Behavioral Economics

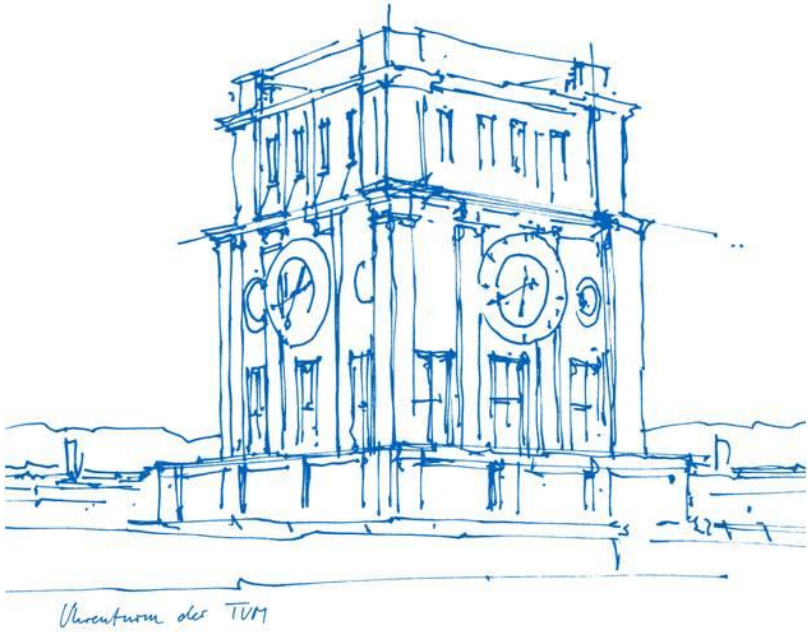
Prof. Dr. Sebastian J. Goerg
Dr. Orestis Kopsacheilis

Technical University of Munich

TUMCS for Biotechnology and Sustainability

TUM School of Management
Department of Economics and Policy

Winter 2023/24



Semester Plan

Course Overview

I. What is Behavioural Economics
II. Principles of Experimental Economics
III. The Standard Economic Model: Consumer Theory
IV. Reference dependence & departures from the standard model
V. Decisions Under Risk and Uncertainty(I & II)
VI. Intertemporal Choice
VII. Interaction with others: Game Theory
VIII. Interaction with others: Beh. Game Theory & Social Pref/ces

Today

VIII. Interaction with others: Beh. Game Theory & Social Pref/ces

A. Limited strategic thinking

- P-beauty contest, Level-k reasoning, Cognitive Hierarchy

B. Multiple equilibria and coordination

- Focal points, Schelling's salience, Pareto & risk dominance

C. Social preferences

- Social dilemmas, Conditional Cooperation, Intentions

D. Measuring social preferences in the Ultimatum Game and its variations

- Ultimatum Game, Dictatorship Game, Trust Game

Let’s play some games!

Keynesian beauty contest

Consider a beauty contest where judges are rewarded for selecting the most popular faces among all judges, rather than those they may personally find the most attractive.

"*It is not a case of choosing those [faces] that, to the best of one's judgment, are really the prettiest, nor even those that average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practice the fourth, fifth and higher degrees*."

- Keynes, General Theory of Employment, Interest and Money, 1936

John Maynard Keynes (1883-1946)

P-beauty contest, application: stock market

- You own stock from a company and its price is currently trending upwards.
- You know that its current price is above its fundamental value so it's bound to deflate soon (bubble).
- Bubbles typically burst when stock owners start selling massively.

- You want to sell before it crushes BUT you also don't want to sell while the price is climbing.
- Assume that:
  - You need to make a decision re. when to sell the stock between today and up to 100 days from now.
  - Let D, be the average number of days that other investors choose to delay selling and that the stock keeps on appreciating $\frac{2}{3} * D$.
  - You want to sell as close to $\frac{2}{3}$ times the average chosen by others as then you manage to cash in at the max. value of the stock's price.
- How many days must you wait before you sell?

P-beauty contest, application: stock market

- In keeping with Keynes's analogy, it has been suggested that this kind of game captures the dynamics of real markets and can explain bubbles in stock and real-estate markets.

- Even if all investors know that the market will ultimately crash, and that the unique Nash equilibrium strategy is to exit the market, they might assume that others will continue to buy for just a little while longer.

- As long as individual investors think that they can stay one step ahead of the competition and exit the market just before everybody else does, they will want to continue to buy. In the process, of course, they will drive prices even higher.

P-beauty contest

You are playing this game with your classmates from the Behavioral Economics course. Every student guesses a number between 0 and 100. The winner is the person who will guess the number closest to 2/3 the average of guesses. Please, make a guess by sliding the bar below accordingly.

0 10 20 30 40 50 60 70 80 90 100

Make a guess

→

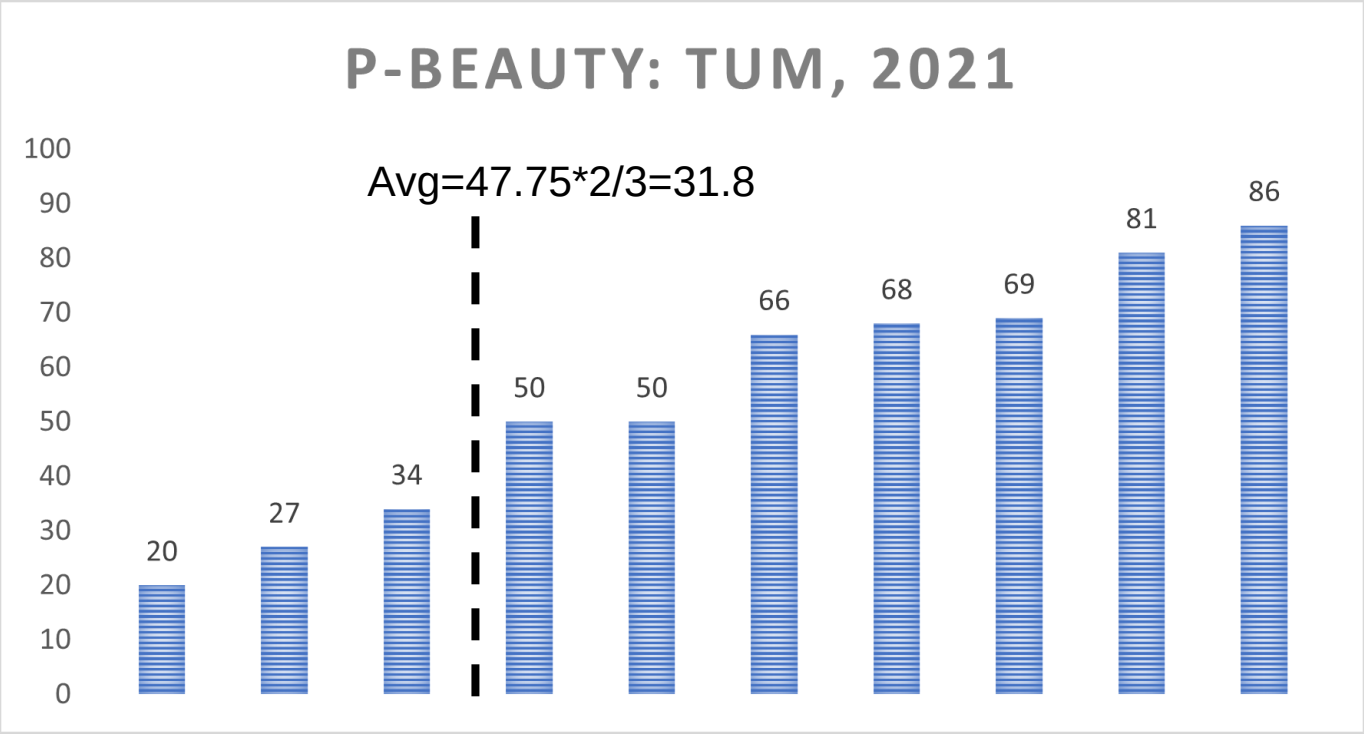
NE: Iterated elimination of dominated strategies

- First, notice that anyone who plays this game strategically (instead of just picking a random number) will likely avoid numbers higher than $100 * \frac{2}{3}$
  - Therefore, any number higher than 66 is strictly dominated by 66.
  - Of course, you may reason that it is unlikely that everyone else waits 100 days. The same principle applies even if you make a different step-1 guess.
  - This is often referred to as **Step 0** of reasoning
- We have assumed common knowledge (everyone knows this and everyone knows that everyone knows this…), so everyone expects that everyone will pick a guess ≤ 66.
- **Step 1** of reasoning: Since no one is expected to wait for more than 66 days, all guess higher than $\frac{2}{3} * 66 = 44$ are strictly dominated by 44…
  - We say that a strategy to wait more than 44 days is one step dominated by a strategy to wait 44 days.
- But the reasoning doesn't stop there. If you believe that no one will ever play a one-step dominated strategy then…

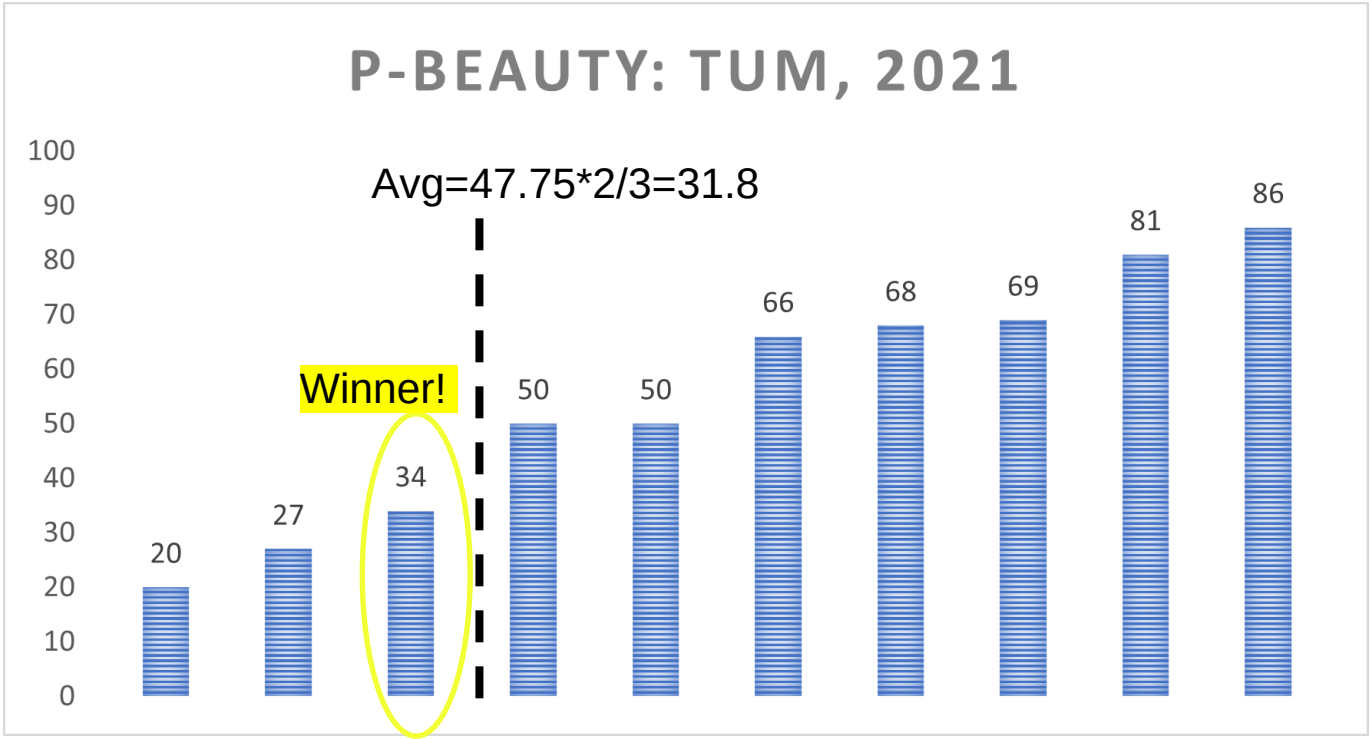
NE: Iterated elimination of dominated strategies

- **Step 2**: 44 is now the new upper boundary, so guesses higher than $\frac{2}{3} * 44 = 29$ are two-step dominated by a strategy to wait 29 days
- **Step 3**:…2/3*29=19.3
- .
- .
- .
- NE= wait 0 days. Therefore, according to formal theory, only one strategy survives iterated deletion of dominated strategies: 0 (i.e. selling today).
- Is this what people do?

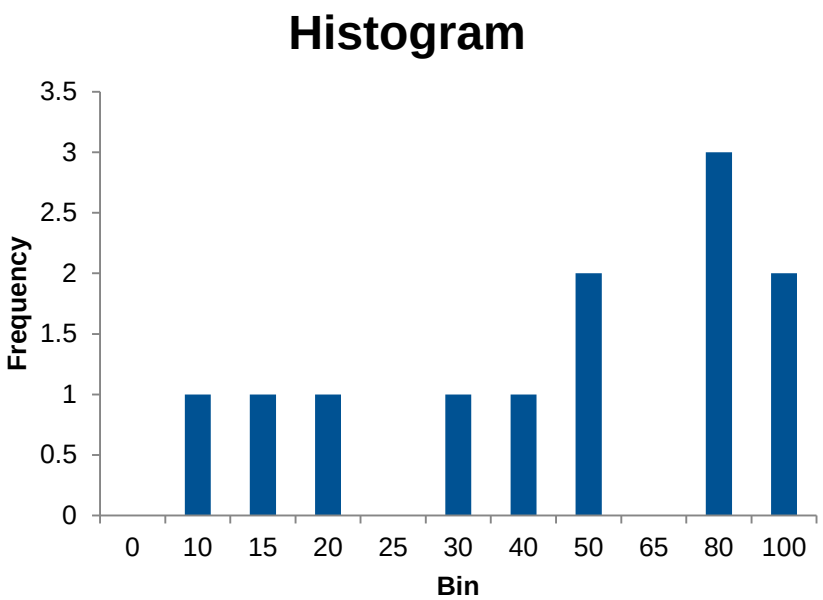
Results from p-beauty (p=2/3) contest, TUM, 2021



Results from p-beauty (p=2/3) contest, TUM, 2021

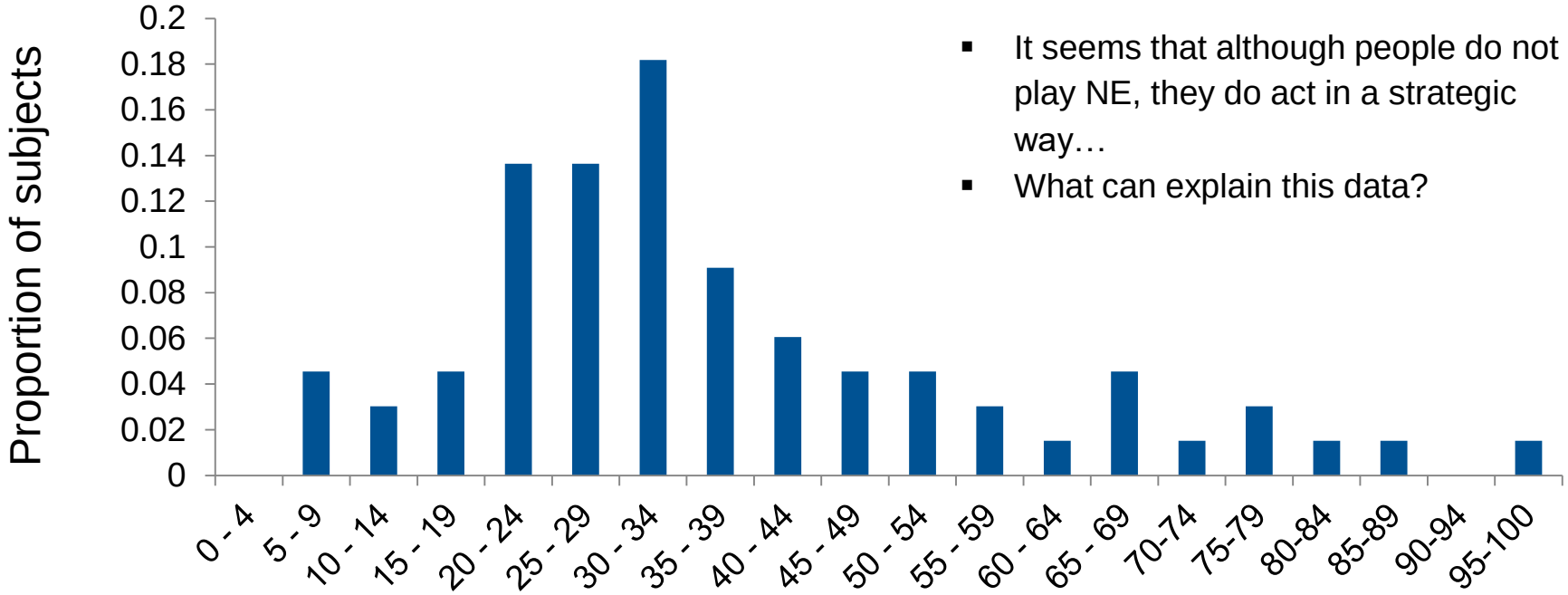


Results from p-beauty (p=2/3) contest, TUM, 2021



1. Some people said more than 66 (a strictly dominated strategy)
2. No-one said 0.
   - Does this mean that people were wrong?
   - In order to win, it's not enough that you understand how to "solve" the game for its NE. It is also important to understand what others think.

P-beauty-contest (p=2/3) responses in Nagel, 1995



- It seems that although people do not play NE, they do act in a strategic way…
- What can explain this data?

Level-k thinking

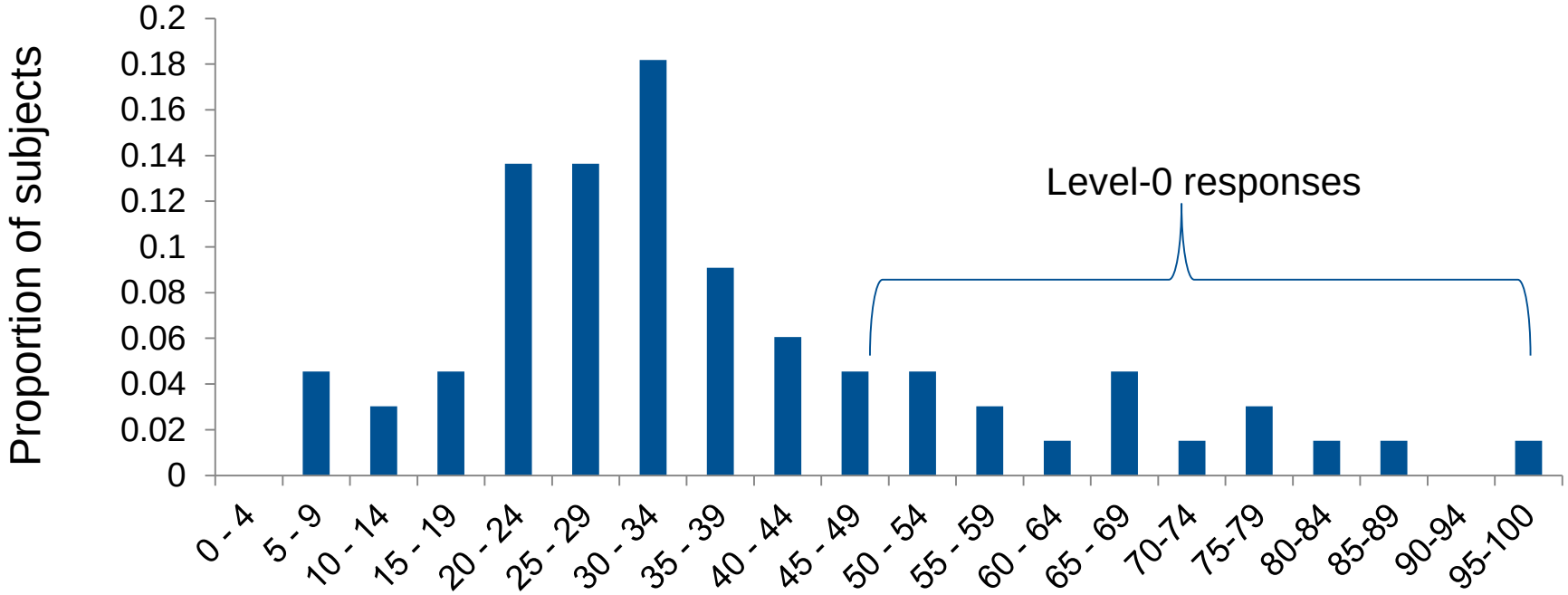
- A theory of limited strategic thinking (Stahl and Wilson, 1995; Bacharach and Stahl, 2000)
- Basic idea: someone forms an expectation of what others will do and tries to reason ‘one step ahead of them’.
- Level-0 type: chooses a number randomly
- Level-1 type:
  - Thinks that everyone is Level-0, so the average number must be 50.
  - Takes the 2/3 of that average: 33
- Level-2 type:
  - Thinks that everyone else is Level-1
  - Takes the 2/3 of 33= 22
- Level-3 type: 2/3 of 22 ≈ 14

...

