

**Cooleconomics.com**  
**Principles of Economics**

**Model of a Competitive Product Market**

Contents

Introduction

Demand

Supply

Equilibrium

Events Changing Equilibrium

Government Preventing Equilibrium

*What is a market?*

A market is an institution or mechanism allowing buyers and sellers to make an exchange (usually money in exchange for an item)

*The Extent of a Market*

A market is usually defined by three attributes

- the item being bought and sold
- the customer base (often a geographic area)
- the time period being examined

Example: The canned soda market in Houston in September

*A “Competitive” Market*

To be competitive, there must be many buyers and sellers of the item, competing with each other.

- the U.S. tomato market is competitive
- the personal computer operating systems market is not competitive

**DEMAND: Modeling the behavior of buyers**

“Demand” means willingness to buy. There are many factors that motivate buyers of a good or service to be willing to buy. These can be categorized:

- the price of the product
- the income of the buyers
- buyers’ tastes and preferences (their perceived usefulness of the product)
- buyers’ expectations (of the future)
- the prices of related products

*More on the categories of things which motivate demand*

Price of the product:

The “Law of Demand” is an observation that, usually, a higher price for a product reduces demand for it. (Equivalently, a lower product price increases demand.)

Income of Buyers:

- “Normal” goods are goods whose demand rises with rising income.
- “Inferior” goods are goods whose demand falls with rising income (e.g. ramen noodles)

Tastes and Preferences:

If a buyer believes that a good provides a lot of usefulness, he/she will be willing to pay a lot for the good. (Advertising can affect this.)

Expectations:

Demand for a good *today* can depend on what the buyer believes will happen *in the future*. For example, demand for bottled water increases if buyers expect a hurricane soon.

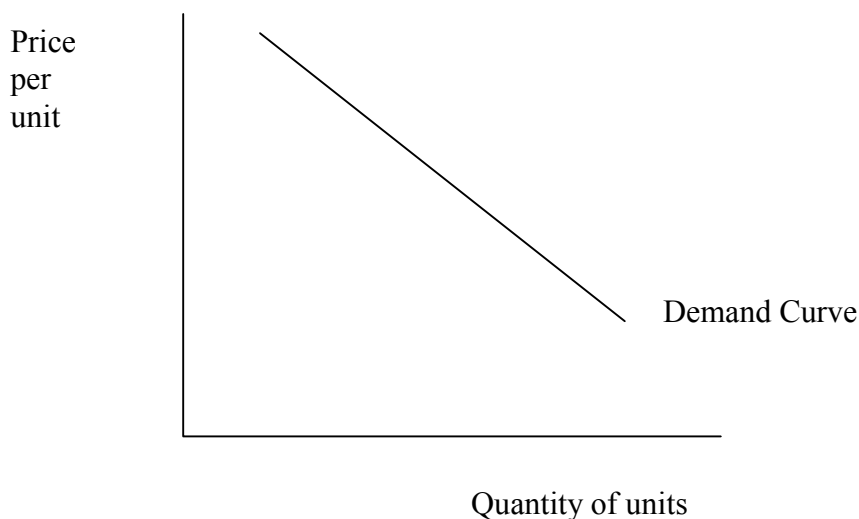
Price of related products:

--The price of a *substitute* good can affect demand for the original good. Substitute goods serve roughly the same purpose to buyers. E.g. an increase in the price of Pepsi will cause higher demand for Coke.

--The price of a *complement* good can affect demand for the original good. Complementary goods are often consumed together. E.g. an increase in the price of hot dogs will cause lower demand for hot dog buns.

DEMAND GRAPHED

A demand curve illustrates willingness to buy a product. Here’s one:



Note 1: The law of demand means that a demand curve slopes downward.

Note 2: A demand curve is not necessarily a straight line.

Shifting the demand curve:

One shifts the demand curve if there is a change in:

- the income of the buyers
- buyers' tastes and preferences (their perceived usefulness of the product)
- buyers' expectations (of the future)
- the prices of related products

More generally, anything that changes demand, except for a change in the price of the product, will cause the demand curve to shift.

