HANDELSHÖGSKOLAN
I STOCKHOLM
STOCKHOLM SCHOOL OF ECONOMICS

(Master thesis version of preliminary and ongoing PhD thesis work)

Participation and Peers in Social Dilemmas – Two Experiments

Abstract

Aspects that might influence the degree of free-riding in social dilemma situations are studied by conducting two social insurance experiments in the lab. Evidence that people are motivated by concerns additional to those of material payoffs is found. These concerns are shown to be strongly connected to the concept of reciprocity. In contrast to what other literature would suggest, voting over or having a higher degree of participation towards an insurance system does not have any positive impact on the levels of free-riding. Previous trends of peers misusing or not misusing the system are found to have an effect on future levels of free-riding. People are more likely to lie and cheat when they believe that others will lie or cheat, but are more likely to be honest when they think that others will be honest. Indicative support is also found for the false consensus effect.

Author: Sebastian Giwa (19628)

Supervisor: Professor Magnus Johannesson, Department of Economics, SSE

Examiner: Mats Lundahl

Presentation: November 29, 2006, 12.00, Room 975a

Acknowledgements: I am indebted to Magnus Johannesson and Martin Dufwenberg for excellent support. I would also like to express gratitude for valuable comments from participants at the Stockholm School of Economics' Lunch Seminar, the Toulouse Summer Institute on Economics and Psychology and the 7th Summer Institute in Behavioral Economics at the Trento and especially to Victor Corzo. Finally, I am thankful for suggestions from Colin Camerer, Ernst Fehr, David Laibsson, Alvin Roth and Klaus Schmidt.

I – Introduction

Social insurance being a form of social dilemma is open to elements of moral hazard and free-riding. However, social insurance systems and many other forms of social dilemmas (e.g. tax compliance, effort-shirk decisions at work, contribution to irrigation systems and usage levels of inshore fisheries) have persisted over time without being destroyed by the negative forces of free-riding. Empirical data, experimental research and everyday knowledge show that people, when in contexts of social dilemmas, are strongly motivated by concerns additional to those of material payoffs. It is commonly believed that social norms to some extent mitigate free-riding (Lindbeck et al [2003]).

Further knowledge of these concerns are important to understand how the welfare state has survived so far and in order to better comprehend the risks that it stands before with increasing levels of cheating and public debate over whether peoples' values of morality and honesty have declined in recent times. This paper looks at two aspects that could prove to be important in this context: whether individuals are willing to abide more by rules that they participated in creating or voted over (e.g. Ostrom [1990, 2000] and Frey [1997]) and whether people abide more by rules if a larger fraction of others around them abide than when a lower proportion does (Lindbeck et al [1999]).

Much work has been done on how social norms and reciprocity have an impact on moral hazard problems. However, as far as I know, no experimental work has been done on to what extent the degree of involvement or attachment towards an insurance system affects the levels of free-riding. Perhaps different levels of involvement lead to different levels of honesty and different formations of social norms, in turn leading to different levels of free-riding and thus overall insurance costs (see Ostrom [1990, 2000], Bowled [1998], Feld and Tyran [2002] for examples where participation in decision making leads to more co-operation). A related thought is that it might be the case that younger generations feel lower levels of involvement towards the social security systems than older generations. Older generations might have a feeling of being part of the decision making that led to the welfare state leading them to more strongly internalize social norms against living on others than younger generations do[1].

For this purpose an experiment is designed and conducted to capture the impact brought on by differing levels of involvement generated in one context with a high degree of involvement and one with a low degree of involvement towards an otherwise identical insurance game. This is done by using two different treatment conditions, "Choice-of-system"-treatment and "Given-system"-treatment. In contrast to other literature, no positive impact of higher levels of participation over the rules of the insurance system on the levels of free-riding is found. On the contrary, some evidence that being given the opportunity to choose system might actually lead to increased levels of free-riding is found.

Some people are arguing that welfare states have or are on their way to be caught in vicious downward spirals[2]: When people hear via media and politicians that others are misusing social insurance systems they tend to be more likely to misuse the systems themselves and so a downward spiral starts that might be hard to curb. Experimental evidence is presented that indicates that people are more likely to lie and cheat when they believe that others will lie or cheat, but are more likely to be honest when they think that others will be honest. This can be taken as support for the conjecture that the larger proportion of a group or society that adhere to a social norm the stronger the norm is internalized by its individuals.

Although the paper focuses on games of social insurance, the results are also relevant for other types of social dilemmas and problems of the commons (tax compliance, effort-shirk decisions at work, contribution to irrigation systems and usage levels of grazing lands).

The rest of this paper is organized as follows. In section 2 some related literature and relevant theory is visited. Section 3 goes through the experimental procedure and design. Section 4 presents hypotheses and results for the

[1] This straw of thought could be in line with what Ostrom [2000] calls transmission failures from one generation to the next.

[2] See for instance Lindbeck [2002].

participation experiment. Section 5 goes through hypotheses and results for the peers experiment. In section 6, I conclude and discuss some ideas for future research.

Appendix i, ii, iii, iv and v contain mathematical derivations, experimental instructions and the additional exit questions.

II – Related literature and theory

In a Quarterly Journal of Economics paper, Lindbeck et al [1999] analyze the interplay between social norms and economic incentives in the context of the modern welfare state and with focus on people's decisions about work and benefits. They assume that it is a social norm to not live on transfers from others. A paper, by Stutzer and Lalive [2004], based on data from Switzerland presents empirical evidence suggesting the existence of a strong norm of self-sufficiency and living of ones own work, and that this norm has a substantial effect on unemployed people's behavior. In a theoretical paper about social norms and moral hazard, Dufwenberg & Lundholm [2001] study the effects of social rewards (in addition to pecuniary ones) on social insurance. Even though their results show that social rewards have an effect on economic behavior, "the theory is silent on why an erosion of social reward might occur" (Dufwenberg & Lundholm [2001, page 16]).

This study is an attempt to shed some light on two factors that might be important in this context; firstly, the sense of participation/impact of having the opportunity to vote over, e.g. an insurance system and secondly the role of different expectations of how others will behave given identical pecuniary incentives.

