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Conditional cooperation: Behavioral regularities from the lab and the field and their policy implications[†]

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1. The problem of voluntary cooperation

A well-known fact from the theory of public goods is that voluntary provision will lead to an inefficient undersupply (Samuelson 1954). The reason is the famous free rider problem: Since, by definition of a public good, an agent can benefit from it, even if he or she has not contributed to the public good, everyone has an incentive to hope that others provide the public good. More specifically, a rational and selfish agent will only equate his or her private marginal benefits and costs of the public good, whereas efficiency requires that the sum of marginal benefits should equal the marginal costs. Thus, there exists a tension between individual and collective rationality, which is prototypical for many cooperation problems. This tension lies at the heart of the matter in such diverse areas like warfare, environmental protection, management of commons, tax compliance, corruption, voting, the participation in collective actions like demonstrations and strikes, donations to charities, teamwork, collusion between firms, embargos and consumer boycotts, and so on.

While the logic of self-interest is straightforward, the data seem to be at odds with the free rider hypothesis that is derived under the joint assumptions of rationality and selfishness. The fact that people vote even in anonymous situations, take part in collective actions, often do not overuse common resources, care for the environment, mostly do not evade taxes on a large scale, donate to public radio, as well as to charities, etc. suggests that the strict self-interest hypothesis is inconsistent with the degree of voluntary cooperation that we observe around us.

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How can we explain this? What are the implications for public policy and management? This paper outlines some possible answers to both these questions. Our main sources of information are controlled laboratory and field experiments.[1] As I will show in this paper, the main finding from a large body of experiments that have been conducted in a variety of settings in the last three decades is that there is much more cooperation than predicted by standard theory (Ledyard 1995). Yet, the experiments also show that voluntary cooperation is fragile in the sense that in repeatedly played public goods games cooperation declines over time.

How can we explain (the fragility of) voluntary cooperation? One important explanation is that people have "warm-glow" preferences, i.e., they have some positive utility simply from the act of contributing (e.g., Andreoni 1990). A second explanation is that many people have altruistic preferences – they want to benefit others. A third reason is errors – people make mistakes (e.g., Anderson, Goeree and Holt 1998). In a clever design Palfrey and Prisbrey (1997) test for warm-glow, altruism and errors and find that altruism does not explain contributions, but some people have "warm-glow" preferences. Errors are important as well and explain why in repeated experiments contribution rates typically decline.

It should be noted that both motives – altruism and "warm glow" – are independent from other people's cooperation behavior. A set of recent experiments has cast doubt on this assumption. A large number of people are "conditionally cooperative" – they cooperate if they believe others cooperate as well. Yet, a significant fraction of people is best characterized as free riders. In summary, recent evidence suggests that there is considerable heterogeneity with respect to people's cooperation preferences, i.e., there are "types" of players.

In section 3 I will take up the issue of preference heterogeneity and discuss four of its predicted consequences:

(i) *Voluntary cooperation is fragile*. This holds in particular without further institutional remedies, like possibilities for communication, punishment or assortative interactions. The reason is that conditional cooperators, who experience free riding, will stop cooperating themselves.

[1] The laboratory allows for a degree of control that is often not feasible in a naturally-occurring field situation. In all the experiments that I will discuss below participants, earned considerable amounts of money that depended on their decisions. Thus, the laboratory allows observing real economic behavior under controlled circumstances and also permits causal inferences that are often not feasible from naturally occurring data. See Kagel and Roth 1995 and Camerer 2003 for excellent overviews of experiments in economics and game theory and Guala 2005 for a discussion of the methodology of experimental economics.

(ii) *There exist social interaction effects in voluntary cooperation*. This means that conditional cooperators will adapt their behavior to the respective group they are in. If other group members shirk, they shirk as well; if others cooperate people cooperate as well. In other words, there exists "social interaction effects", whereby people's behavior is influenced by their group mates.

(iii) *Group composition with respect to "types" matters for voluntary cooperation*. For instance, if conditional cooperators know that the other group members are cooperators as well, then they should be able to maintain high cooperation levels. The "team spirit" of "like-minded" cooperators should suffice to maintain high cooperation. Similarly, free riders, who know that others are "free rider types" as well, are predicted to defect.

(iv) *Belief management matters for voluntary cooperation*. Conditional cooperators cooperate by definition, if they believe others cooperate as well. Hence, any factor that influences beliefs will affect cooperation behavior.

I will present evidence from new experiments that were set up to test these predictions. The evidence from these experiments unequivocally supports the importance of conditional cooperation and preference heterogeneity to understand cooperation behavior. I see the experiments as behavioral models that may help us understand important field phenomena. In section 4 I will therefore interpret field evidence on tax evasion, bribery, and welfare fraud, attitudes toward the welfare state, charitable giving, and work morale in the light of the four behavioral models.

The findings on the importance of conditional cooperation and preference heterogeneity have consequences for theory and policy. If people are largely motivated by "warm-glow" preferences and if the decay in contributions is due to reduced errors, then the modeling approach might be another one than if people were free riders or conditional cooperators whose interaction explains the decay in contributions. In the former case, a modeling approach where errors figure prominently might be the preferable one (see, e.g., Anderson et al. 1998). In the latter case, a theory of social preferences might be chosen (see, e.g., Camerer 2003, Fehr and Schmidt 2003 and Sobel 2005 for surveys of models, and Tyran and Sausgruber 2006, for a policy application). The findings also have consequences for public policy and management. I discuss them in section 5. Section 6 concludes.

2. Conditional cooperation in the lab and the field

I start by presenting some stylized facts from laboratory experiments (section 2.1). This will only be a sketch and the interested reader may wish to consult Ledyard (1995) and Gächter and Herrmann (2005) for more complete accounts of important results from economic experiments. Dawes (1980) discusses evidence from social psychological experiments. I will discuss recent field experiments that are consistent with the lab findings in section 2.2. Section 2.3 presents evidence that behavior in the lab is consistent with naturally occurring field behavior.