- increased demand is a rightward shift of the demand curve
- reduced demand is a leftward shift of the demand curve

A shift in the demand curve need not be parallel to the original curve.

Examples:

- An increase in the price of hot dogs will cause the hot dog **bun** demand curve to shift leftward.
- An increase in income will cause the caviar demand curve to shift to the right.

A DEMAND EQUATION

Economists use survey methods and statistical techniques to estimate demand equations. The simplest possible demand equation is linear. Here is an example:

$$Q_d = 1000 - 10P$$

“Q<sub>d</sub>” is quantity demanded                      P is price

Note that one can express the same demand curve in the standard form  $Y = b + mX$ , by solving the equation for P:

$$10P = 1000 - Q_d \quad \text{so} \quad P = 100 - .1Q_d$$

## **SUPPLY: Modeling the behavior of sellers**

“Supply” means willingness to sell. There are many factors that motivate suppliers of a good or service to be willing to sell. These can be categorized:

- the price of the product
- the cost of producing each unit of output:
  - cost of factors of production (land, labor, and capital)
  - production technology
  - government taxes, subsidies, or regulations

In addition, a change in the number of sellers resulting from circumstances outside of the market (such as a drought or war) also affects supply

*More on the categories of things which affect supply*

### Price of the product:

The “Law of Supply” is an observation that, usually, a higher price for a product increases the supply of it. (Over longer time periods, this law may be violated, as higher quantities are accompanied by lower selling prices in markets where producers can take advantage of economies of scale in production. More on this later in the class.)

### Costs of factors of production:

- Higher costs, caused for example by unionized labor getting wage hikes, reduce supply.
- Lower costs, caused for example lower crude oil prices, increase supply.

### Production technology:

Technology that allows greater output for a given level of inputs causes increased supply.

### Government taxes, subsidies, or regulations:

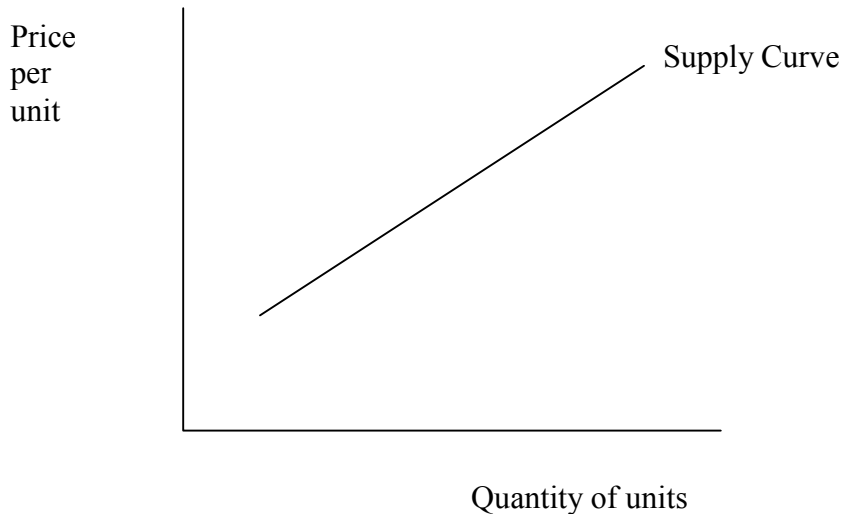
“Excise” taxes—taxes such as cigarette or gasoline taxes—reduce supply. Subsidies increase supply. Regulations increase production costs, reducing supply.

### Sudden change in number of sellers:

A hurricane that destroys grocery stores will reduce the supply of groceries in the area, for example.

## SUPPLY GRAPHED

A supply curve illustrates willingness to sell a product. Here's one:



Note 1: The law of supply means that a supply curve slopes upward.

Note 2: A supply curve is not necessarily a straight line.

### Shifting the supply curve:

One shifts the supply curve if there is a change in:

- cost of factors of production (land, labor, and capital)
- production technology
- government taxes, subsidies, or regulations
- a change in the number of sellers resulting from circumstances outside the market

More generally, anything that changes supply, except for a change in the price of the product, will cause the supply curve to shift.