Evolutionary theory and empirical research support the assumption that humans have an inherited inclination to learn social norms (Pinker 1994). But what norms we learn and what power we let them have over us vary from situation to situation (Ostrom [2000]). For instance, experimental research has consistently shown that communication in the form of cheap talk substantially can increase the level of cooperation between individuals in games of social dilemmas (see e.g. Sally [1995] or Dawes, McTavish and Shaklee [1977]). The most compelling reasons for why communication increases levels of co-operation include: driving a sense of mutual commitment, facilitating increased trust, reinforcing or even creating social norms and strengthening of group identity (Ostrom [1998]).

From management theory participation and involvement in decision making are believed to have positive impacts on co-operation levels in groups and corporations through the same channels that communication has - driving a sense of mutual commitment, facilitating increased trust, reinforcing or even creating social norms and strengthening group identity.

Ostrom [1990, 2000] discuss design principles that characterize well functioning common pool regimes. The third principle states the importance of individuals being able to participate in making and modifying the rules of a system or regime. This participation creates a stronger sense of fairness which in turn leads to smaller problems of moral hazard. Bowles [1998] discusses that individuals are willing to abide more by rules that they participated in creating since such rules meet a kind of shared concept of fairness.

Evidence from the lab indicates that rules that are externally imposed can crowd out cooperative behavior [Frey 1999]. Bardhan [2001] provides a field study from India that links different levels of perceived involvement/participation in rule creation to different levels of perceived fairness of rules and subsequently different levels of rule violations.

Feld and Tyran [2002] show that when taxpayers directly can influence tax laws and rates, tax evasion appears to be lower. Alm, Jackson and McKee [1993] provide additional experimental evidence to this point while Pommerehne and Weck-Hannemann [1996] and Frey [1997] demonstrate supporting field evidence.

From the above, a natural hypothesis can be formulated: If people feel that they where part of the decision making process over the rules in a social insurance system, they might to a higher extent internalize a norm to not live unnecessarily on transfers. This could in turn lead them to be less likely to free-ride than if they do not feel that they were a part of the decision making progress. The key purpose of the first experiment is to test this hypothesis.

In the model of Lindbeck et al [1999] the social norm of living of ones own work is assumed to be endogenous in the sense that the more people adhere to the norm the stronger the norm is internalized. If this is the case, welfare states could face the risk of being caught in vicious downward spirals. If people via media and politicians increasingly hear that others are misusing social insurance systems they might tend to be more likely to misuse the systems themselves. The driving force of this could be triggering a kind of negative reciprocity and/or dampening what Charness and Dufwenberg [2006] call guilt aversion. It could also be related to the cost of lying being different if the perceived relative consequence of lying is different in cases when a high vs. low fraction of others lie (Gneezy [2005]).

From the above the following hypothesis can be formed: In games of social insurance, given the same economic incentives, people are more likely to lie and cheat when they believe that others will lie or cheat, but are more likely to be honest when they think that others will be honest. The second experiment in this paper aims to shed some light on this hypothesis.

III – Experimental design and results

The experiments on voting/participation ("experiment 1") and on the impact of different proportions lying/not lying ("experiment 2") were conducted in direct succession, in effect creating one big experiment ("the experiment"). However, none of the subjects new about the opportunity for them to take part in experiment 2 until experiment 1 was finished.

Two parallel sessions of each of the two experiments were carried out at three different occasions between January and April 2006. All of these six plus six experimental sessions where conducted in the computer labs at the Stockholm School of Economics, Sweden.

A total of 96 subjects were recruited from the undergraduate programs in economics, business, medicine and engineering at the Stockholm School of Economics, Stockholm University, Karolinska Insititutet and the Royal Institute of Technology. Some of the students had participated in economics experiments before, but not in this particular type of experiment. No one participated more than once in each experiment.

The experiment lasted for between 60 and 75 minutes, with experiment 1 constituting roughly haft of the time, experiment 2 comprising one quarter of the time and initial welcoming, instructions and the exit survey accounting for the last quarter. Subject earnings were paid after the experiment in a different place and in an anonymous way by other people than the experiment leaders. Each subject earned on average SEK 42 (USD 5.7) for experiment 1 and SEK 41 (USD 5.5) for experiment 2 in addition to the guaranteed show-up fee of SEK 50 (approx USD 6.7) leading to an average total earning of SEK 133 (USD 17.8). [3]

Table 1a - Summary statistics: Demographics

Gender		Education				Years of study		
Female	Male	Stockholm School of Econoimics	Stockholm University	Karolinska Insitutet	Royal Institute of Technology	<1.5	1.5 - 3	>3
39%	61%	36%	29%	21%	13%	35%	38%	26%

Table 1b - Summary statistics: Payoffs

	Experiment 1	Experiment 2	Exp 1 + Exp 2	Show up fee	Totel total
	SEK (USD)	SEK (USD)	SEK (USD)	SEK (USD)	SEK (USD)
Mean	42 (6)	41 (5)	83 (11)	50 (7)	133 (18)
Min	24 (3)	0 (0)	43 (6)	N.a.	93 (12)
Max	56 (7)	50 (7)	99 (13)	N.a.	149 (20)
Median	44 (6)	40 (5)	85 (11)	N.a.	135 (18)

[3] Exchange rate of SEK 7.5 per USD assumed.

In order to enable communication and voting at the same time that anonymity is preserved it was natural to execute both experiments in a computer lab[4]. This also enables the relatively complex re-matching of subjects into new groups at four different occasions in experiment 2 to be done automatically and without any loss of time. Another important aspect of using a computer lab setting is that it helps preserve some social distance between subjects, hence, leading to a slightly better representation of reality. Furthermore using a computerized system enables me to guarantee each subject's anonymity with regards to the experimental leaders.

To make sure everyone easily would understand how to use the computer program a simple Internet browser interface was created. (The program can be found at www.adresstobedecided.com/insurancegame.htm and was programmed in co-operation with people at the consultancy Mindglowing).

