

Microeconomics

Topic 3: “Understand how various factors shift supply or demand and understand the consequences for equilibrium price and quantity.”

Reference: Gregory Mankiw’s *Principles of Microeconomics*, 2nd edition, Chapter 4.

The Supply and Demand Model

Supply and demand is a model for understanding the how prices and quantities are determined in a market system. The explanation works by looking at two different groups -- buyers and sellers -- and asking how they interact.

The supply and demand model relies on a high degree of competition, meaning that there are enough buyers and sellers in the market for bidding to take place. Buyers bid against each other and thereby raise the price, while sellers bid against each other and thereby lower the price. The equilibrium is a point at which all the bidding has been done; nobody has an incentive to offer higher prices or accept lower prices.

Perfect competition exists when there are so many buyers and sellers that no single buyer or seller can affect the price on the market. Imperfect competition exists when a single buyer or seller has the power to influence the price on the market. For more discussion of perfect and imperfect competition, see the notes on Microeconomics topic 7.

The supply and demand model applies most accurately when there is perfect competition. In reality, few markets are perfectly competitive. However, the supply and demand framework still provides a good approximation for what is happening much of the time.

The Consumer Side of the Market

Demand is the relationship between the price of a good and the quantity of the good that consumers are willing and able to buy.

Quantity demanded is the total amount of a good that buyers would choose to purchase under given conditions. The given conditions include:

- price of the good
- income and wealth
- prices of substitutes and complements
- population
- preferences

We refer to all of these things except the price of the good as determinants of demand.

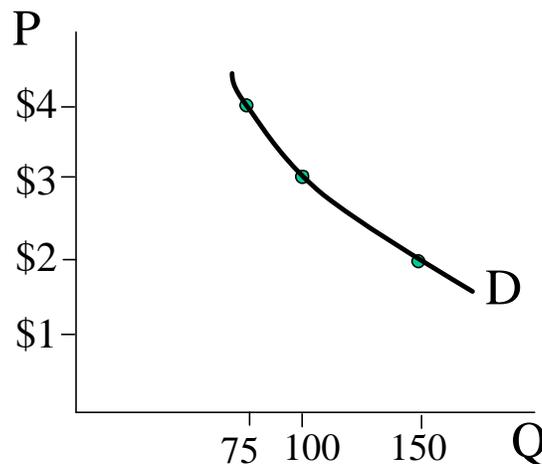
The Law of Demand states that when the price of a good rises, and everything else remains the same, the quantity of the good demanded will fall.

The assumption that “everything else remains the same” is known as the “ceteris paribus” or “other things equal” assumption. In this context, it means that income, wealth, prices of substitutes and complements, population, and preferences -- in other words, the determinants of demand -- all remain fixed along a given demand curve.

A demand schedule is a table that shows the different prices for a good and the corresponding quantities demanded. Here is a short demand schedule for 2-pound bags of tortilla chips:

Price per bag of tortilla chips	Quantity demanded of bags of tortilla chips
\$2.00	150
\$3.00	100
\$4.00	75

A demand curve is a graphical representation of the relationship between price and quantity demanded (*ceteris paribus*). It is a curve or line, each point of which is a (P, Q_d) pair. Each point shows the amount of the good buyers would choose to buy at that price. Here is a demand curve for bags of tortilla chips, with the points from the demand schedule above marked on it:



Shifts in Demand

A change in demand or shift in demand occurs when one of the determinants of demand changes. (Remember, price is not considered one of the determinants of demand. A change in price leads to a movement along a demand curve, *not* a shift of the demand curve.)

Examples:

1. The price of a substitute good, such as potato chips or popcorn, falls. As a result, customers are willing to buy fewer bags of tortilla chips at each price. This implies a leftward shift of the demand curve. (An increase in the price of

a substitute would have the opposite effect: the demand curve would shift right.)

2. The price of a complement good, such as picante sauce or guacamole, falls. As a result, customers are willing to buy more bags of tortilla chips at each price. This implies a rightward shift of the demand curve. (An increase in the price of a complement would have the opposite effect: the demand curve would shift left.)
3. Incomes increase. As a result, consumers buy more tortilla chips at each price. This implies a rightward shift. (A decrease in incomes would shift demand to the left.)
4. Preferences change. As more people are introduced to tortilla chips, they start to like them more. This implies a rightward shift. (If people started liking tortilla chips less, demand would shift left.)

Demand versus Quantity Demanded. This is a crucial distinction. Remember that quantity demanded is a specific amount of a good associated with a specific price. Demand, on the other hand, is the general relationship between price and quantity demanded, involving many quantities demanded for a whole range of prices. A “change in quantity demanded” means a movement along the demand curve, corresponding to a change in price. A “change in demand” refers to a shift of the entire demand curve, caused by a change in something other than the price (i.e., a determinant of demand).

The Producer Side of the Market

Supply is the relationship between the price of a good and the quantity of the good that firms are willing and able to produce and sell.

