Andrew Kato
Econ 200
Fall 2001 Schwab

Problem Set 2 Solutions to Problems 1, 2, 3, and 4

1. The elasticity of demand for gasoline is 0.5. By what percent would the price of gasoline need to rise in order to reduce the quantity of gasoline demanded by 2 percent?

Usually we are given the percentage change in price and quantity and are asked to find elasticity. In this particular problem, we are instead given percentage change in quantity and elasticity, and we are asked to find percent change in price. Elasticity is:

$Elasticity = \frac{\%\Delta Q}{\%\Delta P}$, the percent change in quantity divided by the percent change in price.

In the problem, we are given some information and can fill this in:

$Elasticity = \frac{\%\Delta Q}{\%\Delta P}$	Definition
$(0.5) = \frac{2}{(\%\Delta P)}$	Substitute in what we are given
$(0.5)(\%\Delta P) = 2$	Multiply both sides by % change in P
$\%\Delta P = \frac{2}{0.5}$	Divide both sides by 0.5
$\%\Delta P = 4$	Done.

So the solution to problem 1 is that the price of gasoline would need to rise 4 percent.

2. Consider the following demand schedule:

Price	Quantity
$12	5
$10	10
$5	20
$3	30

a. Calculate the elasticity of demand between each pair of prices.
b. When price rises from $3 to $5, does expenditure rise, fall, or remain constant? When price rises from $5 to $10? When price rises from $10 to $12?
C. Why should you have anticipated your answers to b once you answered part a?

To calculate the elasticity between two prices, we need to do the following:

$$Elasticity(2\,prices) = \frac{\frac{Q_{FIRST} - Q_{SECOND}}{(Q_{FIRST} + Q_{SECOND})/2}}{\frac{P_{FIRST} - P_{SECOND}}{(P_{FIRST} + P_{SECOND})/2}}$$

Okay what are we doing here? There are four items here:

Q_{FIRST} - Q_{SECOND} = The change that occurs between the two quantities.
(Q_{FIRST} + Q_{SECOND})/2 = The average of the two quantities.

The change divided by the average gives us percentage change in quantity.

P_{FIRST} - P_{SECOND} = The change that occurs between the two prices.
(P_{FIRST} + P_{SECOND})/2 = The average of the two prices.

The change divided by the average gives us percentage change in quantity.

Now recall what the definition of elasticity is. The price elasticity of demand (or supply) is the percentage change in quantity divided by the percentage change in price. If we do all that stuff above, we will get the price elasticity of demand between a pair of prices.

$$Elasticity(12,10) = \frac{\frac{5-10}{(5+10)/2}}{\frac{12-10}{(12+10)/2}} = \frac{\frac{-5}{7.5}}{\frac{2}{11}} = \frac{-2}{3} \cdot \frac{11}{2} = \frac{-11}{3} \approx -3.67$$ Elastic Demand

$$Elasticity(10,5) = \frac{\frac{10-20}{(10+20)/2}}{\frac{10-5}{(10+5)/2}} = \frac{\frac{-10}{15}}{\frac{5}{7.5}} = \frac{-2}{3} \cdot \frac{3}{2} = -1$$ Unit Elastic Demand

$$Elasticity(5,3) = \frac{\frac{20-30}{(20+30)/2}}{\frac{5-3}{(5+3)/2}} = \frac{\frac{-10}{25}}{\frac{2}{4}} = \frac{-2}{5} \cdot 2 = -0.8$$ Inelastic Demand

Okay that was the answer to part a. Now what about part b? When price rises from \$3 to \$5, what happens to expenditures? First, what's expenditures? Expenditures equal the total amount of money spent by consumers. That means quantity purchased times the price they are paying per unit.

When P = \$3, 30 units are bought for total expenditures of \$3 x 30 = \$90
When P = \$5, 20 units are bought for total expenditures of \$5 x 20 = \$100
When P = \$10, 10 units are bought for total expenditures of \$10 x 10 = \$100
When P = \$12, 5 units are bought for total expenditures of \$12 x 5 = \$60

So: When P rises from \$3 to \$5, expenditures rise.
When P rises from \$5 to \$10, expenditures remain constant.
When P rises from \$10 to \$12, expenditures fall.