Throughout both experiments the subjects were given instructions both verbally and via the computer. At smaller steps the computer took care of guiding the subjects forward without any particular verbal back-up. At two stages in experiment 1 and one stage in experiment 2 written instructions were handed out on paper. To guarantee understanding at key occasions each subject had to pass a comprehensive battery of control questions to be allowed by the computer to continue to the next step. The participants were asked to raise any questions by raising their hands. A general discussion was avoided by taking and answering the questions individually.[5]

To make the instructions concrete and easy to take in, both experiments were framed with the context of a health insurance system.

At the end of experiment 2. All participants where given information on how to register to receive draft and final versions of this paper.

---

[4] In a non-computerized pilot experiment to this study (Corzo and Giwa [2002]) we received several comments on that choosing report would have been easier in a fully anonymous context. Also, the particularly high level of non-defection 80% was likely an effect of the failure to not only guarantee hidden *action* but to also guarantee hidden *identity*.

[5] The questions answered were to clarify procedure and instructions. No questions on the nature or aim of the study were answered until after both experiments had been completed.

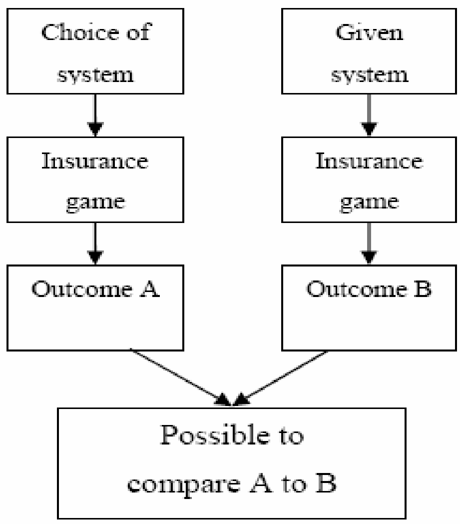
IV – Experiment 1

Design

Two treatment, three stage design

Recall that the purpose of experiment 1 is to shed some light on whether people free-ride less in a social dilemma context if they feel that they are part of the decision making process over the system's rules. A two treatment, three stage design is created in which subjects play under double anonymity within groups of four. Subjects are randomly divvied into either a "Choice of system"-treatment or a "Given system"-treatment. When the subjects thereafter have to make a co-operation/defect decision in the health insurance system it becomes possible to compare the impact of the two treatments on the likelihood to defect (see Figure 1)

Fig 1. The Overall Design



The three main stages of the experiment can be summarized as follows:

1. Each group has up to 10 minutes to – via an anonymous chat based communication interface – discuss and decide on an insurance level that with a 50% probability will govern the insurance game subsequently to be played.

2. By a randomization device, half of the groups are to play in their chosen insurance system, while half of the groups are given an exogenously decided insurance system to play in.

3. Each person individually and anonymously decides whether or not to co-operate or defect in the social dilemma game, i.e. to misuse or not to misuse the insurance system in the case that she is "healthy".

Payoffs and game structure

Before the first stage each subject was given information about the different stages.[6] Each subject started with an initial 1 000 points. With 5/6th probability the subject would turn out to be "healthy" and earn an additional 2 000 points as a wage, but with 1/6th the subject would be "sick" and earn zero in additional points. Subjects were told that the monetary value of points was decreasing and that points would be exchanged for real money after the experiment at the "exchange rate":

# points from experiment	0	1000	2000	3000	4000	5000	6000
SEK in hand after experiment	0	28	38	47	54	60	65

Each subject was told that her group of four would have an insurance system, and that, given the decreasing monetary value of points, such an insurance system could improve aggregate welfare.

The insurance level would be x % of the 2 000 points salary, where x % would be between 10 and 100%. Each group member would pay an equal share of the cost of the system up to a cap of 1 000 points per subject (given the initial endowment, no subject could hence earn a negative amount of points).

A person who found herself in the "sick" condition would receive 0 points in salary plus:

1. x % of 2 000 points if the system had enough funds to cover all claims or
2. an equal share (equal to 100% if only one person was claiming to be sick) of the entire fund if smaller than the claim(s) on it

[6] The information was given to the subjects in a more layman way than presented here.

The subjects were also informed that there was no way to control whether a person was "sick" or "healthy" and that a healthy person potentially could lie, allege to be sick and hence claim insurance on and on top of her salary.

This main game is hence a multi-person prisoner's dilemma with the sub-game perfect, individually rational and dominant strategy to free-ride opposing the aggregate welfare of the group which would be maximized by co-operation and non-free-riding[7].

Collective-choice process

The procedure used for the collective-choice process was highly stylized. Each group was given 10 minutes to reach a decision on the insurance level x (=10, 20…, 100%) by unanimity.[8] Inline with Walker et al [2000], this process intentionally lacks many features from real voting situations (political parties, agenda setting agents, face to face communication, etc) in order to be able to draw clear inferences on the effects of the voting per se.

Strategy method

For methodological reasons, at stage 3 all participants where asked to decide what they would do, if they were healthy, before finding out their state of health. This approach is called the strategy method and enables the recording of behavior of players even in cases when they do not reach the information set in question, in our case the state of "healthy".[9]

---

[7] See appendix for a formal derivation.

[8] To ensure that groups made their decisions on time, a threat that not reaching a decision before the time ran out would result in the group not being allowed to play the insurance game and hence only receiving the show up fee. Luckily all groups did reach decisions within the time limit.

[9] The approach goes back to 1967 and Selten, see e.g. Dufwenberg & Gneezy, [2000].

Distinguishing a potential effect of participation from that of communication

A challenge when designing the experiment was to find a good way to isolate the effect of decision making and participation from effects of communication and learning. The chosen design enables such isolation by letting subjects in both treatments communicate and make a decision over an insurance system that they only with a 50% probability will keep. Thereafter the subject's groups are, by a randomization device, either allowed to keep the insurance system they decided over or given an insurance system by the computer.

Each group in the "Given-system"-treatment got (without knowing it) an insurance level that was the duplicate of the insurance level of a "Choice-of-system"-treatment group. Hence, on an aggregate level the "Given-system"-treatment exactly mirrors the level "Choice-of-system"-treatment with respect to the payoff structure of the main game.

The only thing that differs between the treatments is whether subjects play in a system that their own group decided upon or in a system that was given externally. Therefore this design nicely isolates the impact of deciding/not deciding over a system on the choice to free-ride or not to free-ride.