2.1 *Evidence from the laboratory*

The linear public goods game (or voluntary contribution mechanism) has proved extremely useful for testing the free rider hypothesis in the lab. In a typical linear public goods experiment, n people form a group. All group members are endowed with z "tokens". Each subject i has to decide independently how many tokens (between 0 and z) to contribute to a common project (the public good). The contributions of the whole group are summed up. The experimenter then multiplies the sum of contributions by $\alpha > 1$ and distributes the resulting amount equally among the four group members. Thus each subject i's payoff is

$$\pi_i = z - g_i + \frac{\alpha}{n}\sum_{j=1}^{n} g_j,\ j = 1,...,n,\ \alpha > 1,\ \alpha / n < 1. \qquad (1)$$

The first term ($z - g_i$) indicates the payoff from the tokens not contributed to the public good (the "private payoff"). The second term is the payoff from the public good. Each token contributed to the public good becomes worth $\alpha > 1$ tokens. The resulting amount is distributed equally among the n group members – irrespective how much an individual has contributed. Thus, an individual benefits from the contributions of other group members, even if he or she has contributed nothing to the public good. A rational and selfish individual therefore has an incentive to keep all tokens for him- or herself, since the "return" per token from the public good for him- or herself is only $\alpha/n < 1$, whereas it is 1 if he or she keeps the token. By contrast, since $\alpha > 1$, the group as a whole is best off if everybody contributes all z tokens.

Figure 1 depicts a typical finding of a public goods experiment, where the exact same game is repeated ten times. Subjects, who play in groups of four, know this. In each period each subject receives 20 tokens and decides how many of them to keep or contribute to the public good. After each round subjects are informed about what the other three group members have contributed. Figure 1 shows the resulting cooperation patterns in a "Stranger"

condition, where group members change randomly from round to round, and a "Partner" condition, in which groups stay constant for all rounds.

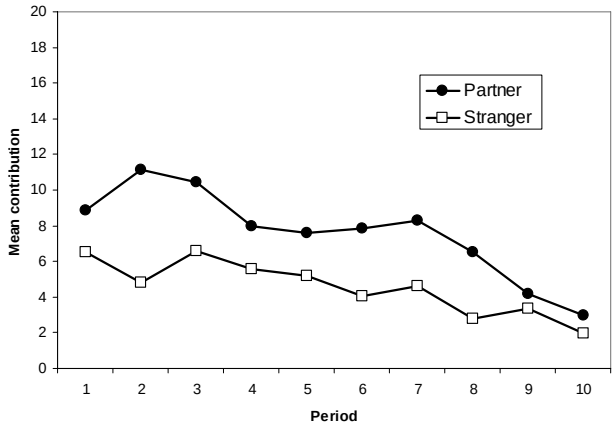

Figure 1: Contributions to a public good in constant ("Partner") and randomly changing groups ("Strangers") over ten repetitions. Source: Fehr and Gächter (2000).

Figure 1 illustrates two stylized facts from dozens of public goods experiments. First, people contribute substantially more than theoretically predicted. In most experiments, "Partners" contribute more than "Strangers" (see Keser and van Winden 2000, and Andreoni and Croson 1998 for an overview). The significance of this and related findings is that people are immediately able to distinguish whether they are in a situation that requires strategic cooperation (the "Partner" condition) or not (the "Stranger" condition) and to adapt their behavior accordingly.

A second stylized fact is that cooperation is very fragile and tends to collapse with repeated interactions. Why is this so? One explanation is that people have altruistic or "warm-glow" preferences, but also have to learn how to play this game. Since errors can only go in one direction, any erroneous decision looks like a contribution. Palfrey and Prisbrey (1997) test these explanations and find that the data are inconsistent with altruism. They find some evidence for "warm glow" but also conclude that people learn and commit fewer errors over time, which is why contributions decline.

Notice that warm glow, altruism and errors are motivations that are independent of others' contributions. Psychologists have long argued that people's cooperation behavior depends on what others do (e.g., Kelley and Stahelski 1970). Using the methodology of experimental economics Keser and van Winden (2000) were among the first economists to argue for the prevalence of conditional cooperation. Croson (2002) went one decisive step forward by eliciting beliefs about other group member's contributions. She found a very high and statistically significant correlation of beliefs and contributions: Subjects who expected

others to contribute a lot were more likely to contribute high amounts than subjects who expected others to free ride. This observation clearly suggests that people's contribution behavior is *not* independent of what they expect others to do. Thus, Croson's findings are consistent with "conditional cooperation".

Croson (2002) did not look at individual behavior. Her observation is that people behave conditionally cooperatively on average in that their contributions and beliefs are positively correlated. Fischbacher and Gächter (2006) also elicited beliefs and replicated Croson's findings of a positive correlation between beliefs and contributions. At the individual level they find subjects who show a positive correlation between beliefs and contributions, whereas other subjects contribute zero even if they believe that others contribute positive amounts.

There are at least three problems with using the correlation between beliefs and contributions as an indicator of conditional cooperation. First, beliefs evolve endogenously in the experiment and are thus beyond the control of the experimenter. Second, a free rider who believes others contribute zero and actually contributes nothing him- or herself is observationally equivalent to a pessimistic conditional cooperator who only contributes little because he or she believes that others will free ride. Third, people may project their behavioral tendencies unto others, i.e., beliefs may reflect a "false consensus effect" (see, e.g., Kelley and Stahelski 1970 and Orbell and Dawes 1993).

Fischbacher, Gächter and Fehr (2001) and Fischbacher and Gächter (2006) circumvent these problems by using a revealed preference method to infer people's contribution preferences in a public goods game as a function of other group members' contributions. Therefore, the subjects in their experiment do not choose one contribution but a contribution as a *function* of other group members' average contribution. The public goods game is played in groups of four subjects and the payoff function is again the same as in (1). The game is played just once to avoid confounds with strategic considerations. Every subject has to indicate a contribution *conditional on others' average contribution*, i.e. for each of the 21 possible values of the average of others' contribution subjects have to enter the number of tokens they want to contribute.

