

Informal sanctions and conditional cooperation: A natural experiment on voluntary contributions to a public good*

Tobias Heldt[†]

June 3, 2005

Abstract

In a natural experiment, this paper studies the impact of an informal sanctioning mechanism on individuals' voluntary contribution to a public good. Cross-country skiers' actual cash contributions in two ski resorts, one with and one without an informal sanctioning system, are used. I find the contributing share to be higher in the informal sanctioning system (79 percent) than in the non-sanctioning system (36 percent). Previous studies in one-shot public good situations have found an increasing conditional contribution (CC) function, i.e. the relationship between expected average contributions of other group members and the individual's own contribution. In contrast, the present results suggest that the CC-function in the non-sanctioning system is non-increasing at high perceived levels of others' contribution. This relationship deserves further testing in lab.

Keywords: Informal sanctions, natural experiments, voluntary contributions, conditional cooperation, *Allemansrätten*

JEL: H41, C93, Z13

*Acknowledgements: I would like to thank Lars Hultkrantz and Jan-Eric Nilsson for insightful and thorough suggestions. Håkan Holm and Magnus Thor have provided useful comments on a previous version of the paper. Thanks to Christer Rosen, Säfsen Resort and Karl-Eric Westerberg, Hovfjället for making this natural experiment possible. Financial support from The Swedish Research Council for Environment, Agricultural Science and Spatial planning (Formas) is gratefully acknowledged. All remaining errors are my own.

[†] Department of Economics and Society, Dalarna University, Sweden. e-mail: the@du.se.

1. Introduction

Today, a large body of evidence exists of people cooperating to a much larger extent than predicted by the self-interest model, and that such results can be explained by a substantial number of people having social preferences (see Fehr and Fischbacher 2002 or Sobel 2004 for a review). More specifically, theories for explaining pro-social behavior have focused on “conditional cooperation”, stating that higher cooperation or contribution rates are expected when information is provided that many others cooperate (Frey and Meier 2005). Conditional cooperation has been explicitly¹ tested in both lab (Fischbacher et al. 2001, Houser and Kurzban 2003) and field experiments (Frey and Meier 2005, Heldt 2005). Conditional cooperative behavior is consistent with theories of individual preferences for reciprocity (Fehr and Fischbacher 2002) but also with conformity, i.e. that people want to copy the most prevalent behavior in a group (Bohnet and Zeckhauser 2004, Carpenter 2004). Studies trying to discriminate between the two motivations get mixed results. Therefore, it still remains a challenge to test in the field under which conditions the motives leading to conditional cooperative behavior prevail (Frey and Meier 2005).

Introducing an option to punish free-riding behavior in a laboratory public good situation has been shown to sustain high cooperation rates over time (Fehr and Gächter 2000). Field evidence of successful governance of common pool resources also shows the importance of a sanctioning mechanism to sustain a norm of voluntary cooperation (Ostrom 2000). It has been shown that individuals holding strong reciprocal preferences are those willing to impose sanctions on others for norm violations (Fehr and Fischbacher 2003). However, it is unclear how the existence of a sanctioning mechanism affects individuals’ voluntary contributions to a public good outside the lab situation.

The general question posed in this study is how voluntary contributions to public goods can be explained. In this paper, I examine the effect of an informal sanctioning system on individuals’ voluntary contribution to a public good. This is done using a natural

¹ Implicitly, conditional cooperation behavior has been inferred from particular patterns of data generated in lab experiments (e.g. Keser and van Winden 2000, Brandts and Schram 2001, Croson et al. 2004).

experiment². I specifically analyze the impact of an informal sanctioning system on the conditional contribution function, i.e. the relationship between expected contributions of others and own contributions.

The context of the experiment is two Swedish ski resorts where a sample of cross-country skiers (hereafter ‘skiers’) face a decision to voluntarily contribute to funding the grooming of the ski tracks.³ The two resorts are very similar in terms of location and visitor characteristics, but differ with respect to the system for collecting user contributions. Ski tracks in Sweden can be conceived of as public goods, since for undeveloped land, including trail infrastructures such as a ski track, it is not legal to exclude skiers. Moreover, it is not legal to charge for access to such facilities.

The results of the experiment support the notion that the existence of an informal sanctioning mechanism affects individuals’ voluntary contribution to a public good. They also suggest that the shape of the conditional contribution function may differ depending on the context of the situation and not only individual personality traits. To my knowledge, this is the first study using a natural field experiment to study the effect of informal sanctions on voluntary contributions to a public good.

The remainder of the paper is organized as follows. Section 2 introduces the field context and reviews relevant theory. Section 3 describes the set up and design of the field experiment. Section 4 presents the results and section 5 concludes.

2. Field context and theory

In Sweden, public access to undeveloped landscapes is open under *Allemansrätten*, the centuries-old right of common access. It is not explicitly codified in law, but is rather a set of customary rules and judicial interpretations regarding activities, such as camping,

² Following the classification of Harrison and List (2004).

³ The results from this study are also useful for addressing the general problem of financing recreational public goods under open access which, besides cross-country skiing, also applies to activities like mountain biking, snowmobiling, canoeing and skating on natural lakes.

berry picking, and cross-country skiing, not listed among state obligations to defend landowner claims (for a more thorough description, see Vail and Heldt 2000). Facilities and infrastructure on land, for example snowmobile trails, mountain bike trails, canoeing waterways or cross-country trails then get the features of public goods, i.e. non-excludability of users and non-rivalry in consumption. Moreover, it is not legal to charge for access to such facilities. The land ethics surrounding Allemansrätten is taught at school and is common knowledge to Swedes.

This section first describes the empirical context of tourism use of a recreational public good in relation to skiing. Then, it elaborates on predictions and results from the standard public good game to serve as a reference point for behavioral predictions. Finally, informal sanctions as a mechanism for sustaining cooperation over time is discussed and related to the concept of conditional cooperation.

