**Demand and Supply** – by Jeff Traczynski, 8/28/07

**Demand**

Our discussion of demand begins with the definition of the Law of Demand:

Law of Demand: the quantity demanded of a good or service is an inverse function of its price, holding everything else constant.

So, what does this mean? There are two important things to take away from this definition. First, this means that when the price of a good goes up, people want to buy less of it. This part is pretty intuitive, and gives demand curves their general shape as shown below.

Here, we see that when the price of the good (P, on the vertical axis) is high, the quantity demanded of the good (Q, on the horizontal axis) is low, and vice versa.

You’ll also notice that while we’ve been calling this a demand “curve”, the picture is clearly a straight line. For simplicity, we’ll be using straight line demand curves at many times throughout the class. This assumption makes the math simpler (especially when we get to monopolies) without sacrificing too much generality. As you’ll see below, we’ll often make the same assumption about supply curves.

The second important part of the Law of Demand is that last little phrase, “holding everything else constant”. Economists call “everything else” which needs to be held constant the Determinants of Demand. These determinants are a list of things which affect how much of the good in question consumers want to buy at a given price, which is exactly what the demand curve represents. Thus, changes in the determinants of demand change the demand curve.
Determinants of Demand
1) Price of the good itself
2) Price of other goods and services
3) Income / Wealth
4) Consumer Preferences / Tastes
5) Population
6) Expected Future Prices

The first item of the above list, the price of the good itself, affects the demand curve differently than the other items. A change in the price of the good itself causes a movement along the existing demand curve, as illustrated below.

Here, the price starts at P1, and consumers demand quantity Q1. Then, the price falls to P2, so consumers respond by increasing their demand to Q2. Thus, a change in the price of the good itself causes a change in quantity demanded, but does not change the demand curve in any way. Instead, we simply have a movement along the existing demand curve from one point to another.

The other five determinants of demand cause a change in demand – that is, the entire demand curve shifts either left or right depending on how the determinant of demand changes. A rightward shift is illustrated below, as the demand curve shifts from D1 to D2. At a given price (say, P1), our consumer was willing to buy Q1 units of the good, but now that the demand curve has shifted, the consumer is willing to buy Q2 units.
Each of the remaining determinants affects the demand curve a little differently, so we’ll go through them carefully.

Prices of other goods and services can be broken down into two types of other goods: complements and substitutes. Complements are other goods which the consumer enjoys consuming along with the good in question. For example, if we’re talking about seeing a movie at a movie theater, a complementary good might be popcorn or candy from the concession stand. Substitutes are goods which the consumer might buy instead of the good in question. For our previous example, a substitute good might be the DVD of the movie, or going to a baseball game (another form of evening entertainment). Knowing whether two goods are complements or substitutes is very important, as this affects how the demand curve shifts in response to the price changes of the other good. The directions of these shifts are summarized below:

**Complements**
- Price of complement up → demand curve shifts left
- Price of complement down → demand curve shifts right

**Substitutes**
- Price of substitute up → demand curve shifts right
- Price of substitute down → demand curve shifts left

How do we make sense of these results? Well, let’s think about the definitions of complements and substitutes. Most people would consider hamburgers and hamburger buns to be complements – if the price of hamburgers goes up, then we might think that people are less likely to buy hamburger buns. By saying that the two goods are
complements, we’re saying that people want to consume them together, so raising the price of one of the goods is raising the “package price” of buying both. When the price of a hamburger goes up, the price of buying a hamburger and a bun to put it on goes up. We expect that the demand for hamburger buns will fall, which is the answer given above. With substitutes, we have just the opposite situation. Most people might think of coffee and tea as substitutes, so when the price of coffee rises, people switch away from coffee and start buying more tea. So at any given price, people are willing to buy a higher quantity of tea, so the demand for tea shifts right when the price of coffee goes up.

Income / Wealth is another determinant of demand which requires further specification. First, we should make the distinction between income and wealth. Wealth is the sum of all a person’s assets, while income is the amount of money a person makes in a year. In general, economists tend to deal with income, but we include wealth here as well for the sake of completeness. Again, we have two types of goods: normal and inferior. Normal goods are those which people want to buy more of when their income increases (Rolls Royces, filet mignon, large houses), while inferior goods are those which people buy less of as their income increases (Pintos, macaroni and cheese, studio apartments). So in order to know how a person’s demand curve will shift when their income increases, we need to know whether the good is normal or inferior. Again, the directions of the shifts are summarized below:

**Normal Goods**
Income of consumer up → demand curve shifts right
Income of consumer down → demand curve shifts left

**Inferior Goods**
Income of consumer up → demand curve shifts left
Income of consumer down → demand curve shifts right

A quick word about complements, substitutes, normal and inferior goods: do you know what a fluffernutter is? It’s a sandwich of peanut butter and marshmallow fluff, and I think they’re delicious. However, you might well disagree. The point is, while peanut butter and fluff are complements for me, they might not be for you. Similarly, one man’s normal good may be another man’s inferior good. Consider different types of cars, for example. For a poor grad student such as myself, a Honda Accord would be a normal good. On the other hand, I have a friend who works at a hedge fund and cleared over $300,000 last year. For him, the Accord is certainly an inferior good. So when working on problems involving these types of goods, be careful not to jump to conclusions too quickly about what “type” a good is – look through the problem carefully and work from the definitions. Don’t just assume that peanut butter and jelly are necessarily complements if the information in the problem is telling you they aren’t in the context of the problem.

