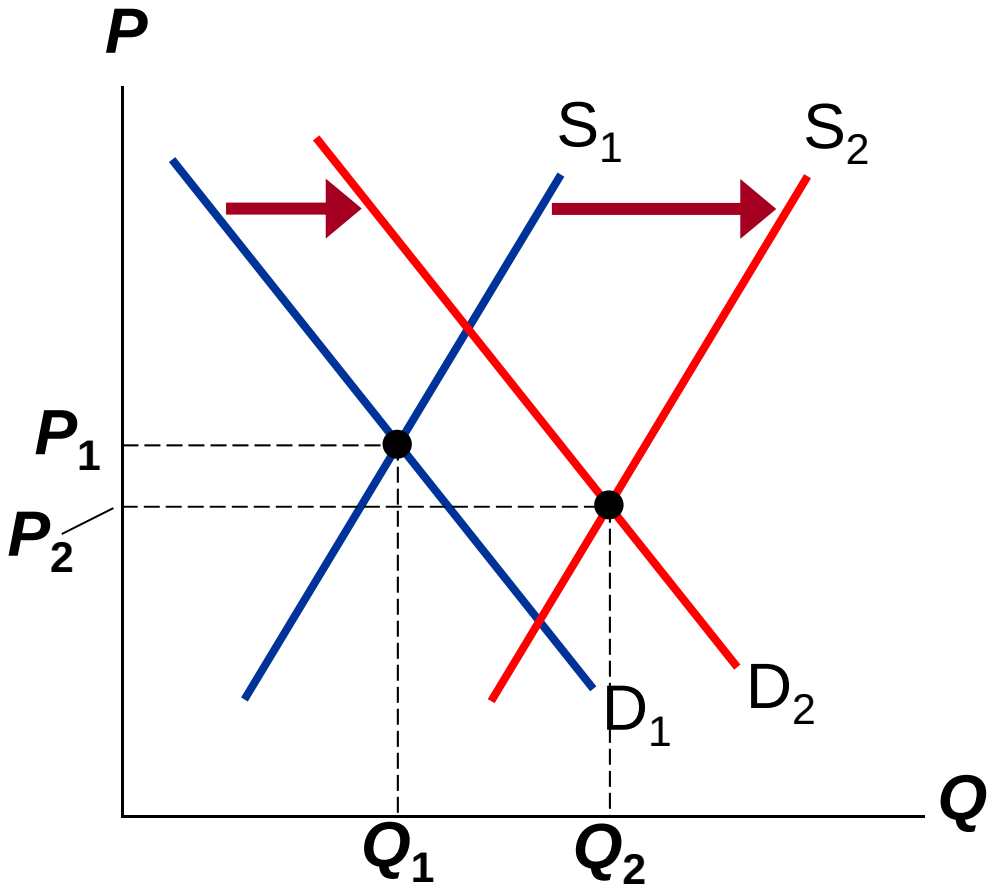


EXAMPLE 3: A Shift in Both Supply and Demand

EVENTS:
price of gas rises AND
new technology reduces
production costs

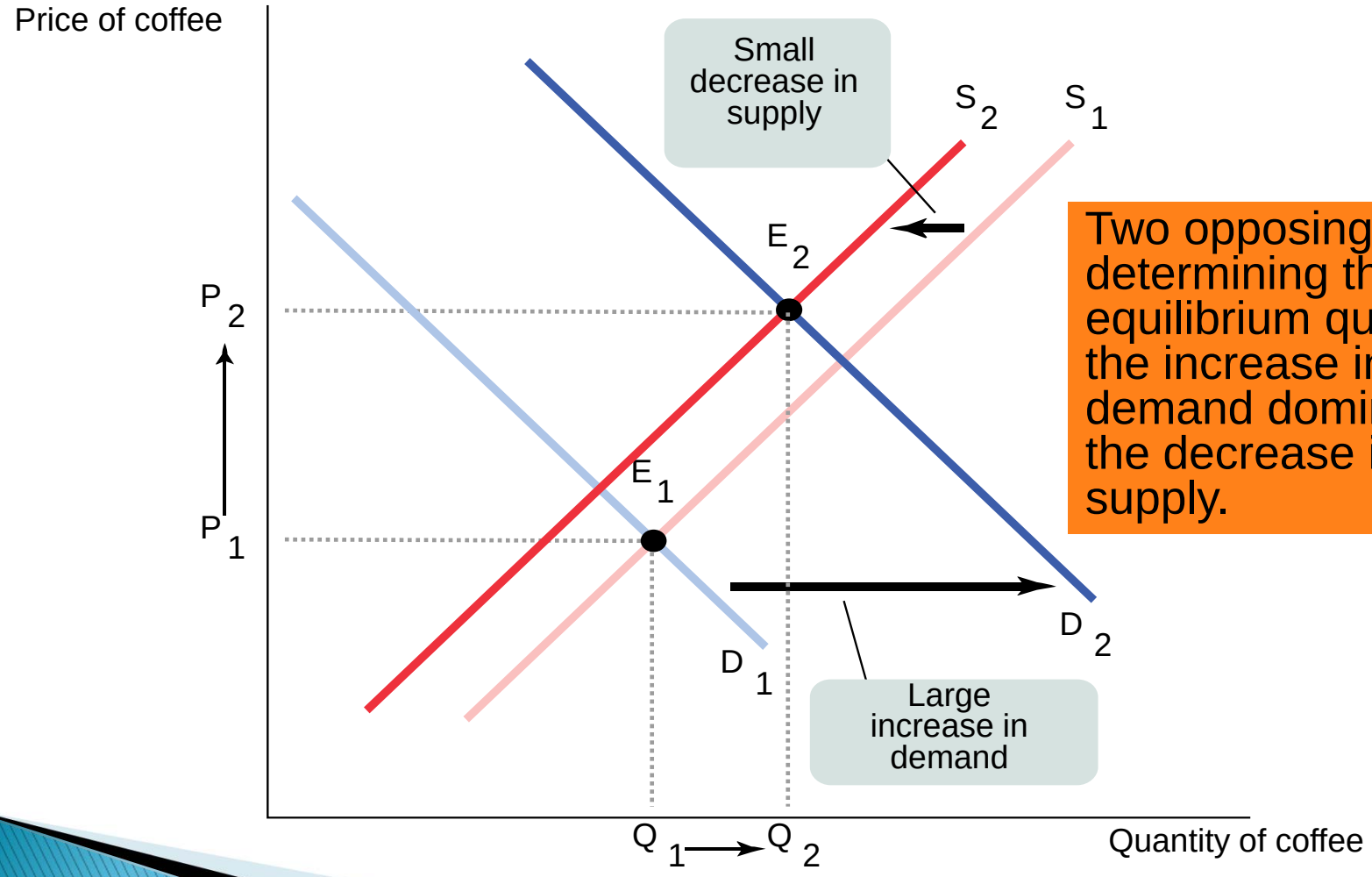
STEP 3, cont.

But if supply increases more than demand, ***P*** falls.



Simultaneous Shifts of the Demand and Supply Curves I (P up, Q up)

(a) **One possible outcome: Price Rises, Quantity Rises**



Two opposing forces determining the equilibrium quantity: the increase in demand dominates the decrease in supply.