2.1 Tourist skiers as one-shot public goods players

Tourism is a one-shot activity by nature.⁴ Often, tourists visit a destination only once or perhaps just a few times. A tourist can therefore be seen as a one-shot player at a destination. In contrast, local inhabitants frequently interact at the destination and can be viewed as playing a repeated game. Tourists and locals can therefore be expected to act differently. For example, consider the use of ground water at an Isle-destination, and the individuals' choice between a shower and a bath at a zero price. Given that a bath is preferred to a shower, a tourist has no incentive to choose to take a shower to save water. A local, at least should, care about the-long term supply of fresh water and more often choose to take a shower (see Hjalager (1998) for a description of ground water conflict in a tourist area).

Both experimental and field studies of voluntary contributions to public goods find the likelihood of cooperation and high contribution rates to increase under certain

⁴ A tourist is defined by the UN as a visitor who has traveled to and visits a destination different from her home environment. The length of the stay must not exceed one year and the purpose of the trip should be something else than to act as paid labor (World Tourism Organization 1994).

circumstances. Cooperation increases when there are connections between participants; there is a small number of participants; personal communication is allowed or there exists a way of sanctioning or punishing non-contributors (Ostrom 2000). In this paper, the behavior of tourists, who can be seen as one-shot players in a tourist area, is most interesting to consider, since few of above criteria are applicable to tourists. The tourists' use of a recreational public good studied in this paper can therefore be seen as a one-shot game of voluntary contributions to a public good with anonymous players.

2.2 A traditional public good game (PGG)

The tools and language of game theory have been proven to be useful to systematically analyze the nature of people's preferences (Camerer and Fehr 2002). Since the experiment in this paper uses a context of voluntary contributions to a public good, the traditional public goods game serves as a reference point. It is typically described as follows. n participating subjects constitute a group. Each subject is given an endowment of x tokens that should be divided between private consumption and contributions to produce a public good. An individual i 's choice to keep one token for private consumption yields a private return of exactly one token, while the individual's investment in the public good, g_i , has a marginal payoff of m tokens to *each* of the n subjects. The utility in terms of total material payoff for an individual i contributing g_i tokens to the public good can be expressed as:

$$U_i = U_i \left[(x - g_i) + m \sum_{j=1}^n g_j \right], \quad (1),$$

where $\sum g_j$ is the sum of contributions to the public good by all n subjects in the group. When $0 < m < 1 < nm$, complete free riding, i.e. a zero contribution ($g_i = 0$), is the dominant strategy Nash equilibrium since $\partial U_i / \partial g_i = m - 1 < 0$. The Pareto efficient allocation is when all subjects contributed their whole endowments to the public good, $g_i = x$ for all i , i.e. a cooperative solution. This follows from $\partial \sum n U_i / \partial g_i = nm - 1 > 0$.

Two results from PGG played in a lab are found to be robust. First, in one-shot games and in contrast to the above prediction, subjects on average contribute 40-60 percent of their endowments. Second, when the standard game is played for multiple rounds, contributions decrease over periods and approach the Nash equilibrium (e.g. Ledyard 1995). The same pattern of decay of cooperation over time has been found in the field (List 2004).

2.3 Informal sanctioning of free riders to sustain cooperation

Varying the standard set up of a PGG makes it possible to study specific effects of the interaction process (e.g. group size, marginal pay off, anonymity and communication). One strong effect on the pattern of contributions over time is found when introducing an option to punish free riders (Fehr and Gächter, 2000).

Informal sanctions have been shown to be a key to enforcing social norms (Falk et al. 2001). To sustain a social norm, it needs to be enforced with a system of sanctions penalizing deviations from the acceptable behavior. In contrast to formal sanctions, informal sanctions include any penalty or loss of benefit arising from other sources than legal authorities (Shafer et al. 1999). Peer pressure, gossiping and social ostracism such as when striking workers ostracize strike breakers, are examples of punishment and sanctioning mechanisms to enforce a norm of non-free riding in a public good situation.

There is strong evidence from both lab and field that sanctions of free riders are important for long-term cooperation. In lab, several studies that have shown that a punishment mechanism can sustain high cooperation levels (Fehr and Gächter 2000, Falk et al. 2001, Masclet et al. 2003)) For example, Fehr and Gächter (2000) let the same subjects play a repeated PGG for ten-rounds, with and without an option to punish. They found that in the last period of the game, 83 percent of subjects in the punishment condition contributed their whole endowment, whereas 53 percent of the same subjects were completely free riding in the non-punishment condition (Fehr and Gächter 2000).

Field evidence from governance of common pool resources can be summarized as follows: “in all self-organized resource governance regimes that have survived for several generations, participants invest resources in monitoring and sanctioning the actions of others so as to reduce the probability of free riding” (Ostrom 2000 p. 138).

A further finding from the literature on public goods and collective action is that our world contains multiple types of individuals, some of which are more willing to cooperate than others (“conditional cooperators”) and some of which are more willing to impose sanctions on free riders than others (Ostrom 2000). Long-term cooperation to achieve a common goal in a group does not only seem to be dependent on the existence of mechanisms to sanction free riders, but also on the composition of personality types in the group. Individuals with strong reciprocal preferences are found to be the key players in both situations (Fehr and Fishbacher 2003).

2.4 Conditional cooperation

Conditional cooperators are “people who are willing to contribute more to a public good the more others contribute” (Fischbacher, Gächter and Fehr 2001, p. 397). Conditional cooperation is based on the notion that people are affected by, and compare themselves to, references groups. In a public good game, a theory of conditional cooperation⁵ predicts higher cooperation or contribution rates when information is provided that many others cooperate (Frey and Meier 2005).

