Resource Management:
INSTITUTIONS AND INSTITUTIONAL DESIGN

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Action situations studied by experiments

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Literature

Ostrom, Elinor 2005, *Understanding Institutional Diversity*, Princeton University Press, Princeton, Ch 3-4

- Studying Action Situations in the Lab
- Animating Institutional Analysis

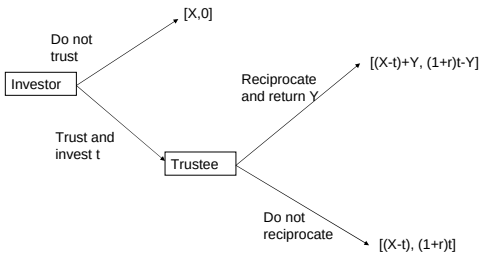
Experimental studies of action situations

- Using social dilemma games to illustrate action situations
  - Showing that small changes in the action situation can produce big differences in outcomes
  - Illustrate how experimental results challenge the presumption that all use the same internal rationality to make decisions
  - Will use the trust game (similar to the snatch game) and
  - The commons dilemma game

The trust game: the baseline

- Participants: two subjects
- Positions: investor and trustee
- Actions:
  - Investor has X. Can choose between
    - Keeping X
    - Giving t to the trustee and keeping X-t
    - Give all X to the trustee (t=X)
  - Trustee can subsequently choose how much to return to investor (Y)
- Outcomes: size of funds resulting from actions
- Action-outcome linkages: rate of return on investment = (1+r)
- Information: all possibilities are known, assurance of anonymity both to players and experimenter
- Potential payoffs (possibilities) [(X-t)+Y] and [(1+r)t-Y]; t>0
  - Often r=2

The trust game: illustration of decisions and outcomes



The trust game: variations

- Positions changing to worker-employer
- Participants from different cultures
- Number of repeated plays: building reputation?
- Information:
  - Investor stipulates minimum returns
  - Investor may apply or refrain from applying costly punishment tied to minimum returns. Applying punishment was found to reduce reciprocity.
  - Highest return when punishment was possible but not used: **external sanctions crowd out reciprocity**
- Small changes in conditions create large differences in outcomes (relative positions, information and sanctions available)
- Results challenge the self-interested actor model: high level of trust in situations where none should have been

Common-pool resources

- A common-pool resource is a natural or man-made resource from which it is difficult or very costly to exclude or limit users once the resource is provided by nature or produced by humans and removal of a resource unit makes that unit unavailable for others
  - Unregulated access leads to overuse and possibly destruction
  - Free-riders

Basics of a commons dilemma I

- Participants: n symmetric subjects without any outside relations with each other
- Positions: appropriator
- Actions: each is endowed with e (=effort, eller =endowment) units e.g. working hours and have to decide on how much to spend on appropriation and how much on earning income from an external source
- Outcomes: actions affect the number of resource units that can be appropriated or returns for working outside
- Action-outcome linkages: 1) wage*work hours 2) resource function is concave and depends on the total effort allocated to appropriation $F(\Sigma_i x_i)$

Basics of a commons dilemma II

- Information: participants know that they are all alike (symmetric) and they know the function linking aggregate effort to individual payoff
  - Information about outcomes are available after each round of allocation
  - No communication is allows
- Potential payoff
  - Payoff for individual i = $w*e$ if $x_i = 0$
  - It is $w*(e - x_i) + (x_i / \Sigma_i x_i)*F(\Sigma_i x_i)$ if $x_i > 0$
- Predicted outcomes [based on 2 hours, e=10 or 25, w=0.05, and return from CPR = $0.01*((x_i / \Sigma_i x_i)*F(\Sigma_i x_i))$]
  - Then predicted x=8 with 8 players ($\Sigma_i x_i = 64$) but earnings would be higher with a total investment of 36 = $\Sigma_i x_i$

Behaviour in a basic commons dilemma

- Overuse of the resource is usually the case
- 25 token experiments do considerably worse than 10 token
- Observes an unpredicted pulsing pattern (increasing investment until declining returns, then reducing it)
- No theoretically satisfactory explanation exist
- Some subjects say they use CPR return over or below 0.05 as guide to investment in the next round
- Results replicated by agent based simulation
- Social psychology suggests cognitive processes are important to outcomes
- Subjects use heuristics in complex problems

Variations on a basic commons dilemma I

that should not affect outcomes but does

1. Allowing face-to-face communication before each session of investment
2. Allowing costly sanctions increase compliance
3. Allowing subjects to covenant to determine investment levels and adopt sanctioning