- increased supply is a rightward shift of the supply curve
- reduced supply is a leftward shift of the supply curve

A shift in the supply curve need not be parallel to the original curve.

Examples:

- An increase in the wage costs of hot dog bun **workers** will cause the hot dog bun supply curve to shift leftward.
- An increase in tobacco subsidies will cause the cigarette supply curve to shift to the right.

## A SUPPLY EQUATION

Economists use survey methods and statistical techniques to estimate supply equations. The simplest possible supply equation is linear. Here is an example:

$$Q_s = -1000 + 5000P$$

“ $Q_s$ ” is quantity supplied                       $P$  is price

Note that one can express the same supply curve in the standard form  $Y = b + mX$ , by solving the equation for  $P$ :

$$5000P = 1000 + Q_s \quad \text{so} \quad P = .2 + (1/5000)Q_s$$

## EQUILIBRIUM

Equilibrium is an allegedly stable situation at which the quantity demanded of an item equals the quantity supplied.

Resistance is futile: Theory suggests that the price of a product naturally gravitates toward the equilibrium price.

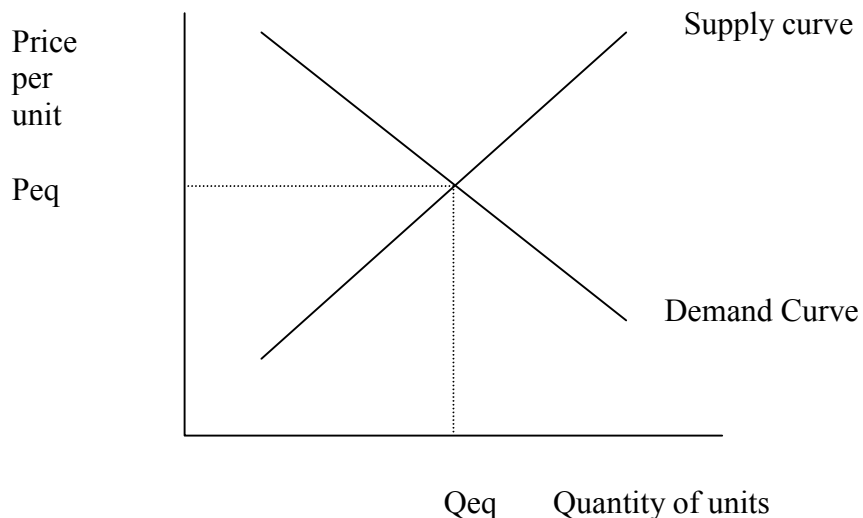
Reasoning: Suppose the price of a product is temporarily *above* its equilibrium. Then demand will be lower than supply, and firms will be accumulating unsold product in inventories. To reduce inventories, firms reduce price, and the price *falls* toward equilibrium.

Using similar reasoning, suppose the price of a product is temporarily *below* its equilibrium. Then demand will be higher than supply, and firms will be turning away some potential customers because they have insufficient product to sell to them. To increase revenues, firms raise prices (and production), and the price *rises* toward equilibrium.

(This reasoning assumes that government is not preventing the price from achieving equilibrium with a price ceiling or a price floor. More on these practices later.)

## EQUILIBRIUM GRAPHED

Equilibrium is the point where the two curves intersect.



## THE ALGEBRA OF EQUILIBRIUM

Consider the market represented by these equations:

$$Q_d = 1000 - 2P \qquad Q_s = -500 + 5.5P$$

Equilibrium is where quantity demanded equals quantity supplied, so set  $Q_d = Q_s$ :