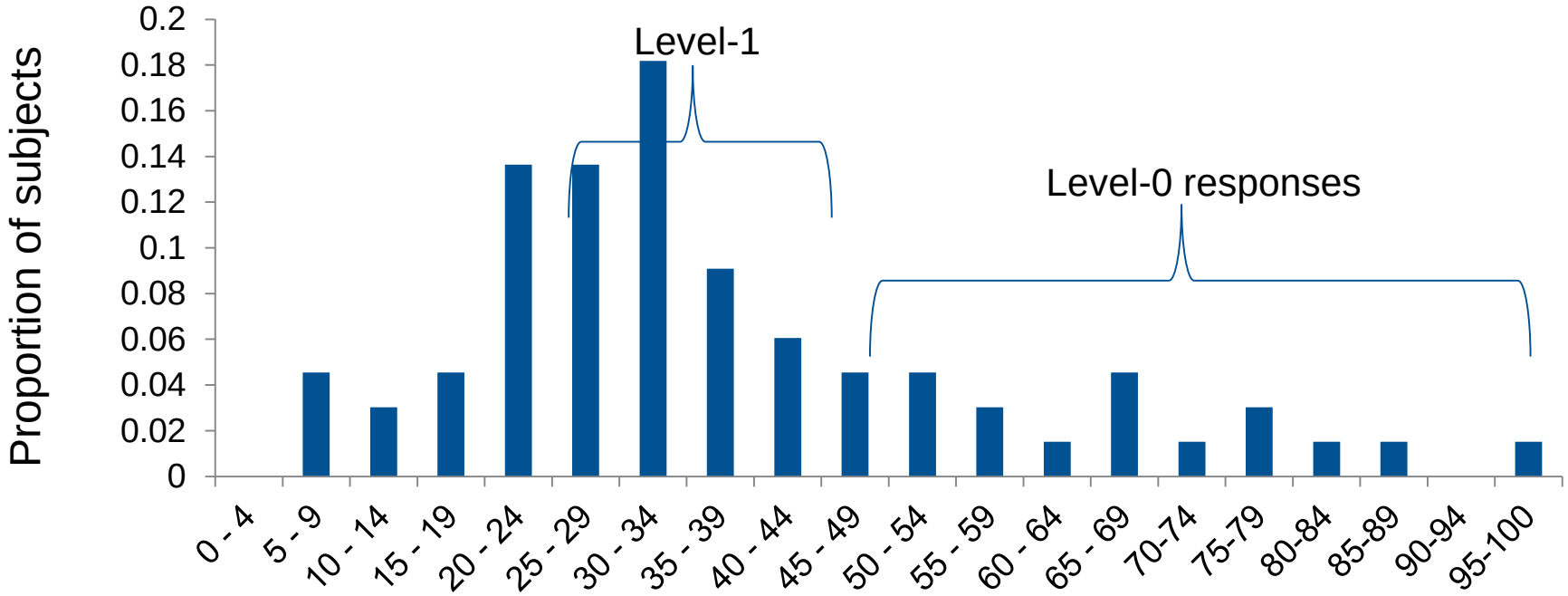
Level-k thinking

- Level-k: thinks that everyone is reasoning at k-1 level.
- The Nash equilibrium of this game, where all players choose the number 0, is thus associated with an infinite level of reasoning.
- Empirically, in a single play of the game, the typical finding is that most participants can be classified from their choice of numbers as members of the lowest Level types 0, 1, 2 or 3, in line with Keynes' observation.

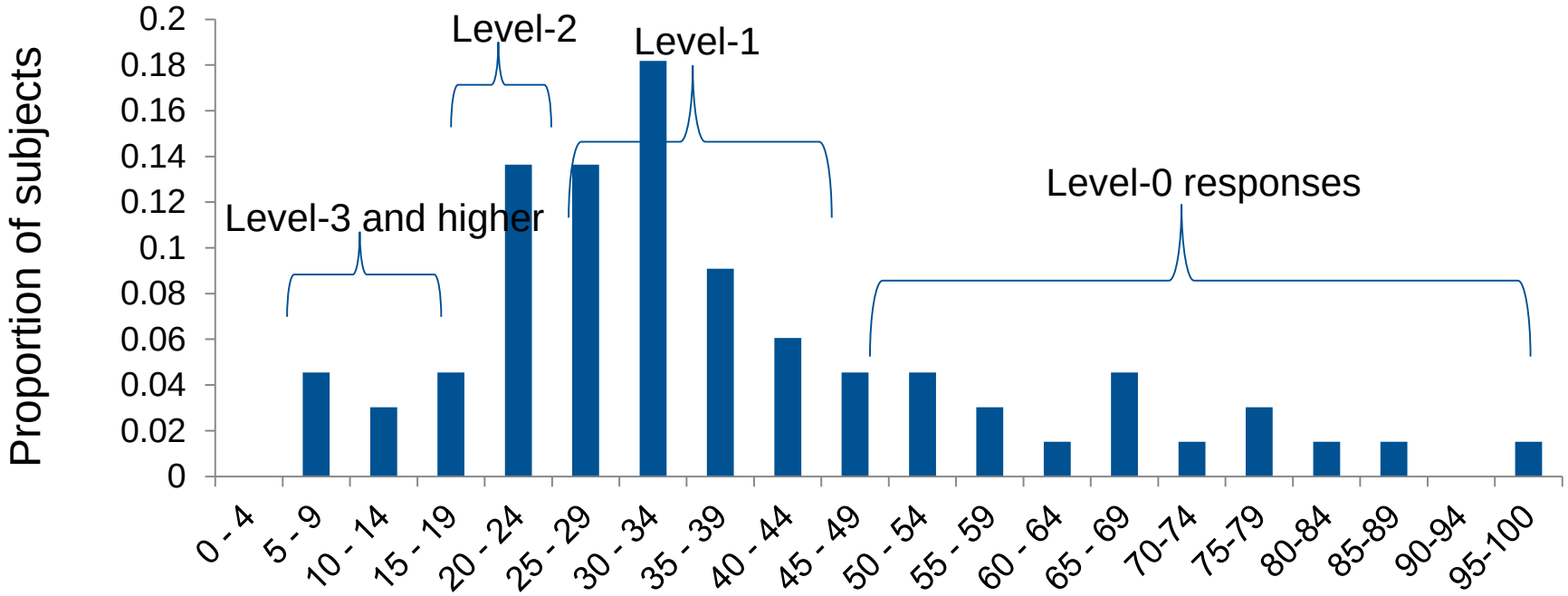
Beauty-contest (p=2/3) responses in Nagel, 1995



Beauty-contest (p=2/3) responses in Nagel, 1995



Beauty-contest (p=2/3) responses in Nagel, 1995



Level-k, Criticism 1: What do Level-0s do?

- What do Level-0 players do?
- In our example earlier we assumed that Level-0 picks a number randomly.
- This is a crucial assumption as Level-1 types base their expectations on that and by extension, all predicted types after that…
- But other possibilities are also possible
- It has been suggested that Level-0 pick focal strategies (in this case numbers).
- Focal point: something that stands out... In this case, round numbers like 50 or 100…
- Another suggestion is that Level-0 play the NE…
- Level-k theory gives different predictions depending on what we assume as Level-0 behavior.
- That's a problem…

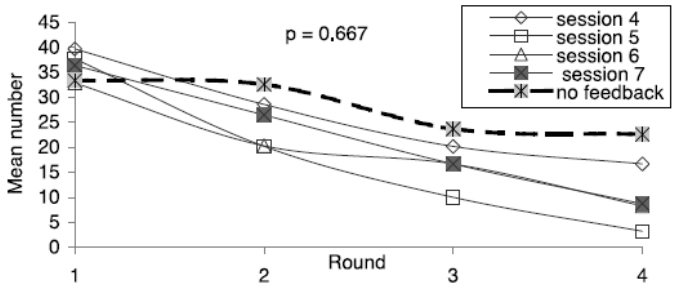
Self-reports vs. Observed behaviour

- This is a comment on the methodology of experimental economics.
- Remember, in the last slide we asked “what motivates Level-0 reasoners?”
- Notice, we cannot know just by observing the data. All we see is a number per person. Intensions are inferred. We cannot look inside participants brains.
- Therefore, there is no way to tell for sure if someone who said “22” picked a random number (Level-0) or exercised a level-2, k-reasoning. Moreover, we cannot tell if someone who picked “50” did so because that number was standing out or because he picked a number at random.
- Asking is one option but economists are sceptical about it for several reasons.
- One reason is that these strategies may be sub-conscious and people cannot describe them.
- Another reason is that self-reports cannot be monetarily incentivised in incentive-compatible way. So, people may “lie”. For example, if we ask how altruistic they are, people might say “very much”. But, will they contribute to a charitable cause if endowed with money, or will they keep all to themselves?
- With technology advancements, we can make some progress in this direction (e.g. mouse-lab, eye-tracking technology, f-MRI scans…).

Level-k, Criticism 2: lack of sophisticated beliefs

- Remember, a level-k type thinks that everyone else is level-(k-1) thinkers.
- Beliefs become increasingly implausible as k gets higher…
- For example, a Level-3 reasoner would expect that the average in the p-beauty contest (p=2/3) would be close to 10… This is very low...
- Perhaps, a more plausible idea, is that a Level-k reasoner would think that there is a distribution of types. Some are Level-2, some are Level-1 and some are Level-0.
- This is the idea behind the Cognitive Hierarchy Model (Camerer, Ho and Chong, 2004)

Repetition in the p-beauty contest



The mean number chosen when playing a p-beauty contest four consecutive times, for each of the experimental sessions.

Sources: Nagel (1995) and Weber (2003).

- Sessions 4-7: participants were given feedback about the winning guess after each round.
- Most people guessed too high initially and adjusted downwards in ensuing rounds, approaching in some cases the NE.
- Interestingly, there was some learning even in the “no-feedback” condition, suggesting that deliberation alone can provide learning effects.

Today

VIII. Interaction with others: Beh. Game Theory & Social Pref/ces

A. Limited strategic thinking
- P-beauty contest, Level-k reasoning, Cognitive Hierarchy

B. Multiple equilibria and coordination
- Focal points, Schelling's salience, Pareto & risk dominance

C. Social preferences
- Social dilemmas, Conditional Cooperation, Intentions

D. Measuring social preferences in the Ultimatum Game and its variations
- Ultimatum Game, Dictatorship Game, Trust Game

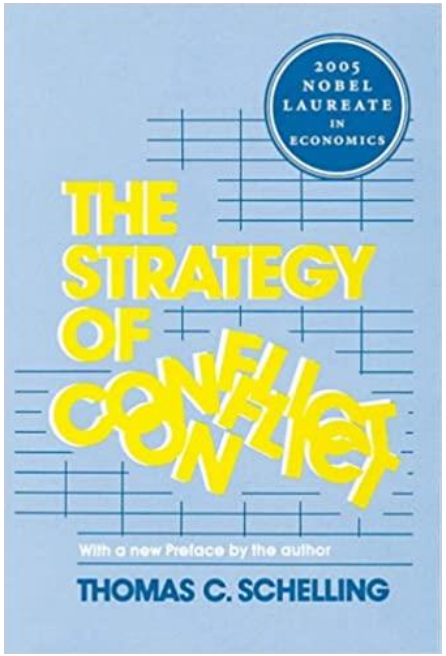
Strategic thinking in pure coordination games

- Consider again the p-beauty contest, but this time, the winners are those who choose the most popular answer.
- This is a pure coordination game. Remember from last lecture the café-coordination game and the “which tire” problem.
- According to standard theory, the NE are as many as the strategies in the game: {0,1,…,…100}
- Without the ability to communicate, it might seem pretty hopeless to coordinate.
- Should one choose a strategy completely at random or are there ideas that might improve chances of win (coordination)?

Focal points and Schelling's salience

- Common finding: players of one-shot coordination games are way more successful than classical game theory predicts. Why?
- Thomas Schelling *(The Strategy of Conflict, 1960)* asked people to imagine that they had to meet someone in New York, but are unable to communicate with that person.
- Where should they go in the hope of meeting?
- New York is a big city, so this seems like a difficult problem but most people named the same place: ***Central Station***

*Central Station is a **focal** place for coordination. But what makes a place focal?*



Salience

- **Primary salience** hypothesis: people choose the option that is most salient to them. Because people are in many ways similar (e.g. often share cultural background, etc.) people coordinate by accident. Under this hypothesis, people coordinated in Grand Central Station, because that's their favourite place in NY

- **Secondary salience** hypothesis: people expect others to use primary salience and so choose the option they think will have primary salience for others. For example, your favourite place in NY might be the Museum Of Modern Art (primary salience). But, you recognise that your taste is not the most popular and choose the Central Station instead, that you recognise as a more popular destination for most other people.

- **Schelling salience** hypothesis. The Schelling salience hypothesis is that people ignore what is primary or secondary salient and look for some key or clue to how to coordinate. For example, Grand Central Station may not be the favorite place of anyone, but somehow stands out as the best choice

Salience, level-k and team reasoning

- Secondary salience is a lot like L-1 reasoning in level-k theory where Level-0 assumes that people choose according to primary salience (no strategic thinking).

- Schelling salience differs. There, the individual asks to himself ‘What should we do as a team?’ and acts upon the answer in the expectation that other members of the group think and behave analogously. In other words, people ignore what is primary or secondary salient and look for some key or clue to how to coordinate. This idea has been formalised using the concept of *team reasoning* (Sugden, 1993; Bacharach, 1999).

Salience, level-k and team reasoning

- Mehta, Starmer and Sugden (1994):
  a. Write down any year, past, present, or future
  b. Write down any positive number

- Condition 1: No incentive to coordinate
- Condition 2: Incentivised to match others responses

- Idea: the answers of those with no incentive to match should tell us what was primary salient.
  - If people use primary salience to coordinate then responses between “no incentive to match” and “incentive to match” should not be very different.
  - If people use secondary salience, then popular answers from the unincentivized condition would become focal in the “incentivised to match” condition.
  - If people use team reasoning, then the coordinating answer will not necessarily have primary salience

Table 6.4 The answers subjects gave, and the proportion giving each answer, to two questions. The answers depend on whether the subjects did or did not have an incentive to match with others.

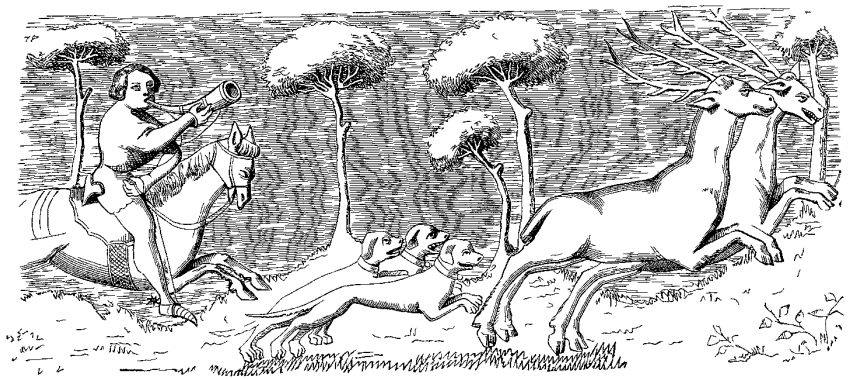
Question	*No incentive to match*		*Incentive to match*	
	Response	*Proportion*	*Response*	*Proportion*
'Write down any year'	1971	8.0	1990	61.1
	1990	6.8	2000	11.1
	2000	6.8	1969	5.6
	1968	5.7		
'Write down any positive number'	7	11.4	1	40.0
	2	10.2	7	14.4
	10	5.7	10	13.3
	1	4.5	2	11.1

Source: Mehta, Starmer and Sugden (1994).

- People don't use primary salience to coordinate: The variance of responses is much higher in the unincentivized condition.
- It seems that an ability to coordinate can come from either secondary salience or Schelling salience. Which fits better seems to change depending on the context.
  - Answers in the "year-question" seem to favour secondary salience: the coordinating response "1990" was among the most popular picks in the no incentive condition but…
  - the "number-question" is suggestive of team reasoning as "1" was among the least popular responses in the "no incentive" condition

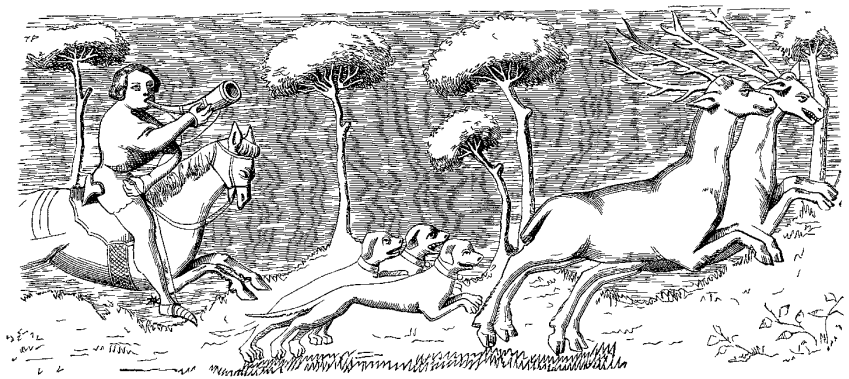
Payoff dominance

		Player 2	
		Stag	Hare
Player 1	Stag	100,100	0,0
	Hare	0,0	80,80



Payoff dominance

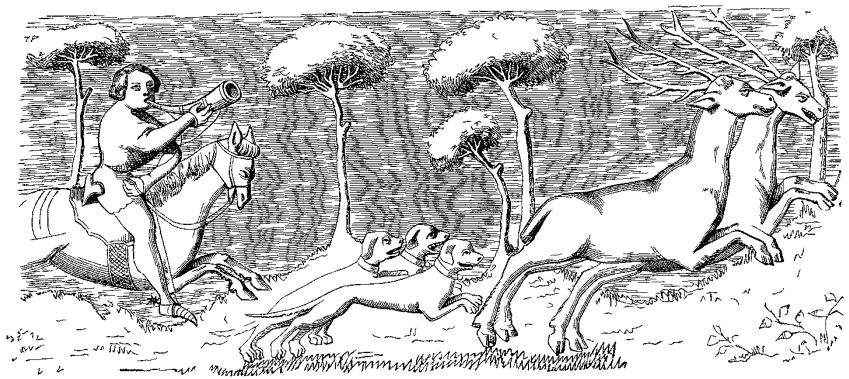
		Player 2	
		Stag	Hare
Player 1	Stag	100,100	0,0
	Hare	0,0	80,80



- NE in pure strategies: (Stag, Stag) and (Hare, Hare)
- (Stag, Stag) is the payoff dominant Nash Equilibrium

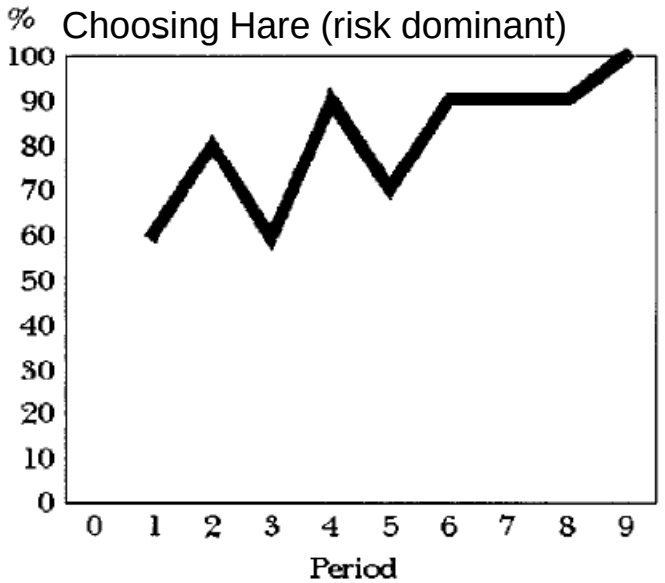
Payoff dominance vs. risk dominance

		Player 2	
		Stag	Hare
Player 1	Stag	100,100	0,80
	Hare	80,0	80,80



- In this form (Hare, Hare) is the risk dominant equilibrium.
- Choosing “Hare” guarantees 80, irrespective of what the other player does.

Empirical evidence for risk dominance



- Stranger's design: new match after every round.
- Initially, people try to coordinate on the payoff dominant outcome.
- But… after a couple of negative outcomes they give up.
- The risk dominant equilibrium takes over.