The consumer preferences / tastes and population determinants are, thankfully, more straightforward. Consumers might have their preferences for a good changed if new information about it becomes available (smoking causes cancer) or the product changes
notably (increased security checks at airports), and the demand curve will always shift in the direction which reflects the change in tastes – right if consumers like the good more, left if they like it less. For population, we simply note that if there are more people around, then there will be a higher quantity demanded of many goods at any given price. So as population goes up, the demand curve shifts right, and as population falls, the demand curve shifts left.

Finally, we come to expected future prices. In general, we can say that if we expect the price of a good to go up in the future, then the demand curve will shift right, and if we expect the price to fall, the demand curve will shift left. This is because if a product will be more expensive in the future, we might expect consumers to want to buy now, before the price increase kicks in. However, for a fuller understanding of what’s going on here, consider the following example. Let’s say that we know, with absolute certainty, that the price of cars will go up in two years. By our above argument, we would predict that the demand curve will shift right. Now let’s say we know that the price of apples will go up in two years. Do we still think that the demand curve for apples will shift right? Probably not. So, what’s the difference? Well, a two-year-old apple is no longer useful, while a two-year-old car is still a functional product. There’s a notion of storability here, or expected lifespan of the good. If a good is supposed to last for a while, then information about future prices might be relevant for over a long timeframe, and the opposite is true if the good is expected to be fully consumed by tomorrow. Thus, we see that the idea of expected future prices might be more nuanced than our original impression.

Supply
Law of Supply: the quantity supplied of a good or service is usually a positive function of its price, holding everything else constant.
Unlike demand curves, supply curves slope upward, as the quantity supplied increases as the price goes up. This gives us the general shape pictured below.

Just like demand curves, we have a set of things which must be held constant, most of which are different from our determinants of demand. They are, of course, the Determinants of Supply.

**Determinants of Supply**
1) Price of the good itself
2) Prices of factors of production
3) Technology / Productivity
4) Weather
5) # of firms in the industry
6) Government regulations and taxes

The first item on the list works in the same way as it does for demand curves – a change in the price of the good itself causes a movement along the supply curve, but does not shift the supply curve.

Here, the price starts at P1, and suppliers supply Q1 units of the good. When the price increases to P2, suppliers respond to the higher price per unit by providing Q2 units. Also similarly, the other five determinants cause the supply curve to shift either left or right so that at any given price, suppliers are now willing to provide either a higher or lower quantity to market. A leftward shift is illustrated below, as the supply curve shifts from S1 to S2. At the given price P1, our supplier was willing to supply Q1 units, but once the supply curve shifts, the supplier is only willing to provide Q2 units of the good.
Fortunately, the determinants of supply are significantly easier to deal with than the determinants of demand. Each of the last five determinants is straightforward to work with, as there are no special types of goods as before (complements, substitutes, normal, inferior). If prices of factors of production go up, the supply curve shifts left; if workers become more productive or technology improves, the supply curve shifts right; if the weather is poor, the supply curve shifts left (mostly for agricultural products, obviously); if more firms enter the industry, the supply curve shifts right; and if the government imposes regulations or taxes which raise the cost of doing business, the supply curve shifts left.

We should also discuss the use of the word “usually” in the Law of Supply. We say that supply curves are usually upward-sloping because there are three noteworthy special cases which are pictured below.
S1 is a perfectly inelastic supply curve, which is exactly vertical. In this case, there is a fixed quantity of the good available for sale, no matter what the market price is. Examples of such goods include Super Bowl tickets or land. S2 is a downward-sloping supply curve, which comes about as a result of increasing returns to scale in production of a good. Industries with downward-sloping supply curves are called natural monopolies. S3 is a backward-bending supply curve, which most often arise in labor markets. A supply curve for labor bends backwards if a worker decides to work less (i.e., supply less labor) in response to receiving a raise. This helps explain why a doctor might work less than a grocery store cashier despite receiving a much higher wage – at some point, the doctor decides that he’s making enough money and that he values his leisure time, so any further raises would only cause him to work less so that he can consume more leisure.

A final word about determinants of demand and supply: the best guide to how to apply these determinants to some actual supply and demand curves is to trust your intuition. For example, we’ve put the weather strictly on the supply list. However, consider the following example. A company is developing technology which would equip soda vending machines with a thermometer which could measure the temperature outside and adjust the price of a soda accordingly. The idea is that on a 90° day, a consumer would be willing to pay more for a soda than on a 70° day, so as the temperature goes up, so will the price. As you might imagine, this technology could be of significant interest to businesses like amusement parks. But here, we’re claiming that the weather has shifted the demand curve for a product. So, try not to be too mechanistic when using these determinants to figure out what happens in a market, but do develop your intuition and learn to trust it.