$$Q_d = Q_s \quad \rightarrow \quad 1000 - 2P = -500 + 5.5P$$

Now solve for  $P$

$$7.5P = 1500 \quad \rightarrow \quad P = 200$$

To get  $Q$ , plug  $P = 200$  into either the demand or supply equation

$$Q_d = 1000 - 2(200) = 600$$

$$Q_s = -500 + 5.5(200) = 600$$

## EVENTS CHANGING EQUILIBRIUM

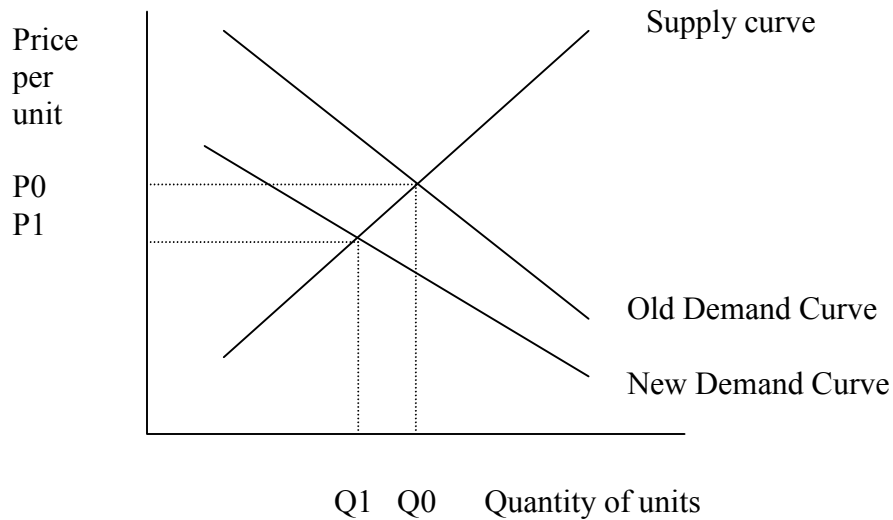
Events that affect demand or supply (or both) will alter the equilibrium price and quantity.

### *A Change in Demand Affecting Equilibrium*

Events which change demand tend to fall into these categories (which oughtta look familiar)

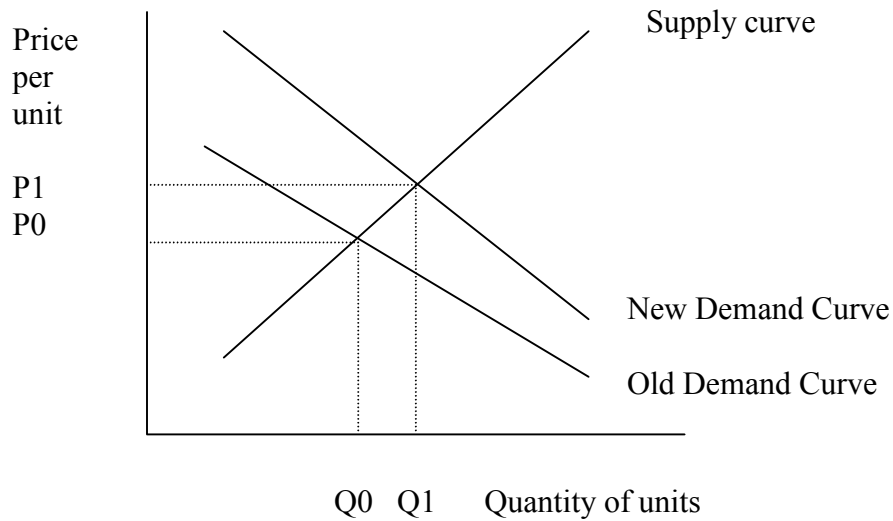
- a change in the income of the buyers
- a change in buyers' tastes and preferences (their perceived usefulness of the product)
- a change in buyers' expectations (of the future)
- a change in the prices of related products

Reduced demand, *ceteris paribus*<sup>1</sup> tends to reduce equilibrium price and quantity, as in the graph below:



<sup>1</sup> *Ceteris paribus* is Latin, meaning “holding all else constant.” In this case, we discuss a change in demand, assuming that the factors which affect *supply* don’t change

Using similar logic, events that increase demand tend, ceteris paribus, to cause higher prices and higher quantities, as in the graph below:

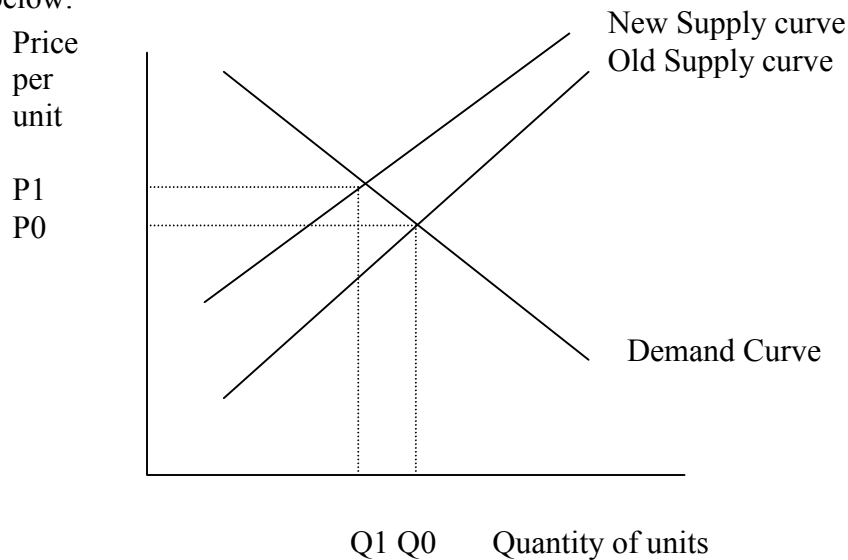


***A Change in Supply Affecting Equilibrium***

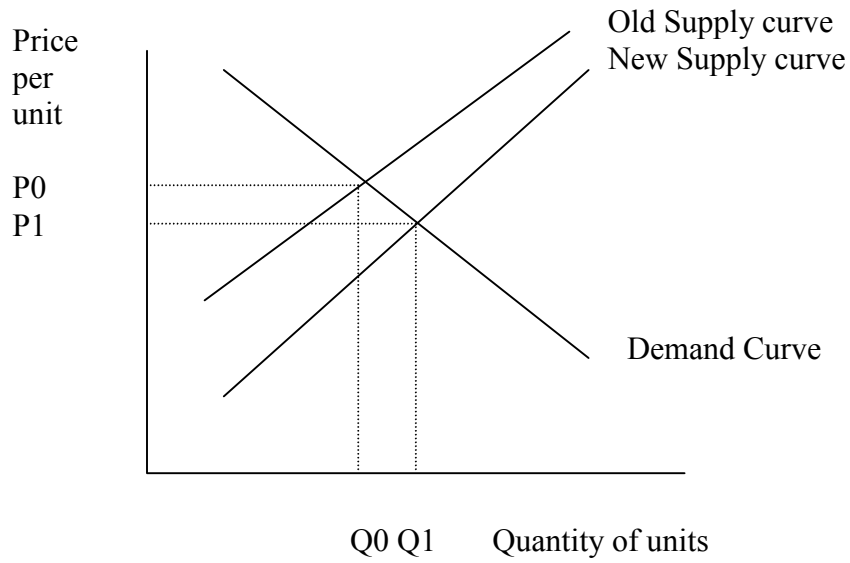
Events that change supply tend to fall into these categories (which oughtta look familiar)

- a change in cost of factors of production (land, labor, and capital)
- a change in production technology
- a change in government taxes, subsidies, or regulations
- a change in the number of sellers resulting from circumstances outside the market

Reduced supply, ceteris paribus, tends to increase equilibrium price and reduce quantity, as in the graph below:



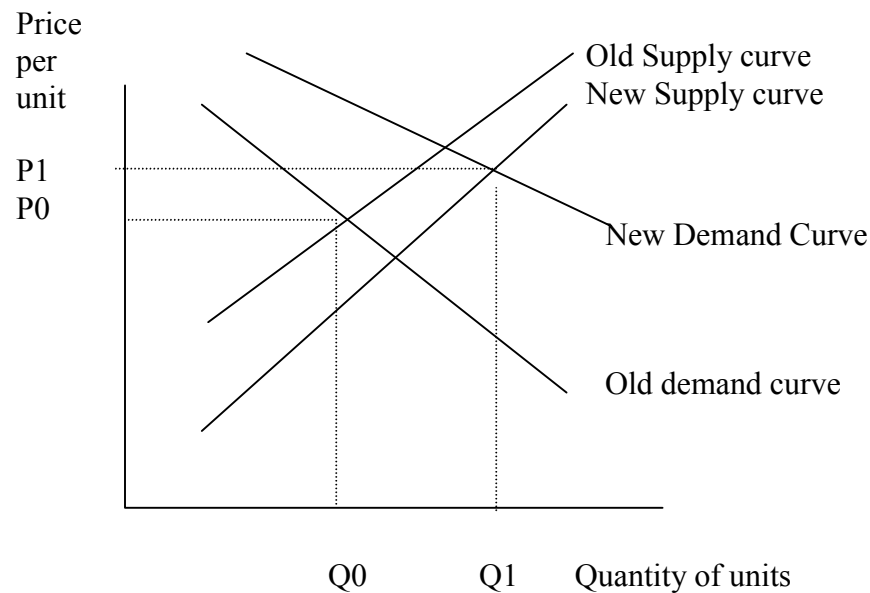
Using similar logic, increased supply, ceteris paribus, tends to reduce equilibrium price and increase quantity, as in the graph below:



### *A Simultaneous Change in Demand and Supply Affecting Equilibrium*

Some events are large enough that they affect both demand and supply simultaneously. Or, two events may occur at nearly the same time—one affecting demand and one affecting supply. In these cases, both the demand and the supply curves shift.

Here's an example: In the caviar market, suppose that (1) the government reduces caviar excise taxes, and (2) incomes of buyers rise. The change in the market would look something like this:



The way that I've drawn the graph, the demand curve shifted UP by a greater magnitude than the supply curve shifted DOWN; as a result, in my graph the price rose.

## THE ALGEBRA OF EVENTS CHANGING EQUILIBRIUM

Consider the market that we discussed earlier:

$$Q_d = 1000 - 2P \qquad Q_s = -500 + 5.5P$$

Recall that we found that the equilibrium price is 200 and quantity 600.

Example 1:

Well, suppose some event increases demand, so that the new demand curve is

$$Q_d = 1750 - 2P$$

Let's calculate the new equilibrium price and quantity:

$$Q_d = Q_s \quad \rightarrow \quad 1750 - 2P = -500 + 5.5P$$

$$2250 = 7.5P \quad \rightarrow \quad P = 300$$

$$Q_d = 1750 - 2(300) = 1150$$

See how the equilibrium price and quantity rose? Wow!

Example 2:

Now, forget about example 1. Instead, suppose some event decreases supply, so that the new supply curve is

$$Q_s = -875 + 5.5P$$

Let's calculate the new equilibrium price and quantity:

$$Q_d = Q_s \quad \rightarrow \quad 1000 - 2P = -875 + 5.5P$$

$$1875 = 7.5P \quad \rightarrow \quad P = 250$$

$$Q_d = 1000 - 2(250) = 500$$

See how the equilibrium price rose and quantity fell relative to the original price and quantity? Wow!

## Example 3:

Now, forget about example 1 and example 2. Instead, suppose some event simultaneously increases both demand and supply, so that the new curves are

$$Q_d = 2000 - 2P \qquad Q_s = -50 + 5.5P$$

Let's calculate the new equilibrium price and quantity:

$$Q_d = Q_s \quad \rightarrow \quad 2000 - 2P = -50 + 5.5P$$

$$2050 = 7.5P \quad \rightarrow \quad P = 273.333$$

$$Q_d = 2000 - 2(273.333) = 1453.333$$

In this case, the increase in demand was relatively larger than the increase in supply, so the equilibrium price rose relative to the original price. The quantity rose too. Wow!

## GOVERNMENT PREVENTING EQUILIBRIUM: PRICE CEILINGS, PRICE FLOORS

### *Price Ceilings*

Suppose government officials believe that an equilibrium price is unfairly high; in post-earthquake Turkey, for example, equilibrium apartment rents were four times higher than their pre-quake levels. In instances such as these, government can outlaw this “price gouging,” and set a *price ceiling*—a legal maximum price—below the equilibrium price. Government officials should consider all of the effects of a price ceiling before acting.

