Chapter 6: Demand and Supply Elasticities

Recall: The law of demand states that as the price of a good falls, the quantity demanded rises.

But by how much will the quantity demanded rise?
To answer this question, we must know how sensitive demand is to price.

The responsiveness or sensitivity of consumers quantity demanded to a change in price is measured by the **Price Elasticity of Demand.**

Price Elasticity of Demand- Ratio of the percentage change in quantity demanded of a product or resource, to the percentage change in it's price.

$$E_d = \frac{\text{\% Change in } Q^d \text{ of product X}}{\text{\% Change in Price of product X}}$$

$$= \frac{\dfrac{\text{Change in } Q^d}{\text{Original Quantity}}}{\dfrac{\text{Change in Price}}{\text{Original Price}}}$$

note: % change = (new-old)/old

We use percentage change rather than absolute change because: 1. The choice of units can mislead us, 2. By using percentages we can compare consumer responsiveness to changes in prices of different products.

1. Consider a bag of popcorn at the movies. If the price is reduced from $3 to $2, and quantity demanded increases from 60 to 100, it makes a difference how we measure the change in price. (60-100)/(3-2)=-40, while (60-100)/(300-200)=-2/5. Whether we measure in pennies or dollars makes a big difference in how we perceive demand sensitivity. To avoid that, we use percentage change.
2. If we wish to compare sensitivity of popcorn with sensitivity of airplane tickets, using simple differences doesn't help when a dollar change in popcorn is a bigger change than a dollar change in the price of a plane ticket!

Note: Because of the law of demand, we know that the price elasticity of demand will always be negative. Economists ignore the minus sign and always write elasticities as absolute values. This makes it easier to say that demand sensitivity of –3 is greater than demand sensitivity of -2.

Elastic Demand –demand for a product is elastic if its price elasticity is greater than 1.
(resulting percentage change in quantity demanded is greater than the percentage change in price)

Inelastic Demand – demand for a product is inelastic if its price elasticity is less than 1.
(resulting percentage change in quantity demanded is less than the percentage change in price)

Unit Elasticity – The elasticity coefficient of demand or supply is equal to 1.
(percentage change in quantity is equal to percentage change in price)

Perfectly Inelastic Demand – Quantity demanded does not respond to a change in price.
$E_d = 0$
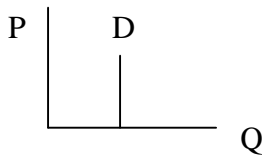
Perfectly Elastic Demand – Quantity demanded will go from 0 to infinity at a particular product price. That is, if the price isn't right, 0 is demanded, as soon as the price is right, infinite amounts will be demanded. $E_d = \infty$
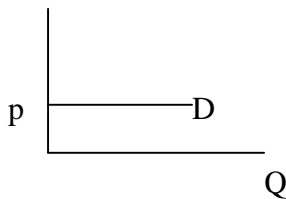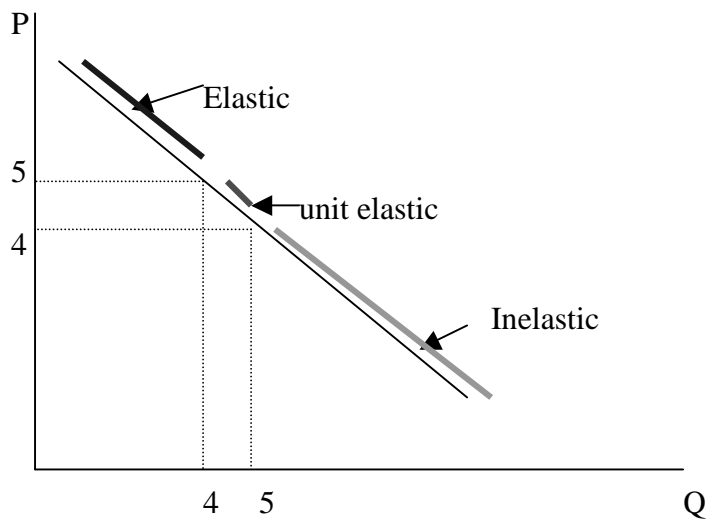

Elasticity of Demand changes at different reference points. To solve this problem, we can use averages.