Interpreting ‘Stag-hunt’

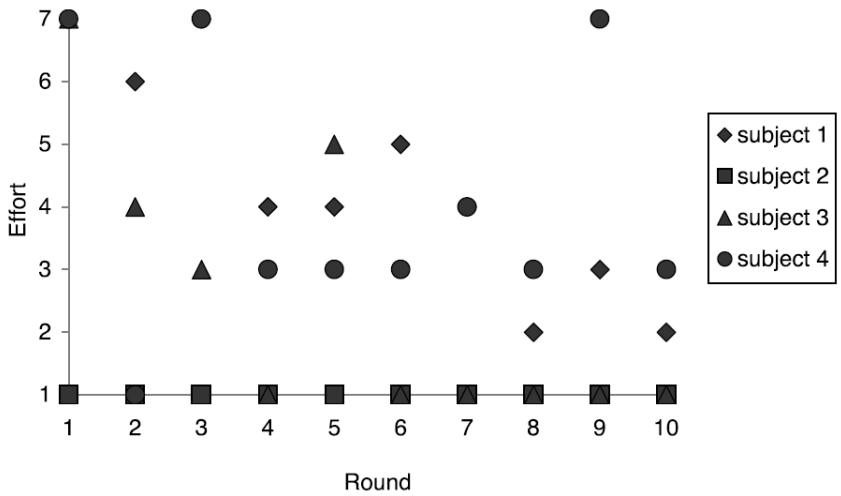
- The rationale behind it is that communal action yields a higher return if all players combine their skills, but if the other player’s intentions to contribute in this team effort are unknown, then going for the payoff-inferior but safer option might be the better individual strategy.
- Message: collective action might fail in the absence of credible commitments.
- Can the result be reversed? Can people coordinate on the payoff dominant equilibrium?

Minimum effort game

Your choice of effort	*Smallest choice of effort in the group*						
	7	*6*	*5*	*4*	*3*	*2*	*1*
7 (high)	13	11	9	7	5	3	1
6		12	10	8	6	4	2
5			11	9	7	5	3
4				10	8	6	4
3					9	7	5
2						8	6
1 (low)							7

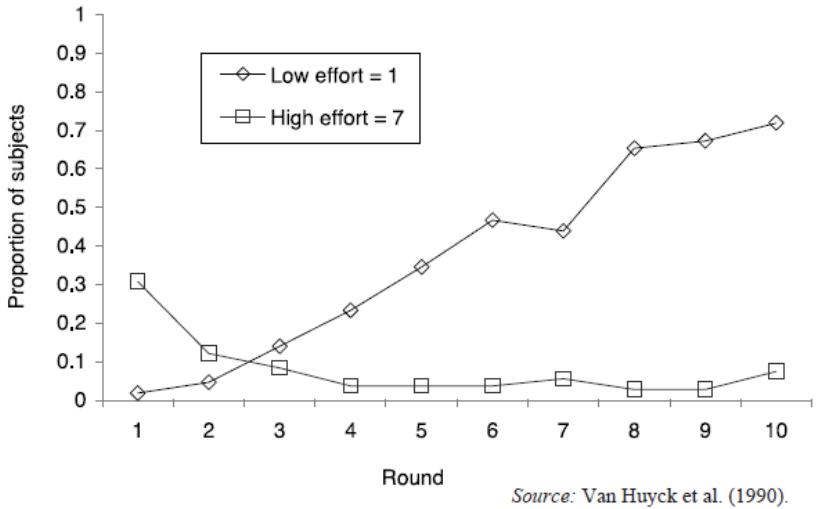
- Introduced by Van Huyck, Battalio and Beil (1990)
- Players choose effort level/ Higher effort is costly
- Minimum effort determines productiveness of team
- 7 pure-strategies NE: where everyone chooses the same effort.
- Ideally, people coordinate on high effort but…
- The safest thing for the individual, however, the risk dominant Nash equilibrium, is to put in low effort. This guarantees a payoff of 7.
- Choosing higher effort is risky because it only takes one member of the group to choose low effort for the high effort to be wasted and costly.

Minimum effort game



- Consider this example from Gillet, Cartwright and Van Vugt (2009).
- A group of 4 is playing the same game for 10 rounds.
- The high effort of Subjects 1, 2 and 3 is going to waste as player 2 always chooses the lowest amount of effort.
- Therefore, player 2 receives 7 while everyone else less than that.

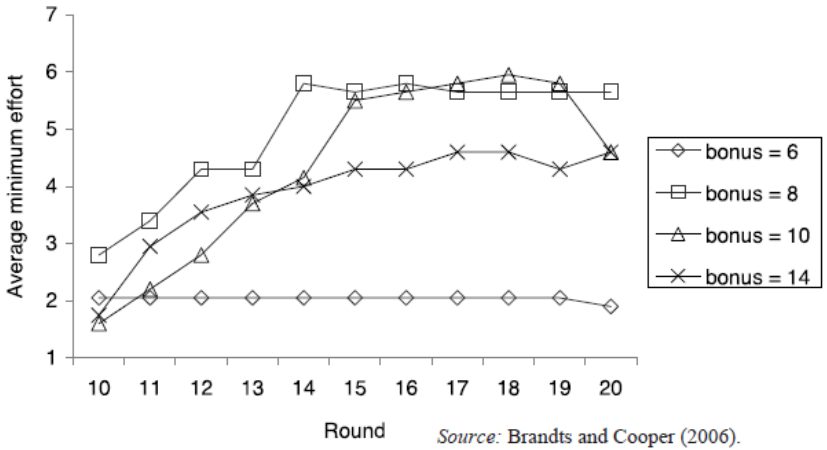
Minimum effort game



Source: Van Huyck et al. (1990).

- The proportion of players choosing the low effort strategy is increasing.
- The proportion of players choosing the high effort is decreasing.
- **Idea**: repeat the experiment but introduce an additional incentive for coordinating in high effort
- You can think of this as a manager stepping in to boost productivity

Minimum effort game – manager's intervention



Source: Brandts and Cooper (2006).

- The manager introduces a bonus for coordinating at the high effort strategy (7).
- Initially, the coordinating bonus was equal to 6 (coordinating at effort level=7 yields final payoff: 7+6=12). So the "bonus=6" condition is the control where no change took place.
- Notice how effort level was always low in the beginning, before the intervention.
- After the intervention effort goes up!

Today

VIII. Interaction with others: Beh. Game Theory & Social Pref/ces

A. Limited strategic thinking
- P-beauty contest, Level-k reasoning, Cognitive Hierarchy

B. Multiple equilibria and coordination
- Focal points, Schelling's salience, Pareto & risk dominance

C. Social preferences
- Social dilemmas, Conditional Cooperation, Intentions

D. Measuring social preferences in the Ultimatum Game and its variations
- Ultimatum Game, Dictatorship Game, Trust Game

What is a social dilemma?

A social dilemma is a situation in which individual incentives are at odds with group incentives. Specifically, individuals have the incentive to free ride, but groups do better when everyone contributes (cooperation problem).

Therefore, a necessary prerequisite is the existence of external effects (positive or negative).

- My action/consumption influences others' payoffs/consumption.

What are examples of social dilemmas?

What is a social dilemma?

A social dilemma is a situation in which individual incentives are at odds with group incentives. Specifically, individuals have the incentive to free ride, but groups do better when everyone contributes (cooperation problem).

Therefore, a necessary prerequisite is the existence of external effects (positive or negative).

- My action/consumption influences others' payoffs/consumption.

What are examples of social dilemmas?

Examples of social dilemmas

- Public goods (streets, bridges, parks, schools, …)
- Common pool resources (natural resources, …)

- Hunting and gathering
- Environmental protection
- Teamwork (e.g., a group project)
- Organizations
- Politics & Voting
- Charities
- ...

Why can‘t a market solve the problem?

Under certain assumptions markets supply an efficient amount of *private* goods.

However, in general private markets do not supply an efficient amount of public goods.

Reason: private marginal benefit ≠ social marginal benefit
(Samuelson 1954, Lindahl 1919).

Why can‘t a market solve the problem?

Under certain assumptions markets supply an efficient amount of *private* goods.

However, in general private markets do not supply an efficient amount of public goods.

Reason: private marginal benefit ≠ social marginal benefit
(Samuelson 1954, Lindahl 1919).

→ If we have to rely on private provision: inefficient undersupply of the public good.

See also:

- Gordon (1954) fishermen; Hardin (1968) pasture : “*tragedy of the commons”*
- Olson (1971): “*problem of collective action”*
- Dawes (1980): “*social dilemma”*

Are the prospects really that bleak?

Prisoners‘ dilemma game as a simple workhorse

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	30$, 30$	10$, 45$
	Defect	45$, 10$	15$, 15$

- Binary choice social dilemma
- Game is played simultaneously and one-shot
- D/D is Nash equilibrium (one-shot game)
- C/C would be socially efficient

Prisoners‘ dilemma game as a simple workhorse

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	30$, 30$	10$, 45$
	Defect	45$, 10$	15$, 15$

- Binary choice social dilemma
- Game is played simultaneously and one-shot
- D/D is Nash equilibrium (one-shot game)
- C/C would be socially efficient

Usual finding: About 40 to 60% of subjects cooperate

BUT: maybe oversimplified?!

Another simple workhorse: VCM

Voluntary contribution mechanism (VCM)

- aka „Public-good game“
- Introduced in the early 1980s by James Walker and Marc Isaac

Usual design in the VCM:

- Groups with *n* members
- Each member has endowment of E “tokens”
- Each group member decides simultaneously about contribution c_i
  - c_i investment in public good
  - private good: $(E - c_i)$
- Payoff function for each group member i:

$$\pi_i = (E - c_i) + \alpha \sum_{j=1}^{n} c_j$$

VCM aka Public Good Game

You are playing this game together with 3 of your classmates. Each of you have been given 100 euros. Every group member has to decide how many euros he or she wishes to contribute to the common pool. Every euro contributed to the common pool gets multiplied by a factor of 2 and gets distributed evenly among group members. Your final payoff is the amount of money you were given in the beginning (EUR100), minus your contribution, plus the returns from the common pool. So for example, if everyone contributes 80% of their initial wealth then each member's final payment would be:
100 - 80 + (4 * 80 * 2)/4 =20 + 160 = EUR180.
How much do you wish to contribute to the common pool?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Select a contribution

What characteristics define a public good?

non-rival (in consumption):

- rivaly means that one's consumption precludes the consumption of another (e.g., ice cream).
- Key difference Public Goods vs. Common Pool Resources is the non-rivalry assumption.

non-excludable (in access)

- excludability means that consumers can be excluded from the benefits of the PG (e.g., pay-tv)

What characteristics define a public good?

non-rival (in consumption):

- rivaly means that one's consumption precludes the consumption of another (e.g., ice cream).
- Key difference Public Goods vs. Common Pool Resources is the non-rivalry assumption.

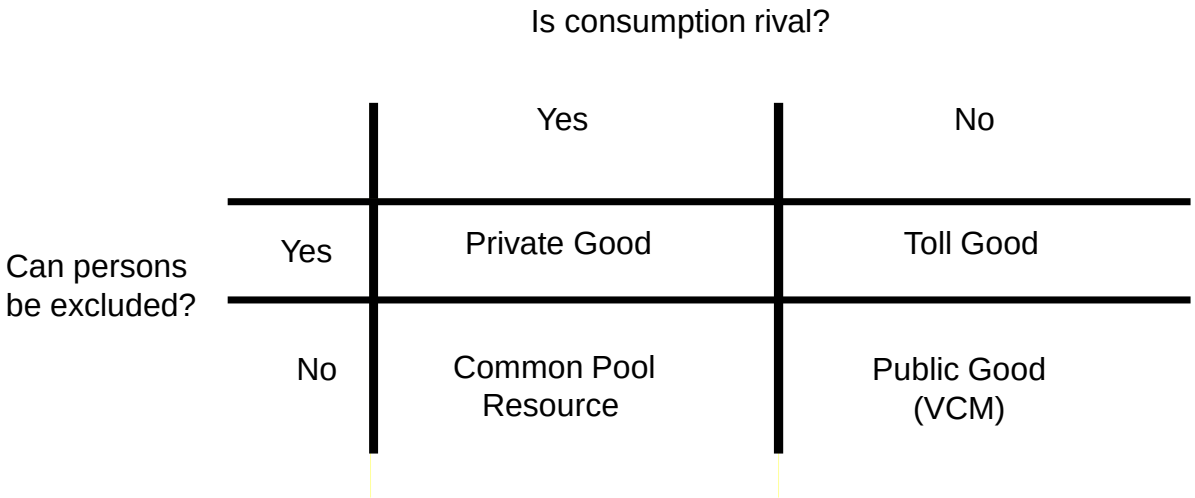
non-excludable (in access)

- excludability means that consumers can be excluded from the benefits of the PG (e.g., pay-tv)

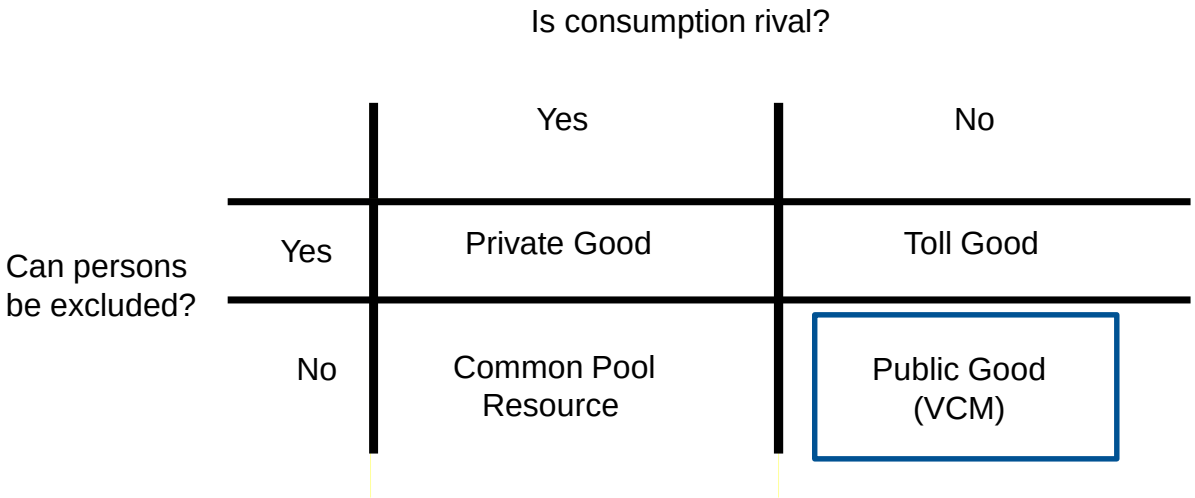
Because of PGs non-rivalry and non-excludability, they are susceptible to **free-riding**. Why?

- Non-excludability is key. People can free ride and enjoy the benefits of the resource without paying any associated costs because they cannot be kicked out of the group of beneficiaries.

Categorizing social dilemmas



Categorizing social dilemmas



The VCM design:

$$\pi_i = (E - c_i) + \alpha \sum_{j=1}^{n} c_j$$

- The MPCR, marginal per capita return, α is the return to an individual from making a contribution to the public account.

- Upper and lower bounds on α for VCM being a public-goods problem (and social dilemma):
  - α<1 : otherwise the “dominant strategy” to allocate all tokens to the public good
  - 1/n < α: otherwise it is socially efficient to keep all tokens because PG is so unproductive
    - if everyone keeps endowment, we end up with a total of nE;
    - if everyone contributes, we end up with n(αnE). Thus, PG is beneficial for the individual

      nαnE > nE
      ⇔ αnE > E
      ⇔ αn > 1
      ⇔ α > 1/n

Usual findings in the VCM

Frequently used parameters: n=4; E=20; α=.4

Standard Prediction: $c_i = 0, \forall\ i$, which implies an inefficient level of contribution!

Do we usually observe this in experiments?

No, initial average contributions are roughly 40 to 60% of the initial endowment

VCM aka Public Good Game

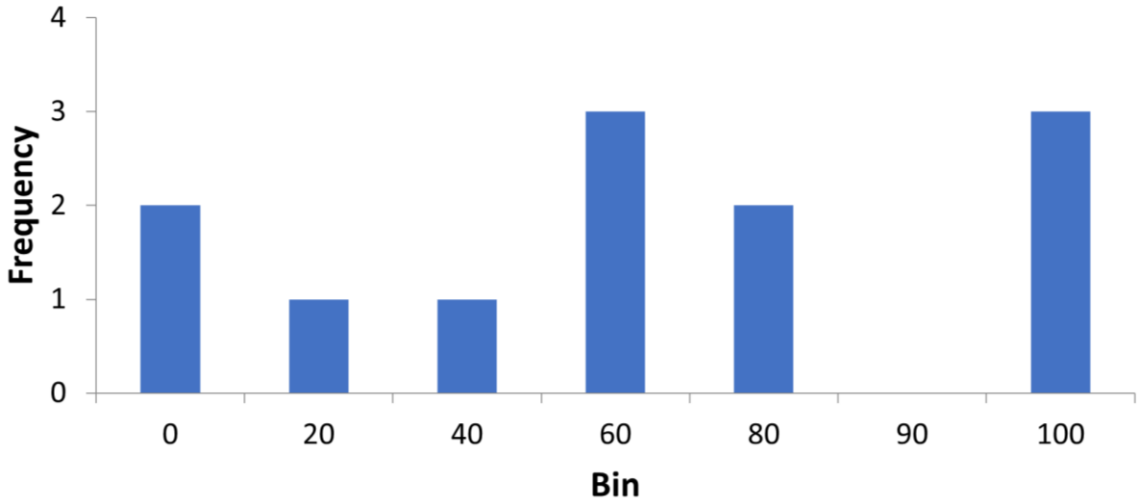
You are playing this game together with 3 of your classmates. Each of you have been given 100 euros. Every group member has to decide how many euros he or she wishes to contribute to the common pool. Every euro contributed to the common pool gets multiplied by a factor of 2 and gets distributed evenly among group members. Your final payoff is the amount of money you were given in the beginning (EUR100), minus your contribution, plus the returns from the common pool. So for example, if everyone contributes 80% of their initial wealth then each member's final payment would be:
100 - 80 + (4 * 80 * 2)/4 =20 + 160 = EUR180.
How much do you wish to contribute to the common pool?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Select a contribution

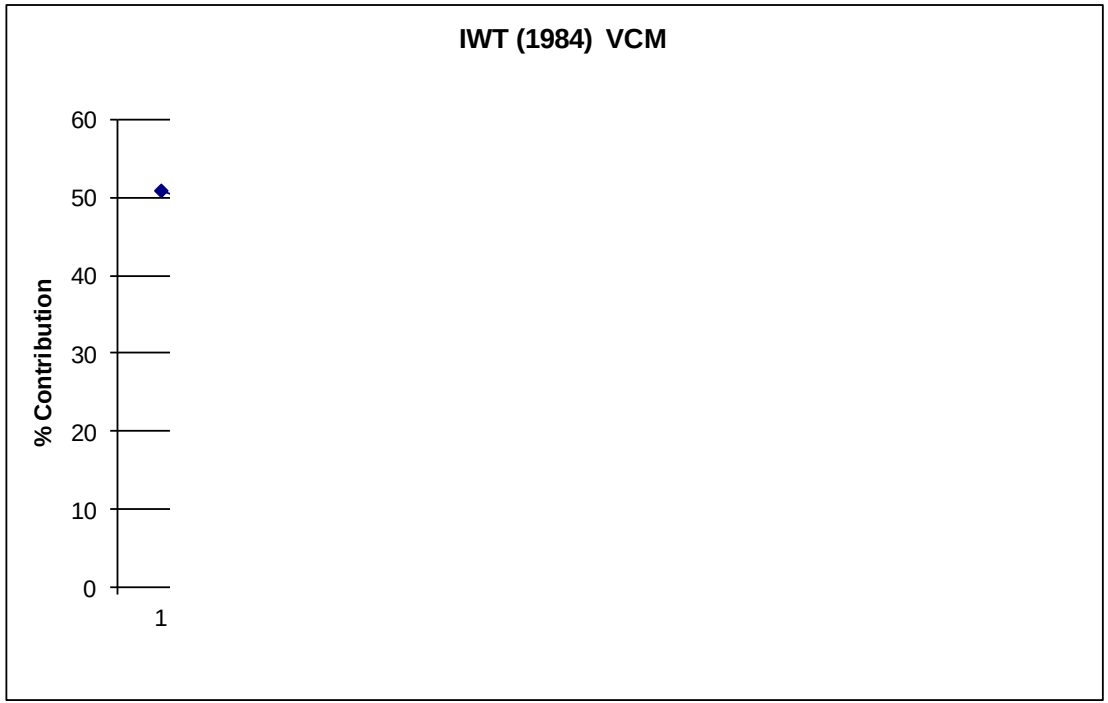
Public Good Game TUM

Typical initial average contributions are 40 to 60% of the initial endowment
In our experiment: average contributions were 54.9%



