

## Lecture 6

ECON 4910, Environmental Economics  
Spring 2010

### Voluntary contributions

Readings:

**Nyborg and Rege (2003)**

See also: **Heyes (1998)**

Lyon and Maxwell (2008)

### Voluntary term paper

- Today:
  - Exchange papers with your partner
  - Solution will be posted on web page
- After class: Correct your partner's paper
- Lecture 7 (March 8):
  - Bring your partner's (corrected) paper

## Voluntary contributions to public goods

- Voluntary contributions:
  - Recycling
  - Eco-labels
  - Climate tickets
  - CSR
  - Ethical investment
- Compared to standard/simple theory predictions:
- (Some) consumers contribute more
- (Some) firms pollute less
- Altruism? Norms?
- How to analyze this?

## Voluntary approaches: Firms

- Firms violate less than predicted (?)
  - The "Harrington paradox" (see Heyes)
- Firms abate more required by law
  - Corporate social responsibility
- Voluntary regulation
  - voluntary/negotiated agreements

## The Harrington paradox

- Theoretical prediction:  $f'(m) = qP'(m)$ 
  - Firm pollutes until marginal abatement cost equals marginal expected penalty.
- Harrington (1988):
  - For most sources, monitoring frequency is low
  - If violations are discovered, penalties are rarely imposed
  - Sources still seem to comply a large part of the time.
- *Is there a paradox?*
  - Info on  $f'(m)$ : Typically not available
  - $qP'(m) \approx 0$ : Expect  $m \approx \hat{m}$  (firms "disregard" regulation)
  - Nyborg and Telle 2006: Low  $qP'(m)$  well documented; high compliance largely undocumented
  - Norway: Few severe, plenty of minor violations

## Voluntary agreements

- Negotiations industry/firm vs. regulator
- Agreement:
  - Firm/industry commits to abatement goal (e.g.: reduce non-recycled packaging waste by 60 per cent by 20xx)
  - Regulator abstains from taxes/CAC measures
- Potential gains:
  - Firms: No tax/CAC regulation
  - Regulator: Better information? More cooperativeness?
- Some potential problems:
  - Legal commitment limitations, regulator
  - Openness / democratic control
- Public voluntary programs (US)
  - Government initiated, no credible regulatory threat
  - Effectiveness: disputed

## Corporate social responsibility

- "A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" (EU Commission 2002)
- Exxon, Chiquita, McDonald's, Coca-Cola, Ford...
  - "Corporate citizenship is a critical part of our business now and in the future. Our focus has expanded from philanthropy and community involvement to a broader look at how we use our resources to create sustainable growth and a better world." (From Ford Motor Company's homepage)
  - Only nice words?
  - Even if yes: Why would firms care to use nice words?

## CSR and markets

- Conventional wisdom:
  - Firms with extra costs are wiped out by competition
  - A perfectly competitive market does not allow for CSR
- But green production and CSR do exist
- Explanations suggested in the literature:
  1. Ethical customers: Extra WTP for green/ethical products
  2. Ethical investors
  3. Ethical workers: recruitment, motivation
  4. Pre-emption of taxes or regulations
  5. Market power: Vertical differentiation
- 1-3: Inconsistent w. standard model?

## Homo Oeconomicus

$$U_i = u_i(x_i, E) \quad (u'_{ix} > 0, u'_{iE} > 0, \text{quasiconcave})$$

- Cares only about own access to private ( $x_i$ ) and public ( $E$ ) goods.
- Max  $U_i$  s.t. budget constraint  $x_i + g_i = F_i$ :
  - contributes until  $MWTP_i =$  unit price of abatement
- *Low and few* contributions:
  - If everyone has the same utility function and the same income, and one person contributes until f.o.c. for interior solution holds, no-one else contributes (disregarding income effects)
  - If everyone has the same utility function (normal goods), but different income, only the richest person will contribute.

## Homo Oeconomicus, cont.

- For simplicity, assume now that

$$U_i = u(x_i) + v(E)$$

for all  $i$ ,  $u$  and  $v$  increasing and concave. Further, let 1 unit contribution improve  $E$  by 1 unit (i.e. price of  $E = f'_k/z' = 1$ ):

$$E = E^0 + \sum_j g_j = E^0 + \sum_{j \neq i} g_j + g_i = E^{-i} + g_i$$

where  $E^{-i}$  = environmental quality if  $i$  contributes nothing, considered exogenous by  $i$ .