Fischbacher et al. (2001) and Fischbacher and Gächter (2006) classify their subjects according to their contribution function (for details see their papers). A subject is called a "free rider" if and only if he or she contributes zero in all 21 cases. A subject is called a "conditional cooperator" if the contribution schedule is a positive function of the others' average contribution. A somewhat peculiar type is the "triangle contributor" whose contribution is increasing in the others' contributions for low values and decreasing for high

levels of others' contributions. Figure 2 illustrates the average contribution function of the different types in the experiments of Fischbacher and Gächter (2006).

More than half of all subjects are "conditional cooperators". Twenty-three percent are "free riders". The rest are either "triangle contributors", or non-classifiable "others". Fischbacher et al. (2001) got a very similar distribution of types and even of average contribution patterns. Ockenfels (1999), Bardsley and Moffatt (2005), Burlando and Guala (2005), Muller et al. (2005), Ones and Putterman (forthcoming) and Page, Putterman and Unel (2005) also find evidence for heterogeneous cooperation preferences in related experimental designs. These studies differ in many details so that a straightforward comparison of the distribution of the different types is not possible. Yet, in almost all studies most subjects are classified as free riders or conditional cooperators, with the latter being the majority type in most studies.

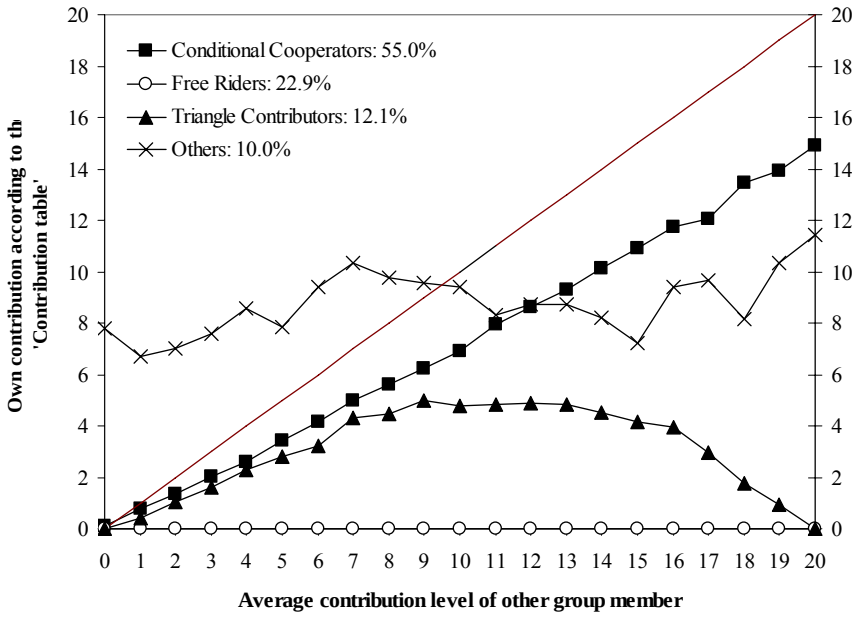

Figure 2: Average contribution function of types *Free Rider*, *Conditional Co-operator*, *Triangle Contributor*, and *Others*. Observations on the diagonal would correspond to the type of a perfect (i.e. one-to-one) *Conditional Co-operator*. Source: Fischbacher and Gächter (2006).

In summary, the evidence from the laboratory unambiguously shows that there is much more cooperation than is predicted by standard theory. Moreover, we find strong evidence that many people's attitude toward voluntary cooperation is conditional on other people's cooperation. This suggests that warm glow is not a dominant motivation. Moreover, the fact that many people contribute more the more others contribute also speaks against pure altruism

explanations, because they predict that people reduce their own contributions when informed that others already contribute to the public good.

A second important finding is that people's contribution preferences are heterogeneous. While a large number of people seem to be conditional cooperators, a significant fraction of subjects is best characterized as free riders. Some others show more complicated patterns. In section 3 I will discuss experiments that test directly for implications of preference heterogeneity. Yet, before I do so, I discuss evidence from the field.

2.2 *Evidence from field experiments*

Field experiments offer a great opportunity to test the behavioral relevance of laboratory findings in naturally occurring contexts (see also Harrison and List 2004). In this section I discuss a few field experiments that present results that are consistent with the lab evidence.

A first interesting study is by Frey and Meier (2004). Their subjects are students of the University of Zurich. Each semester each student is asked upon registering whether, in addition to the tuition fee, he or she would like to donate to two funds – one that helps needy students with cheap loans, and one that supports foreign students. A donation to the loans fund costs CHF 7 (roughly €4.7) and CHF 5 (€3.3) to the support fund for foreign students. Students can either donate these fixed amounts or not. Intermediate donations are not possible. The data set comprises 37,624 students. For the field experiment, 2,500 non-freshmen students were randomly selected; 2000 of them received information about what others did. One thousand students received the information that a high fraction of others (64 percent) made a donation in the past; the remaining 1000 students got the information that a relatively low fraction (46 percent) made a donation in the past.[2] From 500 students Frey and Meier (2004) elicited the expectations about the fraction of students who make a donation.

The results are consistent with theories of conditional cooperation. First, students who expect more others to donate are more likely to donate. The correlation between expressed expectations and actual donation is 0.34 ($p < 0.001$). Second, a logit analysis shows that those students who received the information that 64 percent of others have donated in the past, are more likely to donate than those who received the information that only 46 percent donated.

Heldt (2005) uses a similar idea than Frey and Meier (2004) to test for conditional cooperation. In his natural field experiment, subjects are tourists who use a cross-country skiing slope for which they are asked to donate for its preparation. Heldt (2005) as well manipulates the information people get. He finds that those who are informed that 70 percent of other tourists donated to the preparation of the slope contributed significantly more than

[2] No deception was involved because real frequencies (resulting from different time periods) were used.

those who did not get that information. Thus, this behavior is consistent with conditional cooperation.