Results from the first VCM

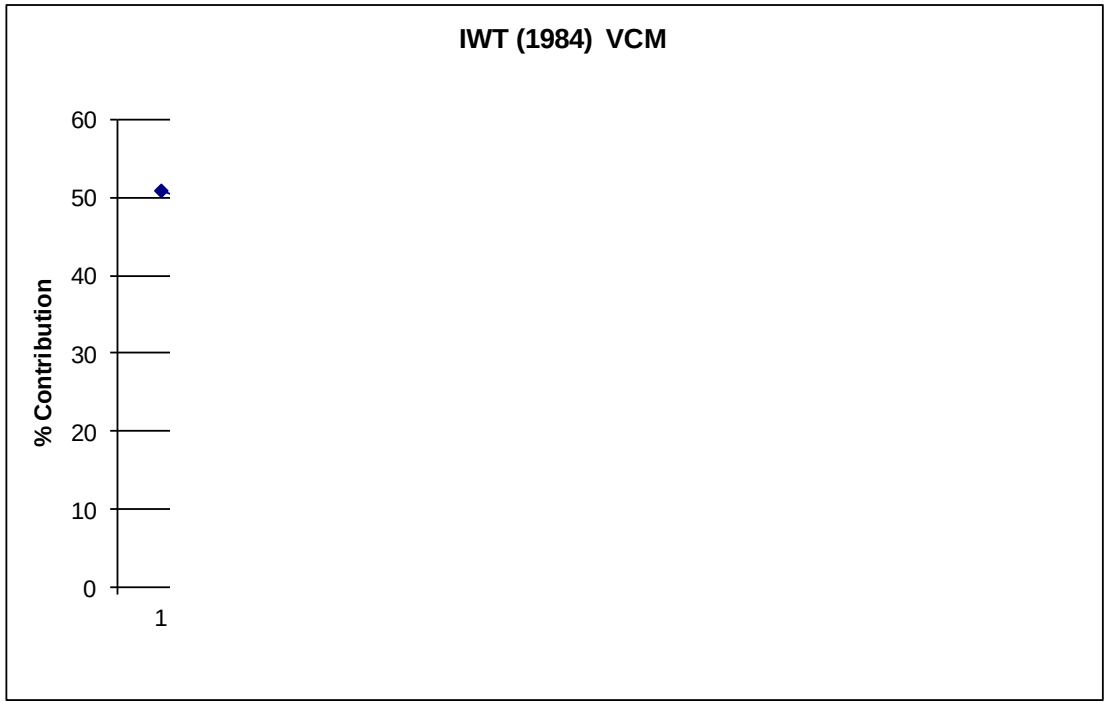
Isaac, Walker & Thomas 1984



Results from the first VCM

Isaac, Walker & Thomas 1984

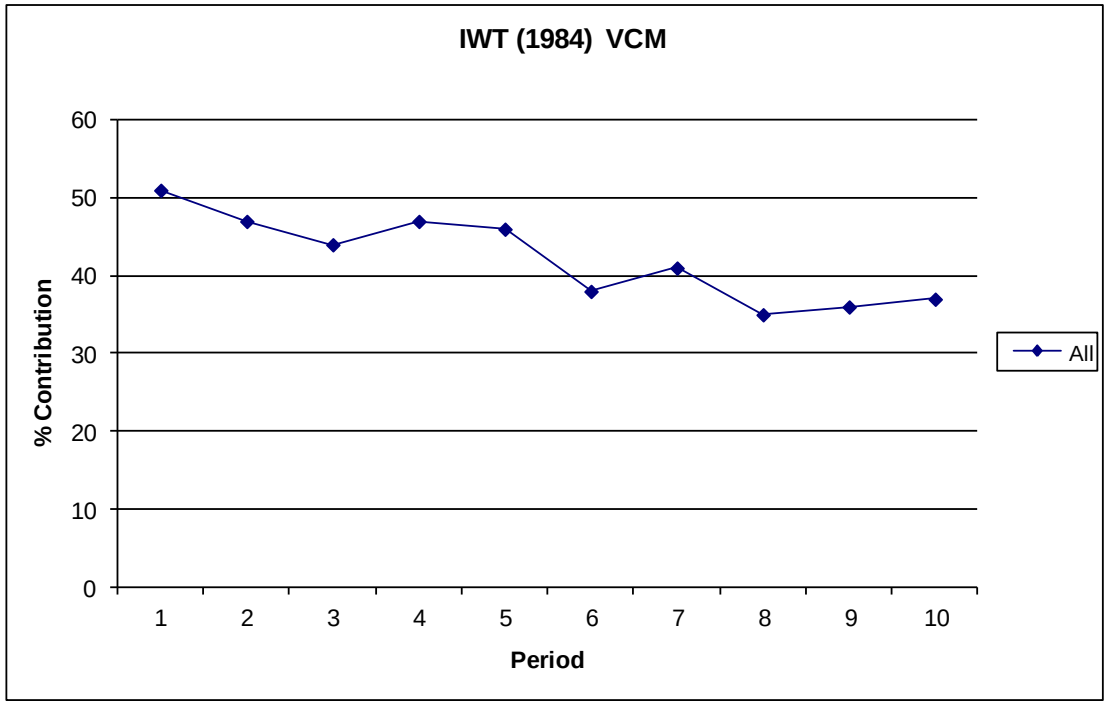
What happens if VCM is played repeatedly? Do they reach equilibrium?



Results from the first VCM

Isaac, Walker & Thomas 1984

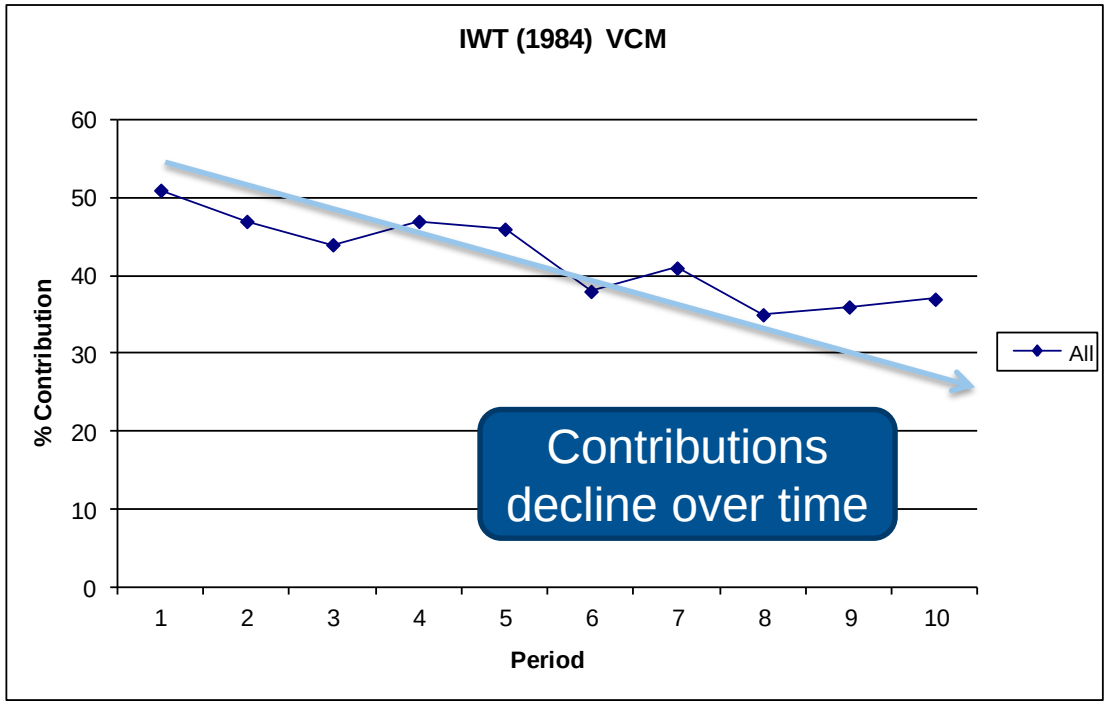
What happens if VCM is played repeatedly? Do they reach equilibrium?



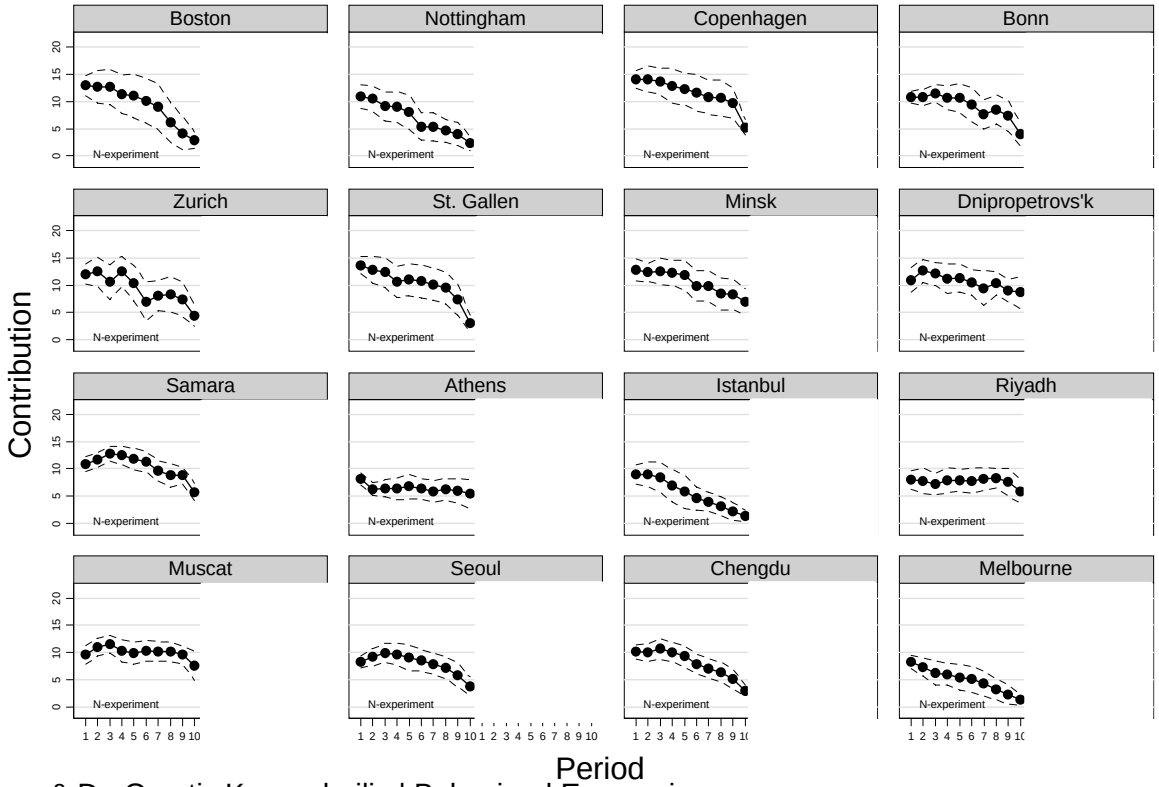
Results from the first VCM

Isaac, Walker & Thomas 1984

What happens if VCM is played repeatedly? Do they reach equilibrium?

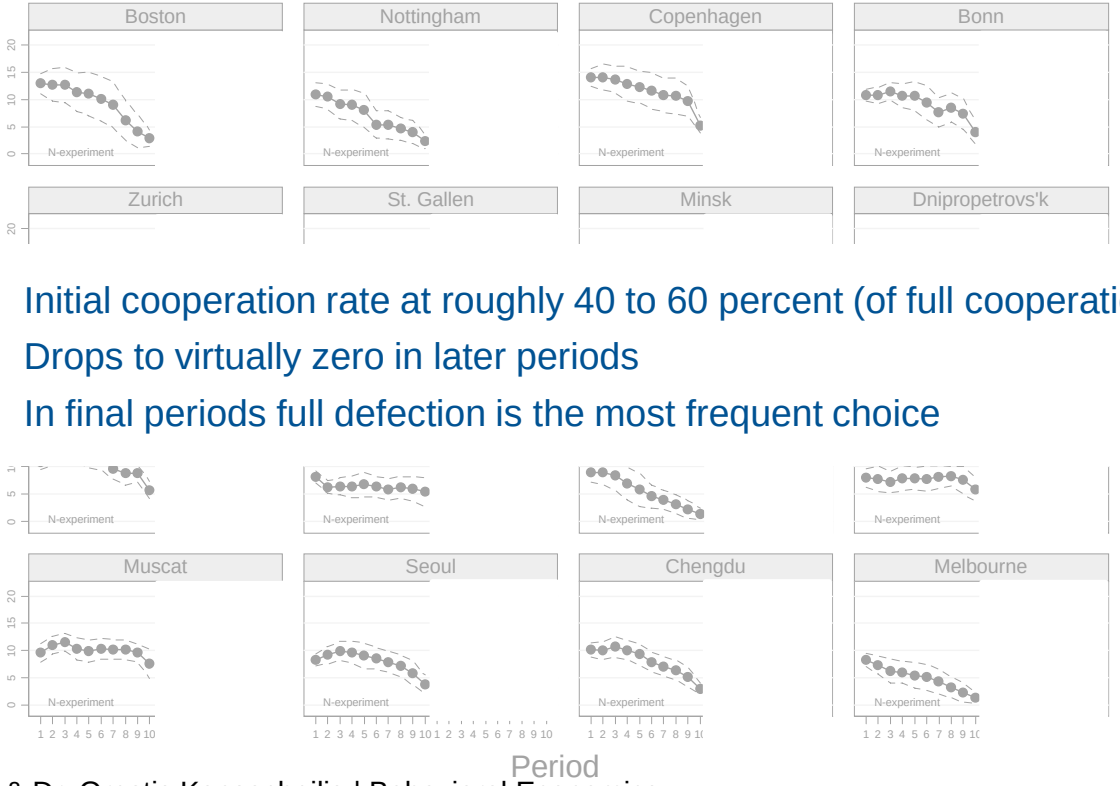


Usual finding in the VCM



Source: Hermann, Thöni, Gächter, Science, 2008

Usual finding in the VCM



- Initial cooperation rate at roughly 40 to 60 percent (of full cooperation)
- Drops to virtually zero in later periods
- In final periods full defection is the most frequent choice

Source: Hermann, Thöni, Gächter, Science, 2008

Why do we observe this contribution pattern?

We observe substantial cooperation in the beginning and a decline of cooperation over time

Why?

Why do we observe this contribution pattern?

We observe substantial cooperation in the beginning and a decline of cooperation over time

Why?

- Maybe the economic standard assumption of self-centered, rational agents is right
  (and thus the Nash prediction of 0-cooperation)

  People…
  - …just make errors (in the beginning)?
  - …just have to learn the Nash-equilibrium point?

Why do we observe this contribution pattern?

We observe substantial cooperation in the beginning and a decline of cooperation over time

Why?

- Maybe the economic standard assumption of self-centered, rational agents is right
  (and thus the Nash prediction of 0-cooperation)

  People…
  - …just make errors (in the beginning)?
  - …just have to learn the Nash-equilibrium point?

- Maybe the assumptions are wrong, and something else is going on in the VCM?

How can we test this?

Do people “learn Nash”?

Andreoni (1988)

Experimental Design:

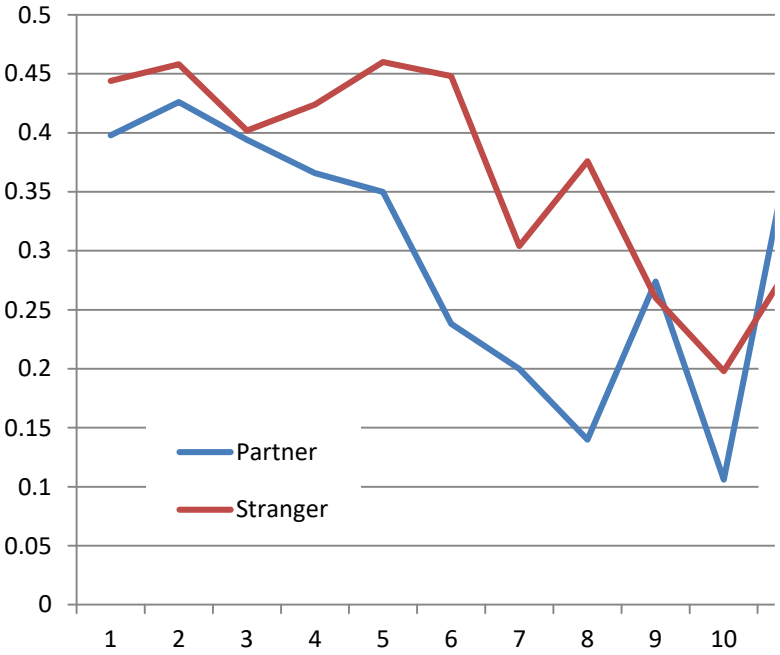
- 10 period VCM
- After period 10 surprise restart of the whole experiment

What does this experiment measure:

- Effect of a surprise restart
- If behavior in the VCM is about learning Nash, subject‘s should behave similar in the period before the restart and directly after

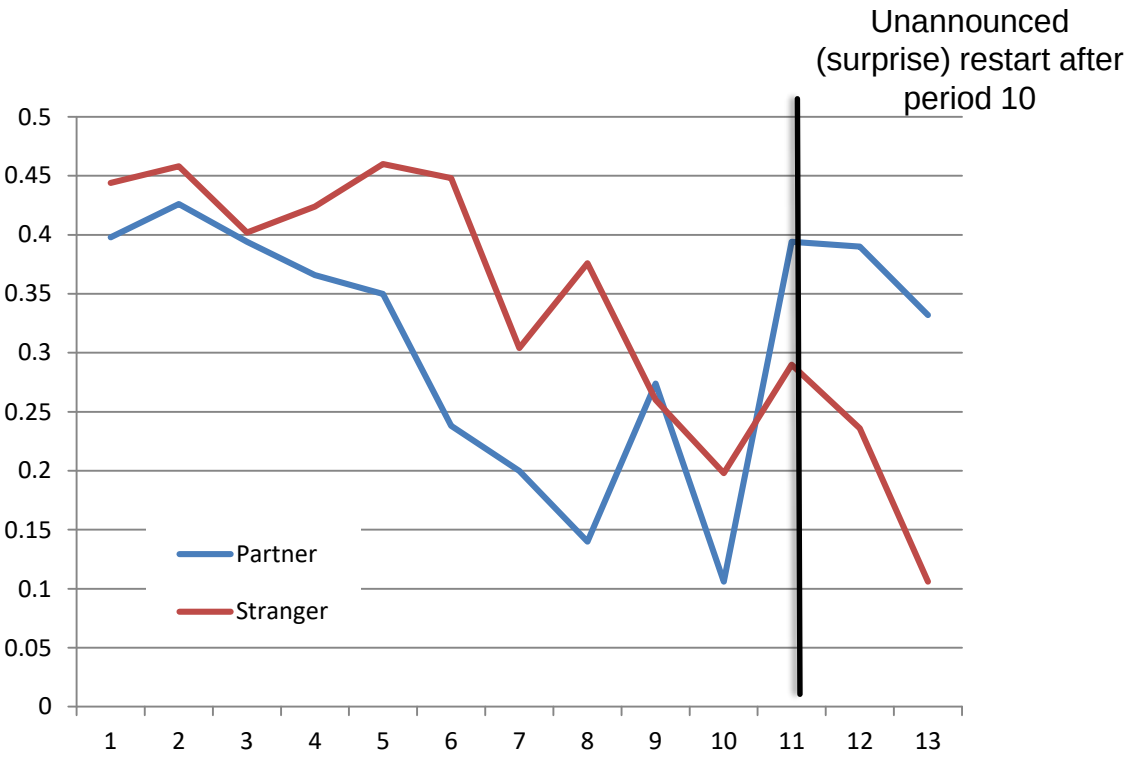
Do people “learn Nash”?