Terms for Shift vs. Movement Along Curve

- **Change in supply**: a shift in the ***S*** curve
  occurs when a non-price determinant of supply changes (like technology or costs)
- **Change in the quantity supplied**:
  a movement along a fixed ***S*** curve
  occurs when ***P*** changes
- **Change in demand**: a shift in the ***D*** curve
  occurs when a non-price determinant of demand changes (like income or # of buyers)
- **Change in the quantity demanded**:
  a movement along a fixed ***D*** curve
  occurs when ***P*** changes

Changes in Market Prices

The four “laws” of supply and demand:

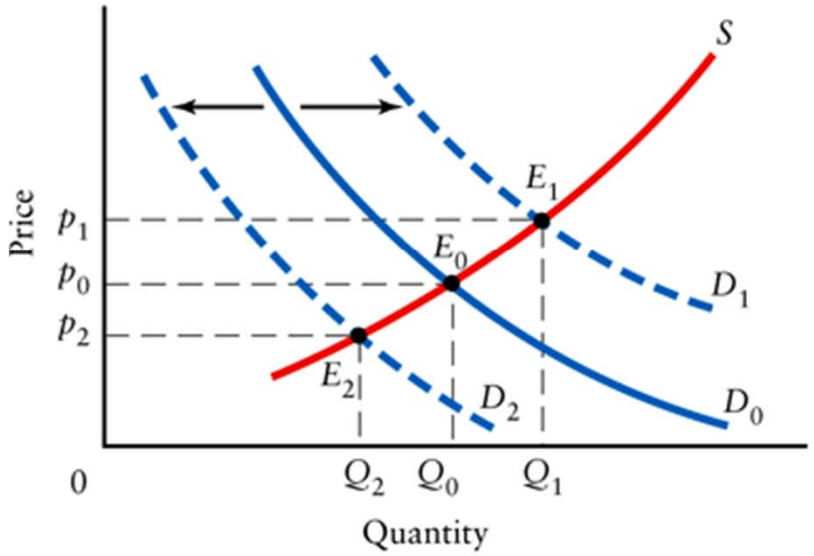
1. An increase in demand causes an increase in both equilibrium price and equilibrium quantity.

2. A decrease in demand causes a decrease in both equilibrium price and equilibrium quantity.

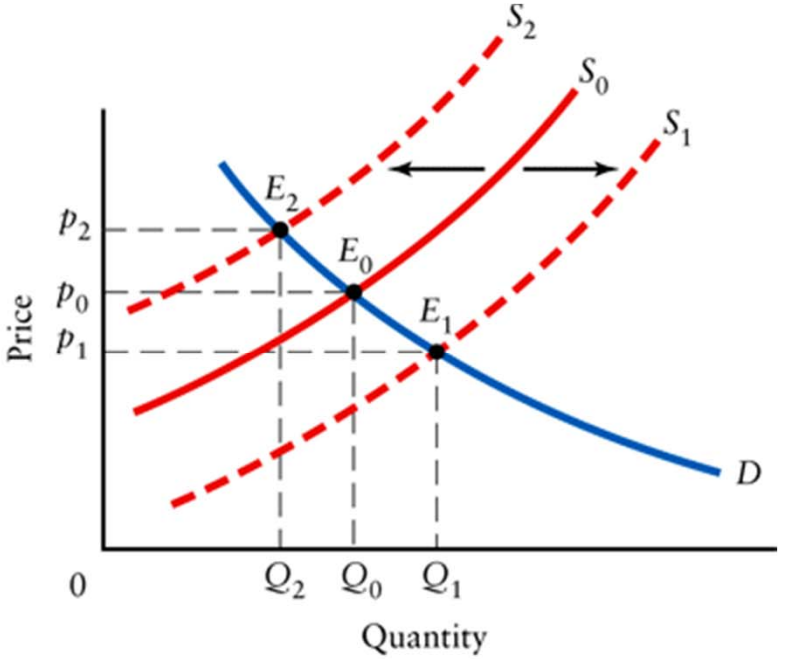
3. An increase in supply causes a decrease in the equilibrium price and an increase in the equilibrium quantity.