Midpoint Formula $E_d = \dfrac{\dfrac{\text{Change in Quantity}}{\text{Sum of Quantities/2}}}{\dfrac{\text{Change in Price}}{\text{Sum of Prices/2}}}$

Quantity Demanded	Price/Unit	E$_d$		Total Revenue	Total revenue test
1	8			8000	
2	7		5.00	14000	Elastic
3	6		2.60	18000	Elastic
4	5		1.57	20000	Elastic
5	4		1.00	20000	Unit Elastic
6	3		0.64	18000	Inelastic
7	2		0.38	14000	Inelastic
8	1		0.20	8000	Inelastic

(review exercise on p.131)

Elasticity varies over different price ranges of a demand curve. For a straight line demand curve, demand is more elastic toward the top of the curve, and more inelastic toward the bottom.
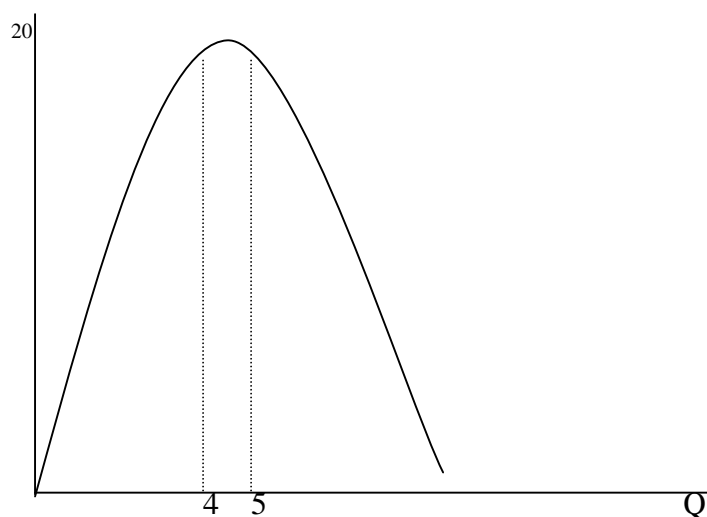
Total Revenue = the total number of dollars received by a firm from the sale of a product
= P*Q

Total Revenue Test: test to determine the elasticity of demand between two prices. When price falls and total revenue increases, demand is elastic. When price falls and total revenue decreases, demand is inelastic. When price falls and total revenue remains unchanged, demand is unit elastic.

Similarly: Elastic demand => decrease in price will increase total revenue
Inelastic Demand => decrease in price will decrease total revenue
Unit Elasticity => decrease in price won't affect total revenue

See Table 6-2 on p.134 it summarizes what we've learned so far. Good to know for exam.

Determinants of Price Elasticity of Demand

So what determines whether demand is sensitive to a change in price? Well, we know that demand is insensitive to price if the good in question is very necessary to our lives. If the cost of insulin goes up, a diabetic will still need to purchase it. While if the good is not necessary, demand will be quite sensitive to price. What sorts of things determine sensitivity?

1. Substitutability – the greater the number of substitute goods that are available, the greater the price elasticity of demand (more substitute goods = demand is more sensitive to price). Ex/ there is not a good substitute for insulin, therefore it is relatively inelastic demand; however, there are many substitutes for Fritos corn chips, therefore, demand for them is relatively elastic.
2. Luxury versus Necessity – The more that a good is considered a luxury rather than a necessity, the greater is the price elasticity of demand. Ex/ Heating, Food, water are all considered necessities, therefore demand for them will be rather inelastic.
3. Proportion of Income – The higher the price of a good relative to consumers' incomes, the greater the price elasticity of demand. Ex/ a 100% increase in the price of a two penny box of matches is a very low fraction of my annual salary, compared to a 100% increase in the price of a porshe boxter (60K to 12K) So the price elasticity of demand on the match box will be much more inelastic than on the porshe boxter.
4. Time – demand is more elastic the longer the period under consideration. Ex/ if the price of a CokaCola goes up, I might not switch to Pepsi at first, but the more time I have to pay the higher price, the more willing I am to try Pepsi and to determine whether Pepsi or other substitute products are good enough.