The study by Martin and Randal (2005) is similar in spirit. In their natural field experiment, conducted in a museum in New Zealand, visitors could donate to the museum by putting money into a transparent box. The experimenters manipulated whether there is money in the box or not. Consistent with conditional cooperation they found that people donate significantly more when there is money in the box than when it is empty.

Shang and Croson (2005) conducted a field experiment on donations to a public radio station, which is a naturally occurring public good. The study is similar in spirit to Frey and Meier (2004). In a fund raising drive, people who called in to make a donation (for renewing their membership) were confronted with what others had donated in the past. Specifically, in the experimental condition (but not in the control condition) the experimenter read the following sentence: "We had another member, they contributed $75 [$180 or $300]", and right after that "How much would you like to pledge today?" Then the callers could make their pledge (any amount they wished). In total, 538 members called to make a donation. The benchmark for donation decision is the fund drive in the previous year, in which the average (median) amount donated was $135 ($75). The amounts used as the treatments correspond to the 50th percentile ($75), the 85th percentile ($180) and the 90th percentile ($300) in the previous fund drive. The results again support conditional cooperation. Callers who were confronted with a previous pledge of $300 by another member donated significantly more than people in the control condition who were not confronted with that information; callers who received the $75 or $180 information, respectively, contributed more as well than the control group, but this effect is not significant.[3]

In summary, the results from field experiments support the importance of conditional cooperation in the field. In the next section I shortly discuss a study that tests to what extent the same person behaves conditionally cooperatively inside and outside of the lab. This is an interesting question, because lab experiments are sometimes criticized for their lack of "external validity".

2.3 *Connections between the lab and the field*

To gather information about the connection between lab and field behavior, the subjects in Benz and Meier (2005) took part in a lab experiment, where they made a donation decision. The same subjects were observed in a naturally occurring environment – the donation

[3] A referee of this paper suggested that a potential problem might be that callers are concerned about their self-image and how they look in the eyes of the receiver of the call.

decisions to two student support funds described above and analyzed in Frey and Meier (2005). In one experiment (n=99), called "social funds", the donation was to exactly the same funds as in the naturally occurring situation; in a second experiment (n=83), called "charities", the donation was to another charity unrelated to university.

The results show that lab and naturally occurring behavior are correlated. In the "social funds" experiment, the correlation between the average donation in the experiment and the average donation in the past four semesters is 0.28 ($p<0.01$). In the "charities" experiment the correlation is very similar (0.27; $p<0.01$). A more refined statistical analysis that controls for socio-demographic variables in a multivariate regression supports the main findings. Thus, although the lab is an artificial environment, one can observe behavior that is also triggered in a naturally occurring environment.

A second interesting study on the connection of lab and field behavior is Carpenter and Seki (2005) who combine the advantages of both environments in a very innovative way. The subjects of their study were Japanese fishermen who took part in a lab experiment but who were also observed in their daily fishing activities. Specifically, Carpenter and Seki (2005) collected data from fishing hauls, which they relate to measures of the fishermen's social preferences. Carpenter and Seki (2005) use a finitely repeated public goods experiment with and without opportunities for social disapproval to derive statistically five measures of social preferences for each fisherman: his level of unconditional cooperation; his conditional cooperation; the propensity to disapprove; the fisherman response to received social disapproval; and finally the level of the unconditional response to disapproval. The results show that fishing productivity is significantly related to the experimentally derived measures of social preferences.

In my view, the results by Benz and Meier (2005) and Carpenter and Seki (2005) strongly underscore the complementarity between the lab and the field. In both the lab and the field we observe real behavior. In the lab we observe behavior in an "artificial" environment, whereas in a naturally occurring situation behavior takes place in a context-rich environment. Depending on the research question, context-richness and artificiality are either a drawback or an advantage. The lab has the advantage that we can observe motivations and behavioral patterns in a degree of clarity that is most often not feasible outside the lab. The fact that we have observed conditional cooperation in tightly controlled lab experiments supports the interpretation of the field results as coming from conditional cooperation. The observation of conditional cooperation in the field tells us that the psychology of conditional cooperation carries over from the lab to the field.

In the following section I will use the power of the lab to test the implications of conditional cooperation and preference heterogeneity. I see these experiments as four behavioral models that might help us interpreting naturally occurring field situations in policy-relevant domains like tax morale and welfare state policies, but also in managerial domains like work-place behavior. The four models will also help me in guiding my discussion of consequences for public policy and management.

3. Four consequences of conditional cooperation and preference heterogeneity

I will present four experiments in this section that test four implications of conditional cooperation and preference heterogeneity in general. The testable consequences are that (i) in groups where group members are randomly selected *voluntary cooperation is fragile*; (ii) *there are group interaction effects,* i.e., people adapt their cooperation behavior to the relevant group they are a member of; (iii) *group composition matters*, i.e., in groups that are composed of "like-minded types" (groups composed of either co-operators or free riders) we should see starkly different cooperation patterns; and (iv) *belief management matters*, i.e., factors that shift the belief about how much others contribute will influence contribution behavior. I discuss these four hypotheses and their experimental support in turn.

3.1 *Voluntary cooperation is fragile*

I provide evidence in this section that heterogeneous motivations in randomly composed groups will lead to fragile cooperation. The reason is that free riders presumably do not contribute to the public good while the conditional cooperators' contributions might be non-minimal, depending on their belief about other group members' contributions. Subjects learn the contributions of the other team members during the repeated interaction. The free riders have no reason to react to that information. The conditional cooperators on the other hand will update their beliefs. Given that the average conditional cooperator does not fully match the others' contribution the reaction will most likely be a decrease of contributions. There is no reason to expect that the remaining types (triangle contributors and "others") will behave in a way that offsets the negative trend.

To test this argument rigorously, Fischbacher and Gächter (2006) combined the elicitation of contribution functions described above with a standard ten-period public goods game. The experiment was conducted in the "stranger" mode, i.e., in every period the groups of four were formed randomly out of all 24 subjects present in a session. As predicted, contributions

actually fell over time in all six sessions (from initially 40 percent to ten percent on average by the last period).