4. A decrease in supply causes an increase in the equilibrium price and a decrease in the equilibrium quantity.

The Four "Laws" of Demand and Supply



(i) The effect of shifts in the demand curve



(ii) The effect of shifts in the supply curve

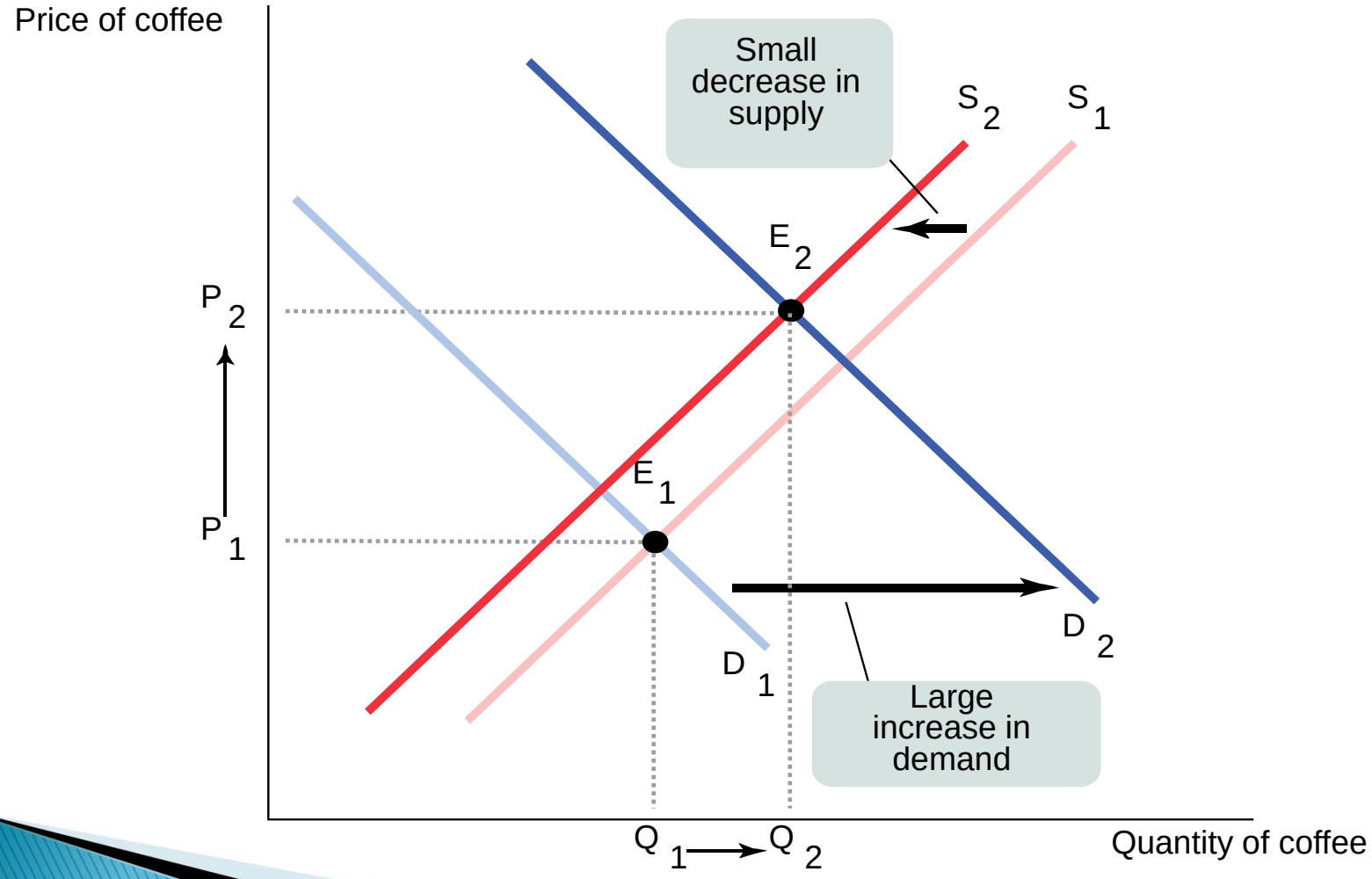
Simultaneous Shifts in Supply and Demand

We can make the following predictions about the outcome when the supply and demand curves shift simultaneously:

