CERE Working Paper, 2012:6

Rationality, Fairness and the Cost of Distrust.

Göran Bostedt[1] & Runar Brännlund[2]

[1]Centre for Environmental and Resource Economics and Dept of Forest Economics
Swedish University of Agricultural Sciences
S-901 83 Umeå, Sweden

[2]Centre for Environmental and Resource Economics and Dept of Economics
University of Umeå
S-901 87 Umeå, Sweden

Department of Economics, Umeå University, S-901 87, Umeå, Sweden

www.cere.se

Rationality, Fairness and the Cost of Distrust

Göran Bostedt[1] & Runar Brännlund[2]

[1]CERE, Centre for Environmental and Resource Economics, and Dept. of Forest Economics, Swedish University of Agricultural Sciences, S-901 87 Umeå, Sweden. Phone: +46-90-786 5027. Fax: +46-90-786 8164. Email: Goran.Bostedt@sekon.slu.se (Corresponding author)

[2]CERE, Centre for Environmental and Resource Economics, and Dept. of Economics, University of Umeå

Abstract

An adapted version of ”the trust game with revenge” is applied to a Swedish setting. Senders – the first-movers - can keep an endowment of SEK 30, or give fractions or all to an unknown receiver. Donations are multiplied by five before reaching receivers, who may, or may not, send back part or the entire received amount. Half of the receivers are given information that the sender has the opportunity to exact revenge, while the remaining are not given this information. Results differ from Fehr and Gächter (2000) *J. Econ. Perspect. 14*, 159-181, in the sense that the share of endowments sent in the first stage is around two thirds, compared to less than one third in Fehr and Gächter. Furthermore, they find a very strong effect of punishment while we find almost no effect. An efficiency frontier is defined and results show that that only 25 % of the outcomes reach this frontier due to lack of trust. If senders were confident that receivers would return at least 20 % of the donated amount, it is optimal to donate the whole endowment. Only about one-fifth returned of the receivers returned less than this, so for the most part the lack of trust is unwarranted.

Keywords: experiments; trust game; revenge; efficiency frontier
JEL Classification: C91, D63, D84

1. Introduction

Experimental economic games have become a popular and important tool for the exploration of such topics as fairness, trust, and cooperation across human societies. For example it has become an important tool in analysing human behaviour and social dilemmas in relation to provision of public goods (for an overview, see Ledyard [4]). Two very fundamental results can be inferred from the literature. Firstly, experiments show that subjects contribute, on average, between 40 and 60 percent of their endowment to a public good, instead of using it for private activities. In repeated games contributions tend to decline, eventually to the free riding level [4]. However, as shown by Keser and van Winden [3] the decay in contribution in a repeated game seems to depend on whether the subjects of the game are partners or strangers, in the sense that there is no trend in the decline when subjects are "partners". This leads to a second result in the literature, which highlights interaction between individuals. For example if subjects have the possibility to punish free riders, or retaliate mean behaviour and the subjects know this, it may affect contribution. Furthermore, as shown by Fehr and Gächter [2] (2000), persons seems to be willing sacrifice private resources just for the sake of retaliation, which may appear irrational (at least from a traditional economic standpoint). Fehr and Gächter argue therefore that interaction between individuals contradicts rational selfishness. According to them, positive interaction implies a will to return good deeds while negative interaction involves retaliation for mean behaviour, even if this is costly. This tendency to return behaviour can lead to seemingly irrational decisions, which has been shown repeatedly in economic experiments.

A well-known experiment aimed to test this behaviour is "the trust game with revenge" [2, 1]. The basic setup of the game involves a "sender", an individual endowed with a certain amount, say $ 10, and who is asked whether they would like to give all, or part, of this amount to an anonymous "receiver". The amount sent is then tripled or quadrupled before reaching the "receiver". The "receiver" can then decide if they would like to keep it all or give part back to the "sender". In the "…with revenge" variant of the game the "sender" has the opportunity to invest money in order to exact revenge. When game participants' brains were scanned using PET (positron emission tomography) techniques it was shown that the brains' reward centre was activated when "senders" exacted revenge on ungrateful "receivers".