- Communication improves outcomes where there is heterogeneity of endowments
  - If subjects are kept out of the communication much less compliance is observed for all

Variations on a basic commons dilemma II

- Voluntary sanctions is chosen even if it is costly to the person proposing it, sanctioning and fines wipe out gains from better performance
- Crafting rules to solve commons dilemmas is costly (second order dilemma) but do occur frequently. Those who covenant do considerably better than those who do not
- Electronic communication do not do as well as face-to-face
- Experiments using real farmers replicate findings
- Experiments based on heterogeneous preferences giving incentives to inspect and punish deviations from covenants explained by a heterogeneous, linear other-regarding model

Animating institutional analysis

- Starting with the full-information, rational behaviour focusing on material outcomes in open, competitive, posted price markets
- Adding complications
  - **Information processes**
  - **Valuation mechanisms used by individuals (preferences)**
  - **Selection processes used by individuals (choice of actions)**

Open competitive processes

- Repetitive situations where complete information and adequate models of the situation can be assumed
  - Explaining learning has proved very difficult
- Assumptions for a rational egoist
  1. Individuals possess as much information about the structure of a situation as is contained in the situation
  2. Internal valuations of outcomes are complete and consistent based on a monotonous mapping of external payoff
  3. Individuals choose actions to maximise expected net benefits based on what resources they have and the actions others are expected to take

Challenges

- It has been shown that it is the structure of the situation that produces efficient choices, not the internal calculations of individuals
- Social dilemmas evoke positive or negative internal valuations not conforming to assumption 2 above
- Imperfect information is rampant, including
  - Asymmetric information,
  - Risk and uncertainty
  - Repetitions and constancy of participants

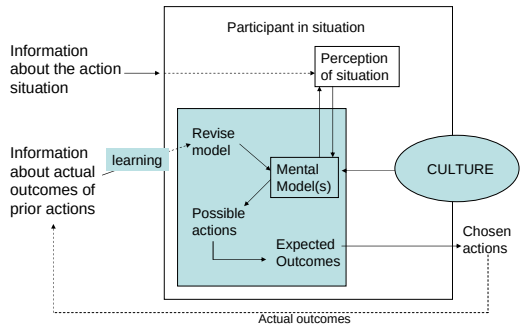
Extending rational choice

- Modelling how participants acquire, process, represent, and use information
- Modelling how participants value actions and outcomes
- Modelling the processes participants use (maximizing, satisficing or using diverse heuristics) to select particular actions or strategic chains of actions in light of their resources

Information processing and mental models

- Due to individual limits on cognitive capacity in pursuing goals, analysts may have to assume bounded rationality rather than full information
- Mental models develop and change from
  - Feedback from the world
  - Shared culture/ belief system
  - ---
- See next slide

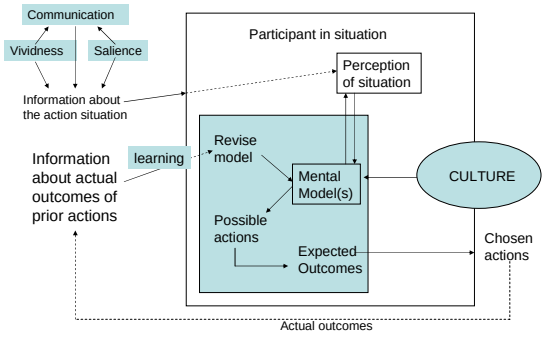
Information, action-outcome linkages, internal mental models



Differences in mental models

- Number of participants large
- Situation is complex
- Situation change frequently or participation is infrequent
- Externally induced need for increased performance
- Information is costly
- Information processing capabilities limited
- Errors of perception
- Errors in understanding a complex structure
- Errors in prediction
- Each participant may choose among several models of
- the situation
  - What determines the choice? Paying attention is costly.
  - See next slide

Impact of communication, vividness and salience



Change in mental models

- Disproportionate information processors (information and decision making do not link directly to output)
- Adaptive strategies and information do not match
- The inner cognitive and emotional architecture of the brain is "showing through" in responding to information
- Change in human institutions tends to be conservative but is subject to occasional large punctuations: "punctuated equilibrium"
- Internal models tend to be stable, until some event triggers a large change
- Rules and routines may help to structure a situation so as to increase the likelihood that individuals will share a mental model of the situation

Valuation processes

- Why trust and reciprocity?
- Why other-regarding preferences and norms backed by emotions (pride, guilt, shame, anger)?
- Why the consistent differences in response to the same conditions?
- Special neural/ emotional reactions to cooperative behaviour is documented
- The dark side of reciprocity and emotional actions: envy, vengeance, and desire to dominate
- Intrinsic motivations are increased if subjects feel self esteem and self determination is enhanced
  - External interventions crowd out intrinsic motivations if they are perceived as controlling
  - Extrinsic interventions crowd in intrinsic motivations if they are perceived as supportive
- People must be expected to differ in the ways they value trust, reciprocity, the welfare of others, equity, etc.