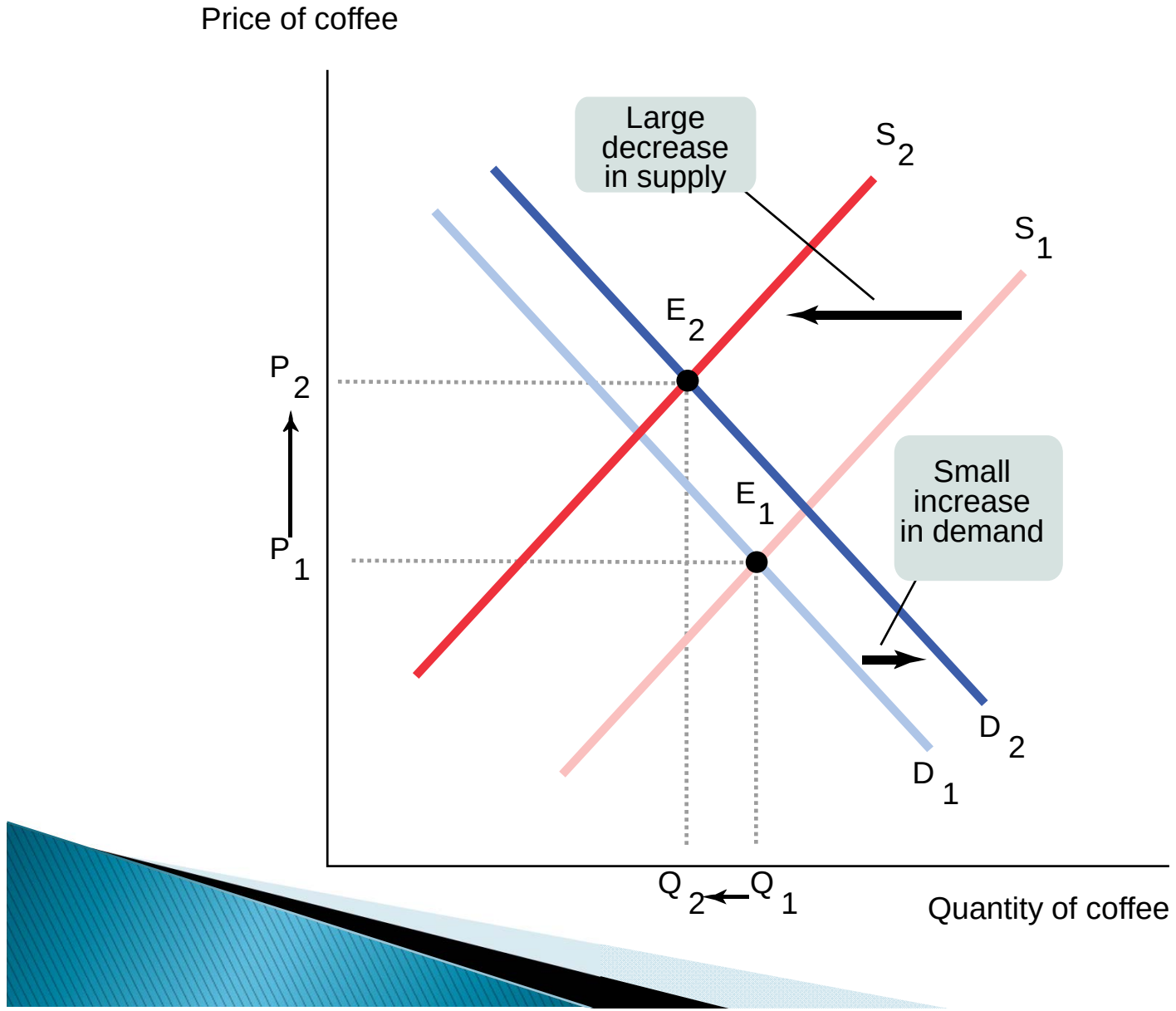
Simultaneous Shifts of Supply and Demand	**Supply Increases**	**Supply Decreases**
Demand Increases	Price: ambiguous Quantity: up	Price: up Quantity: ambiguous
Demand Decreases	Price: down Quantity: ambiguous	Price: ambiguous Quantity: down