Is this decline actually due to the interaction of heterogeneously motivated types? Stringent support for the conjecture comes from using the elicited contribution functions for predicting contributions. Recall that the strategies asked subjects to indicate how much they are prepared to contribute to the public good for all feasible average contribution levels of the other group members. In the standard ten-period public goods game Fischbacher and Gächter (2006) also elicited in each period each subject's *belief* about the other group members' contributions. Therefore, we can – given a stated belief about other group members' average contribution – *predict* what a subject should contribute to the public good if he or she would be perfectly consistent with his or her elicited contribution function. Figure 3 depicts the actual average contributions in the ten rounds of the public goods game and the predicted contributions as a result of stated beliefs and contribution schedules.

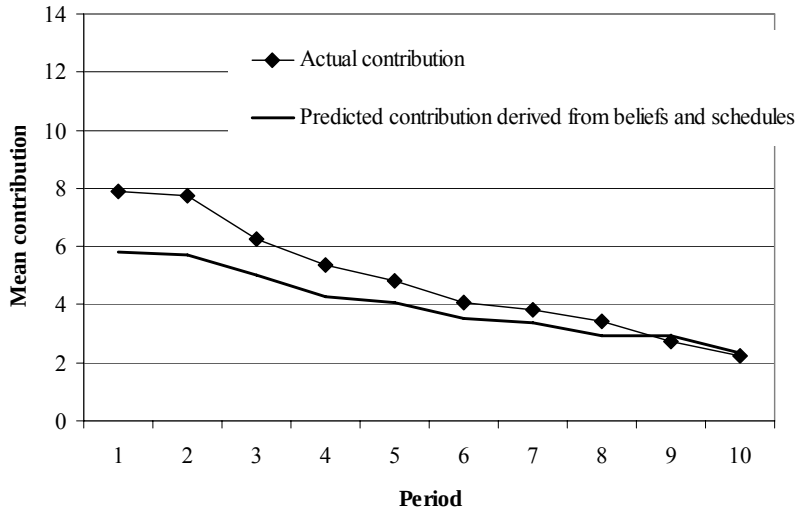

Figure 3: Average actual contributions and predicted contributions. Source: Fischbacher and Gächter (2006).

Although average predicted contributions are too low compared with actual contributions, we find that predicted contributions, which are derived from the contribution functions and the elicited beliefs, decline and converge to the actual pattern. This result therefore supports the argument that preference heterogeneity leads to unstable cooperation.

3.2 *There are social interaction effects in cooperation*

If people are motivated by conditional cooperation, this may give rise to a "social interaction effect", which occurs if an individual changes his or her behavior as a *function of*

his or her respective group members' behavior. Identifying social or group interaction effects (often also called "neighborhood" or "peer effects") is notoriously difficult (Manski 2000). The ideal data set would observe the same individual at the same time in different groups, which are identical – apart from different group members. Obviously, this is impossible in the field. By contrast, in the lab it is possible to come very close to this "counterfactual state". In an experiment, one is able to *observe decisions of the same subject at the same time* in two economically identical environments. Social interactions, i.e., the fact that a person is systematically affected by the behavior of his or her group members in the two environments are the only reason to behave differently in these two environments. Falk, Fischbacher and Gächter (2005) test this idea in a design where every subject simultaneously is a member of two groups, group 1 and group 2, that provide two independent public goods. The two groups consist of three group members each and are identical except that for each subject the other two group members in both groups are different people. Group composition stays constant for the twenty periods of the game. Falk et al. (2005) speak of a social interaction effect if the following holds: the larger the *difference* in contributions of group members in group 1 and group 2 in the previous period, the larger is the *difference* in current contributions of a group member to the two groups. Figure 4 provides the evidence from the 126 subjects who participated in this experiment.

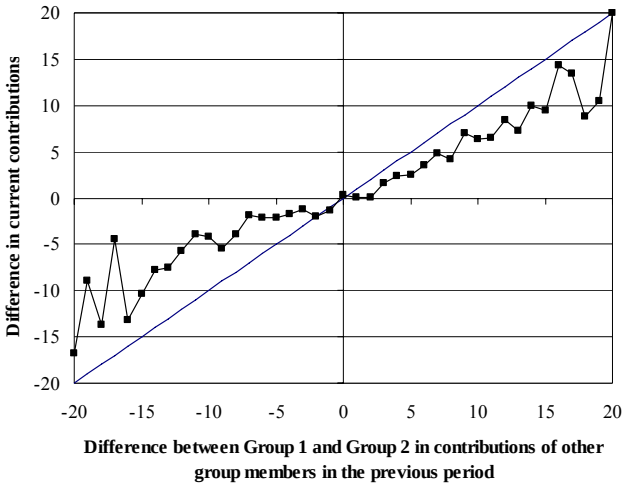

Figure 4: Social interaction effects: Difference in own contribution as a function of the group members' contributions in the two groups. Source: Falk, Fischbacher and Gächter (2005).

The results provide unambiguous support for the social interaction hypothesis. In a given period a majority of subjects contributes more to the group that has contributed more in the

previous period. This result holds for all fourteen independent units of observations, which is a result that is very unlikely due to chance ($p<0.00007$).

3.3 *Group composition matters*

We have seen that a mixture of conditional cooperators and free riders is unfavorable for reaching cooperation in the public goods game. According to our third conjecture, conditional cooperators would presumably prefer to play the game with like-minded cooperators. Cooperation should be easy if the team players knew that they are among like-minded group members. Similarly, if the "true game" subjects are playing is a game where cooperation is one of the equilibria (free riding being another one), then knowing that others are like-minded cooperators should make it easy for subjects to coordinate on cooperation and to prevent free riding. Likewise, if free rider types would know that they are among other free riders, free riding should be paramount.

