

Lecture 6

ECON 4910, Environmental Economics
Spring 2011

Voluntary contributions to public goods

Readings:

Nyborg and Rege (2003)

See also: **Heyes (1998)**

Lyon and Maxwell (2008)

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 μ ($1 < \mu < N$), 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

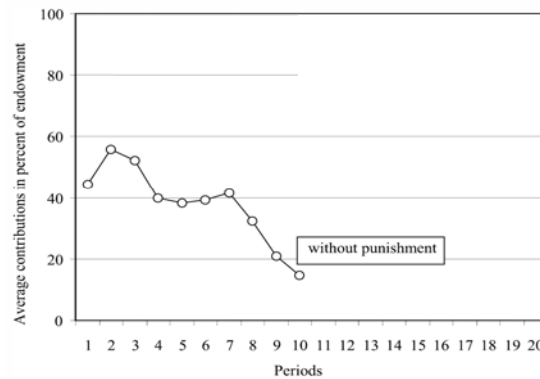


Fig. 4. Average Contributions to the Public Good
Source: Fehr and Gächter (2000a)

Voluntary approaches: Firms

- The "Harrington paradox"
 - Firms violate less than predicted
- Corporate social responsibility
 - Firms abate more than required by law
- Voluntary agreements
 - Voluntary regulation / 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)
 - Low $qP'(m)$: well documented. High compliance *largely undocumented* (Nyborg and Telle 2006)
 - 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 60-80 per cent by given date)
 - 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. Pre-emption of taxes or regulations
 2. Market power: Vertical differentiation
 3. Ethical customers: Extra WTP for green/ethical products
 4. Ethical investors: Accept lower rates of return
 5. Ethical workers: wage levels; recruitment; motivation
- 3-5: Inconsistent w. standard model?

- Motives for contributions?
 - Lamppost
 - Climate ticket

Homo Oeconomicus

- $U_i = u_i(x_i, E)$ ($u'_{ix} > 0, u'_{iE} > 0$, quasiconcave)
- Cares only about own access to private (x_i) and public (E) goods.
 - Max U_i s.t. budget constraint $x_i + g_i = F_i$:
 ($x_i = i$'s consumption, $g_i = i$'s contribution, $F_i = i$'s exogenous income)
 - contributes until $MWTP_i =$ unit price of abatement
 - Recall: bargaining
 - *Low and few* contributions
 - Homo Oeconomicus does not take *others'* benefits into account
 - As soon as $MWTP_i \leq$ unit price for every i : No-one provides more

Homo Oeconomicus, cont.

- Assume: for all i , $U_i = u(x_i) + v(E)$
 u and v increasing and concave.
- Let 1 unit g_i improve E by 1 unit
 – i.e.: unit price of $E = 1$ ($= f'_k/z'$)
 $E = E^0 + \sum_j g_j$
 where $E^{-i} = \text{env. quality if } g_i = 0$. E^{-i} considered exogenous by i .
- 1.o.c., utility max:
 $v'(E)/u'(x_i) = 1 \quad \Leftrightarrow \quad v'(E) = u'(x_i)$
- For a given E^{-i} , will i contribute at all?
- If $v'(E^{-i}) < u'(F_i)$, i contributes nothing

Homo Oeconomicus and public goods

F.o.c.: $v' = u'$. Contributes if $v'(E^{-i}) > u'(F_i)$

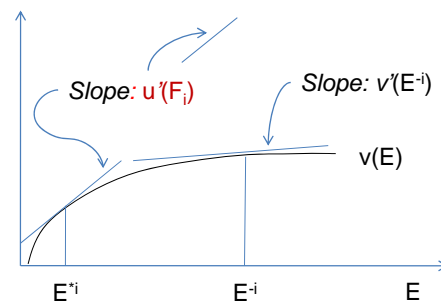
Note: for i , $u'(F_i)$ is a fixed number (lower the higher F_i)

Does i contribute?

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

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

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 E)
- 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

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

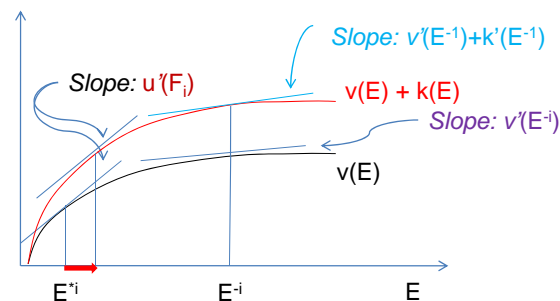
$$\text{F.o.c.: } (v' + k') / u' = 1 \quad \text{or:} \quad v'(E) + k'(E) = u'(x_i)$$

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.



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

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

Pure altruism and voluntary contributions

- Cannot explain anything which could not have been explained by the HOe model
- Empirical findings:
 - People contribute *more* if others contribute more
 - Public supply crowds out voluntary contributions, but not one-to-one
- Pure altruists (and HOe)
 - would contribute *less* if others contribute more.
 - would crowd out public supply one-to-one in Nash eq.
 - In fact: would neutralize the entire tax system..!
- Unsatisfactory explanation
 - Yields implausible predictions

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: $v'(E) + h'(g_i) = u'(F_i - g_i)$
- Contributes if $v'(E^{-i}) + h'(g_i) > u'(F_i)$
- Marginal "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 Nash 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
- Private benefit: Satisfaction of repayment
- Can produce
 - Conditional cooperation (contributes if others contribute)
 - Willingness to punish (even if costly)
- Experimental studies: Many conditional cooperators
- Fischbacher et al. (2001):
 - 30 % free-riders (Homo Oeconomicus)
 - 50 % conditional cooperators
 - No unconditional cooperators
- Free-riders undermine conditional cooperators' motivation

Summary, voluntary contributions

- *Substantial* contributions by *many*
 - *cannot* be explained by strong preferences for environmental quality alone: free-rider problem persists (& implausible implications)
 - *can* be explained if own contributions produce a private benefit to the contributor (own role matters)
- Further analysis:
 - What exactly is this private benefit?
 - How does the private benefit depend on other factors?
 - Social approval? Reciprocity? Ethical principles/self-image?

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.
 - (The ethics & politics: If you're interested and read Norwegian, see also Nyborg, K. (2002): [Miljø og nytte-kostnadsanalyse. Noen prinsipielle vurderinger](#), Rapport 5/2002, Oslo: Frisch Centre.)