- 1.o.c. for utility max:

$$v'(E)/u'(x_i) = 1, \text{ or } v'(E) = u'(x_i)$$

- Question: For a given  $E^{-i}$ , will  $i$  contribute at all?
- If  $v'(E^{-i}) < u'(F_i)$ ,  $i$  contributes nothing
  - Note:  $u'(F_i)$  is a fixed number ( $F_i$  exogenously fixed)
  - The higher  $F_i$ , the lower  $u'(F_i)$

## Homo Oeconomicus and public goods

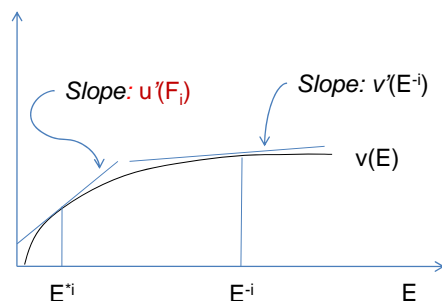
F.o.c.:  $v' = u'$

Contributes if  $v'(E^{-i}) > u'(F_i)$

1) Find that  $E$  (let's call it  $E^{*i}$ ) where  $v'(E) = u'(F_i)$

2) Check: Is  $E^{*i} > E^{-i}$ ?

If yes,  $i$  will contribute; if no,  $i$  contributes nothing.



If  $E^{-i}$  is large,  $i$  contributes nothing

Higher  $F_i$ , lower  $u'(F_i)$ : Only the richest contribute

## Pure altruism (Andreoni 1988)

$$U_i = \omega(x_i, E) \quad (\omega'_x > 0, \omega'_E > 0, \text{quasiconcave})$$

- I care about my own income, and *my own and others'* access to the public good.
  - Example:  $U_i = u(x_i) + v(E) + k(E)$   
where  $u$ ,  $v$  and  $k$  are concave and increasing.
- Formally equivalent to Homo Oeconomicus  
( $k' > 0$  corresponds to stronger preference for  $G$ )
- Few and small contributions
  - exactly like Homo Oeconomicus, just not quite as few and/or quite as small...
- Does not solve the free-rider problem

## Pure altruism and public goods

Ex:  $U_i = u(x_i) + v(E) + k(E)$

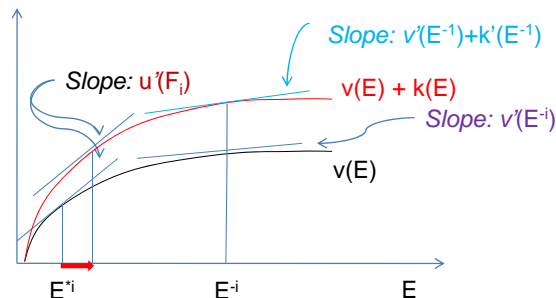
F.o.c.:  $(v' + k') / u' = 1$  or:  $v'(E) + k'(E) = u'(x_i)$

Contributes if  $v'(E^{-i}) + k'(E^{-i}) > u'(F_i)$

1) Find that  $E = E^{**i}$  where  $v'(E) + k'(E) = u'(F_i)$

2) Check: Is  $E^{**i} > E^{-i}$ ?

If yes,  $i$  will contribute; if no,  $i$  contributes nothing.



High  $F_i$ , low  $u'(F_i)$  -> only the richest contribute

## Pure altruism and voluntary contributions

- Homo Oeconomicus:  $U_i = u(x_i, E)$
- Pure altruist:  $U_i = \omega(x_i, E)$ 
  - Formally equivalent to Homo Oeconomicus
- Cannot explain anything which could not have been explained by the HOe model
- Empirical findings:
- People contribute more if others contribute more
  - Pure altruists would contribute *less* if others contribute more.
- Public supply decrease voluntary contributions, but less than one-to-one
  - Pure altruism would give one-to-one crowding out
  - In fact: Pure altruism would yield neutral tax system..!

## Impure altruism (Andreoni 1989,1990)

$$U_i = w(x_i, E, g_i) \quad (w'_x > 0, w'_G > 0, w'_g > 0, w \text{ quasiconcave})$$

- Own contribution produces a "warm glow"
  - Process/role orientation, not just final outcomes
  - For given  $x_i$  and  $E$ : I feel better if I contributed myself (good conscience)
- An impure altruist may contribute
  - to get more of the public good (for selfish or altruistic reasons)
  - to get more warm glow
- Crucial difference:
  - Own contribution produces a *private good* to  $i$
  - Reduces the free-rider problem

## Impure altruism, cont.

- Ex:  $U_i = u(x_i) + v(E) + h(g_i)$   $u, v, h$ , concave and incr.
- Budget:  $F_i = g_i + x_i$
- The environment:  $E = E^{-i} + g_i$
- Insert:  $U_i = u(F_i - g_i) + v(E^{-i} + g_i) + h(g_i)$
- F.o.c. for utility max (diff. wrt  $g_i$ ):
  - $-u' + v' + h' = 0$
  - or:  $v'(E^{-i} + g_i) + h'(g_i) = u'(F_i - g_i)$
- Marginal benefit from "warm glow" *does not* depend on others' contributions.
  - Hence, even if  $E^{-i}$  is very large,  $i$  may want to contribute.
- Others can provide a good environment for me; they cannot give me a good conscience.