Results

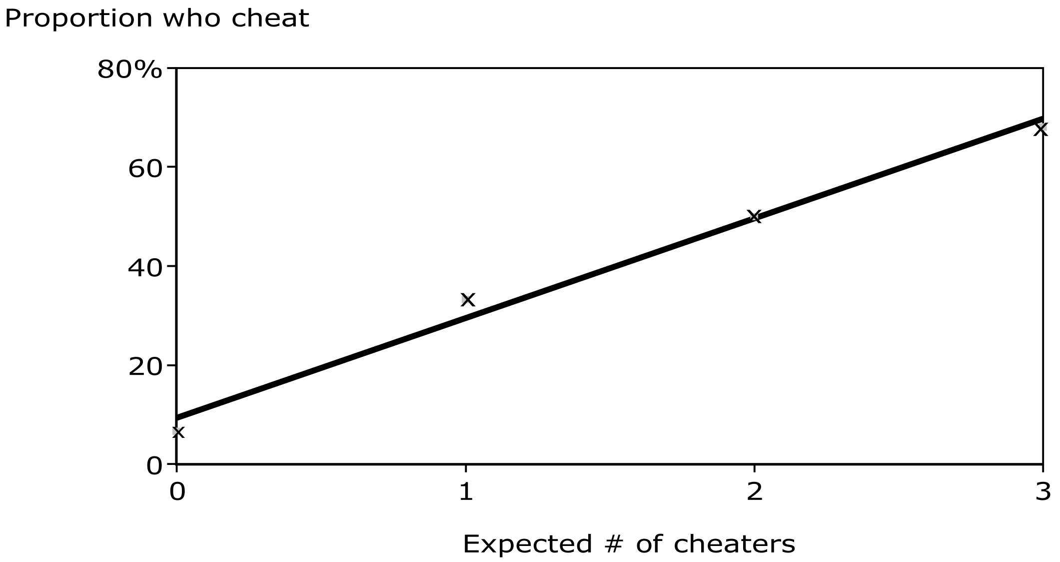
As expected a prediction based on all subjects being purely motivated by pecuniary payoffs and playing the sub-game perfect and dominant strategy "cheat" is strongly rejected. But 39% of the participants did chose defection. The overall defection rate of is roughly in line with results found in other studies and clearly significantly different from 100%.

Table 2 - Overall Co-operation Rate

Experiment 1	Sally [1995] Meta analysis	
Co-operation rate	Co-operation rate	Standard deviation
61%	47%	24%

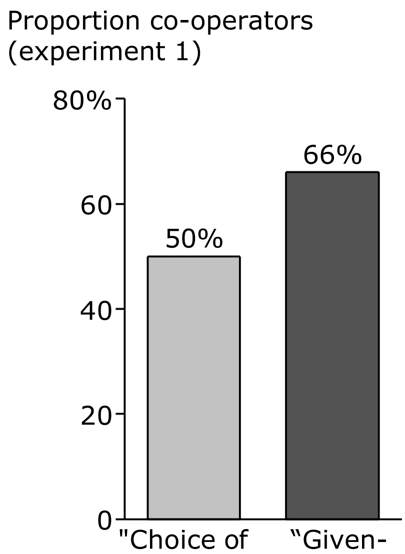
Evidence that some subjects behave according to a form of reciprocity can also be found as expectations of others behavior and peoples own behavior are strongly correlated. A regression of the aggregate proportion of people's decisions to cheat or not on the aggregate (self-reported) expectations on how many in their respective groups would cheat is presented in Figure 1. Of course when interpreting this, it is important to bear in mind that the causality probably runs in both directions.

Figur 2



A probit regression on dummy variables yields a similar result.

A key finding is that, in contrast to the conjecture and hypothesis based on other literature presented in section II, no positive impact of higher levels of participation towards the insurance system on the levels of free-riding is found.



OLS and probit regressions of a dummy that is one for co-operate and zero for defect on a dummy that is one for "Choice-of-system" and zero for "Given-system"-

treatment both yield point estimates that choosing system actually reduces the probability to co-operate by 16%. However, this is not significant at conventional levels (p = 0.12 in both cases). The conclusion is identical same when non-parametric analysis is conducted. A two sided chi-2 frequency sample test yields a p-value of 0.12 at the same time that the contingency coefficient (correlations measure which is between 0 and a theoretical ceiling which almost always is below 1) is 0.16.

Table 3 - Size and significance of treatment effect (experiment 1)

	OLS	Probit	Non-parametric
	Co-operate	Co-operate	Co-operate
Constant	.5		
(p-value from t-stat)	*(.000)*		
Given-system dummy	.159		
(p-value from t-stat)	*(.119)*		
Given-system dummy (dF/dx for disctrete change)		.159	
(p-value from z-stat)		*(.116)*	
Contigency coefficient			0.158
(p-value from chi-2 frequence sample test)			*(.116)*

From the above one must ask whether a week indication is found that being given the opportunity to choose system might actually lead to increased levels of free-riding. This does not appear to be case.

Given that males in some studies have been found to free-ride to a higher extent than females do and males although the randomization were not allocated in a totally identical proportion to both treatments an additional regression controlling for a male dummy was run. Again the result that playing in a system that one's own group had chosen the insurance level for is found to reduce the probability to co-operate. This time with 17% and significant at the 10%-level. However, when also including dummies for other back-ground variables the effect no-longer is significant.

Table 4 - Treatment when using other controls			
	Co-operate	Co-operate	Co-operate
Constant	.58	.68	1.0
(t-stat)	*(6.4)*	(5.8)	(6.4)
Given-system dummy	.17	.15	.11
(t-stat)	*(1.7)**	*(1.4)*	(1.1)
Male dummy	- .14	- .15	-15
(t-stat)	*(- 1.3)*	*(- 1.4)*	*(- 1.4)*
SSE dummy		- .19	- .11
(t-stat)		*(-1.5)*	*(- .9)*
KI dummy		- .13	- .9
(t-stat)		*(- .9)*	*(- .6)*
KTH dummy		.15	.17
(t-stat)		*(- .9)*	*(1.0)*
Expect 1 dummy			-.30
(t-stat)			*(- 2.0)***
Expect 2 dummy			-0.41
(t-stat)			*(- 2.8)***
Expect 3 dummy			-0.56
(t-stat)			*(- 3.5)***

It is also noteworthy that those in "Given-system"-treatment cheat less than those in the "Choice of system"-treatment no matter whether given a lower insurance rate than their group chose or a higher rate than their group chose. The proportion non-cheaters in "Choice of system"-treatment is 50% while it is 65% in the "Given-system" treatment when the insurance rate was higher vs 67% when the insurance rate was lower. There is no statistical difference in the proportion of non-cheaters between the case when the given-system insurance rate is higher and the case when it is lower.