Gächter and Thöni (2005) conducted an experiment where the 105 subjects play in groups of "like-minded" people. Like-mindedness refers to the type of a subject according to a classification whether one is a free rider or a cooperator. The experiment starts with a three-person one-shot public goods game. When all subjects have chosen their contribution the subjects are ranked according to their contribution. Then the subjects are reassigned to new groups of three subjects. The reassignment works as follows. The three subjects with the highest contribution in the one-shot public goods game constitute a first group. The subjects with the fourth to sixth highest contribution are in the second group and so on. Finally, the three least cooperative subjects find themselves in the last group. The subjects are informed about the reassignment procedure only after they finished the first game. Then the subjects learn the contributions their new group members chose in the one-shot public goods game. In the new group subjects play a ten-period public goods game. It is also important to note that the subjects do not know the reassignment mechanism when choosing their contribution in the one-shot public goods game. Therefore, a high contribution in this game credibly reveals a cooperative attitude.

The left panel of Figure 5 shows the results of the main treatment. The maximal contribution is 20 in this game. For expositional ease the groups are divided into three classes (TOP, MIDDLE and LOW) according to their average contribution in the one-shot public goods game. The three graphs show the average contribution during the ten periods separated by class. The unconnected dots in period zero depict the average contribution in the one-shot public goods game that determines the group composition. The classes remain clearly

separated over all periods. The groups in the TOP class consist to a large degree of subjects who contributed their entire endowment in the one-shot public goods game. These groups manage to maintain almost full cooperation until the penultimate period. The contributions of the MIDDLE class (consisting of subjects with intermediate contributions in the one-shot public goods game) show a similar pattern on a somewhat lower level. Surprisingly, also the subjects in the LOW class, who almost all chose a contribution of zero in the one-shot public goods game, manage to reach a certain level of cooperation in the repeated game. There are two explanations for this observation. First, if uncooperative subjects know that they are among themselves then it is clear that there are no cooperative subjects to free ride on. This presumably motivates even uncooperative subjects to contribute in order to encourage the other free riders to contribute as well. A second related reason is that in contrast to a one-shot game a ten-period repeated game induces even free riders to strategically feign cooperation. Yet, by the final period feigning cooperation does not pay off anymore and consequently the contributions of these free rider subjects drop to zero.

The right panel of Figure 5 shows the results from a control experiment. Groups are formed randomly in this experiment, i.e., there is no reassignment according to cooperativeness. In order to make the two treatments comparable the data is still separated into the three classes of the top, middle and lowest third of groups with respect to their mean contribution levels. The separation now merely reflects the fact that there is variance in the contributions. Subjects in these control experiments are able to maintain a high level of contributions in all terciles until period 8; only in the penultimate and the final period contributions drop to rather low levels. This "endgame effect" is typical for repeated public goods experiments in which groups are fixed for a finite number of periods (see, e.g., Keser and van Winden 2000).

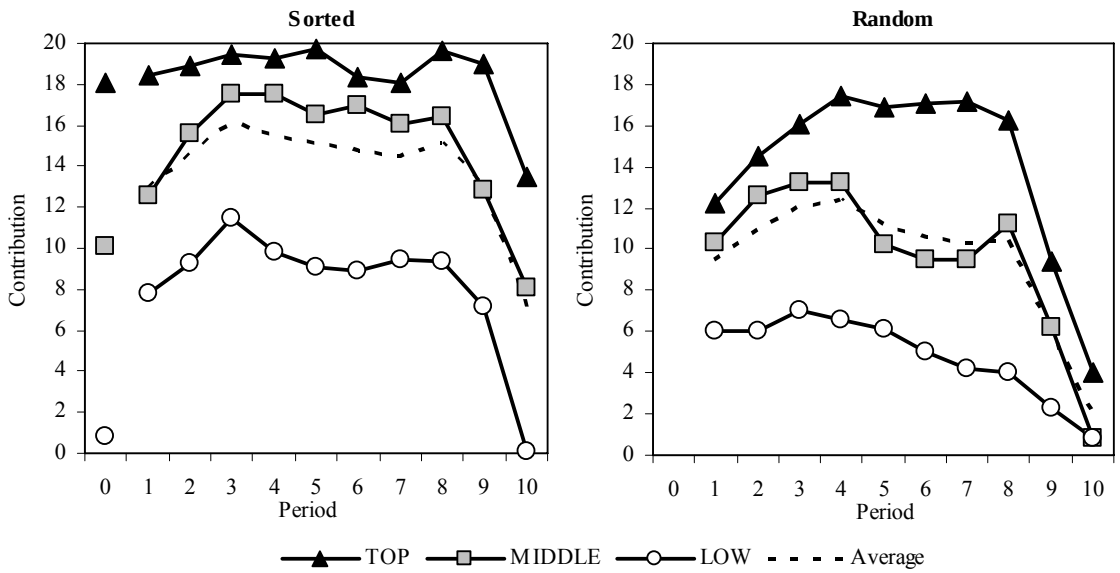

Figure 5, left panel: Average contributions over the ten periods for the TOP, MIDDLE and LOW class in the *Sorted* treatment. The unconnected dots in period zero are the average contributions in the *Ranking* treatment. Right panel: Average contribution of the most, intermediate and least cooperative groups over the ten periods. Source: Gächter and Thöni (2005).

Cooperation in the TOP class of the sorted treatment is much higher than the average contribution in the random treatment (dotted line in the right panel). However, the real value of the sorting mechanism becomes clear if we compare the TOP class with the most cooperative third of the groups in the random treatment. The average contribution of the TOP class of like-minded groups is significantly higher than the average contribution of the most cooperative third of the groups in the random treatment.

In summary, to be among like-minded people strongly affects cooperation behavior of all types. Related experiments suggest a similar conclusion. In Gunnthorsdottir, Houser, McCabe and Ameden (2001) subjects were regrouped as a function of their contributions but subjects were not aware of this. In Ones and Putterman (forthcoming) and Page et al. (2005) subjects learned about others' contributions and were then regrouped according to the subjects' preferences of who they wanted to be grouped with. In all experiments regrouping made a significant difference relative to random groupings. Thus, for reasons of preference heterogeneity the "ecology of collective action", as Ones and Putterman (forthcoming) aptly put it, matters a lot for the efficiency of voluntary cooperation.[4]

[4] See Ones and Putterman (forthcoming) and Gächter and Thöni (2005) for a further discussion of the related literature.