In this paper ”the trust game with revenge” has been adapted somewhat and applied to a Swedish setting, something which to our knowledge has not been done previously. The next section outlines the experimental setup. Section three presents an analysis of the results of the experiments, while the last section contains some concluding remarks.

2. Method

2.1 Sampling

The experiment was conducted during the spring of 2010 in three rounds and with a total of 62 undergraduate students and one lecturer from Umeå University. Of the students 18 were from the social work programme, 14 came from the MBA programme, 11 from the social geography programme, 6 from the media producer programme, while 13 came from different engineering programmes. Despite being a convenience sample of undergraduates care was taken to obtain an even gender distribution (30 of 63 participants were male, i.e. 47.6 percent) in both the sender and receiver groups, and to obtain participants from different types of education. An important disadvantage with student sampling is the limited variation in age and this study is no exception. The mean age was 22.6 years, with all participants with the exception of the lecturer being between 19 and 30 years (Table 1). That most participants were from northern Sweden despite the fact that only about 10 percent of the Swedish population comes from this region reflects the fact that Umeå University mainly recruits students from this region.

Table 1. Characteristics of experiment participants

Senders	
Mean age (Interval)	24.5 (19-56)
Mean gender (male = 1)	0.5
Studies/occupation	MBA student: 12 Engineering programme: 9 Social work programme: 9 Lecturer: 1
Geographic background	Northern Sweden:23 Stockholm: 1 Rest of Sweden: 6 Foreign: 1
Size of home town/city	Countryside: 6 Small town: 4 Medium sized town: 10 Large city: 10
Receivers	
Mean age (Interval)	21.4 (19-28)
Mean gender (male = 1)	0.437
Studies/occupation	MBA student: 2 Engineering programme: 4 Social work programme: 9 Social geography programme: 11 Media producer programme: 6
Geographic background	Northern Sweden:22 Stockholm: 2 Rest of Sweden: 8
Size of home town/city	Countryside: 5 Small town: 3 Medium sized town: 12 Large city: 11

2.2 The Experiment

The experiment was conducted after classes and the participating students were informed that they had a chance to participate in a game with the opportunity to win money. ”Senders” and ”receivers” were then placed in separate rooms. The senders, who are the first-movers in the game, are placed with their backs to one another and given an envelope with a SEK 20 bill and a SEK 10 coin, in total SEK 30 (about USD 4) and written instructions. The senders then have to decide whether to keep the money or give SEK 10, 20 or 30 to their receiver, whom they have not met. From the instructions they know that the amount they send will be multiplied by five before reaching the receiver, and that the receiver may, or may not, choose to send back part or all of what he/she receives. Finally, the sender is given information about

the possibility to exact revenge by investing private funds. For every SEK invested in punishment SEK 5 is deducted from the amount the receiver gets.

After the senders have made their decision the envelope is transferred to the receivers. They are shown the initial amount donated by the senders and the total after multiplication by five. The receivers are then asked to decide how much they want to return to the senders. Half of the receivers are also given the information that the sender have the opportunity to exact revenge if they are disappointed with the amount returned, while the remaining half are not given this information. After the receivers have made their decision the senders are shown the amount ”their” receivers decided to return. The senders then decide if they want to exact revenge and how much they want to invest in this revenge. After this round the game ends and the senders and receivers are given their respective profits, which in the case of the receivers may be diminished by the revenge. Both parties are then asked to fill out a questionnaire. Apart from demographic questions the senders’ questionnaire contained questions on motives for sending and motives for retaliation in cases were this occurred. The receivers’ questionnaire contained questions about motives for returning part or the entire amount received.

It should be noted that the fact that the senders where given a combination of one SEK 10 coin and one SEK 20 bill limits the senders’ to four discrete choices, to give SEK 0, 10, 20 or 30.

3. Results

3.1 Senders

The distribution of the amount donated by the sender group can be seen in Table 2. Note that the vast majority donated SEK 20 or the whole sum, i.e. SEK 30.