Conditional cooperative behavior is consistent both with theories of conformity (as will be described below) and theories of reciprocity. In repeated PGG, conditional cooperation has been used as a description for a behavior that implies matching the average contribution of others in their group (Croson 1996, Keser and Van Winden 2000, Croson et al. 2004). These studies suggest reciprocity to be driving the behavior. An

⁵ Conditional cooperation can also be seen as a social norm prescribing cooperation if other group members cooperate, whereas others’ non-cooperation is a legitimate excuse for individual defection (Fehr and Fischbacher 2004).

individual with reciprocal preferences respond to actions perceived as kind in a friendly manner, i.e. with rewards, and to actions perceived as unkind in a hostile manner, i.e. with punishment⁶ (Rabin 1993, Falk and Fischbacher 2000). The preferences for conditional cooperation would be similar to weak reciprocal preferences, which only include the positive or rewarding side of reciprocity. It is not necessarily the case that conditional cooperation is consistent with the negative or punishing side of reciprocity.

Fischbacher, Gächter and Fehr (2001) was the first to explicitly test conditional cooperation in lab. Using a standard PGG setting, they found that 50 percent of the participants could be classified as conditional cooperators, and 30 percent as free riders, while 14 percent displayed a hump-shaped contribution pattern. In their study, subjects were classified as different types depending on their reported contribution functions in a “contribution table”. Subjects indicated how much they were willing to contribute for each of 21 possible average contribution levels of the other group members.

Theoretically, it has been shown that even in a population with a majority of reciprocators, a small minority of free riders may render zero cooperation to be the unique equilibrium in a repeated game (Fehr and Schmidt 1999). This decay of cooperation over time has been explained by referring to the influence of free riders always giving zero contributions. This explanation can be illustrated by referring to the conditional contribution function (CC-function), defined as “the relationship between the expected average contribution of other group members to the public good and the contribution of a representative individual”⁷ (Fehr and Fischbacher 2003). For example, in a ten-period repeated PGG, an individual initially expects an average contribution of 80 percent, and makes her own contributions accordingly. A conditional cooperator matches the contribution rate of the group based on beliefs of group contributions, while a free rider never contributes. This induces an average contribution in the first period of for example 50 percent. Since the expectations of average contributions in period one are not met, this leads to a downward revision of the expectations to about 50 percent for

⁶ The behavior is analogous with the “tit-for-tat-strategy” (Axelrod 1984).

⁷ Beliefs about the average contribution of others may range from zero to 100 percent, which is also the case for an individual’s contribution in relation to the endowment.

period two. When cooperators expect 50 percent contributions, the actual contribution rate for that period will be less, for example only 30 percent, causing a further downward revision of the expectations for the next period of the game. Therefore, the existence of free riders in the group is the cause of the breakdown of cooperation (Fehr and Fischbacher 2003). However, the CC-function has been shown to be increasing in a population with heterogeneous individual types (Fischbacher et al. 2001).

The imitative behavior to follow a social norm⁸ is called conformity. Conformity has been defined as “the tendency to copy the most prevalent behavior in a population” (Carpenter 2004 p.395). Traditionally, conformity has two major motivations (see Jones 1984, for a thorough review). An individual may conform either as a way of taking advantage of information acquired by others or to avoid being sanctioned for norm deviation. In a model of conformist behavior, the latter aspect has been modeled as a social cost of nonconformity. Thus, an individual is aware of the cost of selecting an action not chosen by others (Jones 1984).

Conformity has been used as an explanation for the rapid decay of cooperation in repeated PGG. In a situation where the number of free riders increases, conformity may be seen as an additional incentive to free ride (Carpenter 2004). Conformity is also likely to be important to help sustain contributions to a public good when these start at a high level. However, the existence of a mechanism to sanction deviation from a norm of non-free riding is crucial for explaining sustained contribution rates by conformity. Hence, in a situation with an informal sanction mechanism, a theory of conformity predicts an increasing CC-function.

Conditional cooperation has been tested in the field in two ways, of which only the first is applied in this present study. The first is to test whether expectations about the behavior of the group vary positively with one’s own behavior. For example, in a field experiment on charitable giving, Frey and Meier (2003) investigate how the expectations about

⁸ A norm is social if shared and sanctioned by others in a group. In contrast, a norm is personal if the individual herself sanctions and rewards violation and adherence. (Kerr 1995)

others' behavior correlate with one's own behavior. They find a correlation of 0.34 between expressed expectations about others' contributing behavior and the own behavior. However, this way of testing has a causality problem. A 'false consensus' effect (Ross et al. 1977) may be present, i.e. people may form expectations about others so as to justify their own behavior. If so, it is not expectations about others that trigger behavior, it is behavior that influences expectations.

The second way means varying the beliefs about the behavior of the group in an experimentally controlled way (see Heldt 2005 for a description). In the field, both Frey and Meier (2005) and Heldt (2005) find that individuals' willingness to contribute increases when they are informed that many others are contributing, as compared to a situation where no or low information about others' contributions is given.

3. Experimental design

The experiment reported in this paper uses the natural variation of two ski resorts, similar in many respects, but different with respect to the system for sanctioning the lack of contributions to ski-track preparation. Two major tasks were performed in the experiment. First, skiers' average contribution rates in both resorts were elicited. Second, skiers' own beliefs about the other skiers' average contribution rate were elicited. The first task produced data used to test differences in the average contribution rates between a non-sanctioning and a sanctioning system. Furthermore, the data can be used to test the difference in contribution rates between a sample of one-shot players, tourists, and repeated game players, non-tourists. The second task produced data used to analyze the impact of an informal sanctioning mechanism on the shape of the conditional contribution function.

3.1 Data collection

The field experiment uses data of individual behavior from two Swedish ski resorts. Data were collected during eight weeks in January and February 2004. The two resorts are

very similar in terms of location and visitor characteristics,⁹ but differ in terms of history and the system of collecting user contributions to fund ski-track grooming. Resort one (hereafter the “sanctioning system”) has a long history of using an informal sanctioning system to enforce contributions, while resort two (hereafter the “non-sanctioning system”) recently introduced a system that does not use informal sanctions. Arriving in the area with prepared tracks, a skier was given information about the resort’s system for user contribution to ski-track funding.