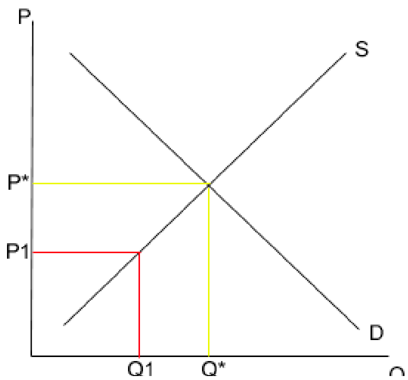
Raising the price on inelastic demanders does not cause a large drop in sales, so you end up making more money when you raise prices.
Raising the price on unit elastic demanders causes a drop in sales that exactly offsets the price rise, so you end up making the same amount of money when you raise prices.
Raising the price on elastic demanders causes a large drop in sales, so even if you make more money per unit, you are selling so many fewer that you end up making less money total when you raise prices.

Of course, once we did part a, we knew that over the range of prices from 3 to 5 demand was inelastic, from 5 to 10 it was unit elastic, and from 10 to 12 it was elastic. Thus, knowing which parts of the demand curve were inelastic, unit elastic, and elastic automatically told us what would happen if we raised prices in any of those parts.

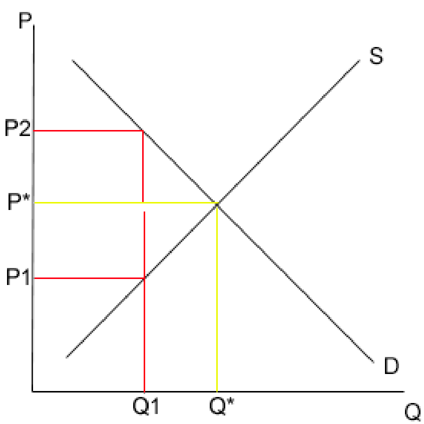
3. The price for tickets at the Uptown Theater to see the re-release of Star Wars was well below the equilibrium price.

a. Why did scalpers wish to buy tickets? (Scalpers are people who buy tickets and later re-sell them)
b. None of us like scalpers very much, but can you see any usefulness in the role scalpers played in the allocation of Star Wars tickets?

The first thing you want to do is imagine what the market for Uptown Theater Star Wars re-release tickets looks like:



First thing, we draw the standard upward sloping supply and downward sloping demand. The next thing we note is that the equilibrium would be at P* and Q*. However, the problem tells us that for some reason, the price is actually too low, at something like P1. In that case, the Uptown Theater is only willing to supply Q1, a quantity below equilibrium Q*.



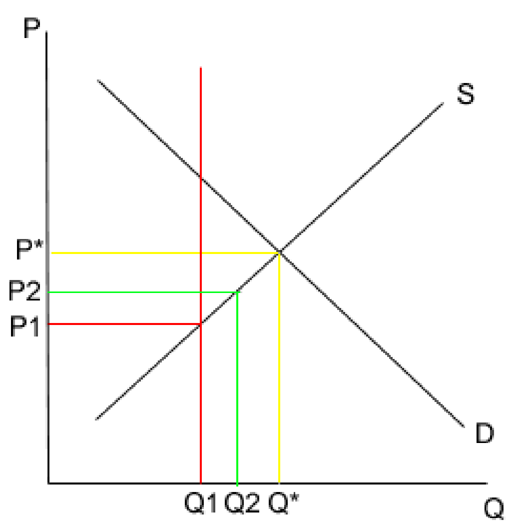
Okay, but wait a minute. At Q1, what price would consumers be willing to pay for those tickets? Even if you raised the price all the way to P2, there would still be enough demand to sell all the tickets. This is where the scalpers come in. The theater is only willing to sell at the low P1 for some reason. The scalpers realize that people would be willing to pay as much as the high P2.

So why do the scalpers want to buy tickets? Because they want to take advantage of this arbitrage opportunity.

Is there any usefulness in what the scalpers are doing? Well, we can think of it this way. We know that there are Q1 people who value the tickets a lot - they are willing to pay a really high price P2 to get them. But if the price is really low like at P1, then a huge bunch of people would be willing to buy it - even low valuation people are willing to buy a ticket because the price is so low.

One of the goals of welfare economics is to get the goods into the hands of the people that value the goods the most. If scalpers buy the tickets and then resell at a high price, we are certain that only the high valuation people will get tickets. If there are no scalpers, we can't guarantee that the tickets go to the people who "want it the most" because there may be some low valuation people who get tickets. In this way, scalpers are allocating the tickets to where they are valued the most, and that *might* be a desirable thing.