Table 2. Amount donated by sender group

Amount donated (SEK)	Observations (Percent)
0	1 (3.23)
10	4 (12.9)
20	12 (38.71)
30	14 (45.16)
Sum	32
Mean: 21,87	Median: 20

3.2 Receivers

The set of choices for the receivers is determined by the amount donated by the senders. A receiver who is given nothing has of course no opportunity to give anything back. A receiver who is given SEK 10 by the sender – which is multiplied by five to SEK 50 before reaching the receiver - has six discrete choices, to give back SEK 0, 10, 20, 30, 40 or 50. Similarly, a receiver who is given SEK 30 by the sender – which is multiplied by five to SEK 150 before reaching the receiver – has 16 discrete choices. Table 3 displays the amount returned by the receivers and the amount donated by the sender party.

Table 2. Amount returned by receiver group

Amount returned (SEK)	Observations (Percent)	Mean amount given by senders (SEK)	Mean payoff to senders (SEK)
0	4 (12.5)	12.5	-12.5
10	1 (3.1)	10	0
20	3 (9.4)	22	2
30	2 (6.2)	15	15
40	7 (21.9)	20	20
50	6 (18.7)	21.7	28.3
60	2 (6.2)	30	30
70	2 (6.2)	23	47
80	4 (12.5)	24	56
150	1 (3.1)	30	120
Sum	32		
Mean amount returned: 21,87		Median amount returned: 20	

From Table 2 it is evident that the mean payoff to the sender's increases with the mean amount donated, although the variance is increasing as well. The same pattern is true when donations and payoffs to senders are studied on an individual level.

3.3 Revenge by senders

The final step in the experiment is revenge. Of the 32 persons in the receiver group, 14 (43.7 %) did not know about the senders' opportunity to exact revenge, while 18 (56.2 %) knew. Of the amount given to the receivers – after multiplying by five – those who didn't know about the threat of revenge returned on average 44.17 %, while those who knew returned on average 43.01 %. The difference is small and not significant, which shows that the threat of revenge did not increase average amounts returned. However, 4 persons in the sample did not return anything, and all these persons belonged to the group that did not know about the threat of revenge. Six persons in the sender group (19.3 %) used the opportunity to exact revenge.

The results here differ from the results in Fehr and Gächter [2] both with respect to the amount sent in the first stage and with respect to the effect of the possibility to exact revenge. The share of endowment sent in the first stage is around two thirds on average, which should be compared to less than one third in Fehr and Gächter. Furthermore, there is a very strong effect of punishment in Fehr and Gächter, whereas we find almost no effect.

3.4 Receiver model

A simple regression model based on the responses to the debriefing questionnaire by the receivers can be used to shed light on the motives behind the amount returned by them, see Table 3.

Table 3. Regression model of amount (SEK) returned by receivers

Variable	Coefficient	T-value
Intercept	-198.09	-3.27***
Knowledge of revenge	-0.405	-1.69
Amount received	0.560	2.93***
Receiver's age	0.576	3.12***
Engineering student	0.095	0.51
MBA student	-0.101	-0.43
Social work student	-0.049	-0.24
Media production student	0.478	2.36**
"Generosity" main motive	0.334	1.35
"Revenge threat" main motive	0.365	1.22
"Not seen as greedy" main motive	0.297	1.23
"Gratitude" main motive	0.528	2.04*
Both "generosity" and "revenge threat"	0.439	1.86*
Both "gratitude" and "revenge threat"	0.282	1.46
Both "gratitude" and "generous"	0.050	0.29
Degrees of freedom	17	
Adjusted R^2	0.47	

* = significant at 90% level, ** = significant at 95% level, *** = significant at 99% level

That an increase in every SEK received significantly increase the amount returned by 0.56 SEK is perhaps not surprising, neither is the result that older receivers return more. Perhaps more interesting is that students that major in media production return significantly more than students in social geography, and that receivers that point to gratitude as the most important motive return more than students that point to generosity, the threat of revenge, or the risk of being seen as greedy by the experiment leader.