3.4 *Belief management matters*

Since the belief about others' contribution is important for conditional cooperators, our fourth conjecture says that any factor that moves these beliefs will influence cooperation. In the experiments of Fischbacher and Gächter (2006), for instance, beliefs evolved endogenously and mimicked the decline in cooperation. To test how beliefs can be influenced, Gächter and Renner (2005) developed a leader-follower design in a group of four players who stayed together for ten rounds, which was known to the subjects. Specifically, one group member was assigned "leader". All group members had the same payoff function (1). The sole difference between the leader and the followers was that the leader made the first contribution decision. The followers observed the leader's contribution before they decided simultaneously about their contribution. Gächter and Renner (2005) also elicited the followers' beliefs about the contribution of the other followers. This allows them to determine how the leader's contribution influences the beliefs about other followers' contribution.

The line with the open squares in the left panel of Figure 6 shows that the leader's contribution in the first period influences the follower's beliefs about other follower's contributions positively. The first period is particularly interesting because the followers have not yet made any observation about the other followers' actual contributions. The more the leader contributes in the first period, the higher are the followers' beliefs about what other follower will contribute. This is the main and most direct evidence that a leader "manages the followers' beliefs". In their actual contributions followers match their beliefs quite closely (see the line with the filled squares).

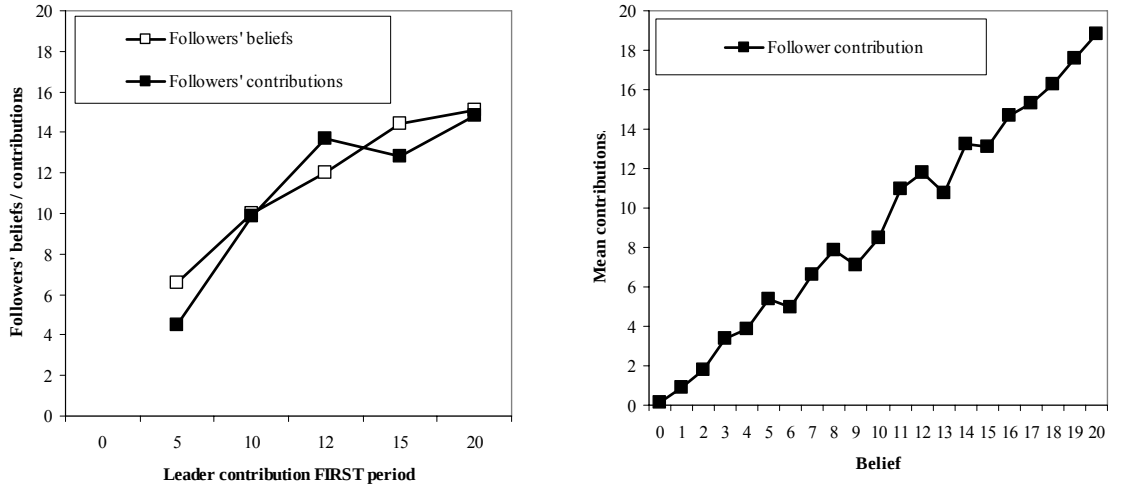

Figure 6: left panel: leader's contribution in the first period and followers beliefs and actual contributions in the first period; right panel: relationship between beliefs and followers' actual contributions over all rounds. Source: Gächter and Renner (2005).

Using the data from all periods, the right panel of Figure 6 shows that followers' beliefs and actual contributions are highly positively correlated. An econometric analysis reveals that these beliefs result from two sources: In a given period $t > 1$, beliefs are highly significantly positively correlated with the leader's contribution in this period. Yet, beliefs are also highly significantly positively correlated with what the other followers contributed in the *previous* period ($t - 1$). Moreover, quantitatively, the followers' contributions in $t - 1$ are more important than the leader's contribution for the followers' beliefs about other followers' contributions in period t. Thus, there is an important path dependency in contributions. If the leader contributed little in the first period, followers are likely to contribute a small amount as well. This observation will – in addition to the leader's contribution – shape beliefs about other followers' contribution. In turn beliefs are – as the right panel of Figure 6 shows – positively correlated with actual contributions. In other words, a bad start will make it very hard for the leader to lead his group by good example to high contribution levels. By contrast, a bold leader who sets a good example right from the beginning will positively influence follower's beliefs and contributions.

In summary, in this section I presented four experiments that tested four implications of conditional cooperation and preference heterogeneity in general. As discussed above, I see these experiments as behavioral models that reveal something of the behavioral logic of conditional cooperation and preference heterogeneity. In the final two sections I will therefore use these behavioral models to look at field phenomena and to discuss implications for public policy and management.[5]

4. Understanding field phenomena

4.1 *Charitable giving*

During the war in former Yugoslavia three Austrian (charity) organizations set up the fund raising campaign "Nachbar in Not" to finance food, clothes and medical aid for the victims of the war. People donated more than 950 millions Austrian Schillings (approx. €70 million) during the three years of the campaign to "Nachbar in Not" alone – donations to other charity organizations not included. "Licht ins Dunkel" by the Austrian broadcasting corporation (ORF) is another example of a very successful and very large charitable fund raising campaign that runs since many years around Christmas.

[5] See Falk (2003), Fehr and Fischbacher (2002) and Kahan (2005) for related discussions and further examples.

In both campaigns it was practice to list the names, hometowns and donated amount of *all* donators either on television or in newspapers which supported the campaigns. Donations by well-known politicians and celebrities were particularly prominently featured. The results from the field experiments discussed in section 2.2 and the lab results on how leader contributions can shape followers' contributions suggests that fund raising organizers did not only rely on people's feelings of altruism, compassion and warm glow but also on conditional cooperation. Seed money effects are a related phenomenon that at least in part exploits the psychology of conditional cooperation (List and Lucking-Reiley 2002). Likewise, fundraisers often make a symbolic gift to the donator. Reciprocity as a form of conditional cooperation predicts that nicer gifts will lead to higher donations. Falk (2004) tests this prediction in a field experiment and finds it unambiguously supported.