Table 5 - Given treatment divided in two sub-treatments		
	Co-operate	Co-operate
Constant	.58	1.0
(t-stat)	*(6.4)***	*(6.4)***
Smaller-system dummy	.19	.12
(t-stat)	*(1.5)*	*(1.0)*
Larger-system dummy	.15	.10
(t-stat)	*(1.2)*	*(.8)*
Male dummy		-15
(t-stat)		*(- 1.6)*
SSE dummy		- .11
(t-stat)		*(- .9)*
KI dummy		- .09
(t-stat)		*(- .6)*
KTH dummy		.17
(t-stat)		*(1.0)*
Expect 1 dummy		-30
(t-stat)		*(- 2.0)**
Expect 2 dummy		-40
(t-stat)		*(- 2.8)***
Expect 3 dummy		-55
(t-stat)		*(- 3.4)***

V – Experiment 2

Design

After playing the first experiment all subjects where invited and also accepted to participate in experiment 2. To simplify instructions the context of this experiment resembles that of experiment 1. Subjects were informed that they by randomization would be grouped in new groups of four and that as before full anonymity would hold. They learned that the probability to be sick was again 1 in 6 and to be healthy was 5 in 6. As before there would be a health insurance system and its potential costs would be financed equally by each group member.

Different to before there was no endowment in the second experiment. If healthy, a wage of 40 kr would be earned, if sick, a wage of zero would be earned. The insurance level was now set to 100% of the wage of 40 kr, i.e. a person who turned out to be sick would receive 40 kr in sick insurance minus 1/4th of the total costs of the insurance system.

As there was no way to verify if a person was sick or not the hazard of a healthy person claiming to be sick and receiving sick-benefits existed. Although there was no diminishing value of points, an efficiency loss of claiming sick benefits when healthy was modeled into the payoff structure. If healthy, but claiming to be sick, a person would – instead of earning 80 (40 + 40) minus 1/4th of the insurance cost – only earn 60 (40 + 40 − 20) minus 1/4th of the insurance cost. It was highlighted that such an efficiency loss would not impact a person who got insurance when really being sick.

The game described above is a social dilemma in the sense that the individually maximizing, sub-game perfect and dominant strategy to cheat is opposed to the group welfare maximizing strategy to co-operate.

The subjects were told that they would play the above game between 3 and 5 times, each time in a new randomized group, and that they would receive the payoff from one of the games, chosen at random, in real money at the end of the experiment. This enables us to view each game as an one-shot interaction.

The computer system then grouped people at random, but in way such that each player would over the course of the four games play against groups where zero people, one person, two people, and all the other three persons had claimed to be sick in the first experiment. The order each person met these four games was also randomized.

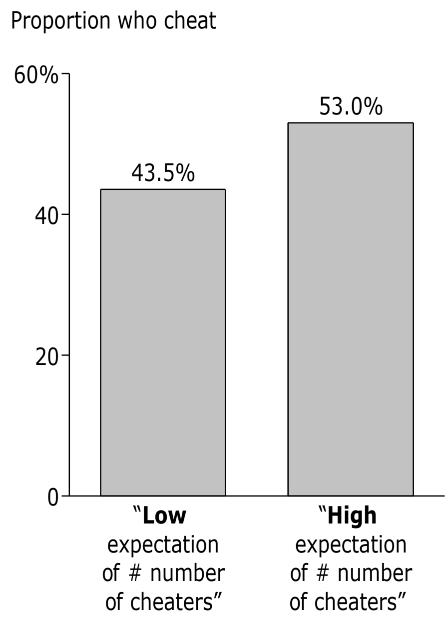
Note that the marginal value of cheating is constant at SEK 20 no matter how many other people would choose to cheat. Informing the subjects of the number of other group members who had claimed to be sick in the first experiment before each new game created four randomized treatment conditions. The difference between the four treatments nicely isolates the effect of the induced expectation of how many group members would cheat.

Results

In order to shed some light on the hypothesis that people abide more by rules if a larger fraction of others around them abide than when a lower proportion do, the four treatments in experiment 2 can be pooled into two:

1. "Low expectation of # number of cheaters" – the treatments where 0 or 1 group member(s) claimed to be sick in experiment 1
2. "High expectation of # number of cheaters" – the treatments where 2 or 3 group members claimed to be sick