3.5 The cost of distrust

Another way to look at the outcomes is to plot them in terms of payoffs to the senders and receivers. From the sender's perspective, if they chose to send nothing they end up with the

SEK 30 the experiment leader gave them initially, and the receiver's payoff is SEK 0. Only two senders chose that alternative. The largest possible payoff to the sender is SEK 150, which occurs if the sender donates the full amount to the receiver, which then gets multiplied to SEK 150, of which the receiver then returns everything. The largest possible payoff to the receiver is also SEK 150, which also occurs if the sender donates the full amount to the receiver, which then gets multiplied to SEK 150, but then the receiver returns nothing. This outcome also requires that the sender does not use the possibility to exact revenge. Any distribution on a linear frontier between {150, 0} and {0, 150}, see Figure 1, can then be said to be on the efficiency frontier in the sense that the two paired players have, without meeting in person, obtained the maximum possible payoff from the experiment. How this payoff is divided between the players is purely a distributional issue. Only 8 out of 32 outcomes (25 %) are on the frontier.

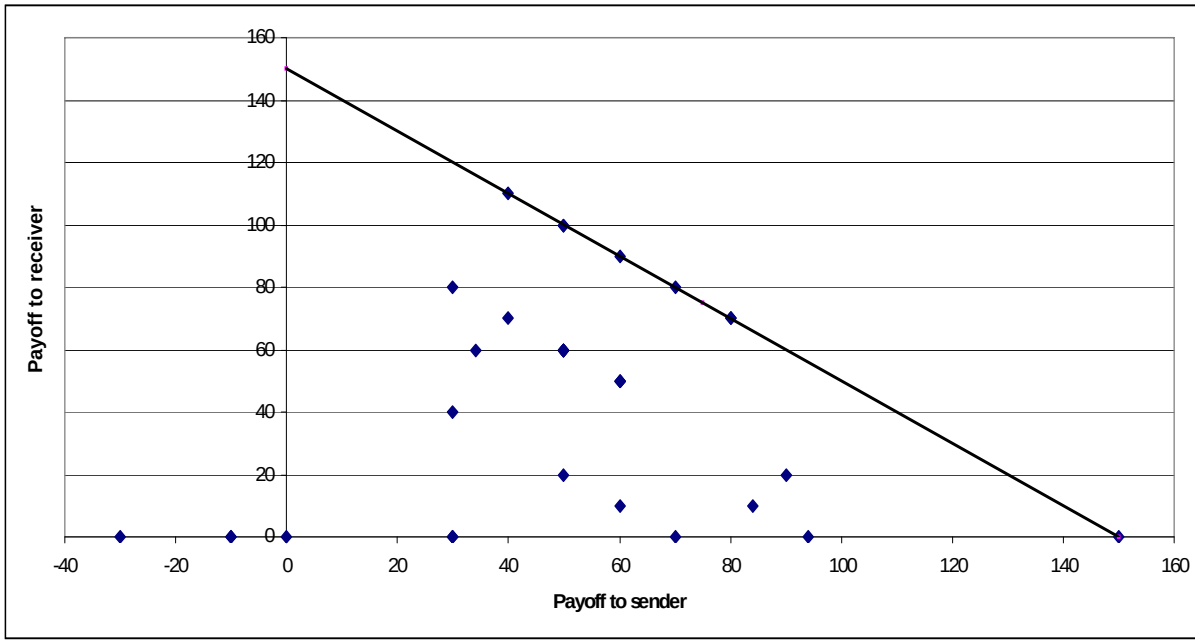

Figure 1. Payoffs to senders and receivers after the experiment and the efficiency frontier

What the experiment shows is that distributional concerns on the side of the sender have implications for efficiency. Senders who do not donate the full amount do so for a reason, but by doing so precludes the possibility to reach the frontier. Also, if the senders chose to exact revenge a distribution that is on, or close to the frontier, might end up farther from it. As an example, if the sender donates SEK 30, the receiver gets SEK 150. If he/she then returns SEK 25 the outcome {25, 125} is on the frontier. But if the sender then uses these SEK 25 to exact revenge the resulting outcome will be {0,0}. As Figure 1 shows, distrust caused by

distributional concerns (e.g. “if I donate the full amount how can I be sure the receiver will be equally generous”) impedes efficiency. There are lots of comparisons to everyday life that can be made here. One example could be team-effort situations where I may shirk, i.e. donate less work-effort, since I suspect other may shirk as well, and the work ends up delayed or not done at all, i.e. the efficiency frontier is not reached. This is a variant of the Tragedy of the Commons, owing to the lack of trust.