Effects of a price ceiling:<sup>2</sup>

- lower prices for some consumers
- a shortage of the product
- long lines to obtain the product
- illegal activity: illegal sales above the ceiling price
- inefficiency

More on these effects:

--lower prices for some consumers: those fortunate enough to be able to buy the product at the government-imposed limit will pay less than the equilibrium price

--a shortage of the product: at a price below equilibrium, there will be a larger quantity demanded than is supplied.

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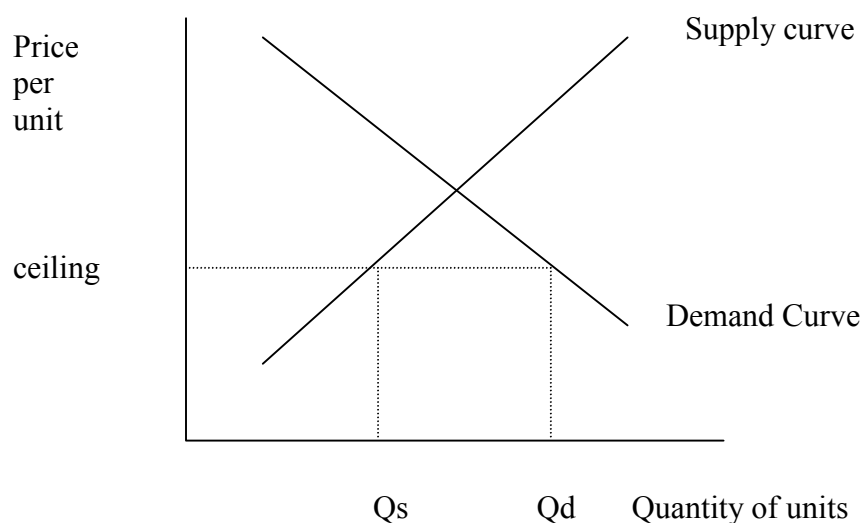
<sup>2</sup> I assume that the price ceiling is set below the equilibrium price. If, for some strange reason, the price ceiling were set above the equilibrium, then it would have no effect on the market.

--long lines to obtain the product: the product is cheap, but scarce, so there will be long lines to obtain it.

--illegal activity: there will be people willing to buy the product at a price above the government-imposed maximum. Lawbreaking sellers can make a profit by selling the product to these folks.

--inefficiency: If the price is kept below equilibrium, then buyers place a greater value on the product than it costs to produce it. It is inefficient to prevent supply of a product whose benefit exceeds its cost of production; yet the price ceiling does just that!!!

### A PRICE CEILING GRAPHED



In the above graph,  $Q_s$  is the quantity supplied at the ceiling price,  $Q_d$  is the quantity demanded at the ceiling price, and the shortage of the product is the horizontal distance between  $Q_s$  and  $Q_d$ .

Note that the steepness of the demand and supply curves is important. Steeper curves would mean a smaller shortage.

## THE ALGEBRA OF A PRICE CEILING

Suppose a market is represented by these equations:

$$Q_d = 1000 - P \qquad Q_s = -20 + 3P$$

If government imposes a price ceiling of \$10, then we can calculate the shortage by

- (1) plugging in \$10 into the demand equation and calculating demand at \$10
- (2) plugging in \$10 into the supply equation and calculating the supply at \$10
- (3) calculating the difference between (1) and (2):

$$(1) \quad Q_d = 1000 - 10 = 990$$

$$(2) \quad Q_s = -20 + 3(10) = 10$$

$$(3) \quad \text{Shortage} = 990 - 10 = 980$$

### ***Price Floors***

Suppose government officials believe that an equilibrium price is unfairly low; in the U.S. in 2000, for example, equilibrium real wheat prices were lower than their 1970s levels. In instances such as these, government can outlaw these unfairly low prices and set a *price floor*—a legal minimum price—above the equilibrium price. Government officials should consider all of the effects of a price floor before acting.