Quantity supplied is the total amount of a good that sellers would choose to produce and sell under given conditions. The given conditions include:

- price of the good
- prices of inputs (labor, capital, etc.)
- technology
- number of firms in the industry

We refer to all of these, except for the price of the good, as determinants of supply.

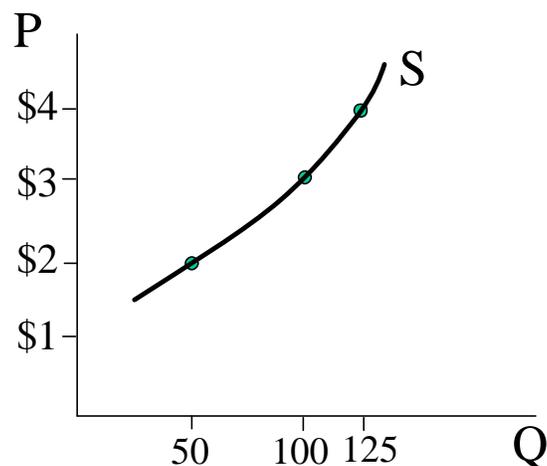
The Law of Supply states that when the price of a good rises, and everything else remains the same, the quantity of the good supplied will also rise.

Again, the “everything else remains the same” or “ceteris paribus” assumption is important. It means that the determinants of supply --prices of inputs, technology progress, and number of firms --are not changing along a given supply curve.

A supply schedule is a table that shows different prices for a good and the corresponding quantities supplied. Here is a short supply schedule for 2-pound bags of tortilla chips:

Price per bag of tortilla chips	Quantity supplied of bags of tortilla chips
\$2.00	50
\$3.00	100
\$4.00	125

A supply curve is a graphical representation of the relationship between price and quantity supplied (*ceteris paribus*). It is a curve or line, each point of which is a (P, Q_s) pair. Each point shows the amount of the good firms would choose to produce and sell at that price. Here is a supply curve for bags of tortilla chips, with the points from the demand schedule above marked on it:



Shifts in Supply

Changes in supply or shifts in supply occur when one of the determinants of supply changes. (Remember, price is not considered one of the determinants of supply. A change in price leads to a movement along a supply curve, *not* a shift of the supply curve.)

Examples:

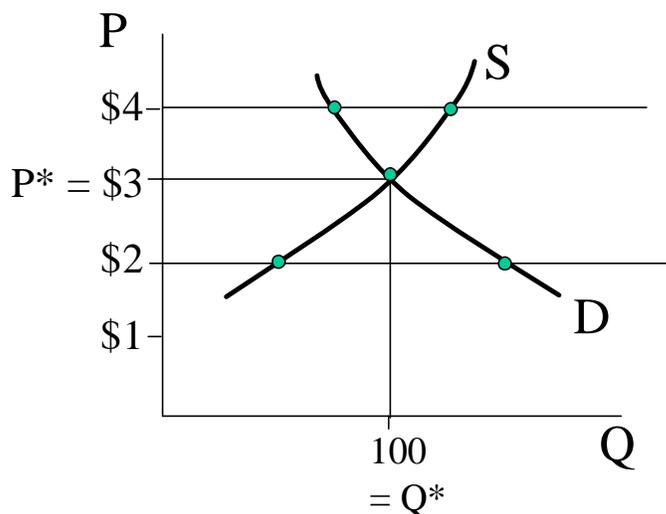
1. The price of an input (corn or ovens) rises. Producers will have to pay more to make tortilla chips and therefore will no longer be able to offer the same quantity of tortilla chips at each possible price. This would cause a leftward shift of the supply curve. (A decrease in the price of an input would cause a rightward shift of supply.)
2. There is an improvement in technology (such as the development of a tortilla-pressing machine that requires less labor to produce chips). This reduces producers' labor costs and leads to a rightward shift of supply.
3. The number of tortilla chip producers increases. The entry of new firms into the industry will increase the quantity supplied at each price. This would cause a rightward shift of supply. (A decrease in the number of tortilla chip producers would cause a leftward shift of supply.)

Supply versus Quantity Supplied. This is analogous to the distinction between demand and quantity demanded. A “change in quantity supplied” means a movement along the supply curve, corresponding to a change in price. A “change in supply” refers to a shift of the entire supply curve, caused by a change in something other than a change in price (i.e., the determinants of supply).

Market Equilibrium

Putting demand and supply together, we can find an equilibrium where the supply and demand curve cross. The equilibrium consists of an equilibrium price P^* and an equilibrium quantity Q^* . The equilibrium price is a price that satisfies the market-clearing condition, which is that quantity demanded must equal quantity supplied. Graphically, this occurs where the supply and demand curves cross.

In the tortilla chip example, a price of \$3.00 results in both quantity demanded and quantity supplied equal to 100. So in this case, $P^* = 3.00$ and $Q^* = 100$. This is illustrated in the figure below.