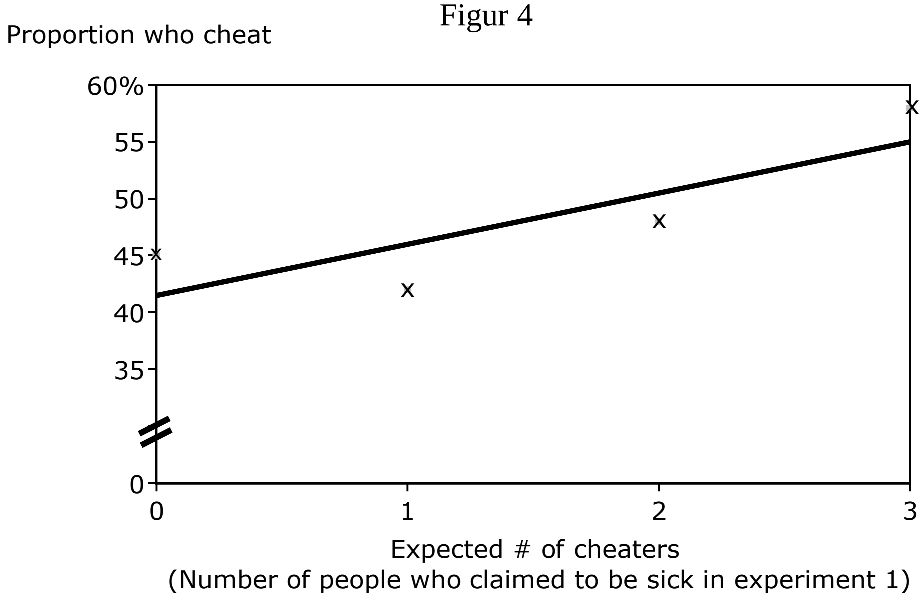
Figur 3



From *Figure 3* it can be seen that cheating in the "high expectations" treatment occurs 10 percentage points or 22 percent more often than in the "low expectations" treatment. This difference is significant at the 5 percent level with a one sided test (p = 0.026). This implies that the null hypothesis that there is no difference in how much people abide by rules if a larger fraction of others around them abide than when a lower proportion do can be rejected in favor of our alternative hypothesis that such a difference does exist.

Looking at the data in more detail by examining all four treatment conditions (information about whether 0, 1, 2 or 3 people claimed to be sick in experiment 3) the picture in *Figure 4* emerges. Visual examination indicates that the higher the

Figur 4



expected number of cheaters is, the more likely is a subject to cheat herself. The difference in the observed proportions cheating between the 0 and 3 treatments and between the 1 and 3 treatments are significant at conventional levels. The difference between treatments 0 and 3 is 13 percentage points and the p-value is 0.030. The difference between treatments 1 and 3 is 16 percentage points with a p-value of 0.011. All other pair wise comparisons are insignificant including the difference between the treatment 0 and 1.[10]

[10] This "kink" existed also in a pilot study to this experiment. Although, I believe that it is due to random sampling errors, it is possible that it actually is showing something that is real. One rough story that could explain it goes as follows. Some people might have an aversion to "bringing" the insurance system down. They might reason: If no-one else will use the system, I should be able to free-ride without causing any substantial harm. If one person is using the system a misuse by my-self might create a too large burden on the system (and in a dynamic setting trigger a downwards spiral) which I do not want to be responsible for. But, if two or three people will use the system, at least one or two of them are free-riding so the system has already failed and I am not going to be a sucker and will hence free-ride.

The visual pattern in figure 4 is confirmed by running different configurations of fixed effects, random effects and probit regressions (see table 6). In all of these regressions the null hypothesis that there is no difference in how much people abide by rules if a larger fraction of others around them abide than when a lower proportion do can be rejected in favor of our alternative hypothesis that such a difference does exist. For instance in the fixed effect regression, a person is on average 14 percentage points or 33% more likely to co-operate when facing a group where none of the others in the group had used the system in the first experiment than when facing a group where all three peers had used the system.

Table 6 - Panel and Probit Regressions on Experiment 2

	Co-operate (F.E.)	Co-operate (R.E.)	Co-operate (R.E.)	Co-operate (Probit)
Constant	0.42	0.48	0.41	
(z-stat)	*(10.5)***	*(6.3)***	*(3.88)***	
Info0 dummy	0.14	0.13	0.13	0.14
(z-stat)	*(2.4)***	*(2.4)***	*(2.4)***	*(2.9)**
Info1 dummy	0.17	0.17	0.17	0.17
(z-stat)	*(3.0)***	*(3.0)***	*(3.0)***	*(2.4)***
Info2 dummy	0.10	0.10	0.10	0.11
(z-stat)	*(1.9)**	*(1.8)**	*(1.8)**	*(1.4)*
Period1 dummy		0.07	0.07	0.07
(z-stat)		*(1.2)*	*(1.2)*	*(0.9)*
Period2 dummy		0.09	0.09	0.10
(z-stat)		*(1.6)*	*(1.6)*	*(1.2)*
Period3 dummy		0.02	0.02	0.02
(z-stat)		*(0.3)*	*(0.3)*	*(0.2)*
Male dummy			-0.03	-0.04
(z-stat)			*(-.05)*	*(-.07)*
SSE dummy			-0.17	-0.19
(z-stat)			*(-1.9)**	*(-2.8)***
KI dummy			-0.21	-0.23
(z-stat)			*(-2.1)***	*(-3.1)***
KTH dummy			-12	-13
(z-stat)			*(-1.0)*	*(-1.4)*
Given system in Exp 1			-0.10	-0.11
(z-stat)			*(-1.4)*	*(-2.0)***
Co-operation in Exp 1			0.27	0.28
(z-stat)			*(3.7)***	*(5.1)***

Though, the point estimates indicate a potential kink in the pattern (between info0 and info1), the kink is insignificant in all regressions.

The second, third and fourth regressions include dummy variables for which period a treatment was played. Although, there is a slight indication that people cheat more in later periods the relationship is not statistically significant.

A quantification of the size of the peer effect can be found in the two regressions below. Given that the potential kink seen in figure 4 turned out to be insignificant in all of the regressions and tests performed to evaluate it, an indicator variable summarizing the treatment information is created. The treatment variable is simply assigned the values 0, 1, 2 or 3 for the treatments where 0, 1, 2 or 3 of the peers had used the system in the first experiment.

In all configurations of the regressions that I have run the picture is the same: Increasing the expectation by one person increased the likelihood to cheat by approximately 5 percentage points or 11% (see table 7).

Table 7 - Treatment when using other controls

	Co-operate (R.E.)	Co-operate (Probit)
Constant	0.58	
(z-stat)	*(5.5)***	
Treatment (0, 1, 2, 3)	-0.046	-0.051
(z-stat)	*(-2.6)***	*(-2.1)***
Period1 dummy	0.07	0.08
(z-stat)	*(1.3)*	*(1.0)*
Period2 dummy	0.09	0.10
(z-stat)	*(1.5)*	*(1.3)*
Period3 dummy	0.02	0.02
(z-stat)	*(0.3)*	*(0.2)*
Male dummy	-0.03	-0.04
(z-stat)	*(-.05)*	*(-.07)*
SSE dummy	-0.17	-0.19
(z-stat)	*(-1.9)**	*(-2.8)***
KI dummy	-0.21	-0.23
(z-stat)	*(-2.1)***	*(-3.1)***
KTH dummy	-12	-13
(z-stat)	*(-1.0)*	*(-1.4)*
Given system in Exp 1	-0.10	-0.11
(z-stat)	*(-1.4)*	*(-2.0)***
Co-operation in Exp 1	0.27	0.28
(z-stat)	*(3.7)***	*(5.1)***

VI – Summary and conclusions

Both experiments provide clear evidence that people are motivated by concerns additional to those of material payoffs. These concerns are shown to be strongly connected to the concept of reciprocity.