An interesting aspect of the results is whether the senders conjecture concerning the amount returned was correct. The expected payoff for an individual sender *i* is:

$$E(\pi) = 30 - x_i + \theta_j \cdot 5 \cdot x_i$$

Where x_i is the senders’ donation and θ_j $\left(0 \le \theta_j \le 1\right)$ is the senders’ expectation of the share the matched receiver *j* will return. The first-order condition for the optimal donation is:

$$\partial E(\pi)/\partial x_i = -1 + \theta_j \cdot 5 = 0$$

or

$$\theta_j = 0.2$$

This means if an individual senders’ expectation was that more than 20 percent of their donation would be returned, the optimal strategy is to donate all the SEK 30, if not they should not donate anything. The data set does not give any information on the senders’ *expectation* of the share returned, only the actual share returned. The mean share returned was 0.435, with a 95 percent confidence interval of 0.332 to 0.538. Only 7 of 32 receivers, i.e. 21.8 percent, returned 20 percent or less of the amount received, while 17 of 32 senders, i.e. 53.1 percent, donated less than the full amount. This further confirms the lack of efficiency due to the distributional concerns and lack of trust on the side of the sender, which, for the most part, is unwarranted.

4. Concluding remarks

This paper reports an application of an adapted version of ”the trust game with revenge” to a Swedish setting. The basic setup of the game involves a ”sender”, an individual endowed with a certain amount who is asked whether they would like to give all, or part, of this amount to an anonymous ”receiver”. The amount sent is then multiplied by 5 before reaching the ”receiver”, and the ”receiver” then decide whether to keep it all or give part back to the ”sender”. In addition, the ”sender” has the opportunity to invest money in order to exact revenge. I our setup half of the receivers know that the senders can retaliate on them, whereas the other half doesn’t know this. The sample we use consists of 62 students in different majors at the Umeå University in Sweden.

The results differ from previous results in two important respects. The first is that the receivers return a relative large share of the received amount to the sender, compared to other studies. The second is that we find no difference in return pattern between the group who were aware of the revenge possibility and the group who did not know. The paper defines an efficiency frontier and the results show that that only about 25 % of the outcomes reach this frontier, since not all senders donate all of his endowments. This lack of efficiency can then be interpreted as a lack of trust on the side of the sender. If the sender were confident that the receiver would return at least 20 percent of the donated amount, then it is optimal to donate the full amount, 30 crowns. Only about one-fifth returned of the receivers returned less than 20 percent, which shows that for the most part the lack of trust is unwarranted.

In summary one can say that the result concerning distrust confirm the well-known result related to the tragedy of the commons. However, one may say that this was less pronounced in this experiment, compared to many other similar experiments. More surprising was the effect of possible revenge on return, which turned out to be non-existent. Not the least the latter may be worth exploring more in future studies. Here we foresee a number of such explorations; comparisons of different groups within a country/region, comparisons between countries, and comparisons between different socio-economic groups within and between countries, just do mention a few.

Acknowledgements

We would like to thank MBA student Frida Rimark who conducted the experiment, and all the participants in the experiment. We acknowledge financial support from the Swedish Energy Agency.

References

[1] J. Berg, J. Dickhaut, K. McCabe, Trust, reciprocity, and social history, Game. Econ. Behav. 10 (1995) 122–142.

[2] E. Fehr, S. Gächter, Fairness and retaliation: The economics of reciprocity, J. Econ. Perspect. 14 (2000) 159-181.

[3] C. Keser, F. van Winden, Conditional cooperation and voluntary contributions to public goods. Scand. J. Econ. 102 (2000) 23-39.

[4] J.O. Ledyard, Public goods: A survey of experimental research, in: J.H. Kagel, A.E. Roth (Eds.), *The Handbook of Experimental Economics*, Princeton University Press, Princeton, 1995, pp. 111-194.