Elasticity

Goals

- Develop a measure of sensitivity that is not unit dependent.
- Get intuition on what goods are price sensitive and which are not.
- Extend to:
  - Normal vs Inferior
  - Complement vs Substitute

Link to Taxes

We talked about sensitivity to prices when addressing burden of a tax.

- The greater tax burden falls on the party least willing to change behavior when prices change.
- Goods with high price sensitivity tend to have high excess burden when taxed.

The Problem

The natural measure of price sensitivity is the slope of supply or demand

$$\frac{Dollars/lb}{lb}$$

Units are still in there. Makes it hard to compare two goods without the same measure, i.e., gallons and pounds.

Elasticity

$$\frac{\%\Delta Effect}{\%\Delta Cause}$$

- Percent change comes without units
  $\%\Delta = \frac{End\$ - Begin\$}{Begin\$} = \frac{End - Begin}{Begin}$.
- Elasticity is unit free
- Credit to engineers; economics stole it.

Demand Elasticity

$$\frac{\%\Delta D_q}{\%\Delta P}$$

- Percent change in quantity demanded over percent change in price.
- Is negative for demand function, but some old folks talk as positive.
- Kind of like slope but:
  - A linear demand has different elasticity at every point.
  - A demand with constant elasticity is shaped like a hyperbola $P = \frac{a}{q^{elasticity}}$
  - No units so can compare feet to gallons.

Definition of Terms for Demand

- ξ_{good}, Greek xi, EL_{good}, E_{good}, η_{good}, Greek eta, are all common.
- $Egood < -1$: Elastic. Sensitive to price changes.
- $Egood > -1$: Inelastic. Insensitive to price changes.
- $Egood = 1$: Unit elastic.

Elasticity and Expenditures

- When a good has an elastic demand
  - Desired purchases increases/decreases quickly when prices change.
  - Price decreases cause an increase in total expenditures on the good.
  - Price increases cause a decrease in total expenditures on the good.

Demo Expenditures

What Goods are More Elastic than Others?

- Narrower definition, e.g., beans vs all food
- Longer time scale, e.g., this year vs today
- Many close substitutes
- “Luxury” vs “Necessity”, e.g., high-end sports cars

Examples

- Green beans vs blue lake green beans
- Gas the week vs gas this year
- Any one of 100 IPAs in Portland

Real Life

Soft drinks:

- -0.8 to -1.0 (general)
- -3.8 (Coca-Cola)
- -4.4 (Mountain Dew)

Car fuel:

- -0.09 (Short run)
- -0.31 (Long run)

Supply elasticity is similar

Just positive sign

Expanded Concept

$$\frac{\%\Delta Effect}{\%\Delta Cause}$$

- Income Elasticity, $E_{good,income} = \frac{\%\Delta D}{\%\Delta I}$
- Cross Price, $E_{good_1,good_2} = \frac{\%\Delta D_1}{\%\Delta P_2}$

Both are about the location of demand and they quantify things we already know.

Income Elasticity

Tells us how normal or inferior a good is:

- $E_{good,income} > 0$ Normal
  - $E_{good,income} > 1$ Luxury or income elastic
  - $0 < E_{good,income} < 1$ Necessity or income inelastic
- $E_{good,income} < 0$ Inferior

How to Tell Luxury from Necessity

If your income doubles and your purchases more than double when the price does not change, then luxury.

Real Life

Tobacco 0.42 Margarine -0.20 Books 1.44

Cross-Price Elasticity

Tells us how substitutable goods are:

- $E_{good_1,good_2} > 0$ Substitutes
- $E_{good_1,good_2} < 0$ Complements

Calculation

Elasticities allow back of the envelop calculation – if you know the right elasticity.

- If you know the price change, you can calculate the change in purchases.
- If you know the income change, you can calculate the change in demand, assuming prices remain the same.

Why? Cancellation

$$\%\Delta P \frac{\%\Delta D_q}{\%\Delta P} = \%\Delta D_q$$

So, if you see a 10% drop in the price of Mountain Dew with $E_p = -4.4$ then you should see a \$-10 % (-4.4) = 40.4% \$ increase in the sales of Mountain Dew.

- Watch the negative signs
- Works with other elasticities too

Look at some real life

https://www.ers.usda.gov/data-products/commodity-and-food-elasticities/

Next Up

- Heading to production and costs
- We will actually find where the supply curve comes from
- Duplicate our perfect competition results
- Show long-term changes
- Then extend to monopolies.