The subjects’ actual behavior was gathered by a self-completed questionnaire on site. This approach was considered most suitable for collecting reliable information on compliance to a voluntary contribution system, but also considered crucial for the possibility of collecting information on individuals’ beliefs. Furthermore, it made it possible to collect individuals’ socio-economic characteristics.

Identical questionnaires were used in the two resorts, except for the question capturing the contributing behavior, which was adapted to the context of each system. To increase the response rates and make respondents take the task of answering seriously, a monetary incentive was provided.¹⁰ Figure 3.1 summarizes the experimental design.

⁹ They are both located in the south western Swedish mountains and the distances to the metropolitan areas of Göteborg and Stockholm are similar. The conditions for alpine skiing are similar, while resort two is ranked slightly higher in terms of kilometers of cross-country ski tracks. Moreover, my data support the picture of similar visitor characteristics, except the frequency of local visitors which is higher in resort one than in resort two.

¹⁰ The sampling of subjects was made on-site. Having had a personal contact with an interviewer and thus having had the chance of posing questions regarding the study has been shown to increase the response rate as compared to mail or telephone surveys. To further increase participation rates in the study, the questionnaire was deliberately made short. After several pre-tests, the final questionnaire version had an average answering time of about five minutes. At randomly chosen time intervals, all skiers passing a specific location were sampled. Subjects were asked to complete the questionnaire on site and return it in a box at a discrete location. If they were hesitating to participate, they were given a pre-stamped envelope and offered the alternative of completing the questionnaire at home and returning it by mail. To screen subjects that had been sampled multiple times and still keep anonymity, the questionnaire requested the subjects to state the last three digits of their car’s license plate number. Quite often skiers go in groups. Party size and age were used in the process of selecting independent observations for the effective sample.

	<i>Sanctioning system</i>	<i>Non-sanctioning system</i>
1. Average contributions	– Testing differences between systems and between tourists and non-tourists	
2. Individuals' beliefs about the average contribution	– Analyzing the shape of the CC-function between systems	

Figure 3.1: Summary of experiments within the study

The sanctioning system

In the sanctioning system, signs informed the skier of the existence of a skiing fee system and that a fee of 25 SEK (\$3,50¹¹) should be paid before skiing. Furthermore, skiing without paying a skiing fee might render a penalty of 100 SEK (\$14). However, in practice, the system is not monitored, and legally the system cannot be enforced due to *Allemansrätten*. The resort only makes spot tests of compliance to the system once or twice every season. A skier that has not paid the skiing fee at a spot test is given a motivation for the system and is told to pay on her way home. Since formal sanctions cannot enforce the paying of a skiing fee, the system can be considered as using an informal sanctioning mechanism.¹² Skiers not paying the skiing fee might run the risk of being caught as a free rider by the resort's personnel during a spot test. If such a situation makes an individual feel embarrassed, the informal sanctioning mechanism can be expressed as "the risk of having to feel embarrassed".

According to representatives from the ski resort, a norm of paying the skiing fees has evolved over the last ten years, with a larger and larger fraction of skiers paying each

¹¹ An approximate value based on an exchange rate of 7 SEK/\$.

¹² Since the land ethics of *Allemansrätten* are deeply rooted and continually educated among the Swedish population, it is likely that most skiers realize that paying the skiing fee at Hovfjället is voluntary. Skiers uninformed about *Allemansrätten* may, of course, view the system differently. If one believes that it is legal to charge user fees for skiing, the decision to pay the skiing fee or not will be based on the trade off between willingness to pay, degree of self-interest, size of penalty and the risk of getting caught.

year. This can be considered as a repeated game where locals living close to the resort reciprocate by buying ski passes, as long as they receive high-quality tracks. When the quality of the ski tracks is low, the resort does not require the paying of a skiing fee. Moreover, the user fee is deliberately set not to cover the costs of ski-track preparations and as compared to an alpine lift ticket of 180-220 SEK, the 25 SEK fee is low. These facts plus the features of non-monitoring and infrequent spot testing of the rules are likely to encourage voluntary compliance. Prior to the study reported in this section, no record of past compliance with the system existed, only records of past skiing fees paid (Westerberg 2004)

To capture the behavior of paying a skiing fee or not the question: “Did you pay the skiing fee before you started your ski trip?”, was included in the questionnaire. Reported answers were cross-validated with the resort’s record of daily sales of skiing fees.

The non-sanctioning system

The non-sanctioning system had no history of skiers’ contributing to fund ski-track preparations. Rather, the tourist resort finances ski-track preparations out of its general revenue. From this season, there was an option of voluntary contributions. When entering the track, skiers were informed about the motivations for the new voluntary contribution system. The information included an explicit request for a voluntary contribution of 20 SEK (\$3) to fund track preparations. There were no explicit statements that the total amount contributed was in any way connected to the quality of present or future tracks. Cash contributions were to be made in a locked box, close to the information sign. The system can be considered purely voluntary with no informal sanction mechanism to affect non-contributors.

To capture the behavior of contributing or not, the question: “Before you leave this place, have you made a voluntary contribution of 20 SEK to track preparations?” was included in the questionnaire. To cross-validate reported behavior with actual behavior, information from the ski resort on the total amount of money contributed in the box during each sampling period was used. Small discrepancies were found; however, these have been shown not to influence the results (see Heldt 2005).

Sample characteristics

The overall response rate in the *sanctioning system* was 81 percent. It was obvious that in a few groups, only one subject returned the questionnaire and that some subjects, when sampled several times, refused to return their questionnaire the second or third time. A total of 343 subjects were sampled, of which 161 subjects with completed questionnaires are in the effective sample, i.e. excluding multiple subjects and including only one subject per household. In the *non-sanctioning system*, the response rate was 76 percent. A total of 272 subjects were sampled, of which 89 subjects entered the effective sample (Appendix table a.1 gives further details). Table 3.1 summarizes a selection of characteristics in the two systems.