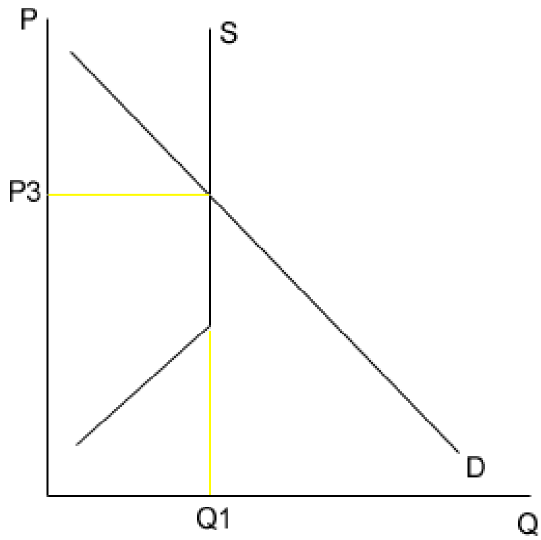
4. Draw a supply and demand diagram to indicate the market for Japanese cars in the United States. Suppose the U.S. government imposes a strict restriction on the quantity of Japanese cars sold in the United States. This restriction would state the maximum number of Japanese cars that the government would allow to be supplied in the U.S. market. Show what happens in this market if the quantity restriction is less than the equilibrium quantity. What will happen if the quantity restriction is greater than the equilibrium quantity?



Okay, here we see the Japanese car market in the United States. We start with our now familiar upward sloping supply curve and downward sloping demand curve. The equilibrium price is P* and the equilibrium quantity is Q*.

Now the government imposes a restriction that says you can't supply more than Q1 Japanese cars in the United States. Of course, Japanese car manufacturers would love to sell Q*, but they can't because of the government restriction. The most they can sell is Q1, so they do that at P*. Suppose price was P2. Japanese firms would love to sell Q2, but they can't because of the government restriction; the most they can sell is Q1 so they do that.

In fact, at *every* price above P1, Japanese auto manufacturers would want to sell more Japanese cars in the United States than the government restriction level Q1 - but they can't. Since that's the most they can ever sell, they have to settle for that. In fact, what the restriction does is it effectively changes the shape of the supply curve:



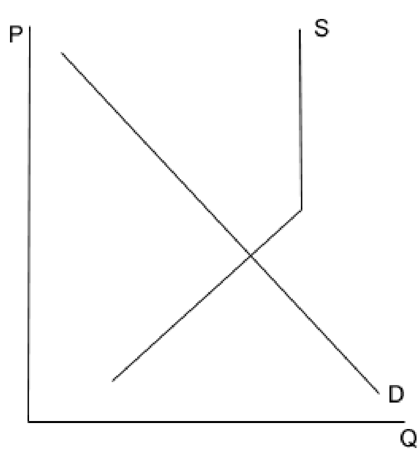
Whoa. What happened? Q1 is the level of the government restriction. At the point where Japanese firms would start wanting to sell more than Q1 (i.e. high prices), they run into the government's brick wall restriction. So after you hit P1 in the previous graph, you are stuck at Q1 for all the higher prices.

This causes a sharp bend (known as a "kink") in the supply curve at price = P1 and quantity = Q1, the price and quantity where Japanese firms want to sell exactly the restriction amount. The supply curve becomes perfectly inelastic at that point and a new equilibrium price P3 comes out of this market.

Why did the supply curve become perfectly inelastic? Recall what it means to be inelastic. Elasticity measures how responsive you are to a change in price. Unfortunately for these Japanese auto manufacturers, they are totally unable to respond at all to a movement in price at "high" price levels. Say price rose to just above P1. Could Japanese firms continue to increase the quantity they supplied? Nope. In fact, they could not do anything at all - they would have absolutely no quantity response to the price change. That's what being perfectly inelastic is all about; total inability to respond to price changes.

Of course, at the "low" prices, the supply curve is still somewhat elastic. They aren't handcuffed until they hit the restriction amount, so any price level below P1 is still in a range where they are still responding to price changes. This is an example of a supply curve that's somewhat elastic over a low range of prices and perfectly inelastic over a high range of prices.

What would happen if the restriction amount was above the equilibrium quantity? Absolutely nothing. The Japanese auto manufacturers wouldn't care because they never wanted to sell that many cars in the first place. It would look something like this:



Has the equilibrium been affected? Of course not. The equilibrium before and after the restriction are the same because the restriction is too high.