Effects of a price floor:<sup>3</sup>

- higher prices for consumers
- a surplus of the product
- higher taxes if government buys the surplus
- illegal activity: illegal sales below the floor price, if government does not buy the surplus
- inefficiency

More on these effects:

--higher prices for some consumers: those fortunate enough to be able to afford the product at the government-imposed floor will pay more than the equilibrium price

--a surplus of the product: at a price above equilibrium, there will be a larger quantity supplied than is demanded.

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<sup>3</sup> I assume that the price floor is set above the equilibrium price. If, for some strange reason, the price floor were set below the equilibrium, then it would have no effect on the market.

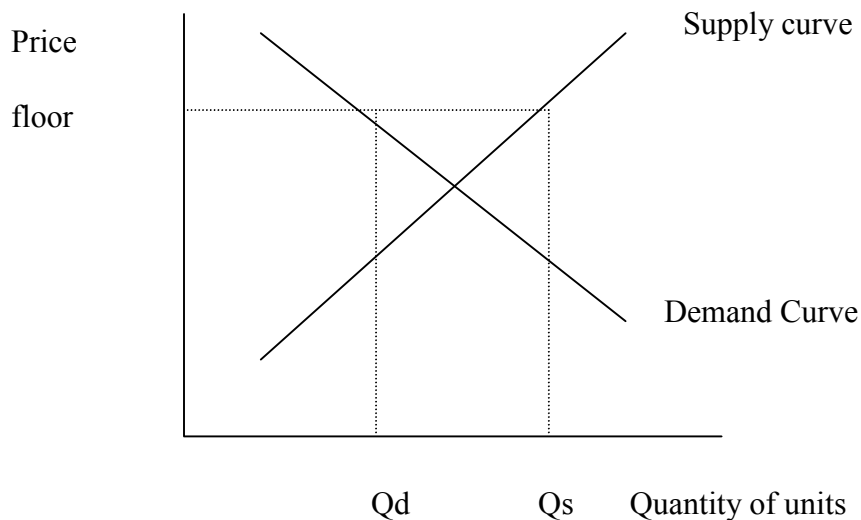
--higher taxes if government buys the surplus: how else are they gonna pay for the surplus—with monopoly money?

--illegal activity: If government doesn't buy the surplus, then there will be lawbreaking sellers who will try to sell their otherwise useless surplus production at a price below the government-imposed minimum.

Example: the minimum wage is a price floor in the low-skilled labor market. (In this market, firms buy the labor and people sell the labor. The “surplus” is the number of people who are willing to sell their labor, i.e. work, at the minimum wage, but can't find a firm to hire them at the minimum wage.) Those workers who can't find work at the minimum wage but who need money to provide for themselves and their families may seek work at lower than minimum wage.

--inefficiency: If the price is kept above equilibrium, then buyers place a lower value on the product than it costs to produce it. It is inefficient to continue supply of a product whose benefit is less than its cost of production; yet the price floor does just that!!!

#### A PRICE FLOOR GRAPHED



In the above graph,  $Q_s$  is the quantity supplied at the floor price,  $Q_d$  is the quantity demanded at the floor price, and the surplus of the product is the horizontal distance between  $Q_s$  and  $Q_d$ .

Note that the steepness of the demand and supply curves is important. Steeper curves would mean a smaller surplus.

## THE ALGEBRA OF A PRICE SURPLUS

Suppose a market is represented by these equations:

$$Q_d = 1000 - P \qquad Q_s = -20 + 3P$$

If government imposes a price floor of \$600, then we can calculate the surplus by

(1) plugging in \$600 into the demand equation and calculating demand at \$600

(2) plugging in \$600 into the supply equation and calculating the supply at \$600

(3) calculating the difference between (1) and (2):

$$(4) \quad Q_d = 1000 - 600 = 400$$

$$(5) \quad Q_s = -20 + 3(600) = 1780$$

$$(6) \quad \text{surplus} = 1780 - 400 = 1380$$