Table 3.1: Selected characteristics of skiers

	<i>All</i>		<i>Tourists</i>	
	<i>Mean</i> (<i>Std. Dev.</i>)	<i>Min - Max</i>	<i>Mean</i> (<i>Std. Dev.</i>)	<i>Min - Max</i>
<i>(a) Sanctioning system</i>	48.25		49.48	
Age	(11.71)	19 - 72	(11.54)	21 - 72
Beliefs	54.70 (22.17)	5 - 99	53.59 (23.55)	10 - 98
Experience	3.35 (2.44)	0 - 9	2.95 (2.20)	1 - 9
Gender (% male)	0.54		0.55	
Tourist (%)	0.52		1.00	
<i>n</i>	161		83	
<i>(b) Non-Sanctioning system</i>	45.21		39.75	
Age	(12.95)	20 - 71	(11.37)	20 - 63
Beliefs	41.60 (23.53)	10 - 100	42.92 (24.30)	10 - 100
Experience	3.29 (2.10)	1 - 9	3.42 (2.38)	1 - 9
Gender (% male)	0.69		0.61	
Tourist (%)	0.40		1.00	
<i>n</i>	89		36	

Notes: Age denotes actual age in years. *Beliefs* refers to subjects' own beliefs about the contribution share of other skiers. *Experience* is a categorical variable ranging from 0-9, measuring individuals' average number of ski trips/week. *Gender* takes the value of 0 if female, and 1 if male. *Tourist* is a variable taking the value of 0 if non-tourist and 1 if tourist.

4. Analysis and results

4.1 Result 1: Voluntary contributions differ between systems

The impact of a sanctioning system on individuals' voluntary contributions are reported in table 4.1. In the non-sanctioning system, on average 35 percent of the skiers contributed, while the same figure for the sanctioning system was 79 percent on average¹³. Furthermore, tourists seem to be less inclined to contribute in the non-sanctioning system than in the sanctioning system. In the sanctioning system, tourists' contribution rate is on average, although not significantly, higher than for all skiers in the system. In the non-sanctioning system, tourists have a significantly lower average contribution rate (22 percent) as compared to non-tourist skiers in the non-sanctioning system. This result is in line with a hypothesis that tourists do not contribute unconditionally. The difference is significant at the five-percent level using a chi-square test.

Table 4.1: Skiers' contribution

	Percent contributing		
	Non-tourist	Tourist	All
<i>Sanctioning system</i> ^{a)***}	74 %	83 %	79 %
<i>Non-Sanctioning system</i>	43 %	22 % ^{b)**}	35 %

a)*** indicates that the contribution rates in the sanctioning system are significantly higher compared to the non-sanctioning system. The smallest difference, i.e. for the group non-tourist between the two systems, is significant at the one-percent level with a chi-square =12.82. b)** indicates a significance at the five-percent level, chi-squared = 4.23, p-value= 0.0396.

The raw data analysis cannot reject a difference in skiers' contribution rates between the two systems. But there could be other factors of the field setting that affect the choice of

¹³ Assuming that all non-responders did not contribute, reduces the average contribution rates to 61 percent in the sanctioning system and 21 percent in the non-sanctioning system.

contributing. Therefore, the effect of an informal sanctioning system is further investigated by pooling the data and estimating a model on the choice of contributing or not, controlling for demographic and field-relevant variables. Table 4.2 presents the results.

Table 4.2: Contributions to ski preparation, regression estimates
(Dependent variable =1 if contributing, 0 if not)

Variable	Logit estimates	
	Coefficient (std.dev.)	Marginal effects ^{a)}
Age	0.003 (0.013)	0.740E-03
Beliefs	0.031*** (0.007)	0.683E-02
Gender	-0.184 (0.323)	-0.410E-01
Sanctioning system	0.945** (0.408)	0.211
Tourist	0.662* (0.409)	0.148
Constant	-1.559* (0.832)	-0.348
<i>Interaction</i>		
Non sanction * Tourist	-1.827*** (0.686)	-0.408
N=250, Log L. -127.3727, Restricted log L. -164.4707		

a) Calculated at the sample means. *, ** and *** indicate significance at the ten, five and one percent levels, respectively. Descriptive statistics and variable descriptions are found in table 3.1, except for the variables; *Sanctioning system* which takes the value of 1 if the individual was sampled in the sanctioning system and 0 otherwise and *Interaction Non-sanction * Tourist* = 1 if tourist in non-sanctioning area, and 0 otherwise.

A few results are worth a comment. First, the coefficient of the variable *Sanctioning system* is significant at the five percent level. This confirms the general pattern from the raw data analysis in table 4.1 that a sanctioning system affects the probability of contributing positively. Second, the coefficient of the variable *Tourist* is significant at the ten-percent level, which implies that the probability of contributing increases if being defined as a tourist. Third, the negative effect of the interaction variable *Non-sanction **

Tourist is significant and implies that the probability of contributing decreases when being a tourist sampled in the non-sanctioning system as compared to being a tourist in the sanctioning system. Furthermore, *Beliefs* has a positive effect on the probability of contributing. The marginal effect of a one-percentage change in beliefs is 0.68 percentage points.¹⁴

4.2 Result 2: The shape of the CC-function differs between systems

A correlation between beliefs about others' behavior and one's own behavior is consistent with a conditional cooperation hypothesis. However, causality is not clear as a false consensus effect might be at work (Ross et al. 1977). Assuming that such an effect, if present, is on average the same in our two ski areas, any difference in correlation or shape of the contribution function is either due to differences in individual characteristics or the context for giving a contribution, i.e. the presence of a sanctioning system or not.

