

## Income Elasticity, CPI, Income and Substitution Effects

### I. Income Elasticity

#### A. Definition

$$\epsilon_I = \frac{Y}{Q} \frac{dQ}{dY}$$

#### B. Change in Prices

Income Elasticity	Good is...	
$\epsilon_I > 1$	Luxury	Normal
$1 > \epsilon_I > 0$	Necessity	
$0 > \epsilon_I$	Inferior	

### II. Consumer Price Index

One formula to remember:

$$P_{real} = \frac{CPI_{base}}{CPI_{current}} \cdot P_{current}$$

Example

### III. Characterizing the individual's response to change in income and prices

#### A. Change in Income

Graphs

- i. What effect does a change in income has on BC?

ii. Income Consumption Curve (ICC)  
Axes are quantity of goods; each point on curve represents the optimal bundle under the given income.

iii. Engel Curve  
Vertical axis is income while horizontal axis is quantity of a good; each point on curve represents the optimal quantity of the good under the given income.

B. Change in Prices

i. What effect does a change in price(s) has on BC?

ii. Price Consumption Curve (PCC)  
Axes are quantity of goods; each point on curve represents the optimal bundle under the given relative price.

iii. Demand Curve  
Vertical axis is price of a good while horizontal axis is the quantity; each point on curve represents the optimal quantity of the good under the given price.

#### IV. Income Effect and Substitution Effect

- Comes from change in price(s); income is held constant.
- Suppose before change in price(s), the individual chooses bundle  $A$ ; after change in price(s), the individual chooses bundle  $B$ .
  
- **Substitution Effect** (for good  $x$ )  
Construct a new BC with the new relative price (i.e. slope) but which touches the old IC; call their intersection point  $D$ . The horizontal distance between  $A$  and  $D$  is the substitution effect. Substitution effect is always negative when price increases.
  
- **Income Effect** (for good  $x$ )  
Income effect is the horizontal distance from  $D$  to  $B$ . Income effect is negative for normal goods but positive for inferior goods when price increases.

Example:

Assume two goods, chewing gum and All Other Goods (AOG). AOG is always considered a normal good. The price of AOG is \$1 and chewing gum is \$2 per pack. Assume that preferences between chewing gum and AOG are strictly convex (i.e. there are diminishing marginal rates of substitution between gum and AOG). Graph the following situations using budget constraints and indifference curves. Make sure to clearly label both the substitution and income effects. Place quantity of AOG consumed on the vertical axis and chewing gum on the horizontal axis.

- (a) An increase in income when gum is a normal good.
- (b) An increase in income when gum is an inferior good.
- (c) The price of gum falls from \$2 to \$1.50 per pack when gum is a normal good.
- (d) The price of gum falls from \$2 to \$1.50 per pack when gum is an inferior good.
- (e) The price of gum falls from \$2 to \$1.50 per pack when gum is a Giffen good.
- (f) The price of gum rises from \$2 to \$2.15 per pack when gum is a normal good.
- (g) The price of gum falls from \$2 to \$2.15 per pack when gum is an inferior good.
- (h) The price of gum falls from \$2 to \$2.15 per pack when gum is a Giffen good.
- (i) Is an inferior good always a Giffen good? If not, give a graphical example.
- (j) Is a Giffen good always an inferior good? If not, give a graphical example.

Tip: No need for accurate absolute graphing, just need to be correct in relative terms.