Andreoni (1988)



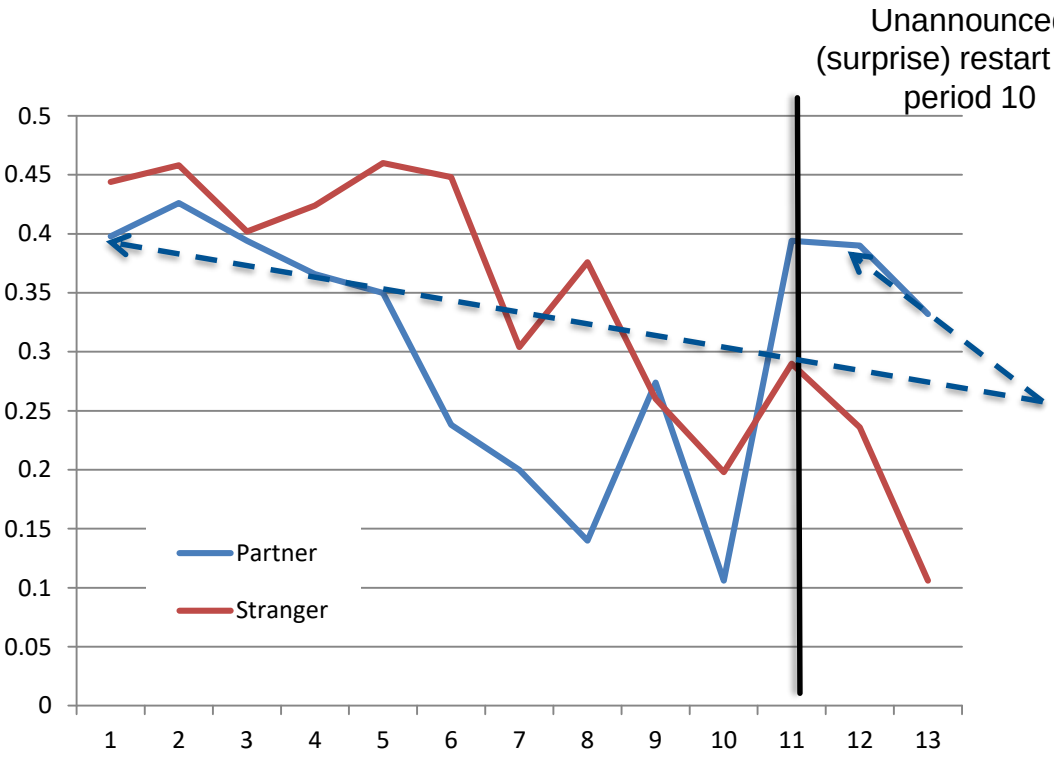
Do people “learn Nash”?

Andreoni (1988)



Do people “learn Nash”?

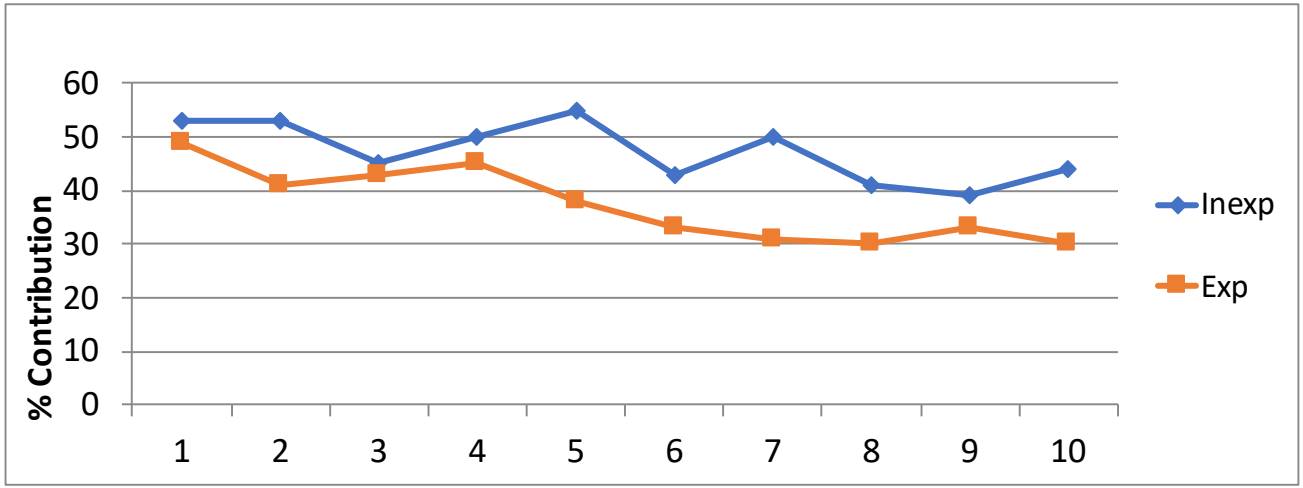
Andreoni (1988)



Contributions almost at initial level after restart → speaks against the learning hypotheses

Do people “learn Nash”?

Isaac, Walker and Thomas (1984)



Experience in the sense of having participated in a VCM before has only a slight level effect, but again we observe a restart effect

Why then do people cooperate?

Maybe not all subjects are self-centered, money-maximizing, rational agents?

- Maybe people care about outcomes and inequality?
  - Fehr and Schmidt (1999, QJE) argue that people have an inequality aversion (advantageous as well as disadvantageous).

$$u_{(\alpha_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\}$$

  - $\boldsymbol{\alpha}$ ≥0 (“envy”), $\boldsymbol{\beta}$ ≥ 0 (“guilt”)

Fehr-Schmidt-Preferences, example Prisoner's Dilemma

$$u_{(\alpha_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\}$$

- $\boldsymbol{\alpha} \geq 0$ ("envy"), $1 \geq \boldsymbol{\beta} \geq 0$ ("guilt")

i / j	C	D
C	a, a	c, b
D	b, c	d, d

→

i / j	C	D
C	a, a	$c - \alpha_i(b-c), b - \beta_j(b-c)$
D	$b - \beta_i(b-c), c - \alpha_j(b-c)$	d, d

Fehr-Schmidt-Preferences, example Prisoner's Dilemma

$$u_{(\alpha_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\}$$

- $\alpha \geq 0$ ("envy"), $1 \geq \beta \geq 0$ ("guilt")

$i \,/\, j$	C	D
C	a, a	c, b
D	b, c	d, d

→

$i \,/\, j$	C	D
C	a, a	$c - \alpha_i(b-c), b - \beta_j(b-c)$
D	$b - \beta_i(b-c), c - \alpha_j(b-c)$	d, d

- Example: α =0.8, β = 0.5

P 2

P 1		C	D
	C	30\$, 30\$	10\$, 45\$
	D	45\$, 10\$	15\$, 15\$

P 2

P 1		C	D
	C	30\$, 30\$	-18\$, 27.5\$
	D	27.5\$, -18\$	15\$, 15\$

Why then do people cooperate?

Maybe not all subjects are self-centered, money-maximizing, rational agents?

- Maybe people care about outcomes and inequality?
  - Fehr and Schmidt (1999, QJE) argue that people have an inequality aversion (advantageous as well as disadvantageous).

$$u_{(\alpha_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i \max\{x_i - x_j, 0\}$$

  - $\boldsymbol{\alpha}$ ≥0 (“envy”), $\boldsymbol{\beta}$ ≥ 0 (“guilt”)

- Maybe people just “feel good” when cooperating?
  - Palfrey and Prisbrey (1997, AER) argue that people receive a “warm glow” from cooperating
  - they cooperate *unconditionally*, i.e., independent of what other group members do (similar to altruists)
  - For some time, this used to be the leading explanation why people cooperate

Why then do people cooperate?
Why then do contributions decline?

But why the decline over time? Does it have to do something with intentions and reciprocity?

Today, most common explanation is existence of **conditional cooperators**:

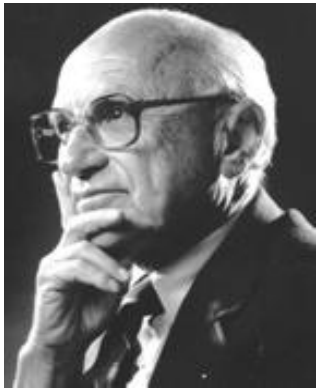
- People “get it” from the start, but the only way that cooperative types can get back at free-riders in the VCM is to withhold their own contributions.

Conditional cooperation is intuitive

"... we might all of us be willing to contribute to the relief of poverty, provided everyone else did. We might not be willing to contribute the same amount without such assurance."

Milton Friedman

Capitalism and Freedom, 1962, p.191



How to identify conditional cooperation?

Let‘s first look again at the binary situation, the prisoners‘ dilemma game

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	30$, 30$	10$, 45$
	Defect	45$, 10$	15$, 15$

Problem:

- if we see someone choosing C, is it an altruist or a conditional cooperator?
- If we see someone choosing D, is it a free-rider or a conditional cooperator?

How to identify conditional cooperation?

Let‘s first look again at the binary situation, the prisoners‘ dilemma game

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	30$, 30$	10$, 45$
	Defect	45$, 10$	15$, 15$

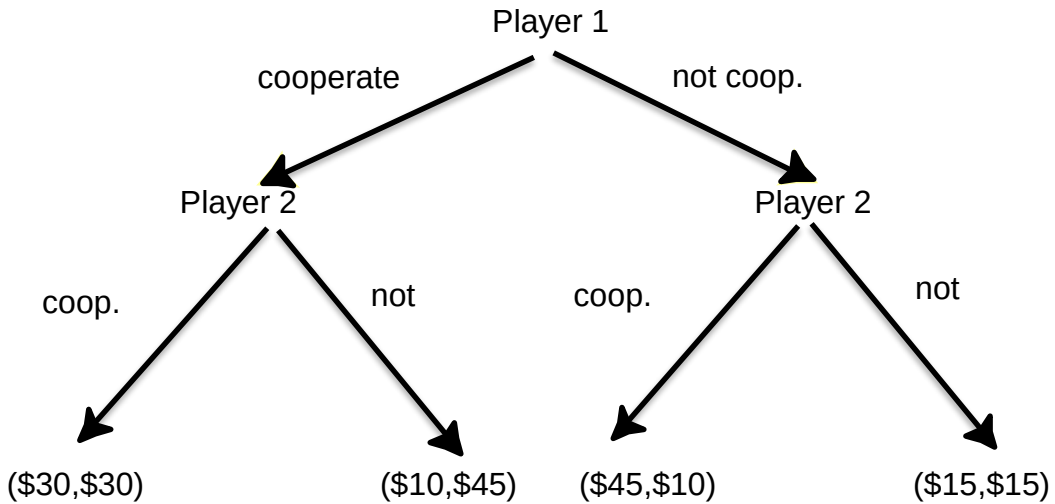
Problem:

- if we see someone choosing C, is it an altruist or a conditional cooperator?
- If we see someone choosing D, is it a free-rider or a conditional cooperator?

Answer depends on the **beliefs**, but how to elicit truthfully?

What if the game is played sequentially?

Fehr, Kosfeld, and Weibull (2003) or Burks, Carpenter, and Goette (2005)



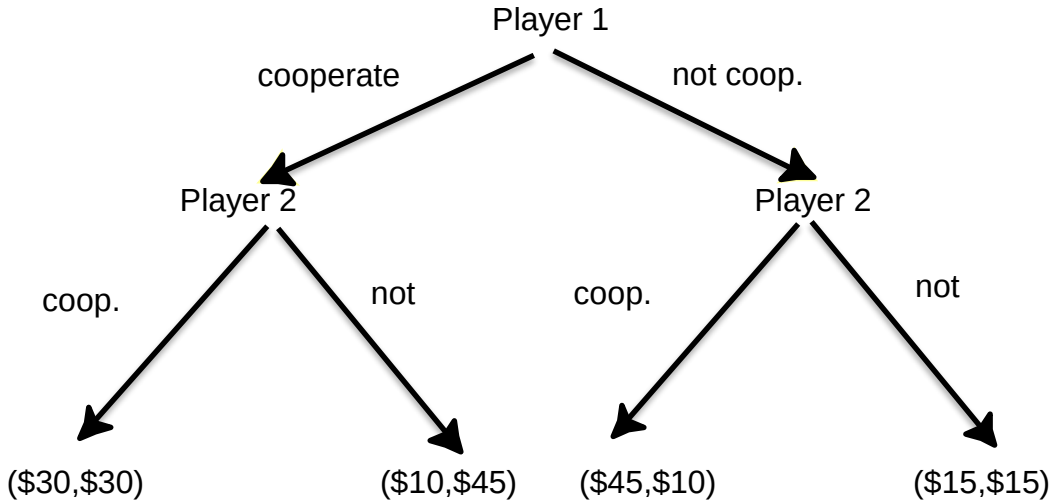
What if the game is played sequentially?

Fehr, Kosfeld, and Weibull (2003) or Burks, Carpenter, and Goette (2005)

What should a free-rider do?

What should an altruist do?

What should a conditional cooperator do?



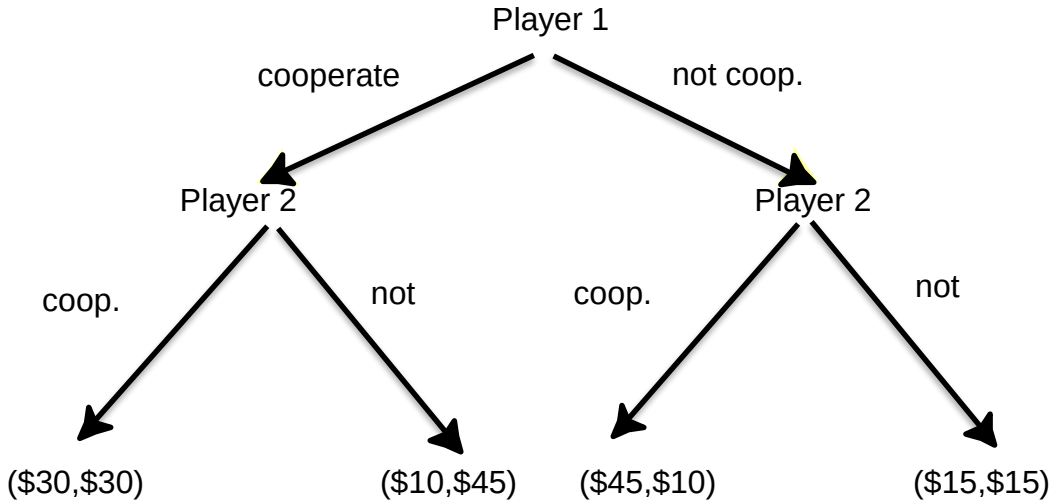
What if the game is played sequentially?

Fehr, Kosfeld, and Weibull (2003) or Burks, Carpenter, and Goette (2005)

What should a free-rider do?

What should an altruist do?

What should a conditional cooperator do?



Trick is to use the **"strategy method"** (Selten 1967): Play as 2 in both branches

How do students play the sequential PD?

Fehr, Kosfeld and Weibull (2003)

Experimental Design:

- 96 Swiss students play both roles in the Sequential PD.
- In player 1 role, they decide to cooperate or to not cooperate
- In player 2 role, they submit a strategy: (if 1 coops, if 1 not coop).

What does this experiment measure:

- Use these strategies to “type” the players as
  - selfish
  - reciprocal (conditional cooperators)
  - altruistic
  - anti-reciprocal

How do students play the sequential PD?

Fehr, Kosfeld and Weibull (2003)

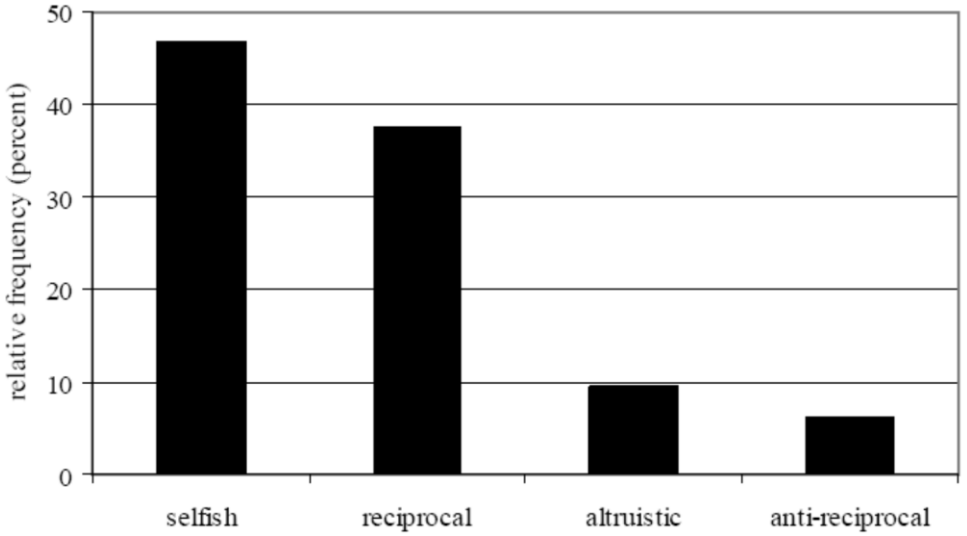


Figure 2: Distribution of revealed PD preferences

How do students play the sequential PD?

Fehr, Kosfeld and Weibull (2003)

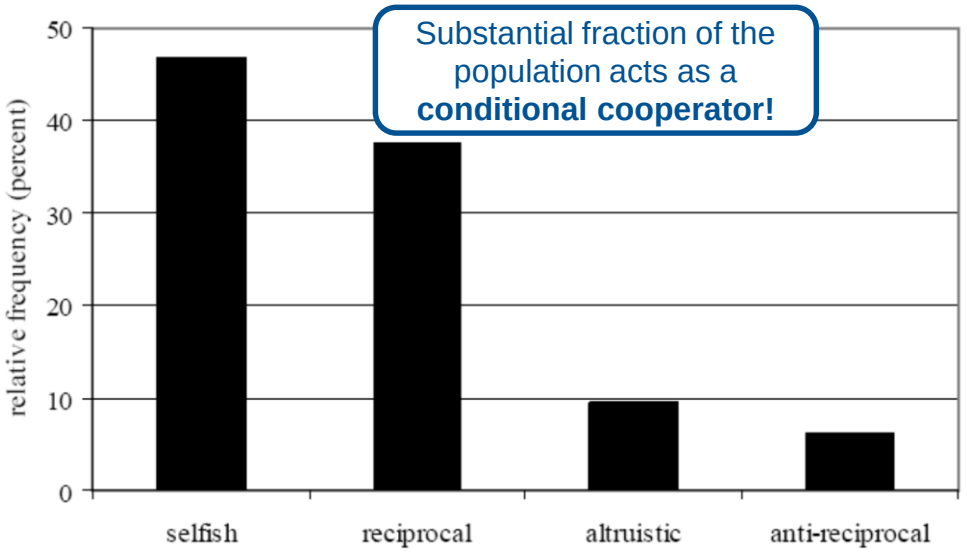


Figure 2: Distribution of revealed PD preferences

Use the same classification approach in the VCM?

‘*conditional cooperators’* in the VCM*:*

- people who are willing to contribute more to a public good the more others contribute

→ maybe more precisely: conditional **contributors**

Use the same classification approach in the VCM?

'*conditional cooperators'* in the VCM*:*

- people who are willing to contribute more to a public good the more others contribute

→ maybe more precisely: conditional **contributors**

Indirectly: look at patterns of behavior (problematic)

- Keser, van Winden Scand J Economics 2000 (partner > stranger)
- Sonnemans, Schram, Offerman, EconLetters 1999 (replacement)

Directly: apply a variant of the 'strategy method' (Selten, 1967) to elicit subjects' type

- Fischbacher, Gächter, Fehr (Economics Letters 2001)
- Falk & Fischbacher (EER 2002)

Conditional Cooperators

Fischbacher, Gächter, Fehr (2001)

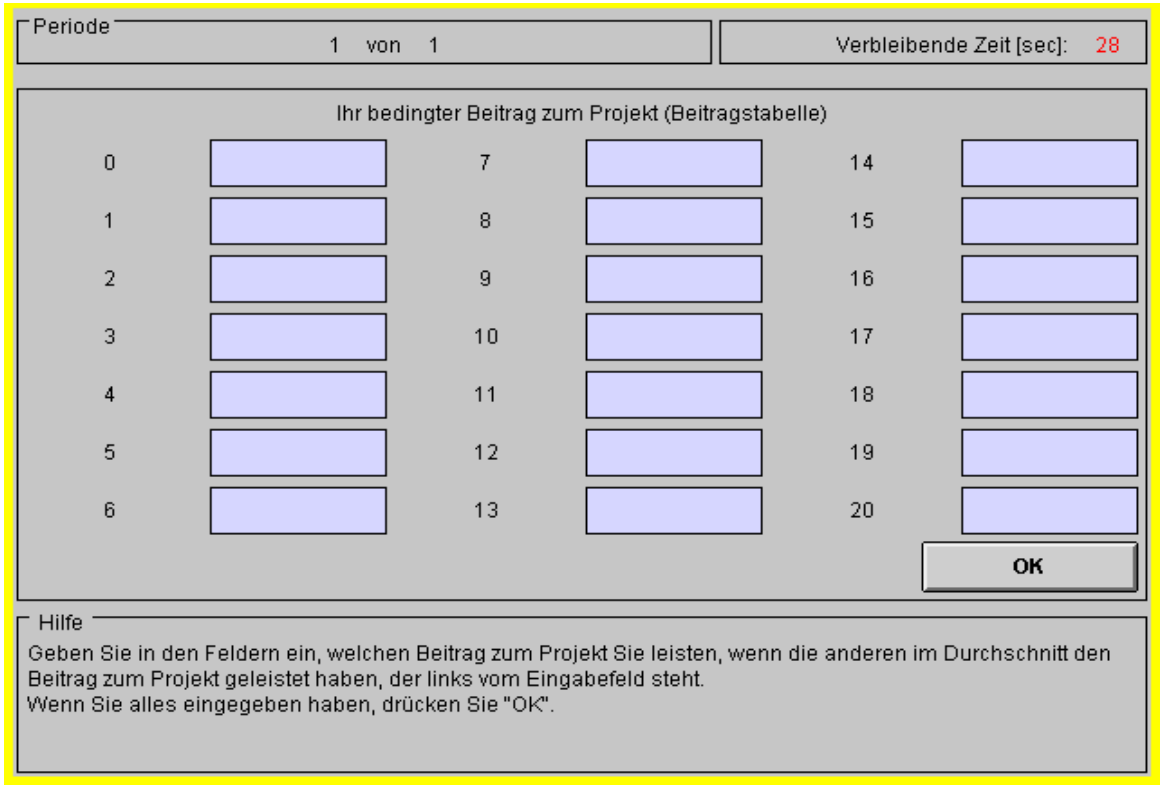
Experimental Design:

- Groups with n=4
- Three-stage VCM:
  - **Stage 1: Unconditional contribution**
  - **Stage 2: Conditional contribution**
    Subjects indicate for each average contribution level of other group members how much they want to contribute to the public good.
  - **Stage 3: One person of the group is randomly selected**
    → conditional contribution (on the average of the other three subjects not selected)

$$\pi_i = 20 - c_i + 0.4\sum_{j=1}^{4} c_j$$

Conditional Cooperators

Fischbacher, Gächter, Fehr (2001)



Conditional Cooperators

Fischbacher, Gächter and Fehr (2001)

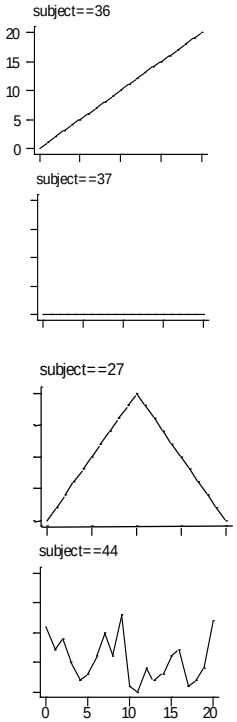
How are types defined?