Skiers facing the sanctioning system expect that, on average, 55 percent of the skiers contribute. On average, this is an underestimation¹⁵ of the real contribution rate of 79 percent in the effective sample. In the non-sanctioning system, on average, skiers slightly overestimate the real contribution rate of other skiers, expecting on average 42 percent to contribute. The average expectation of other skiers' contribution by tourists is just about the same as for the overall sample, both in the sanctioning and the non-sanctioning system, 53 and 43 percent, respectively. But what about the correlation between beliefs about others' behavior and own behavior?

Consistent with a conditional cooperation hypothesis, there is a positive correlation between beliefs and behavior in both systems. This is true also for the tourists. The higher the expectation of other skiers' average contribution, the more likely are skiers to contribute. The correlation coefficients between expressed belief and a contribution are 0.33 (0.31) and 0.18 (0.14) for the sanctioning system (tourists) and the non-sanctioning

¹⁴ This is similar to the 0.6 percentage points found in Frey and Meier (2005) as a marginal effect of elicited beliefs on the choice of voluntary contributing in a field experiment context.

¹⁵ However, this is just a slight underestimation as compared to an average contribution of 61 percent which is the result, assuming that all non-respondents did not contribute.

system (tourists) , respectively. The former is similar to the 0.34 found in Frey and Meier (2003).

The conditional contribution functions for the two systems are presented in figure 4.1. The average contribution rates and individual beliefs about the contribution of others are plotted and grouped in increments of ten-percentage points (except for the ninth and tenth percentiles, which are added together due to small sub-samples).

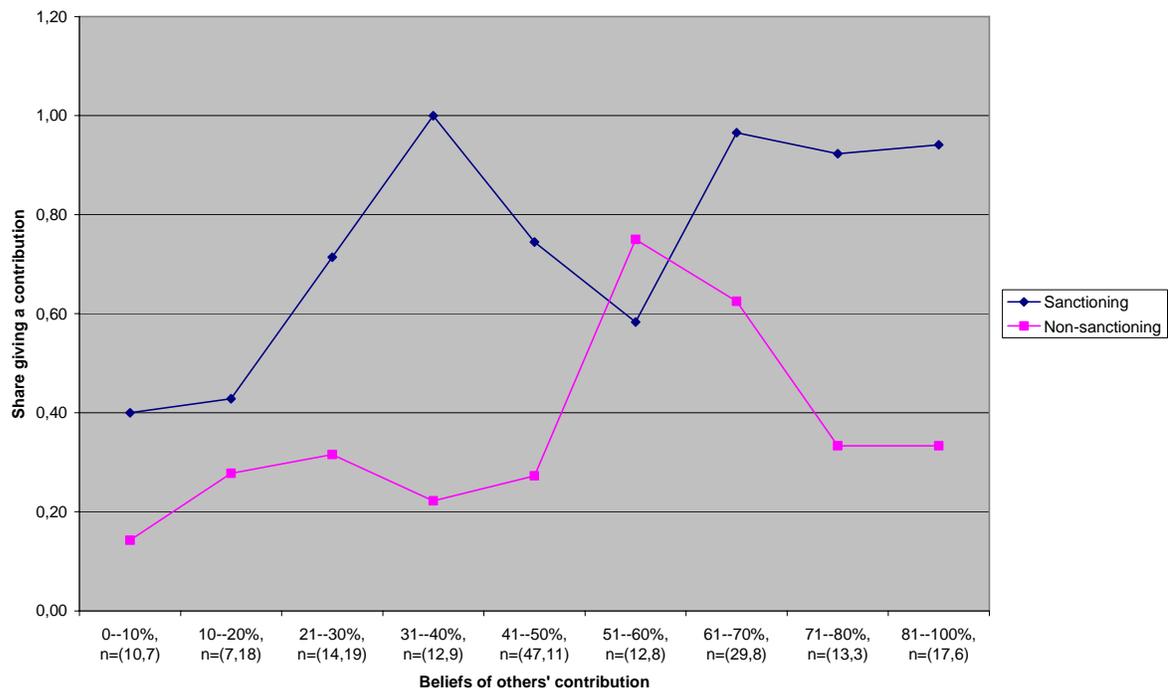


Figure 4.2: Actual contributions from skiers depending on beliefs of others' contribution, percentiles (sub-sample sizes (*Sanctioning*, *Non-sanctioning*) in parenthesis)

The shape of the CC-function for the sanctioning system is increasing. However, it is not clear that the same holds in the non-sanctioning system at high perceived contribution rates. Explicitly testing the contribution rates between the eight and nine/tenth percentiles, and the sixth and seventh percentiles reveals a significant difference at the ten-percent level (chi-square 2.932, p-value 0.086) indicating that the CC-function for the non-sanctioning system actually falls in that region.

A non-increasing relationship, between average contributions and beliefs about others' contributions, stands in contrast to predictions by a theory of reciprocity. However, it is consistent with the notion that conformity plays less of a role in a non-sanctioning system. I have found this relationship in a field experiment. It might be asked whether any particular features of the non-sanctioning system used in this study may have influenced this result. Reexamining data from a previous study using a context of skiers' voluntary contributions to improve skiing conditions under a non-sanctioning system supports the previous findings (Heldt and Nerhagen 2001).

Their explorative contingent valuation study,¹⁶ including three treatments, reports data that may be used to test the impact on skiers' willingness to contribute (WTP) from information about the norm of voluntary contributions in the population. Prior to answering the valuation question, respondents were to consider the assumption that x (10, 50 and 90 depending on treatment) percent of the skiers in the population were contributing 25 SEK. Then, a traditional open-ended valuation question followed. Using that data to run a regression to test the impact of different treatments on average WTP, controlling for socio-economic characteristics, gives results indicating a non-increasing CC-function going to the highest level of hypothesized contribution rate of others. The coefficient for the variable *Norm 90* indicates that the average WTP for the sample receiving the 90 percent treatment is significantly lower as compared to the base case, i.e. the 50 percent treatment. Table 4.3 gives the result (descriptive statistics are given in Appendix table A2.1).