## "Pure", "impure"?

- The pure altruist:  $U_i = \omega(x_i, E)$ 
  - If  $E$  is included only because of care for others (e.g.  $E$  = poverty relief, and  $i$  is not poor)
  - then  $i$ 's altruism is "unselfish"
- The impure altruist:  $U_i = w(x_i, E, g_i)$ 
  - If  $E$  is included only because of care for others
  - and  $g_i$  is included because  $i$  wants a good conscience
  - then part of  $i$ 's altruism is "selfish"
- But also: Pure altruism is formally equivalent to Homo Oeconomicus
  - If  $E$  is included only for  $i$ 's own use,  $i$  is no altruist at all!

## Impure altruism: summary

- Can explain substantial contributions by many
  - $i$  not indifferent as to *whom* provides the public good: Own provision provides warm glow, others' does not
  - Even with high public provision/provision by others,  $i$  may contribute in order to get a warm glow
- Imperfect crowding out
  - Public/others' supply can replace  $i$ 's effort to secure a high  $E$ , but cannot replace  $i$ 's good conscience
  - But: Predicts that  $i$ 's contribution is decreasing in others' (due to the "pure" altruism part). Empirical studies find the opposite.
- Much used model for analysing e.g. demand for eco-labeled goods, recycling, climate tickets etc.

### Warm glow: Other interpretations

- Most important insight: Substantial voluntary contributions hard to explain without private benefit component of own contributions.
- What's this private benefit?
  - Good conscience?
  - Good self-image?
  - Approval from others?
  - Conformity (being “normal”)?
- Does it vary with other things than own contributions?
  - Others' behavior?
  - Context?
  - Duty/responsibility (determined by...?)
- Impure altruism model: Starting point for more sophisticated modeling of social/moral norms

### Social norms

- Private benefit: Social approval (disapproval)
  - I contribute; people like me better
- Assume norm followers sanction more than others
  - Recyclers frown more at non-recyclers
- Then, marginal private benefit from contributing increases in others' contributions
  - The larger share who recycle, the more approval I get when recycling (or less frowns when not recycling)
- Possibility: Multiple equilibria
  - I recycle if others do so (to avoid others frowning at me)
  - I do not recycle if the others don't (no recyclers are there to frown)
  - Once reached, both situations may be stable: Everyone recycles (there is a social norm), or no-one recycles (no norm)

## Reciprocity and conditional cooperation

- Reciprocity: *Preference* for repaying good intentions by good actions, bad intentions by bad actions
- Can produce
  - Conditional cooperation (contributes if others contribute)
  - Willingness to punish (even if costly)
- Interaction between heterogeneous types:
  - Free-riders: undermine conditional cooperators' motivation
  - Contributors: stimulate conditional cooperators' motivation
- Experimental studies: Many conditional cooperators
- Fischbacher et al. (2001):
  - 30 % free-riders (Homo Oeconomicus)
  - 50 % conditional cooperators
  - No unconditional cooperators

## Lab experiments: Public good games

- Groups of  $N$  anonymous subjects
- Each subject receives an amount of money,  $X$
- Task: Share  $X$  between oneself and the group
- Simultaneous choice
- All contributions to the group are multiplied by a factor  $\mu$  ( $1 < \mu < N$ ), and then shared equally between the  $N$  group members
- Contribution maximizing group payoff:  $X$
- Contribution maximizing individual payoff, given others' contribution:  $0$

## Typical findings, public good games

- One-shot, or first round of repeated games:
  - Average contributions 40-60 %
- Repetition, changing groups: Contributions decrease
- If punishment is possible:
  - Contributions are sustained, or increase (Fehr and Gächter 2000, 2002), even if punishing others is costly

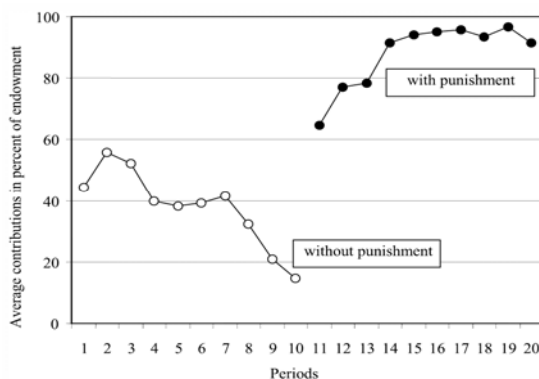


Fig. 4. Average Contributions to the Public Good  
Source: Fehr and Gächter (2000a)

## Summary, voluntary contributions

- Firms and consumers contribute more to public goods than Homo Oeconomicus
- Not explained simply by strong preferences for a good environment: free-rider problem persists
- Possible explanation: Own contributions produce a private benefit to the contributor
- Further analysis:
  - What exactly is this private good?
  - Does it depend on other relevant variables than own contributions? How?
  - Social approval, reciprocity: Social interaction in the private benefit of contributions; potential multiple eq.

## Next time

- Monetary valuation of environmental quality changes
- The politics and ethics of environmental cost-benefit analysis
- Readings:
  - Perman et al. Ch 12**
  - Perman et al., Ch. 3.1-3.4.