Conditional Cooperators.: Spearman‘s rho > 0, p-value<0.001

Free-riders: trivial (always give 0)

Hump-shaped: increasing up to some point, then decreasing

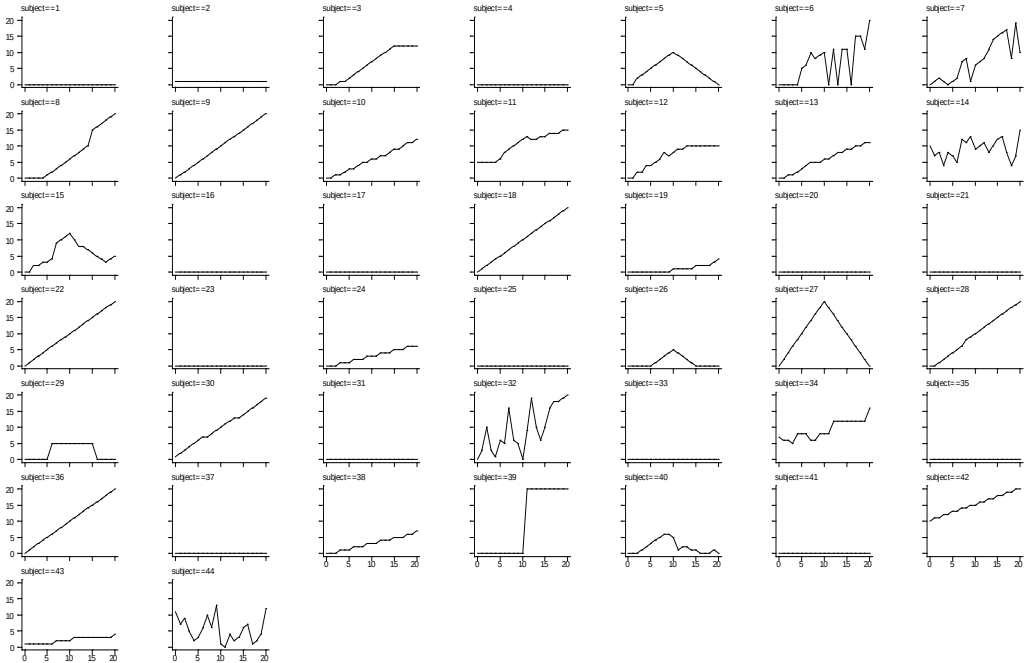
Others: everyone else, e.g.,



Conditional Cooperators

Fischbacher, Gächter and Fehr (2001)

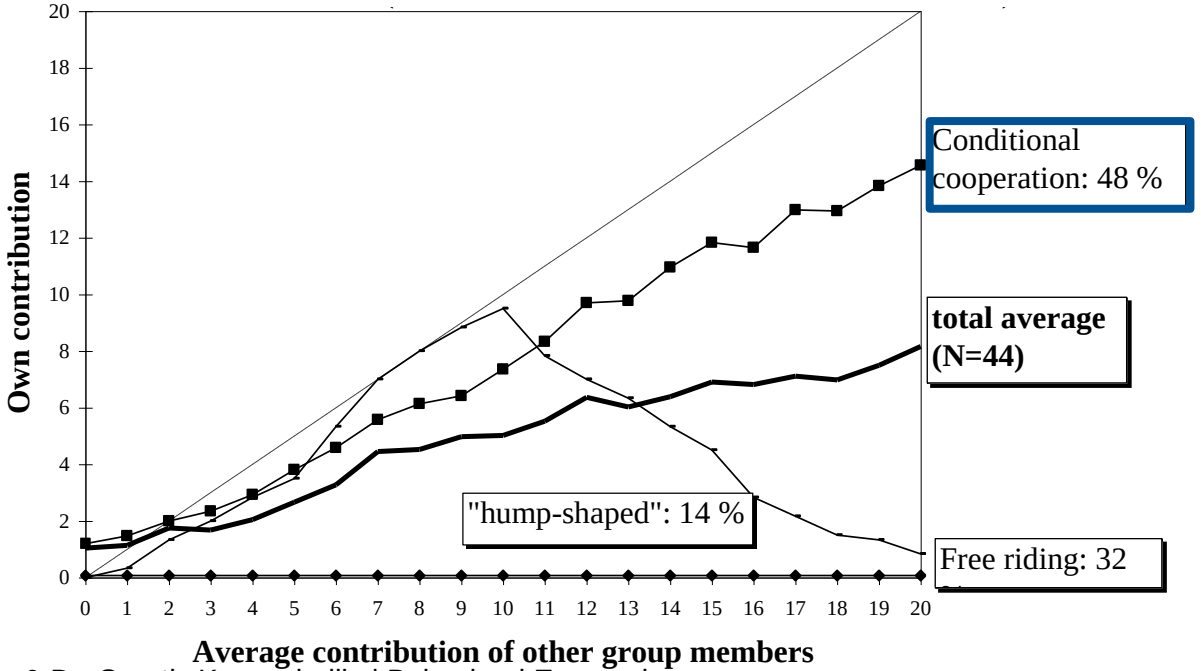
Finding: Subjects are heterogeneous



Conditional Cooperators

Fischbacher, Gächter and Fehr (2001)

Finding: Substantial fraction of the population acts as a conditional cooperator!



Findings provide a potential explanation for the unraveling of cooperation.

Many people are willing to cooperate conditional on others' cooperation.

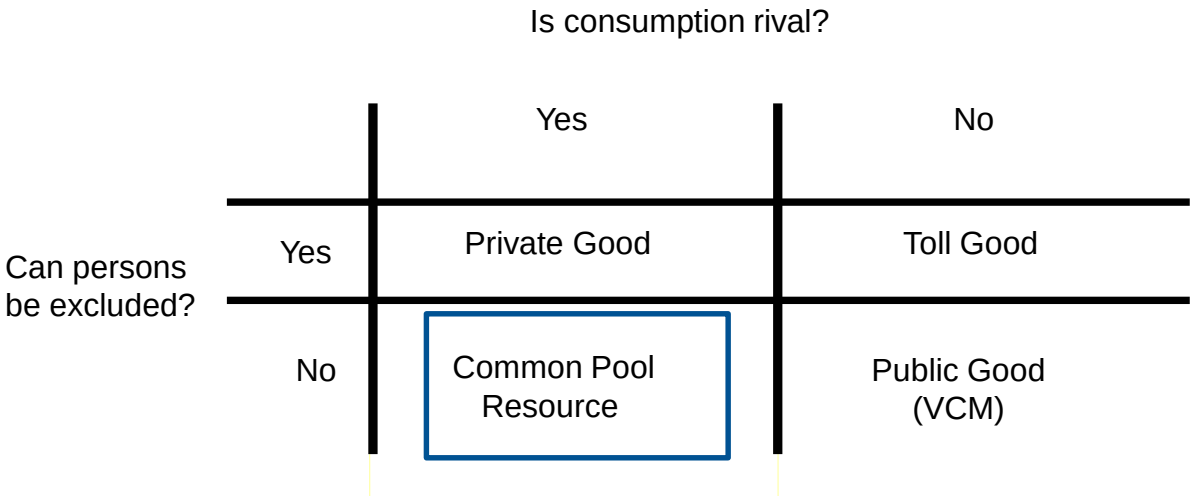
A large minority of the subjects free-rides fully irrespective of what others do.

The free-riders induce the conditional cooperators to cease to cooperate once they realize that there are free-riders in the group. Potentially explains the decay in cooperation over time.

Can we test this hypotheses?

Common Pool Ressource Game (CPR)

Up to now, the problem of voluntary provision of public goods was considered (VCM)
But what if consumption is rival, i.e., when we have negative externalities?



Common Pool Ressource Game (CPR)

When thinking of a public goods, some people think of it as a common resource

- tragedy of the commons (“Allmende Problem”)
- Examples: fishing, foresting

The CPR models extraction from a resource that reduces the others’ possibility of extraction

- Here consumption is rival and access is non-excludable.
- In other words, my extraction creates a negative externality for you.
- Given this, people cooperate by limiting their extraction from the CPR.

An example of a CPR experiment

Cardenas, Stranlund, and Willis (2000)

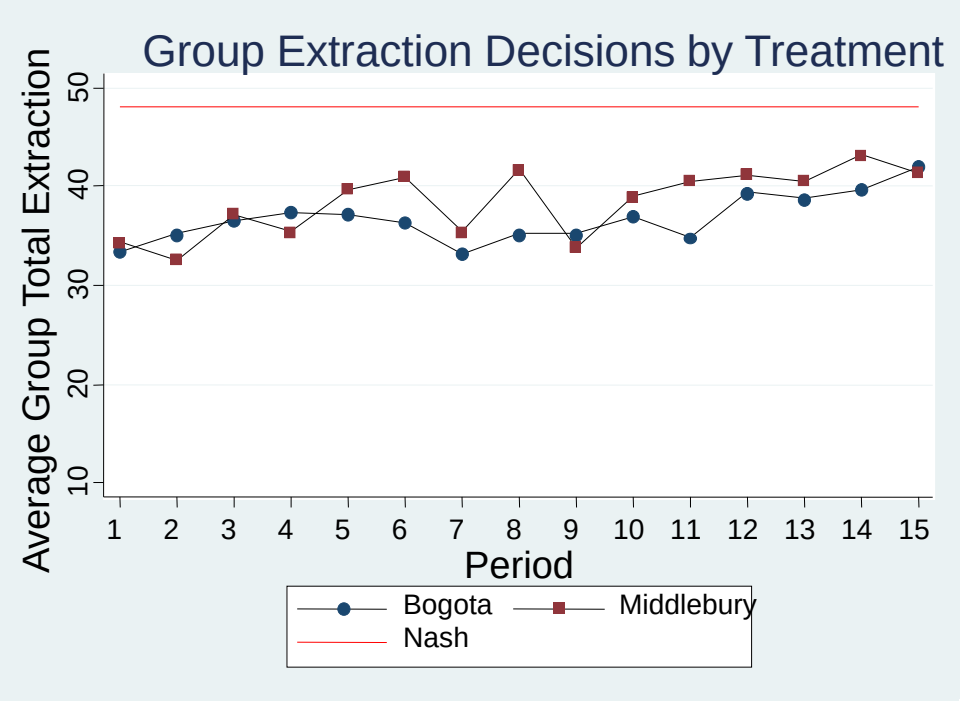
Design:

- Columbia: rural population with significant interests in local natural resources and environmental quality
- Payoffs for the game:
  - generated from a model of individual efforts to collect firewood from local forests.
  - Wage in formal sector, benefit from collecting firewood, water quality and firewood collection, valuation of water quality
  - Private and social interests diverge (higher levels of firewood extraction heighten soil erosion and ultimately damage local water quality)
- Framing: subjects are fully aware they are playing a game with this specific relationship between firewood extraction and water quality in place
- Groups of 8 play the CPR
- The underlying payoff function was presented (for obvious reasons) in form of a payoff table

An example of a CPR experiment

Cardenas, Stranlund, and Willis (2000)

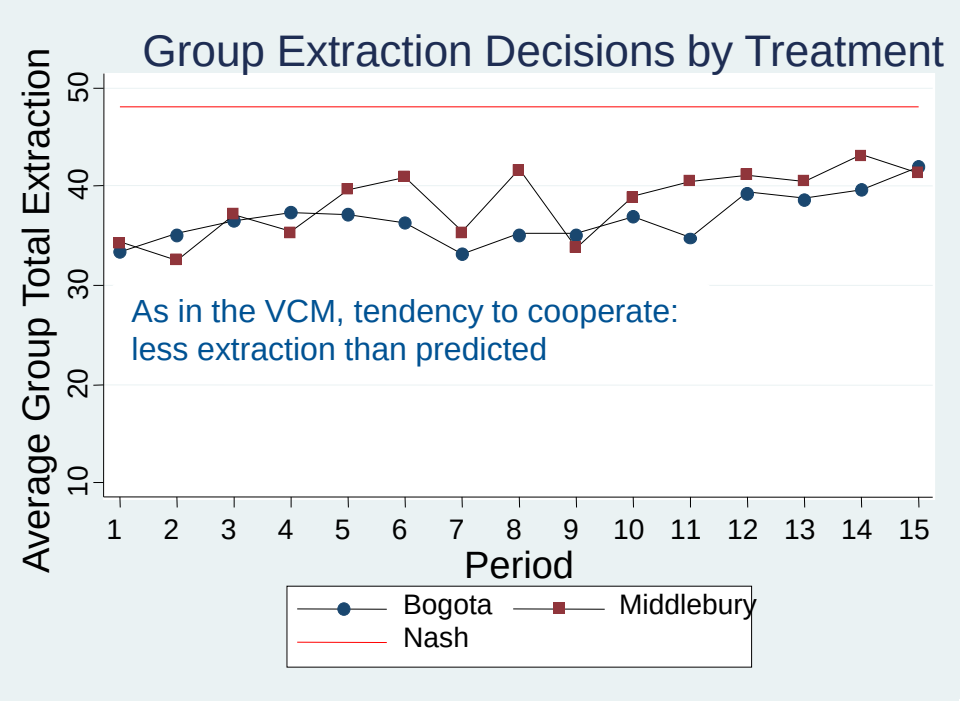
Finding: Behavior in the CPR closely resembles what is observed in the VCM games



An example of a CPR experiment

Cardenas, Stranlund, and Willis (2000)

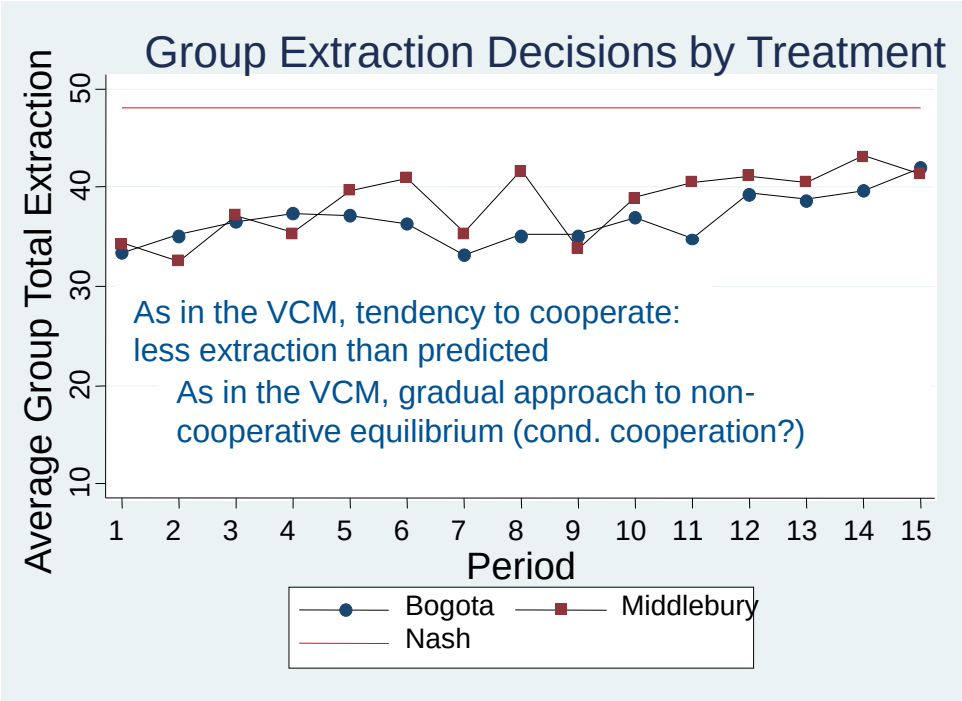
Finding: Behavior in the CPR closely resembles what is observed in the VCM games



An example of a CPR experiment

Cardenas, Stranlund, and Willis (2000)

Finding: Behavior in the CPR closely resembles what is observed in the VCM games



Often external regulations are implemented to solve such problems

External intervention:

- an outside body (e.g., the state) monitors and sanctions asocial behavior, e.g.
  - Controls and fines to hinder exploitation of resources
  - (tax schemes to provide public goods)

As we know from everyday life, this often solves the social dilemma

- This is particularly true for deterrent sanctions…
- …but it must not necessarily be the case….

The problems with external intervention

Ostrom (1990), reviewing many case studies suggests that external government intervention in the management of CPRs can just as often harm the CPR as help it.

In some cases, the government has less information than local users and this lack of information is harmful. In other cases, formal exogenous institutions (like monitoring and fines) “crowd out” whatever pro-social tendencies that local users may have.

What about endogenous interventions?

Endogenous interventions

Endogenous regulation (self-governance)

- the members of the group establish rules and norms for dealing with free riders
- they impose sanctions if norms are broken.

But: endogenous regulations are again a public good; now a 2nd-order public good.

To see what that means, consider the following game that tries to capture endogenous regulations…

Decentralized punishment game

Typical design:

Stage 1: regular VCM: $\pi_i = (20 - c_i) + 0.4\sum_{j=1}^{n} c_j$

Stage 2:

- Players observe (anonymously) how much the others contributed.
- They then decide simultaneously whether to assign punishment points p_{ij} to other players.
- Each punishment point costs 1 token for the punisher.
- Each punishment point reduces the payoff of the punishee by 3 tokens.

$$\pi_i = (20 - c_i) + 0.4\sum_{j=1}^{n} c_j - 1\sum_{i \neq j} p_{ij} - 3\sum_{j \neq i} p_{ji}$$

Punishment as a 2nd-order public good

Payoff function is

$$\pi_i = (20 - c_i) + 0{,}4\sum_{j=1}^{n} c_j - \sum_{i \neq j} p_{ij} - 3\sum_{j \neq i} p_{ji}$$

Using backward induction, what is the SP equilibrium?

- Do not punish on stage 2, because it reduces your payoff.
- Therefore, on stage 1 do not expect others to punish you for free-riding on stage 2
- Thus feel safe and do not contribute.
- Everybody would be better off if free-rider would be punished on stage 2 so that they do cooperate on stage 1 – but everybody would want the other to carry out the costly punishment → 2nd-order public good

Punishment as a 2nd-order public good

Payoff function is

$$\pi_i = (20 - c_i) + 0{,}4\sum_{j=1}^{n} c_j - \sum_{i \neq j} p_{ij} - 3\sum_{j \neq i} p_{ji}$$

Using backward induction, what is the SP equilibrium?

