Things to know about elasticity.

1. Price elasticity of demand

   a. Meaning: The amount (as a percentage of total) that quantity demanded changes as price changes.

   b. Factors that make demand **more price elastic**
   - close substitutes available at comparable price. e.g. butter, margarine
   - the market is narrowly defined. e.g. Hondas as opposed to cars, Mcintosh apples as opposed to fruits.
   - the time frame is long.

   c. Definition: negative of percentage change in quantity demanded divided by percentage change in price. This is

   $$\frac{-(Q_2 - Q_1)/(Q_1 + Q_2)/2}{(P_2 - P_1)/(P_1 + P_2)/2}.$$ 

   for the price elasticity of demand between two points $P_1$ and $P_2$ on the demand curve.

   d. Properties
   - If the demand curve is a downward-sloping straight line, the elasticity becomes higher as the average of the two prices $P_1$ and $P_2$ rises. The elasticity above the midpoint of the line segment in the positive quadrant is greater than 1. The elasticity below the midpoint is less than 1.
   - The flatter the demand curve is between fixed prices $P_1$ and $P_2$, the more elastic it is between $P_1$ and $P_2$.

   e. Uses
   - For a given size of supply shift (with fixed initial equilibrium point), the lower demand elasticity is, the greater the change in price will be.
- If the price elasticity of demand is greater than 1, a rise in price causes an
decrease in revenue for the seller.

-If the price elasticity of demand is lower than 1, a rise in price causes an
increase in revenue for the seller.

-If the price elasticity of demand equals 1, a rise in price causes no change
in revenue for the seller.

- If elasticity is greater than 1 and the supply curve shifts to the left, price
will rise. Thus revenue will decrease.

-If elasticity is less than 1 and the supply curve shifts to the left, price will
rise. Thus revenue will increase.

2. Income elasticity of demand

a. meaning: The amount (as a percentage of total) that demand changes as
income changes.

b. Definition: Percentage change in quantity demanded divided by percent-
age change in income. This is

$$\frac{(Q_2 - Q_1)/[(Q_1 + Q_2)/2]}{(I_2 - I_1)/[(I_1 + I_2)/2]}$$

for two income points $I_1$ and $I_2$. When calculating income elasticity of demand,
assume price does not change.

c. Types of good distinguished by their income elasticity of demand:

- If the income elasticity of demand is greater than zero, the good is a normal
good. It means that demand for the good rises as income rises. Most goods are
normal goods.

- If the income elasticity of demand is less than zero, the good is an inferior
good. It means that demand for the good falls as income rises. e.g. bus rides,
poor quality substitutes for normal goods.

-If the income elasticity of demand for a good is greater than 1, the good
is called a luxury (A higher proportion of budget is spent on the good as the
consumer gets richer) . e.g. concerts, yachts.
If the income elasticity of demand for a good is less than 1, the good is called a necessity. (A lower portion of budget is spent on the good as the consumer gets richer). E.g. food.

3. Cross-price elasticity of demand

a. meaning: the amount (as a percentage of total) that demand for good A changes as price of good B changes.

b. Definition: Percentage change in quantity demanded of good A divided by percentage change in price of good B. This is

\[
\frac{(Q_A^2 - Q_A^1)/[(Q_A^1 + Q_A^2)/2]}{(P_B^2 - P_B^1)/[(P_B^1 + P_B^2)/2]}
\]

where \(Q_A^1\) and \(Q_A^2\) are quantities demanded of good A and \(P_B^1\) and \(P_B^2\) are corresponding prices of good B. Assume when calculating cross-price elasticity of demand that price of good A and income remain constant as price of good B changes.

c. Types of good distinguished by their cross-price elasticity of demand.

- Good A is a substitute for good B if the demand for good A rises when the price of good B rises. Thus good A is a substitute for good B if the cross-price elasticity of demand of A for B is greater than 0 \(\frac{(Q_A^2 - Q_A^1)/[(Q_A^1 + Q_A^2)/2]}{(P_B^2 - P_B^1)/[(P_B^1 + P_B^2)/2]} > 0\). e.g. movies and dvds, soy milk and rice milk, pencil and pen.

- Good A is a complement for good B if the demand for good A falls when the price of good B rises. Thus good A is a complement for good B if the cross-price elasticity of demand of good A for good B is less than zero \(\frac{(Q_A^2 - Q_A^1)/[(Q_A^1 + Q_A^2)/2]}{(P_B^2 - P_B^1)/[(P_B^1 + P_B^2)/2]} < 0\). e.g. potato chips and tv, paper and pencil.

4. Price elasticity of supply

a. meaning: the amount (as a percentage of total) that supply changes when price changes.

b. Factor that makes supply of a good more elastic

- time frame considered is long

c. Definition: Percentage change in quantity supplied divided by percentage
change in price. This is
\[
\frac{(Q_2 - Q_1)/[(Q_1 + Q_2)/2]}{(P_2 - P_1)/[(P_1 + P_2)/2]}
\]
where \(Q_1\) and \(Q_2\) are points on the supply curve and \(P_1\) and \(P_2\) are the corresponding prices.

d. Properties

- a linear upward sloping supply curve that has \(P < 0\) when \(Q = 0\) is inelastic everywhere.

- a linear upward sloping supply curve that has \(P > 0\) when \(Q = 0\) is elastic everywhere.

- a linear upward sloping supply curve that has \(P = 0\) when \(Q = 0\) is unit elastic everywhere.

e. Uses

- For a given size of demand shift (with fixed initial equilibrium point), the more inelastic supply is, the more price will change.

Applications of Supply and Demand Elasticity

1. Taxation. Government sometimes tries to reduce the supply of a good or raise revenue by taxing the purchase of a good.

A tax of size \(t\) on each unit sold of a good has the effect of shifting the supply curve up (vertically) by \(t\). This is because given a price \(P\), the seller only receives \(P - t\) for each unit sold. Therefore they must get a unit price \(P + t\) to be willing to sell \(Q\) units when before they were willing to sell \(Q\) units at a price of \(P\) each.

The quantity supplied at each price decreases after the tax is imposed, unless the supply curve is vertical.

The effects of the tax depend on the elasticities of the demand and the supply curves.

The more inelastic demand is, the more price will rise due to the tax.

The more inelastic demand is, the more revenue government will collect from
the tax.

The more inelastic demand is, the smaller is the change in quantity bought due to the tax.

Study Guide page 80.

In order to reduce teen smoking, the government places a $2 per pack tax on cigarettes. After one month, while the price to the consumer has increased a great deal, the quantity demanded of cigarettes has been reduced only slightly.

1. Is the demand for cigarettes over the period of one month elastic or inelastic?

Mankiw, page 111, 10.

Pharmaceutical drugs have an inelastic demand and computers have an elastic demand. Suppose that technological advance doubles the supply of both products (that is, the quantity supplied at each price is twice what it was).

a. What happens to the equilibrium price and quantity in each market?
b. Which product experiences a larger (percentage) change in price?

c. Which product experiences a larger (percentage) change in quantity?

d. What happens to total consumer spending on each product?