Application: Demand for farm products is highly inelastic. Thus, increases in output of bushels of wheat will lower the price of wheat and therefore lower the (total revenue) income of farmers. For farmers, therefore, large crop may be undesirable. If the government wishes to increase farmers income, they may wish to restrict farmers output.

Application 2: Illegal Drugs. Proponents for legalization of certain drugs argue that once drugs are legalized, prices of these drugs would fall dramatically (since they are cheap to make). Because demand by drug addicts is highly inelastic, these lower prices would not result in much increase in demand. As such, total expenditures on illegal drugs would fall and thereby make it unprofitable to finance drug trade. Opponents of legalization claim that demand for drugs like cocaine and heroine is more elastic than we think because a portion of the users are dabblers who try it when prices are low. Thus, the lower prices associated with legalization would increase consumption by these dabblers, and these dabblers might even become addicts. These opponents also think that legalizing drugs would make them more socially acceptable, thereby increasing demand. As such, opponents believe legalization would lead to higher drug revenue and support the continuation of drug trade.

Price Elasticity of Supply – the ratio of the percentage change in quantity supplied of a product to the percentage change in its price. (the responsiveness of production to a change in price of a product or resource)

E_s = Percentage change in quantity supplied of product X
Percentage change in price of product X

As with demand, averages, or midpoints, of the before and after quantities supplied are used as reference points for the percentage changes.

What determines price elasticity of supply?   ->Time

If the price of a product increases, the amount of increase in quantity supplied will depend on the ability of a firm to shift resources to production of that product. The more time they have, the more able they will be to shift more resources.

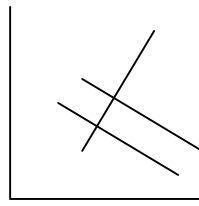We can consider a firms response immediately, after a short duration, and in the long run.

Immediately, there's not much a firm can do. If I bring a barrel of green beans to the market, I can't sell any more than I brought, no matter how high the price. It takes time to produce them.(inelastic) In the short term, I can grow green beans more intensively, planting more of my land and using fertilizer. (fairly elastic) In the long term, I can buy more land and maybe other farmers will start growing green beans. (very elastic)

Market Period: a period in which producers of a product are unable to change the quantity produced in response to a change in price.
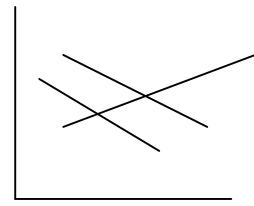
Time and supply Elasticity Graphs: what does supply look like in the immediate market period, short term and long run?
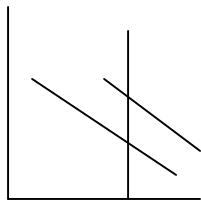
Immediate Market Pd.   Short Run   Long Run

Cross Elasticity of Demand Measure of how sensitive consumer demand of one product is to the change in price of some other product. The ratio of the percentage change in quantity demanded of one good to ther percentage change in the price of some other good.

$$E_{xy} = \frac{\text{Percentage change in quantity demanded of product X}}{\text{Percentage price in change of product Y}}$$

 Positive coefficient indicates that the two goods are substitutes.
 A negative coefficient indicates the goods are complements
A zero or near zero coefficient indicates that the two goods are independent

Income Elasticity of Demand –degree to which consumer demand responds to a change in income. The ratio of the percentage change in the quantity demanded of a good to a percentage change in consumer income.

$$E_i = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

A positive coefficient indicates that the good is a normal good
A negative coefficient indicates that the good is an inferior good