Example

(a) One possible outcome: Price Rises, Quantity Rises



(b) **Another Possibility Outcome: Price Rises, Quantity Falls**

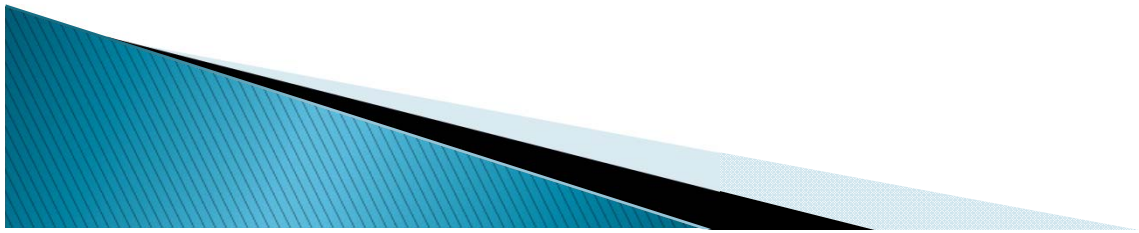


The Great Tortilla Crises:

- A sharp rise in the price of tortillas, a staple food of Mexico's poor, which had gone from 25 cents a pound to between 35 and 45 cents a pound in just a few months in early 2007.

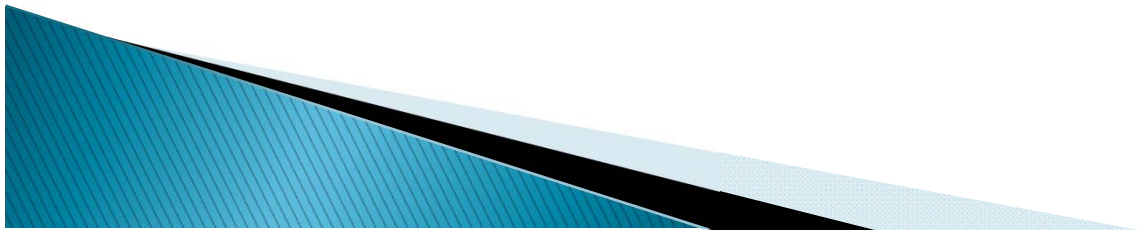
Why were tortilla prices soaring?

- It was a classic example of what happens to equilibrium prices when supply falls. Tortillas are made from corn; much of Mexico's corn is imported from the United States, with the price of corn in both countries basically set in the U.S. corn market. And U.S. corn prices were rising rapidly thanks to surging demand in a new market: the market for ethanol.



Demand and supply shifts at work in the global economy

- A recent **drought in Australia** reduced the amount of grass on which Australian dairy cows could feed, thus limiting the amount of milk these cows produced for export.
- At the same time, a **new tax levied by the government of Argentina** raised the price of the milk the country exported, thereby decreasing Argentine milk sales worldwide.
- These two developments produced a supply shortage in the world market, which dairy farmers in Europe couldn't fill because of strict production **quotas set by the European Union**.



Demand and supply shifts at work in the global economy

- **In China**, meanwhile, demand for milk and milk products increased, as rising income levels drove higher per-capita consumption.

- **All these occurrences resulted in a strong upward pressure on the price of milk everywhere in 2007**.

Relative Prices and Inflation

The absolute price of a product is the amount of money that must be spent to acquire one unit of that product.

A relative price is the price of one good in terms of another.

Demand and supply curves are drawn in terms of relative prices rather than absolute prices.

Sources:

- Krugman, P. and Robin Wells (2008)
- Frank, R.H. (2010)
- Mankiw, N.G. (2012)
- Lipsey, Regan, and Storer (2008)