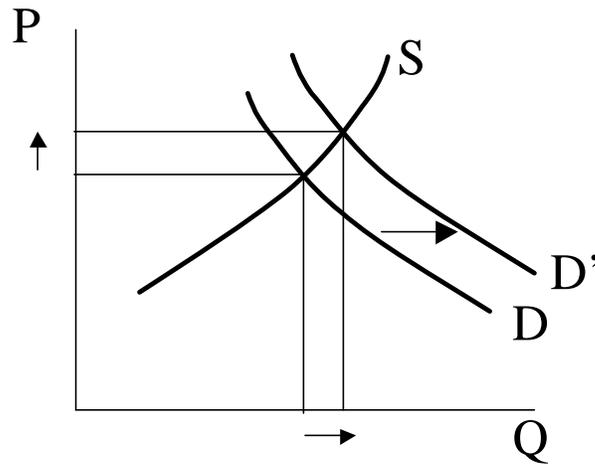
If price is below P^* , such as \$2 in the figure, then we have $Q_d > Q_s$. Consumers want to buy more than firms want to sell. This is called “excess demand” or “shortage.” It is not an equilibrium. Buyers who are willing to pay more than \$2 will start offering more, and firms will respond by raising their prices. They can raise prices without fear of losing customers, because customers are already asking to buy more than the firms are willing to sell. Thus, competition among buyers will drive the price upward toward the equilibrium price.

If price is above P^* , such as \$4 in the figure, then we have $Q_s > Q_d$. Firms want to sell more than consumers want to buy. This is called “excess supply” or “surplus.” It is not an equilibrium. Sellers unable to find enough customers to buy their inventories will start cutting price to attract more customers. Thus, competition among sellers will drive the price downward toward the equilibrium price.

Changes in Market Equilibrium

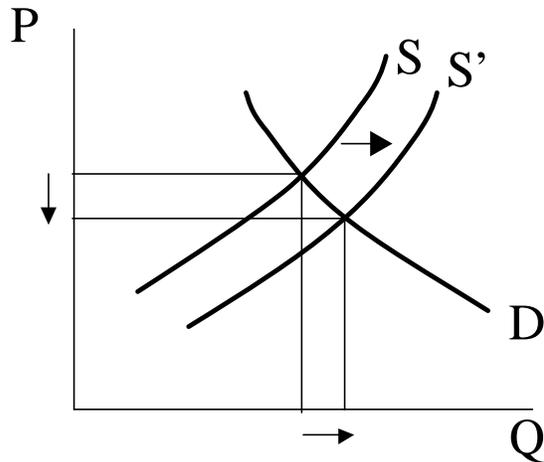
We've already discussed shifts in Supply and Demand. Now we'll see how they affect the equilibrium price and quantity.

Consider first a rightward shift in Demand. This could be caused by many things: an increase in income, higher price of a substitute good, lower price of a complement good, etc. Such a shift will tend to have two effects: raising equilibrium price, and raising equilibrium quantity. This is shown in the figure below. The numbers have been removed to simplify the picture.



A leftward shift of demand would reverse the effects, resulting in a fall in both price and quantity. The general result is that demand shifts cause equilibrium price and equilibrium quantity to move in the same direction.

Now consider a rightward shift of supply (caused by lower input prices, better technology, or entry of new firms). This will tend to have two effects: raising equilibrium quantity, and lowering equilibrium price. This is shown in the figure below, again with the numbers removed for simplicity.



A leftward shift of supply would reverse the effects, so the general result is that supply shifts tend to cause equilibrium price and equilibrium quantity to move in opposite directions.

What If Supply and Demand Both Shift?

Sometimes, the supply and demand curves will both shift at the same time. This makes the analysis slightly more difficult.

Let's suppose that supply and demand both shift right at the same time. For example, technological improvements lower the cost of producing computers, while new software makes more people want to have computers. Now, we know that a rightward shift of supply tends to *increase quantity* and *decrease price*. We also know that a rightward shift of demand tends to *increase quantity* and *increase price*. (If you're not sure why, go back and review the previous section.)

What is the overall effect? For quantity, the answer is obvious: both shifts tend to increase quantity, so quantity goes up. But for price, the answer is unclear: one shift tends to decrease price, and the other tends to increase it. Without any additional information, the answer to the question is, "Equilibrium quantity increases, and equilibrium price could increase or decrease."

With more information about the size of the shifts, we could say more. For example, if you know that the rightward shift in supply is relatively large, while the rightward shift in demand is relatively small, then you can predict that the equilibrium price will decrease.

There are two important things to remember here. First, if you draw a graph of a situation where both curves shift, *don't let yourself be fooled by it*. In this example, if you draw a relatively large shift in supply and small shift in demand, your graph will show that price falls. But unless you've been told that the supply shift is indeed larger, that's not correct. The correct answer is that equilibrium price could go up or down.

Second, don't let this one example mislead you. In this example, the change in quantity is clear, while the change in price is not clear. But in other situations, it could be the other way around. For instance, suppose that supply shifts left while demand shifts right. Then equilibrium *price* will definitely increase, while equilibrium *quantity* could go up or down. Verify that result for yourself to see why it's true.