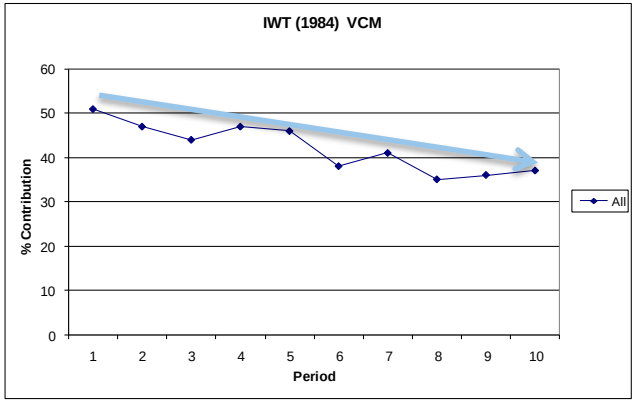
- Do not punish on stage 2, because it reduces your payoff.
- Therefore, on stage 1 do not expect others to punish you for free-riding on stage 2
- Thus feel safe and do not contribute.
- Everybody would be better off if free-rider would be punished on stage 2 so that they do cooperate on stage 1 – but everybody would want the other to carry out the costly punishment → 2nd-order public good

Regardless of the theoretical solution, how do you think behavior differs under the new rules?

Selfish and reciprocal types in the VCM+PUN

Recall the data from a standard VCM →

Also recall that the leading hypothesis about what is going on is **conditional cooperation**.



Given conditional cooperation is the first impulse of most of the participants, punishment might provide a new means so that people don't feel the need to withhold contributions in order to get back at free riders!

Cooperation and punishment

Fehr and Gächter (2000)

One of the first to run VCMs with endogenous regulation.

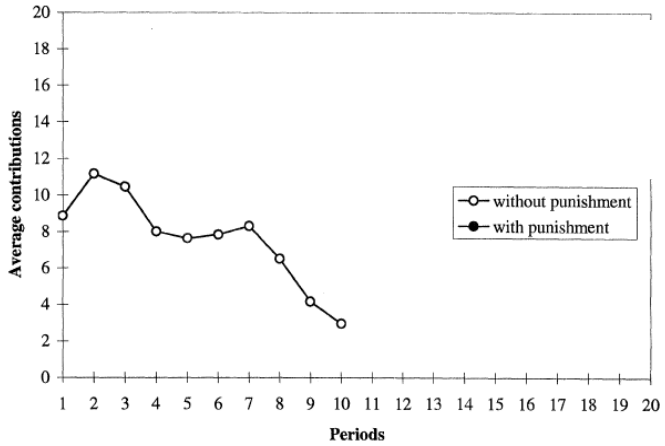
Design:

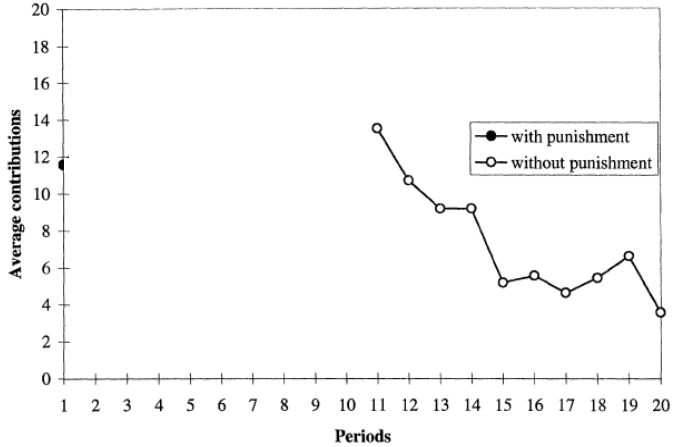
- Payoff structure was a little more complicated
- (pay a cost to reduce the target's earnings by 10%; roughly 1:3 relation)
- However, their design is nice because they allow for within-session exposure to both the baseline (VCM) and the punishment game.
- Their design is balanced to control for potential **order-effects**: NoPun-Pun & Pun-NoPun.

Cooperation and punishment

Fehr and Gächter (2000)

Partner condition, both orders:

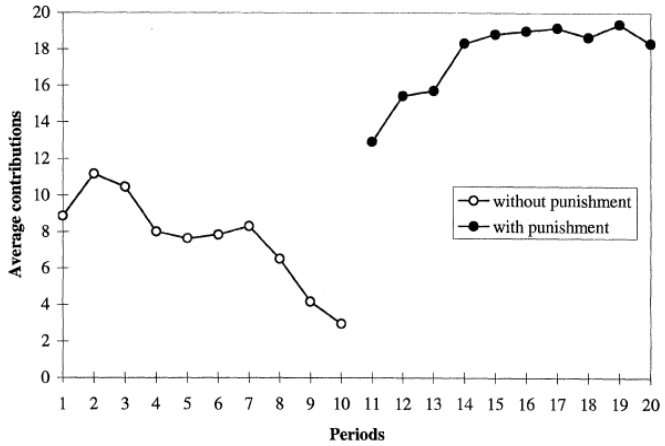


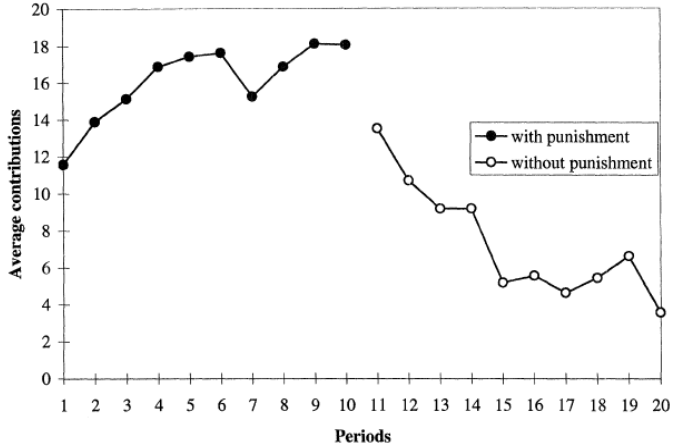


Cooperation and punishment

Fehr and Gächter (2000)

Partner condition, both orders:

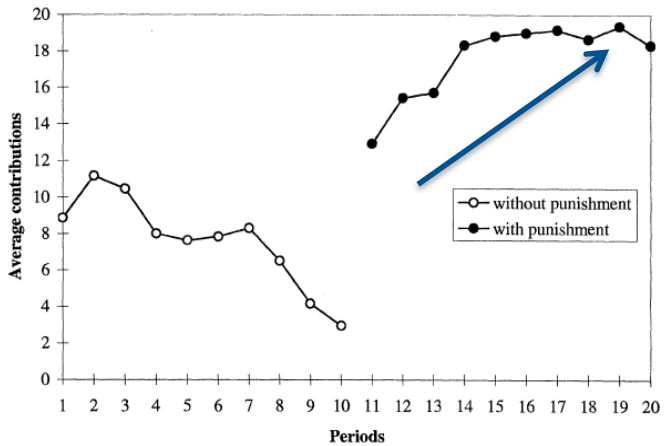


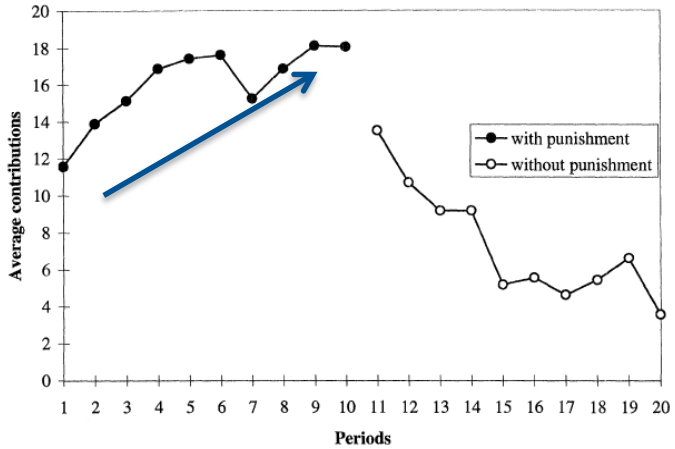


Cooperation and punishment

Fehr and Gächter (2000)

Partner condition, both orders:



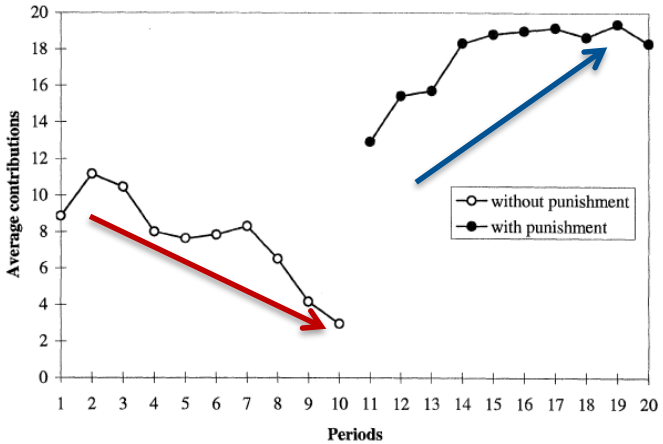


The imposition of punishment increases contributions

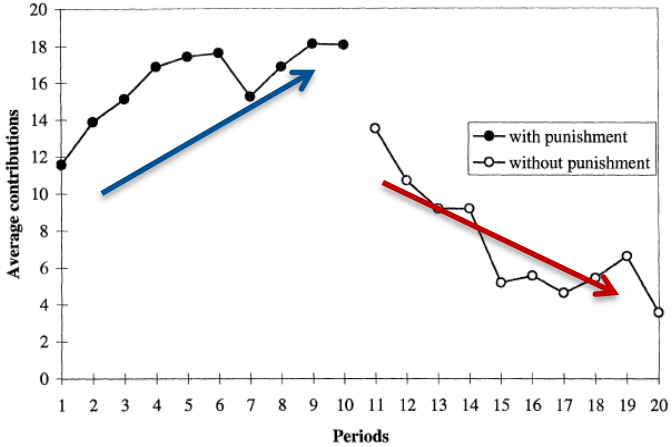
Cooperation and punishment

Fehr and Gächter (2000)

Partner condition, both orders:



The imposition of punishment increases contributions



The removal of punishment allows contributions to fade.

Decentralized punishment is very effective

- Punishment is very frequent.
- The less a player contributes the more he is punished.
- While cooperation declines without a punishment opportunity, cooperation is stable or increases with a punishment opportunity.
- Reciprocal players effectively discipline free-riders.
- 82.5% of the subjects contribute the whole endowment in the final period of the partner treatment when there is a punishment option while the majority fully defects in the final period when there is no punishment option.

Enforcement of norms

The fact that subjects are willing to sanction free-riding behavior has important consequences for the enforcement of norms and incomplete contracts

In some sense, these informal sanctions are part of a society's social capital

Whether this is beneficial depends on the content of a norm:

- Team incentives work better than expected(cooperation norm = work hard)
- Tournament incentives work less well because cooperation means here to work less
- Less littering, less crime, tougher strikes of workers, more voting etc.

Some (cautionary) words about social punishment

Decentralized (social) punishment is frequently effective, but:

- Strong informational assumptions (you need to know/observe what the others did)
- (Monetary) loss to society due to punishment costs (at least in the short-run)
- Might backfire, because no one guarantees that punishment is targeted at free-riders
- If the norm is susceptible to personal interpretation (for example in a complex environment), punishment can induce counter-punishment.

VCM+PUN also effective in other cultures?

Hermann, Thöni, and Gächter (2008)

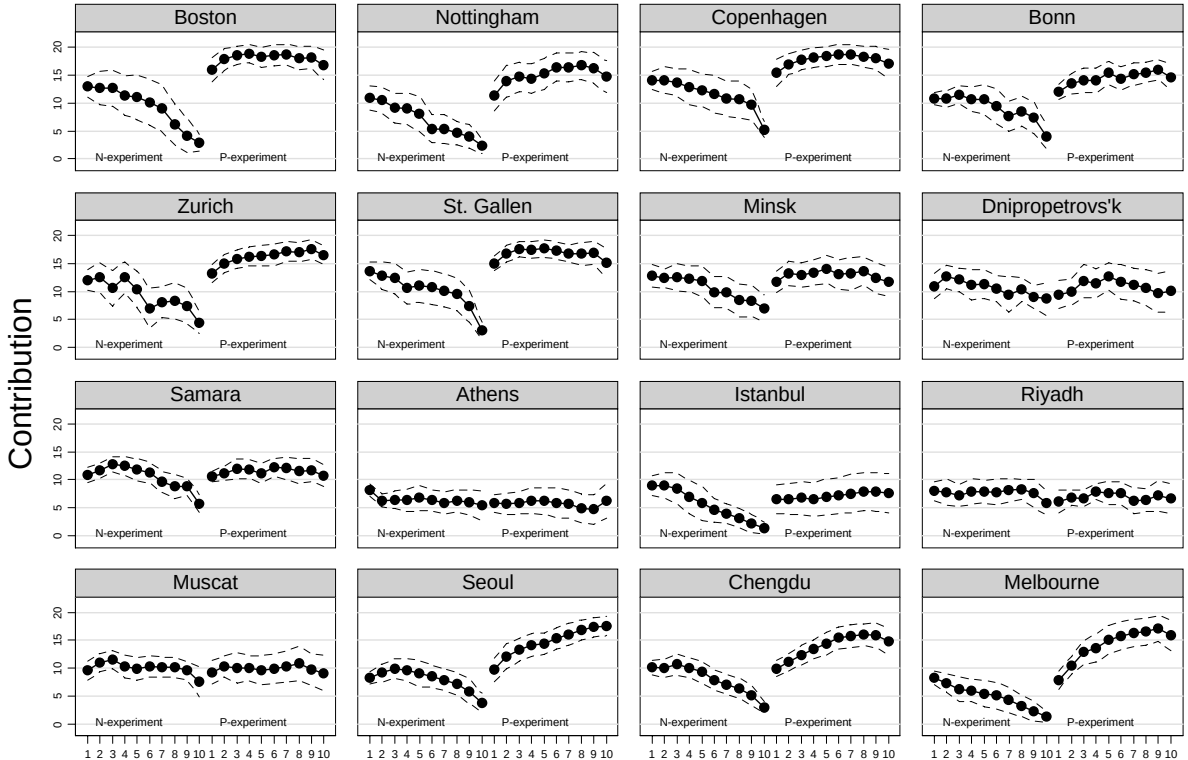
Design:

- VCM with and without punishment in 15 countries
- 1.168 subjects
- Subjects are comparable (undergraduate students)

- But subject pools come from societies that differ strongly according to:
  - Trust and norms of civic cooperation (World Value Survey)
  - Cultural dimensions (Hofstede)
  - Value orientations (Inglehart)
  - Rule of Law
  - GDP per capita

VCM+PUN also effective in other cultures?

Hermann, Thöni, and Gächter (2008)

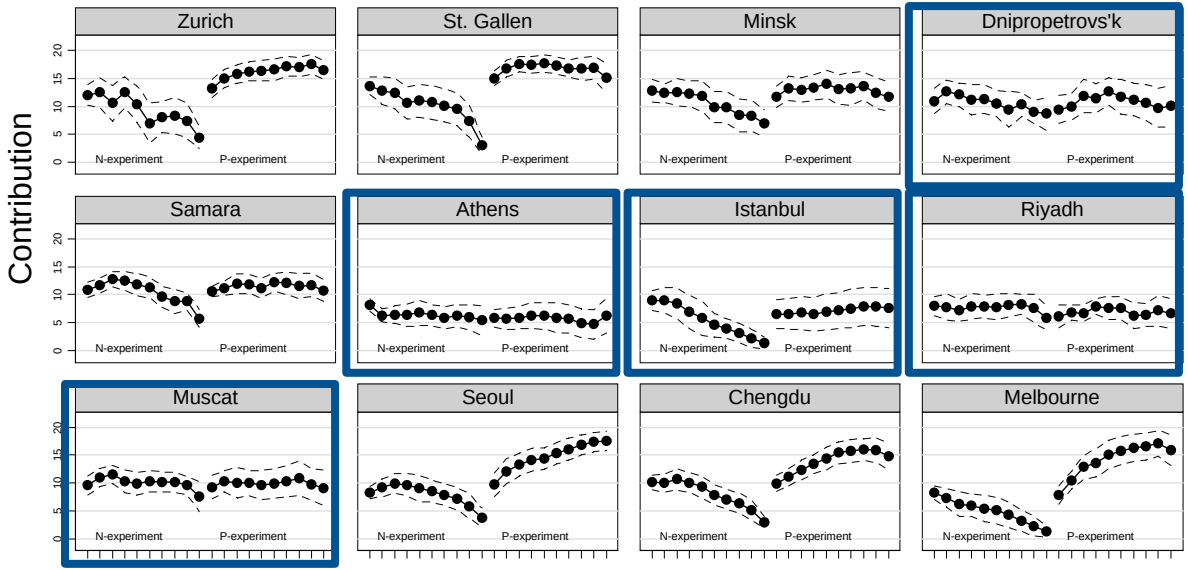


VCM+PUN also effective in other cultures?

Hermann, Thöni, and Gächter (2008)

Findings:

- Decentralized punishment almost always increases contributions
- But there are instances where it does not work (anti-social punishment)



„Anti-social punishment“

Punishment of cooperators (“anti-social punishment”):

- Revenge
- Taste for increasing payoff differences
- “normative conformity” – all deviations get punished
- Dislike of “do-gooders”

Why does punishment fail in some societies?

Is punishment correlated with societal-level social norms of cooperation?

Cooperation is the collectively optimal behavior. The stronger social norms of cooperation are, the more free riding is viewed as illegitimate and cooperation as desirable.

Hypotheses:

- The stronger norms of cooperation are, the stronger should punishment of free riders be.
- The stronger norms of cooperation are, the less cooperators should be punished, because they act in the normatively desirable way.

Measurement:

- World Values Survey: Questions on how justifiable are tax evasion, welfare fraud, and free riding on public transport.
- Theoretical scale: 10=never justified, 1=fully justified.

Is punishment correlated with societal-level social norms of cooperation?

Cooperation is the collectively optimal behavior. The stronger social norms of cooperation are, the more free riding is viewed as illegitimate and cooperation as desirable.

Hypotheses:

- The stronger norms of cooperation are, the stronger should punishment of free riders be. ✓
- The stronger norms of cooperation are, the less cooperators should be punished, because they act in the normatively desirable way. ✓

Measurement:

- World Values Survey: Questions on how justifiable are tax evasion, welfare fraud, and free riding on public transport.
- Theoretical scale: 10=never justified, 1=fully justified.

Hypotheses are confirmed.

Is punishment correlated with the strength of the Rule of Law in a society?

The rule of law indicator (World Bank) is based on a host of different variables that measure *"the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence".*

- **Strong Rule of Law**: Punishment is widely perceived as being impartial ("Gewaltmonopol") and bound by the law. Punishment is done by legitimate law enforcement institutions. Revenge is shunned.
- **Weak Rule of Law**: punishment is not impartial, is often "unfair" and arbitrary.
- Rule of Law might influence beliefs about fairness and norms of punishment in society.

Hypothesis:

- The stronger the Rule of Law in a society, the lower should anti-social punishment be.

Measurement:

- The rule of law indicator (World Bank)
- The theoretical range is –2.5 (very weak rule of law) to 2.5 (very strong rule of law).

Is punishment correlated with the strength of the Rule of Law in a society?

The rule of law indicator (World Bank) is based on a host of different variables that measure *"the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence".*

- **Strong Rule of Law**: Punishment is widely perceived as being impartial ("Gewaltmonopol") and bound by the law. Punishment is done by legitimate law enforcement institutions. Revenge is shunned.
- **Weak Rule of Law**: punishment is not impartial, is often "unfair" and arbitrary.
- Rule of Law might influence beliefs about fairness and norms of punishment in society.

Hypothesis:

- The stronger the Rule of Law in a society, the lower should anti-social punishment be. ✓

Measurement:

- The rule of law indicator (World Bank)
- The theoretical range is –2.5 (very weak rule of law) to 2.5 (very strong rule of law).

Hypothesis is confirmed.

Is punishment always a panacea?