¹⁶ The contingent valuation method (CVM) is a stated preference method, developed for the purpose of determining values of non-market goods and services. An individual's valuation or willingness to pay (or accept) for a good or service is contingent on the hypothetical market described, including a payment vehicle and an elicitation procedure. If properly conducted, values from a CVM study may be used as input in a cost-benefit analysis. (see further Mitchell and Carson 1989).

Table 4.3: WTP in a non-sanctioning context, regression estimates

Variable	OLS	
	Coefficient	Std. Dev.
Age	0.32**	0.15
Gender	-6.24	5.71
Income	0.04***	0.02
Norm10	-6.25	7.13
Norm 50 (base case)	x	x
Norm 90	-12.57*	6,69
Constant	2.01	11,49

N=58. R²=0.16.
Log L. -245.6201.
Restricted log L. -250.7418

*, ** and *** indicate significance at the ten, five and one percent levels, respectively. Descriptive statistics and variable descriptions are found in table A2.1.

5. Summary and conclusions

	Informal sanctioning system	Non-sanctioning system
1. Average contributions	– On average 79 percent contribute	– On average 35 percent contribute – Significantly lower contributions by tourists ¹⁷
2. Individuals' beliefs about the average contribution	– An increasing conditional contribution function	– A <i>non-increasing</i> conditional contribution function at high perceived levels of others' contribution

Figure 5.1: Summary of results from the study

In this paper, the effect of an informal sanctioning mechanism on individuals' voluntary contribution to a public good has been studied using a natural experiment. The results of the experiment, summarized in figure 5.1, support the notion that the existence of an informal sanctioning mechanism has a positive effect on individuals' willingness to give a voluntary contribution. The share of skiers giving a contribution to fund the preparation of the ski tracks was higher in a sanctioning system as compared to a non-sanctioning system. This constitutes a first field experimental test of the effect of a mechanism to punish free riders, at the level of contributions to a public good.

Previous studies have indicated that the relationship between expected contributions of others and own contributions (the CC-function), differs with respect to individual type

¹⁷ The average contribution rate of tourists in the non-sanctioning area is significantly lower compared to other skiers in the non-sanctioning area and also significantly lower compared to tourists in the sanctioning system. The first indicates that tourists are not prepared to unconditionally give a voluntary contribution. However the second indicates that an informal sanctioning system may effectively "raise" even one-shot playing tourists to make a voluntary contributions.

(Fischbacher et al. 2001). In this paper, I have also found indications that contextual features may influence the shape of the CC-function. While skiers' CC-function was increasing in a sanctioning system, it was non-increasing at high perceived levels of others' contribution in a non-sanctioning system. Such a relationship stands in contrast to predictions by theories of reciprocity, but is consistent with a notion of conformity playing less of a role when there are no individual costs of deviating from the behavior of the majority.

The effect of an informal sanctioning mechanism on the shape of the CC-function deserves more rigorous testing in a laboratory environment. Future studies to explain human cooperation in general and voluntary contribution to a public good in particular should pay attention to the interaction between two forces: A desire to contribute conditionally on others' contribution and the threat of sanctions when choosing a non-contribution strategy.

References

- Axelrod R. (1984). *The Evolution of Cooperation*. New York: Basic Books.
- Bohnet I. and R. Zeckhauser (2004). Social Comparisons in Ultimatum Bargaining. *Scandinavian Journal of Economics*, 106(3): 495-510.
- Brandts J. and A. Schram (2001). Cooperation of Noise in Public Goods Experiments: Applying the Contribution Function. *Journal of Public Economics*, 79(2): 399-427.
- Camerer C. F. and E. Fehr (2002). Measuring Social Norms and Preferences using Experimental Games: A Guide for Social Scientists. Institute for Empirical Research in Economics, University of Zürich, Working Paper No. 97.
- Carpenter J. P. (2004). When in Rome: Conformity and the Provision of Public Goods. *Journal of Socio-Economics*, 33: 395-408.
- Croson R. (1996). Contributions to Public Goods: Altruism or Reciprocity. Working Paper, Wharton School, University of Pennsylvania.
- Croson R., E. Fatas and T. Neugebauer (2004). Reciprocity, Matching and Conditional Cooperation in Two Public Goods Games. Working Paper, IESA 09-04.
- Falk A. and U. Fischbacher (2000). A Theory of Reciprocity. Working Paper No 6. Institute for Empirical Research in Economics, University of Zürich.
- Falk A., E. Fehr and U. Fischbacher (2001). Driving Forces of Informal Sanctions. Institute for Empirical Research in Economics, University of Zürich, Working Paper No. 59.
- Fehr E. and K. Schmidt (1999). A Theory of Fairness, Competition and Cooperation. *Quarterly Journal of Economics*, 114: 817-868.
- Fehr E. and S. Gächter (2000). Fairness and Retaliation - The Economics of Reciprocity. *Journal of Economic Perspectives*, 14: 159-181.
- Fehr E. and U. Fischbacher (2002). Why Social Preferences Matter – The Impact of Non-selfish Motives on Competition, Cooperation and Incentives. *The Economic Journal*, 112: C1-C33.
- Fehr E. and U. Fischbacher (2003). The Nature of Human Altruism. *Nature* 425 (23): 785-791.
- Fehr E. and U. Fischbacher (2004). Social Norms and Human Cooperation. *Trends in Cognitive Sciences*, 8(4): 185 - 190.

Fischbacher U., S. Gächter and E. Fehr (2001). Are People Conditionally Cooperative? Evidence from a Public Goods Experiment, *Economic Letters*, 71: 397- 404.