The selection process

- Heuristics studied
  - Measured reaction (subjects seemed to follow this)
  - Grim trigger (after discussions this was rejected)
- Inherent problems of inference in studies of "black boxes" by observing external behaviour
- Eight heuristics tested with variable time constraints, based on cue- values
  - LEX the lexicographic strategy ("take the best")
  - LEX-semi (small differences are not ranked)
  - EBA elimination by aspects
  - Features highest no of good features
  - ADD highest sum of cue values
  - LEX-ADD LEX-semi used to select two alternatives, ADD to choose one
  - PROS highest no of "pros" (as in pro&contra)
  - WADD weighted ADD
- LEX do very well compared to an optimised regression approach

Variety and complexity

- The diversity of assumptions must be consistent with deeper more general patterns of human behaviour
- Need to understand how specific situations trigger internal models for selecting actions and valuing outcomes
- Humans are fallible and learning
  - With complex motivations including narrow self-interest, norms of proper behaviour and other-regarding preferences
- Institutions matter!

Collective action and social dilemmas

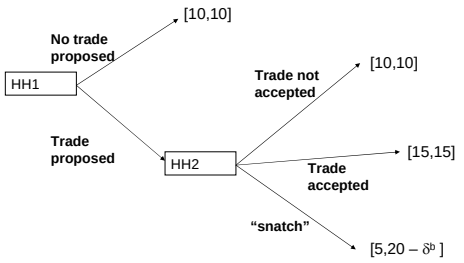
- Also outside the market there are highly competitive situations where rational choice theory applies (voting, legislative decisions)
- Engagement in collective action to overcome social dilemmas is not among these
- Behaviour in social dilemmas needs much better explanations
  - Evolution of norms for trust, other-regarding preferences
  - Rules regulating norms: e.g. backing good or counteracting bad reciprocity

Norms

- Norms in formal theory is currently problematic but not inherently impossible
- Norms are individual beliefs about permitted, prohibited or possible actions or outcomes in particular situations
- Snatch game with norms
  1. Utility of HH2: $U_2 = \pi_2 - \delta^b$
  2. π_2 = payoff obtained by HH2
  3. $-\delta^b$ = decrease in the value of π_2 due to breaking of norms
- This means that not only presence of norms but also strength matters to behaviour

The "snatch" game with norms

Is δ^b >5 or <5 ?



Heterogeneity

- Heterogeneity of norms
  - Individual variations
  - Situational variations
- Strength of norms
  - Socialization
  - Type of community
  - Institutional backing or counteracting
- Saints, conditional cooperators, sociopaths
  - Cooperators need to be able to find each others
  - Spatial and/ or institutional clustering
- Institutions matter!

Evolution of norms I

- Model: individuals inherit strategies, individuals with more successful strategies have a higher rate of reproduction and increase in frequency in the next generation
  - Good at face recognition
  - Good at detecting cheating
  - Keep internal accounts of goodwill and threats
  - Deontic reasoning (permitted, prohibited or proscribed) looks for cheating and violations
  - Reasoning about what is true or false looks for confirmation
  - Good at learning language

Evolution of norms II

- Language represents a new way of inheriting strategies: "genetic change ceases to be the main basis of change: history begins" (Maynard Smith and Harper 2003:140)
  - Good at learning norms and rules
  - Cultural and situational variations
- Norm of reciprocity is often (always?) present
  - Reward cooperation
  - Punish defectors and those who donot punish defectors

Indirect evolutionary approach to adaptation through experience

- Model: players receive objective payoffs but make decisions based on the transformation of these material rewards into their own intrinsic values. Over a generation the intrinsic values are adjusted in the direction of the objective payoff
- With full information or knowledge of past history of the players rational egoists will not survive in an indefinitely played game
- With no information and many players rational egoists will dominate
- Known probabilities of trustworthy players or a “noisy” signal (better than random) of trustworthiness (e.g. from face-to-face communication) may help conditional cooperators to survive in substantial proportions

Next

- The nature of informal institutions:
- Probably the most important aspects of institutions are in peoples heads and exist only because we believe them to be real
- Searle, John R. 1995, *The Construction of Social Reality*, The Free Press, New York