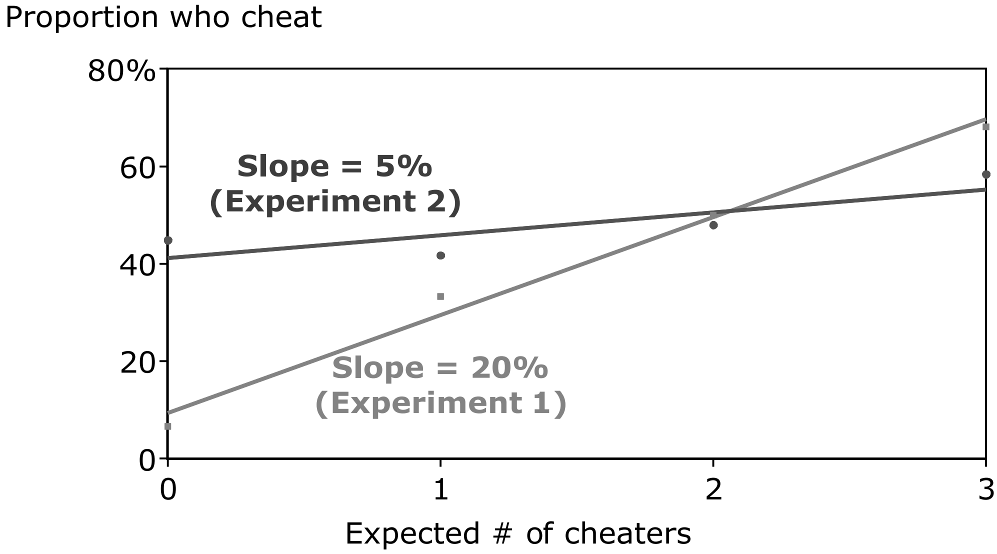
Interestingly, experiment 1 – in contrast to what other literature would suggest – indicates that voting over or having a higher degree of participation towards an insurance system does not have any positive impact on the levels of free-riding. Further research is needed to better understand this. It is possible that participation has two opposing effects: a) creating shared beliefs of fairness (decreasing free-riding) and b) inducing negative reciprocity due to conflict during decision making (increasing free-riding). Though not done yet, it is possible to analyze and codify each group's and individual's discussion before deciding in experiment 1. Doing this and including these new variables in the regression analysis should shed further light on the strength of "effect b". If effect b is found to be significant, the story: "Participation decreases free-riding in games of moral hazard" must perhaps be complemented with or even substituted by a story such as "Outside authority – a solution to intra-group conflict".

From experiment 2 it is clear that previous trends of peers misusing or not misusing the system have an effect on future levels of free-riding. People are more likely to lie and cheat when they believe that others will lie or cheat. The effect is of an economically significant magnitude. Increasing the expectation of the number of cheaters by approximately one person increased the likelihood to cheat by 5 percentage points or by 11%. Replication of this effect to further calibrate its magnitude as well as gaining an understanding of how the effect potentially varies in different contexts would be interesting.

Though outside the original scope of this study, indicative support is found for the false consensus effect. The false consensus effect refers to the finding that people who engage in a given behavior believe that the behavior is more prevalent than those who do not (Ross, Greene and House [1977]). Using the unique opportunity to do an intra-experiment same individuals comparison provides an opportunity to evaluate this potential effect.

In figure 2 in experiment 1 we saw a relationship between the expected number of cheaters and the proportion who decided to cheat. Though not exactly comparable figure 4 in experiment 2 also shows the relation between the expected number of cheaters and the proportion who decided to cheat – but now when the expected number of cheaters is largely given exogenously (by the information in each treatment regarding exactly how group members had used the system in the first experiment).

Figur 5



The large difference between the slopes of these two graphs – 20% in experiment 1 vs. 5% in experiment 2 – strongly suggests that the false consensus effect was present in the first experiment. Further analysis of this is planned and might prove to be very interesting.

Appendix i – mathematical derivation of the insurance game in experiment 1

Types: $\theta_i \in \{healthy, sick\} := \{h, s\}$

Messages depends on types: $\sigma_i(\theta_i) \in \{\hat{h}, \hat{s}\}$.

Payoffs: Let P_0 be the initial endowment. Further, P_1 is the wage for a healthy worker, C is the social insurance contribution per worker, and P_I is the ex ante determined social insurance transfer to the sick. We have $C \leq P_0$. Let ι_i^s be an indicator variable taking the value 1 if player i reports sick. Any feasible insurance system must satisfy

$$P_I' \sum_{i=1}^{4} \iota_i^s = 4C \leq 4P_0.$$

The maximum transfer is

$$P_I^{\max} = \frac{4P_0}{\sum_{i=1}^{4} \iota_i^s}$$

Let $\bar{P}_I(\sigma, \theta)$ be the actual transfer for a given strategy profile σ and type profile θ. We have

$$\bar{P}_I(\sigma, \theta) = \min\{P_I, P_I^{\max}(\sigma, \theta)\}.$$

Finally, let $C(\sigma, \theta)$ be the social insurance contribution for a given strategy profile σ and type profile θ.