Frey B. S. and S. Meier (2003). Social Comparisons and Pro-social Behavior: Testing Conditional Cooperation in a Field Experiment. Working Paper no. 162. Institute for Empirical Research in Economics, University of Zurich.

Frey B. S. and S. Meier (2005). Social Comparisons and Pro-social Behavior: Testing Conditional Cooperation in a Field Experiment. Forthcoming in *American Economic Review*.

Harrison G. W. and J. A. List (2004). Field Experiments. *Journal of Economic Literature*, 42(4): 1009-1055.

Heldt T. (2005). Conditional Cooperation in the Field: Cross-Country Skiers' Behavior in Sweden. In Heldt T. (2005). *Sustainable Nature Tourism and the Nature of Tourists' Cooperative Behavior: Recreation Conflicts, Conditional Cooperation and the Public Good Problem*, Uppsala University.

Heldt T. and L. Nerhagen (2001). Turskid-och skoteråkning i Sälenfjällen: Är "På rätt led i Sälenfjällen" ur led? Working paper 2001: 3 in Transportation and Tourism. Dalarna University, Borlänge.

Hjalager A-M. (1998). Environmental Regulation of Tourism: Impact on Business Innovation. *Progress in Tourism and Hospitality Research*, 4: 17-30.

Houser D. and R. Kurzban (2003). Conditional Cooperation and Group Dynamics: Experimental Evidence from a Sequential Public Goods Game. Working Paper Interdisciplinary Center for Economic Science, George Mason University.

Jones S. R.G. (1984). *The Economics of Conformism*. Oxford: Basil Blackwell.

Keser C. and F. van Winden (2000). Conditional Cooperation and Voluntary Contributions to Public Goods. *Scandinavian Journal of Economics*, 102(1): 23-39.

Kerr N. L. (1995). Norms in Social Dilemmas, in Schroeder D. (Ed.) *Social Dilemmas: Perspectives on Individuals and Groups*. London: Praeger.

Ledyard J. O. (1995). Public Goods: A Survey of Experimental Research. In Kagel J. and A. Roth (Eds.) *Handbook of Experimental Economics*. Princeton: Princeton University Press.

List J. A. (2004). Young, Selfish and Male: Field Evidence of Social Preferences. *The Economic Journal*, 114: 121-149.

Masclet D., C. Noussair, S. Tucker, and M.-C. Villeval (2003). Monetary and Non-Monetary Punishment in the Voluntary Contribution Mechanism. *American Economic Review*, 93(1): 366-380.

Mitchell R. C. and R. T. Carson (1989). *Using Surveys to Value Public Goods: The Contingent Valuation Method*. John Hopkins University Press, Washington.

Ostrom E. (2000). Collective Action and the Evolution of Social Norms. *Journal of Economic Perspectives*, 14: 137-158.

Ross L., D. Green and P. House (1977). 'The False Consensus Effect': An Egocentric Bias in Social Perception and Attribution Processes. *Journal of Experimental Social Psychology*, 13: 279-301.

Rabin M. (1993). Incorporating Fairness into Game Theory and Economics. *American Economic Review*, 83: 1281-1302.

Shafer W. E., R. E. Morris and A. A. Ketchand (1999). The Effects of Formal Sanctions on Auditor Independence. *Auditing, Supplement*, 18: 85-101.

Sobel J. (2004). Interdependent Preferences and Reciprocity. Working Paper, Center for Advanced Study in the Behavioral Sciences, University of California, San Diego.

Vail D. and T. Heldt (2000). Institutional Factors Influencing the Size and Structure of Tourism: Dalarna (Sweden) and Maine (USA). *Current Issues in Tourism*, 3(4): 283-324.

Westerberg K-E. (2004) Managing Director, Hovfjället, Torsby, Sweden (interview).

World Tourism Organization (1994). *Recommendations on Tourism Statistics*. World Tourism Organization, Madrid.

Appendix 1. Descriptive statistics

Table A1.1: Effective sample sizes

	The sanctioning system (Resort one)	The non-sanctioning system (Resort two)
Main sample	278	243
Real sample	272	233
Returned blank	0	2
Responses	216	177
Previously sampled + More than one in a party – excluded	55	88
Effective sample	161	89

Response rate (%), sanctioning system 81 % and non-sanctioning system 76 %.

Table A1.3: Summary of field sessions in the *sanctioning* system

Field session	Effective sample <i>n</i>	No. of subjects paying skiing fee <i>b</i>	Share paying skiing fee <i>b/n</i>
1	29	20	0.69
2	42	37	0.88
3	48	36	0.75
4	42	34	0.81
Total	161	127	0.79

Table A1.4: Summary of field sessions in the *non-sanctioning* system

Field session	Effective sample <i>n</i>	No. of subjects contributing <i>c</i>	Share contributing <i>c/n</i>
1	35	13	0.37
2	13	4	0.31
3	19	8	0.42
4	3	3	1.00
5	5	2	0.40
6	3	0	0.00
7	11	1	0.09
Total	89	31	0.35

Appendix 2. Descriptive statistics, data in Heldt and Nerhagen (2001)

Table A2.1: Respondent characteristics, Non-sanctioning context

	<i>Mean</i>	<i>Min - Max</i>
Age	56.03 (13.54)	26 - 83
Gender (% male)	0.59	0 - 1
Income	283.45 (139.28)	70 - 550
WTP	21.98 (18.41)	0 - 100
Norm10 (share of sample receiving treatment)	0.36	0 - 1
Norm 50 (share of sample receiving treatment)	0.29	0 - 1
Norm 90 (share of sample receiving treatment)	0.34	0 - 1
<i>N</i>	58	

Notes: *Age* denotes actual age in years. *Gender* takes the value of 0 if female and 1 if male. *Income* is an approximation to individuals' yearly income before tax in the year 2000, inferred from answers to a categorical question in ten levels. *WTP* is respondents reported willingness to pay.