The Hatfield Clan
(1897)

The Hatfield–McCoy feud involved two rural families of the West Virginia–Kentucky area along the Tug Fork of the Big Sandy River in the years 1863–1891. More than a dozen people were killed.
https://en.wikipedia.org/wiki/Hatfield–McCoy_feud

Today

VIII. Interaction with others: Beh. Game Theory & Social Pref/ces

A. Limited strategic thinking
- P-beauty contest, Level-k reasoning, Cognitive Hierarchy

B. Multiple equilibria and coordination
- Focal points, Schelling's salience, Pareto & risk dominance

C. Social preferences
- Social dilemmas, Conditional Cooperation, Intentions

D. Measuring social preferences in the Ultimatum Game and its variations
- Ultimatum Game, Dictatorship Game, Trust Game

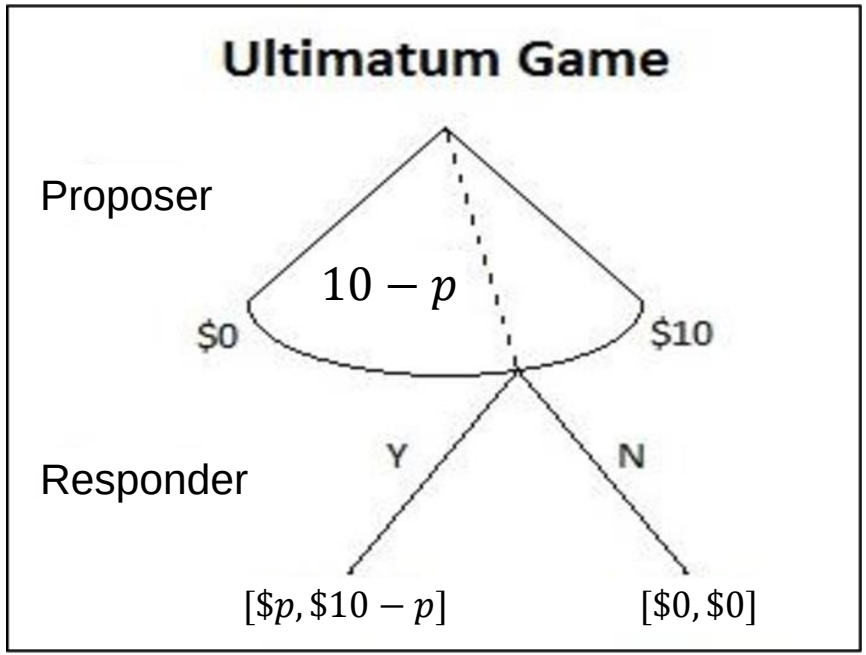
Ultimatum game (Guth, Schmittberger, and Schwarze, 1982)

- One player, the proposer, is endowed with a sum of money.
  - Let's assume that the sum of money is $10.
- The proposer is tasked with splitting it with another player, the responder.
  - Let's assume that the division is only in integers: (0,1,2…,10).
- The Proposer decides how much to keep for himself: $\$p$ and suggests a "take it or leave it" offer to the responder: $\$(10 - p)$
- The responder may accept (*Y*) it or reject (*N*) it.
  - If the responder accepts, the money is split per the proposal
  - If the responder rejects, both players receive nothing.
- Both players know in advance the consequences of the responder accepting or rejecting the offer.

Ultimatum game: Why study it

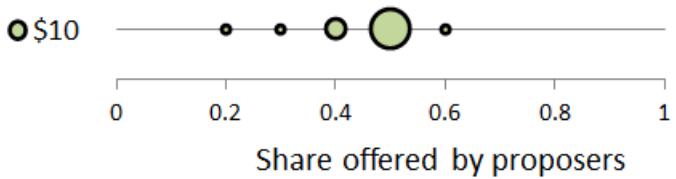
- Important economics applications: bargaining, negotiations, conflict resolution, court settlements, etc…
- Simple variations of the game can help us study concepts like charitable giving (“dictator game” variant) or labor relations (“gift-exchange” variant).
- Puts important assumptions about strategic decision making in the microscope:
  - Are players “rational”?
  - Are they solely motivated by maximising own payoffs?
  - Do they use backwards induction?
- Can be used to capture differences in cross-societal characteristics (notions of fairness, sharing, etc.)

Ultimatum game: formal analysis



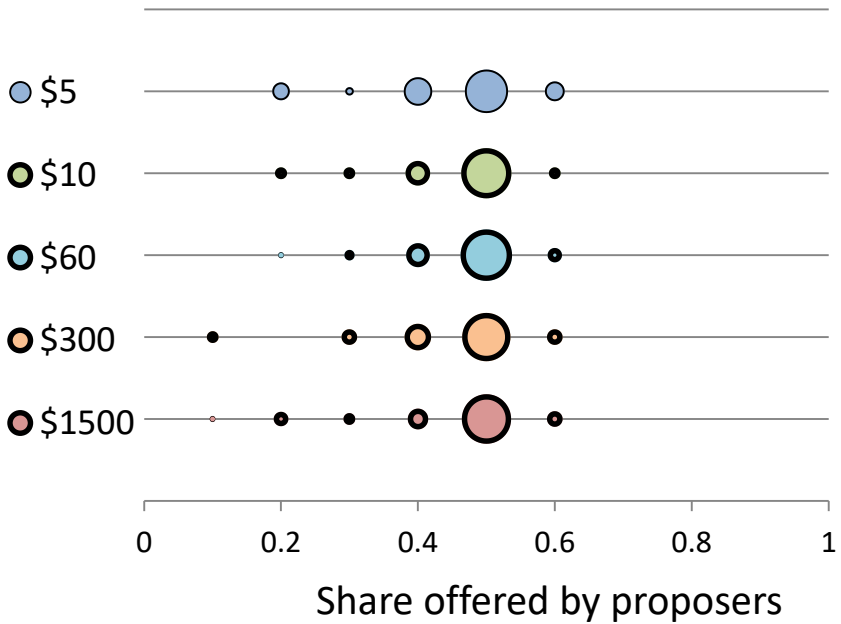
- Finding the SPNE with backwards induction:
  - The Responder would accept any positive over as if he rejects he ends up with \$0.
  - The Proposer anticipates this and offers the smallest possible positive amount. That is, he keeps $p = \$9$ to himself, offers $10 - p = \$1$ to the Responder and the Responder accepts.
    - In theory, $\$p = 10$ followed by "Yes" is also a SPNE, but notice that the Responder should be indifferent between rejecting and accepting in this case.
- There are more NE in which the Responder has a strategy of the form: "Reject if offer is less than…\$y" with y>1. But, these NE are based on a "non-credible threat".

Ultimatum game: empirical results



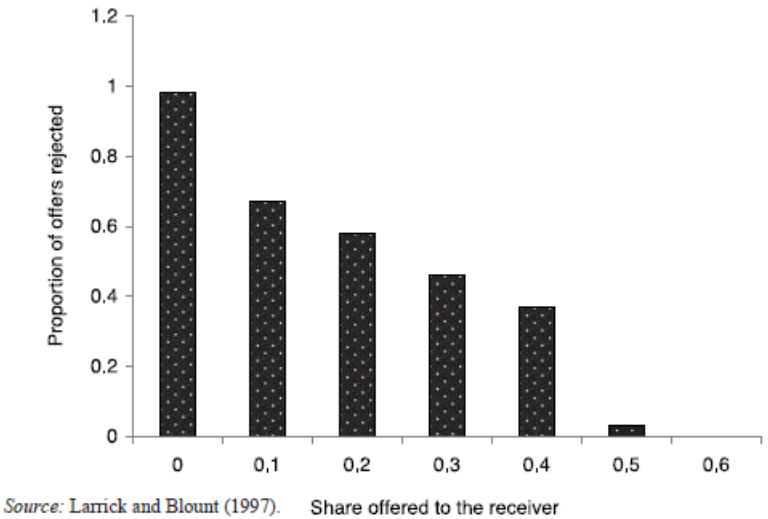
- Source: Forsythe et al. (1994), Slonim and Roth (1998)
- Size of the bubble -> proportion of subjects
- Proposers do not offer $0. In fact, most suggest a 50-50 split. Why?
  - Explanation 1: inexperience with the game and/or lack of sufficient motivation (low stakes)
  - Explanation 2: fear of rejection (strategic concerns)
  - Explanation 3: notions of fairness and altruism

Ultimatum Game: Why give so much? Explanation 1



- The share that proposers gave in ultimatum experiments where the amount of money given to proposer ranged from $5 to $1500
- Most people offer a 50-50 split
- **Stake size has no effect in these experiments for the amount proposers gave**.
- However, responders were less likely to reject when the stakes were higher:
  - $60 – 17.1% rejection rate
  - $300 – 12.1% rejection rate
  - $1,500 – 8.8% rejection rate
- **Repetition does not affect** Proposers' behaviour **much** (Roth et al, 1991, Bolton and Zwick, 1995, Knez and Camerer, List and Cherry, 2000)

Ultimatum Game: Why give so much? Explanation 2



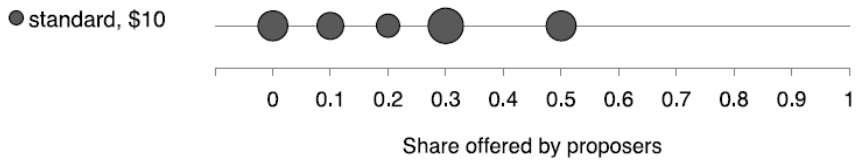
Source: Larrick and Blount (1997).

- The proportion of offers rejected in an Ultimatum Game.
- Offers of a 0.5 share ore better are rarely rejected.
- But: offers of a less than 0.5 are often rejected
- **Conclusion**: People are willing to sacrifice their own monetary payoff to decrease that of others & payoff maximisation is not their sole objective.
- Proposers are right to be afraid. But is this all there is to it?

Dictator “game”

- Variation of the Ultimatum Game where player 2 is passive: has to accept the offer.
- The term “’game’” is in quotation marks because, strictly speaking, a game requires strategic interaction.
- How much do people give in dictator game and why?
- If dictators choose positive offers then there is more than the strategic interpretation for the UG results
- Applications: charity giving, tipping on restaurants (that you don’t plan to come back to), etc…

Dictator “game”: empirical findings



Sources: Forsythe et al. (1994), Hoffman et al. (1994), Hoffman et al. (1996), Camerer (2003).

- Many people give $0.
- But, many people make offers (donate) more than $0.
- Strategic concerns in UG cannot be the only explanation.
- Genuine concerns for fairness and altruism

Ultimatum Game: Fehr-Schmidt preferences (I)

$$u_{(a_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i max\{x_i - x_j, 0\}$$

- $\alpha \geq 0$: envy.
- $\beta \geq 0$: guilt
- $\alpha \geq \beta$: envy more consequential than guilt

Assume that P, the Proposer, keeps p to himself.

- Then R, the responder receives $10 - p$.
- How much does P keep?
- Does R accept or reject?

Step 1: How much does the (naïve) Proposer offer?

- 'naïve': without strategic consideration of the Responder's acceptance threshold.
- Given that β ≤ α, there is never any incentive to give more than \$5, so $p \geq 5$
- Therefore, the Proposer maximises:

$$maxu_{(a_P,\beta_P)}(p) = p - \alpha_P * 0 - \beta_P(2p - 10)$$
$$s.t\ 5 \leq p \leq 10$$

- The derivative wrt p is $1 - 2\beta_P$.
- Therefore, when $1 - 2\beta_P > 0 \Rightarrow \beta_P < 0.5$, $p = \$10$
  - Proposer keeps everything to himself.
- When $1 - 2\beta_P \leq 0 \Rightarrow \beta_P \geq 0.5, p = \$5$
  - Proposer splits the pie evenly

Ultimatum Game: Fehr-Schmidt preferences (II)

$$u_{(a_i,\beta_i)}(x_i, x_j) = x_i - \alpha_i \max\{x_j - x_i, 0\} - \beta_i max\{x_i - x_j, 0\}$$

- $a \geq 0$: envy.
- $\beta \geq 0$: guilt
- $\alpha \geq \beta$: envy more consequential than guilt

Assume that P, the Proposer, keeps p to himself.

- Then R, the responder receives $10 - p$.
- How much does P keep?
- Does R accept or reject?

Step 2: What's the acceptance threshold?

- If the Responder accepts she receives:

$$10 - p - a_R(2p - 10)$$

  - Assuming that the Proposer will never offer more than half.
- If the Responder rejects she receives: \$0.
- Therefore, the Responder accepts if

$$p < 10\left(\frac{1 + \alpha_R}{1 + 2\alpha_R}\right)$$

- So, if the Responder does not care if her earnings are less than the Responder ($a_R = 0$), she would accept any offer.
- **But**, if $a_R = 1$ (for example) she will reject any offer less than $1/3$ of the 'pie'.

Ultimatum Game: Fehr-Schmidt preferences (III)

- The naïve Proposer either:
  - splits the sum equally (when his guilt parameter is $\beta \geq 0.5$) or
  - offers nothing (when his guilt parameter is $\beta < 0.5$).
  - You can think of the naïve Proposer as the dictator in the dictator game, where the Responder cannot reject.
- The Responder who cares about getting less than the Proposer, will reject some offers (how big depends on her level of envy, α).
- The strategic Proposer that has $\beta \geq 0.5$ has nothing to worry about. He would split the offer equally and the split will be accepted (most likely). This prediction is corroborated from the data.
- The strategic Proposer that has $\beta < 0.5$ want to offer the minimum amount that will be accepted. His problem is that he doesn't know the inequality aversion of the Responder. So he has to form an expectation and take a decision under risk…

Ultimatum Game methodology: strategy vs. game method

- In the Ultimatum Game we observe two types of data: $p from the Proposer and “Yes/ No” from the Responder.
- Problem: we can never know whether or not the Responders would have rejected/ accepted a lower/higher offer. In other words, we don’t know what is their threshold for accepting an offer.
- One way around this is the strategy method (Selten, 1967), where responders are asked what they would do in any possible contingency. So, receivers have to say what they would do if they got offered $0, $1, $2, and so on.
- In theory, the strategy method should be equivalent to the “game method” approach (where responder only sees the one, actual offer). But, whether or not it is behaviorally equivalent, is an open question.
- Another open question is with respect to its ‘external validity’/ which methodology is more ‘realistic’.
  - Game method: we get to see, for example, the waiter’s service before we decide the tip.
  - Strategy method: wage contracts might specify what will happen for a variety of different possible effort levels

Dictator game methodology: single vs. double blind

One concern with the dictator game is that if contributions are observed Proposers might be motivated by reputation effects.

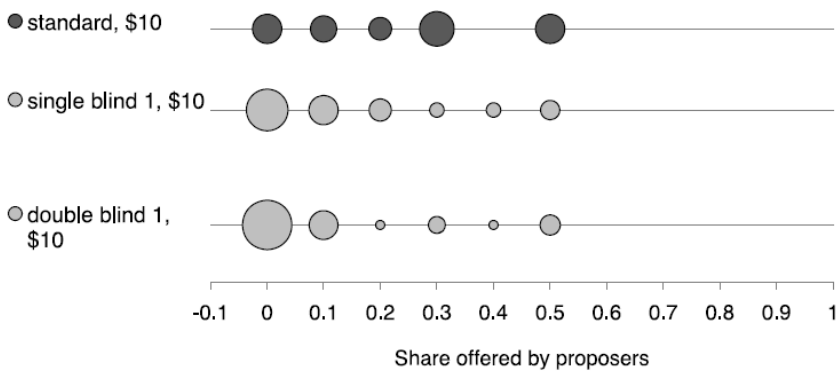
Single blind: anonymity of Proposer to Responder but not to Experimenter.

- All Proposers put their offers in an envelope anonymously.
- Responders pick an envelope at random.
- But, Experimenter has to look in the envelope (to make the payment accordingly).

Double blind: anonymity of Proposer to Responder and to Experimenter.

- Monitoring of offers by student monitor – not the researcher
- two dummy envelopes containing $0 are also put in the box: receiver who gets $0 cannot know whether it was from the proposer or bad luck.

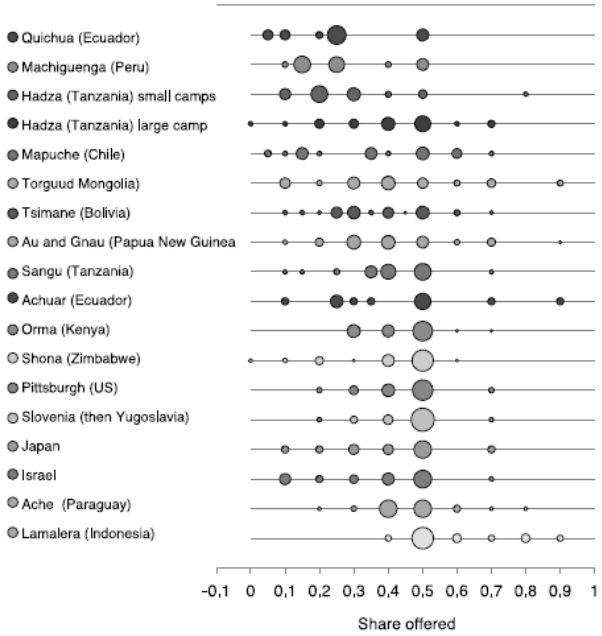
Dictator game methodology: single vs. double blind



Sources: Forsythe et al. (1994), Hoffman et al. (1994), Hoffman et al. (1996), Camerer (2003).

- The further we go down the line, the great the social distance between Proposer and Receiver
  - Anonymity is better preserved, less room for reputation concerns.
- Greater social distance leads to smaller donations but a significant proportion of Proposers still give money, even in the double blind variation.

Ultimatum Game: Cross-societal findings



Ultimatum game offers across different cultures.

Source: Henrich et al. (2004), Roth et al. (1991).

- Highest offers: Lamalera. Whale-hunting village on Indonesian island where cooperation and sharing is integral.
- Lowest offers: Machiguenga/Peruvian Amazon where people live in single family units and cooperation outside kinship is rare.
- The UG seems to capture well local ecology, social complexity and settlement size.

Trust game: description

- Consider an investor (player 1) and a proposer (player 2).
- Both players are given $10.
- The investor is told that he can give as much of this $10 as he likes to the proposer.
- Any amount he gives will be tripled in value before being given to the proposer.
- The proposer can then give as much money as she likes back to the investor.

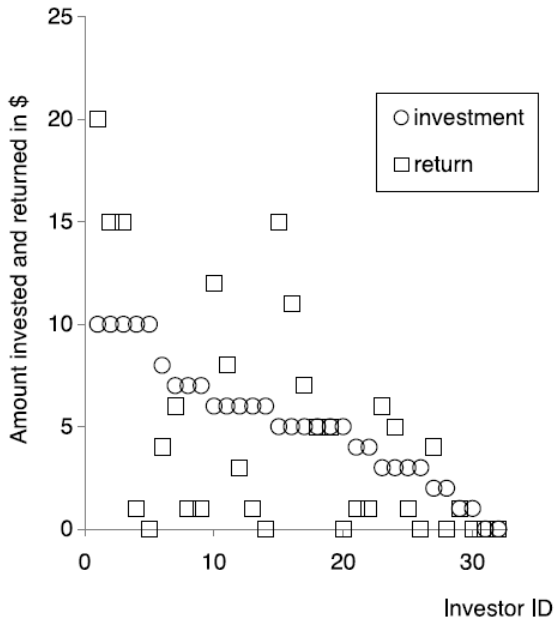
Trust game: formal prediction

- What is the SPNE of the game? Using backwards induction:
  - As in the dictator game, a proposer who cares only about he own payoff should not give any money back to the investor.
  - Investors, therefore, should not give money to proposers.

- Obviously, this outcome is socially inefficient. If the investor had trusted the Proposer and given all his $10 then the proposer would have $40 and so could easily pay back (with interest!) the investor on his investment.

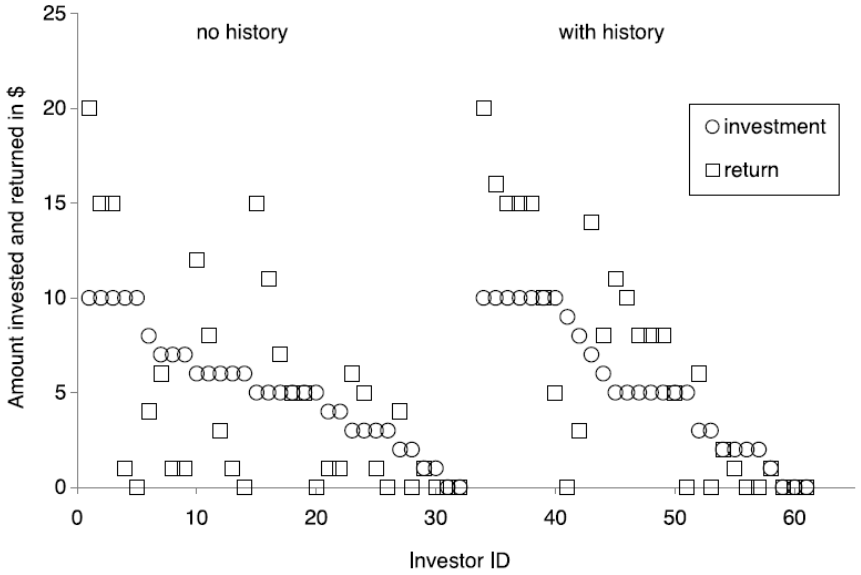
- Applications: study behavior on investment (e.g. in start-ups) but also employment and salary offers (example: level of salary in anticipation of level of effort).

Trust game: empirical observations (no history)



- Source: Berg, Dickhaut and McCabe (1994)
- Most investors invest something.
- Many proposers do not “reciprocate” (they don’t give anything back)
- But, the majority gives something back.

Trust game: empirical observations (with history)



- In the “with history” experiment, investors and proposers were shown the graph with “no history” so as participants knew what had happened in the previous experiment
- Things could have gone either way:
  - Investors could have been put off investing by seeing how many proposers kept all the money.
  - But, they chose to focus on the positive investing and returning -> Increase in money being returned -> More efficient social outcomes!