Given a strategy profile σ_{-i} of the other players, the expected payoffs to a healthy player i is

$$\begin{aligned}
\pi(\hat{s}; h, \sigma_{-i}) &= E_\theta \left[\sqrt{P_0 + P_1 - C(\hat{s}, \sigma_{-i}, \theta) + \bar{P}_I(\sigma, \theta)} \right] \\
\pi(\hat{h}; h, \sigma_{-i}) &= E_\theta \left[\sqrt{P_0 + P_1 - C(\hat{h}, \sigma_{-i}, \theta)} \right]
\end{aligned}$$

A sufficient condition for a healthy player to always report sick, is that

$$-C(\hat{s}, \sigma_{-i}, \theta) + \bar{P}_I(\sigma, \theta) \geq -C(\hat{h}, \sigma_{-i}, \theta)$$

for all type profiles θ. Can rewrite this as

$$\bar{P}_I(\sigma, \theta) \geq C(\hat{s}, \sigma_{-i}, \theta) - C(\hat{h}, \sigma_{-i}, \theta).$$

In other words, the transfer must be greater than the increase in contribution due to player i also reporting sick. It is clear that this condition always will be satsified.

Case 1: If the feasibility condition always is slack (P_I is sufficiently low), C will not increase if i also reports sick, and since $P_I \geq 0$, this condition is satisfied.

Case 2: If the feasibility condition is binding when i does not report sick, this implies that C cannot increase further, and since $\bar{P}_I$ then must be positive, the condition is satisfied.

The final case to check is when the feasibility condition is slack with i not reporting sick, but binding if i reports sick.

Case 3: In this case we have (let n others report sick):

$$
\begin{aligned}
P_I n &= 4C \\
P_I(n+1) &\geq 4P_0 \\
\bar{P}_I &= \frac{4P_0}{n+1} \\
&\Rightarrow \Delta C = P_0 - C = P_0 - \frac{P_I n}{4}.
\end{aligned}
$$

We need

$$
\begin{aligned}
\bar{P}_I &= \frac{4P_0}{n+1} \geq P_0 - \frac{P_I n}{4} = \Delta C \\
&\Updownarrow \\
\frac{4P_0}{n+1} &\geq P_0 - \frac{P_I n}{4} \\
&\Updownarrow \\
P_0\left(\frac{4}{n+1} - 1\right) &\geq -\frac{P_I n}{4},
\end{aligned}
$$

which is always satisfied, as $\frac{4}{n+1} \geq 1$. Thus, it is always a weakly dominant strategy for a healthy player to report sick (strictly if $P_I > 0$).

Appendix ii – experiment instructions part 1

To be translated to English, version in Swedish available at request

Appendix iii – experiment instructions part 2

To be translated to English, version in Swedish available at request

Appendix iv – experiment instructions part 3

To be translated to English, version in Swedish available at request

Appendix v – exit survey

To be translated to English, version in Swedish available at request

References

Alm, J., B.R. Jackson and M. McKee [1993]. "Fiscal Exchange, Collective Decision Institutions and Tax Compliance", Journal of Economic Behavior and Organization. 22: 285-303

Bardan, P, [2001]. ″Water Community: An Empirical Analysis of Cooperation on Irrigation in South India″, in M. Aoki and Y. Hayami (eds.), Community and Market in Economic Development, 2001.

Bowles, S, [1998]. "Endogenous preferences: The Cultural Consequences of Markets and Other Economic Institutions", Journal of Economics Literature, March, 36, 75-111

Charness, G. and Dufwenberg, M. "Promises & Partnership", forthcoming in Econometrica

Davis & Holt [1993]. Experimental Economics, Princeton University Press

Dawes, McTavish and Shaklee [1977]. "Behavior, communication, and assumptions about other people's behavior in a commons dilemma situation", Journal of Personality and Social Psychology, Vol 35, pp 1-11.

Corzo, V. and Giwa, S. [2002]. "Health insurance and moral hazard – an experiment", Bachelor Thesis, Stockholm University

Dufwenberg, M. & Lundholm, M. [2001]. "Social Norms and Moral Hazard", The economic journal, vol. 111, No. 473, 506-525

Dufwenberg, M. & Gneezy, U. [2000]. "Measuring Beliefs in an Experimental Lost Wallet Game", Academic Press

Feld, L.P., and Tyran, J-R [2002]. "Tax Evasion and Voting: An Experimental Analysis", Kyklos, Vol 55

Frey, B. S. [1994]. “How Intrinsic Motivation is Crowded Out and In.”, Rationality and Society, 6, 334-52

Frey, B. S. [1997]. “A Constitution for Knaves Crowds Out Civic Virtues, Economic Journal 107: 1043-1053

Gneezy, U. [2005]. ″Deception: The role of consequences,″ American Economic Review, 384-394

Lindbeck, A. et al. [1999]. “Social Norms and Economic Incentives in the Welfare State”, The Quarterly Journal of Economics

Lindbeck, A. [2002]. “Sverige är inne i en ond cirkel”, Dagens Nyheter, DN Debatt - October 13.

Lindbeck, A. et al. [2003]. “Social Norms and Welfare State Dynamics”, Journal of the European Economic Association , 1(2-3), April-May 2003, 533-542.

Ostrom, E [1990]. “Governing the Commons: The Evolution of Institutions for Collective Action”, Ann Arbor: University of Michigan Press

Ostrom, E [1998]. “A Behavioral Approach to the Rational Choice Theory of Collective Action: Presidential Address, American Political Science Association, 1997”, American Political Science Review, Vol 92, No 1, 1-22

Ostrom, E [2000]. “Collective Action and the Evolution of Social Norms”, Journal of Economic Perspectivev, Vol 14, No 2, 137-158

Pinker, S. [1994]. “The Language Instinct”, New York: W. Morrow

Pommerehne, W.W. & Weck-Hannemann, H. [1996]. “Tax Rates, Tax Administration and Income Tax Evation in Swizerland”, Public Choice. 88: 161-170

Ross, L., Greene, D. & House, P. (1977). “The false consensus effect: an egocentric bias in social perception and attribution processes”, Journal of Experimental Social Psychology 13, 279-301.

Sally, D. [1995]. “Conversation and cooperation in social dilemmas - a meta-analysis of experiments from 1958 to 1992”, Rationality and Society, vol 7

Seigel, S. [1956]. “Nonparametric statistics for the behavioral sciences”, McGraw Hill

Stutzer, A & Lalive, R, [2004]. “The Role of Social Work Norms in Job Searching and Subjective Well-Being”, Journal of the European Economic Association, vol. 2(4), 696-719, 06.

Walker, J. M., Gardner, R., Herr, A. and Ostrom, E. [2000]. The Economic Journal 110 (January), 212-234