Elasticity

- Unit-free measure of responsiveness
  - Usually quantity on price
- If B=f(A,…), then the elasticity of B with respect to A $\varepsilon_{B,A}= (\partial B/\partial A)(A/B)$
  - % change in B with a % change in A
- Price elasticity of demand
  - $\varepsilon_{Q,P}= (\partial Q/\partial P)(P/Q)$

- definitions
  - $\varepsilon_{Q,P}<-1$ “elastic”
  - $\varepsilon_{Q,P}=-1$ “unit elastic”
  - $\varepsilon_{Q,P}>-1$ “inelastic”
- Elasticity, price changes, and revenue:
  - Rev = P*Q(P)
  - (dRev/dP)=p(dQ/dP)+Q(P)
  - $(dRev/dP)/Q=(p/Q)(dQ/dP)+Q(P)/Q=1+ \varepsilon_{Q,P}$
  - $\Rightarrow$if demand is **inelastic**, P$\uparrow \Rightarrow$ Rev $\uparrow$
  - $\Rightarrow$if demand is **elastic**, P$\uparrow \Rightarrow$ Rev$\downarrow$

Other Elasticities

- Income elasticity (recall Q=Q(P,I))
  - $\varepsilon_{Q,I} = (\partial Q/\partial I)(I/Q) = (\%\text{ ch } Q)/(\%\text{ ch } I)$
- Cross price elasticity: How does demand change with price of other goods?
  - $\varepsilon_{Q,P'} = (\partial Q/\partial P')(P'/Q)$

Examples

- Linear demand
  - E.g. $Q = 10-P$
- Constant elasticity
  - $Q=Ap^b$
- Question: what determines elasticity of demand?

Evidence about Elasticities

Item	Income elasticity	Price elasticity
Food	0.28	-0.21
Medical services	0.22	-0.20
Autos	3.0	-1.20
Gas	1.06	-0.54
Beer	0.93	-1.13

Consumer Surplus

- Difference between consumers' willingness to pay, and the price, for a good