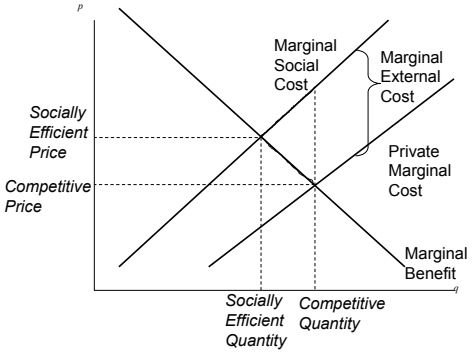
Externalities

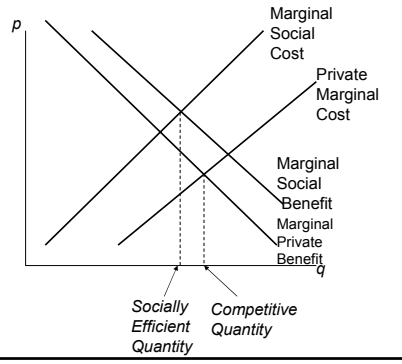
External Effects

- Effects on others not part of a transaction
  - – pollution
  - + education
  - + gardens
  - – noise

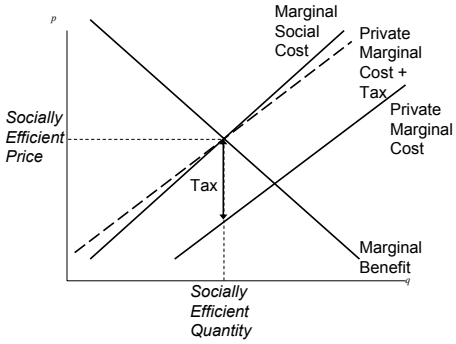
Social Benefit, Cost



General Picture



Pigouvian Taxes

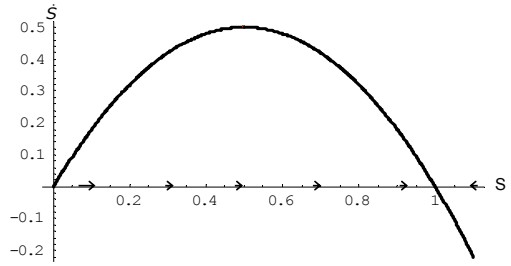


Quotas

- Fix quantity at the efficient level
- Tradable permits yields efficient use
- Used in SO_2, other pollution
  - Permits bought by environmentalists occasionally

Extinction

- Stock S of fish $\dot{S} = rS(1-S)$.



Add Fishing

- Cost b to operate a fishing boat
- Catches proportion a of fish ($Q=naS$)
- Constant elasticity of demand ε
- Competitive (zero profits) fishers, n boats

$$b = \left(Q/n\right)p(Q)$$

$$Q = \left(\frac{aS}{b}\right)^{\varepsilon} \qquad n = \frac{a^{\varepsilon-1}}{b^{\varepsilon}} S^{\varepsilon-1}$$

Population Dynamics

$$\dot{S} = rS(1-S) - \left(\frac{aS}{b}\right)^{\varepsilon}.$$

- If demand elastic, $S \approx 0 \Rightarrow \dot{S} \approx rS > 0$
- No extinction
- If demand inelastic, extinction possible
- Necessary if boats sufficiently cheap

Extinction

- With inelastic demand, fishing effort rises as stock of fish fall
- If rises fast enough, will drive fish to extinction
- Problem is externality
  - Fishers share common resource pool
  - Market doesn't account for the effect of their catch on the future profitability of fishing

Public Goods

Public Goods

- Two Key features:
- Non-excludability
- Non-rivalry
- Examples
  - Fireworks
  - National defense
  - ~ Rural highways
  - ~ Parks

Free-Riders

- Park size S (measured in \$)
- Individual value $v_i(S)$
- Individual contributions stop if $v_i'(S) \leq 1$
- With voluntary contributions, park is sized so that $\max v_i'(S) = 1$
- Efficient size satisfies

$$\sum_i v_i'(S) = 1$$

Taxes

- Solve inefficient size by setting park size and charging people $1/n$ of the cost
- Individuals get $v_i(S) - S/n$
- Under voting, median dominates
- Park is sized at $Median\ v_i'(S) = 1/n$
- Closer to optimal

Local Public Goods

- Local public good is "locally non-excludable"
- Localities differentiate, and public moves to optimal neighborhood
- Makes public goods provision much more efficient
- Especially relevant for schools