Conditional cooperation is of course not the only reason why people donate to charities (see Andreoni, forthcoming, and Vesterlund, forthcoming, for extensive reviews). People certainly also contribute for signaling reasons (Glazer and Konrad 1996), social approval (e.g., Andreoni and Petrie 2004; Soetevent 2005), or because observing others has informational value about the charity (Romano and Yildirim 2001; Vesterlund 2003). Our results suggest that genuine conditional cooperation may be an important determinant of people's philanthropy in addition to all other motivations.

4.2 *Tax morale, benefit fraud, and corruption*

Norms of reciprocity and conditional cooperation might also influence tax morale. Tax morale is an interesting case because taxes are typically used to finance public goods from which one benefits even if one has not paid taxes. Indeed, there is evidence both from the field and the lab that people pay more taxes than the standard economic model of tax evasion predicts (e.g., Andreoni et al. 1998; Webley et al. 1991; Torgler 2002). Our results suggest that controlling for detection probabilities conditional cooperators will be more likely to evade taxes (or falsely claim welfare benefits) if they have the impression that many others do the same. Too many cheaters can spoil tax morale. The evidence is consistent with this prediction. People are less likely to cheat on their taxes or to commit benefit fraud if others behave honestly (e.g., Cialdini 1989; Roth et al. 1989; Slemrod 1992; Andreoni et al. 1998; Rothstein 2000). Frey and Torgler (2004) provide the most direct evidence on the relevance of conditional cooperation for tax morale. They use data from the European Values Survey and conduct a multivariate analysis across 30 countries (with at least 1000 individuals per country). Frey and Torgler (2004) find a positive correlation between people's tax morale

(measured by a question whether cheating on tax is justified if you have the chance) and people's perception how many others cheat on taxes.[6] While Frey and Torgler (2004) cannot prove causation in their data, the results from the strategy method experiments by Fischbacher et al. (2001) and Fischbacher and Gächter (2006) suggest that causality goes from beliefs about others' cheating to own cheating rather than vice versa.

The prevalence of corruption also seems to be influenced by motivations similar to conditional cooperation (see Abbink et al. 2002 for an experiment and further references to the literature). There are also important social interaction effects in these phenomena (Bertrand et al. 2000; van der Klaauw and van Ours 2003), which is also predicted by conditional cooperation and our model on social interaction effects (section 3.2).

A particularly interesting observation is that the perception of the fairness of the tax system matters (Seidl and Traub 2001). Likewise, the treatment by authorities apparently is an important determinant for people's tax morale (Pommerehne and Weck-Hannemann 1996; Frey 1997; Goette and Kucher 1998; Scholz and Lubell 1998; Feld and Frey 2002; Torgler 2003; Cummings, Matinez-Vazquez, McKee and Torgler 2005; Alm and Torgler, forthcoming). For instance, Cummings et al. (2005) present results from laboratory experiments which they conducted in Botswana and South Africa. The experiments demonstrate that differences in the fairness of tax administration, perceived fiscal exchange and attitudes towards the government can explain observed differences in compliance. Cummings et al. show that the experimental results are robust by replicating them for the same countries using survey responses that measure tax compliance.

How can our models explain such findings? First, there may be a direct effect by the concerned individual who may reciprocate unfair treatment by authorities and/or the tax system by lower tax morale, simply because the taxpayer resents unfair treatment (Smith 1992). Second, much like in the leadership experiments discussed in section 3.4, which showed that the leader strongly shapes the beliefs followers hold about other follower's behavior, there may be an indirect effect of tax authorities, via the beliefs on other tax payers' behavior. The reason is that if many people share similar feelings and experiences, then this will lower the belief that others have a high tax morale, which further undermines tax morale. Similarly the government's trust in the honesty of its citizens, may lead to a direct effect of "trust breeds trust" (Feld and Frey 2002), presumably because people like to be considered

[6] Cheaters may also entertain a self-serving belief about how many others cheat on their taxes, to justify their own misbehavior. Thus, causality may not run from beliefs about the prevalence of cheating in the population, but cheating may induce self-serving beliefs. I am grateful to a referee for suggesting this possibility.

trustworthy. Again, if such feelings are widespread, they may shape beliefs about other citizen's tax morale and hence reinforce the tax payer's morale.

A further interesting observation is that tax evasion at the Swiss cantonal level is higher in cantons where citizens have more direct democratic rights (e.g., Torgler 2005). Direct-democratic procedures may positively influence tax morale according to our models. The reason is that direct democracy may affect the beliefs about other people's tax morale once a tax law is passed in a referendum. A referendum signals people's opinion about a topic and the dissemination of opinions via the result of a referendum may shape people's beliefs about others' behavior. Tyran and Feld (2002) tested this intuition in an experiment and found support for it.

4.3 *Solidarity and support for the welfare state*

Observers of welfare state policies (e.g., Wax 2000; Fong 2001; Fong et al. 2005; Lindbeck et al. 1999) point out that many people hold reciprocity norms that are akin to the conditional cooperation observed in our experiments. Fong et al. (2002) even argue that "people support the welfare state because it conforms to deeply held norms of reciprocity and conditional obligations to others". There is evidence that people resent certain welfare policies if they think that the recipient is a free rider who could earn his or her own living (Wax 2000; Fong et al. 2005). In their paper on tax payer resentment (i.e., the resentment to finance welfare payments), Besley and Coate (1992, p. 175) quote a notable British columnist, Lynda-Lee Porter, who neatly expresses the psychology of such resentment: "Our bronzed, healthy, young hedonistic army of self-unemployed are holidaying by the sea at our expense this year and, yes I do resent it. I resent working to support the idle loafers who have a laugh at our expensively generous system which allows them to get away with legalised plunder."

4.4 *Work morale*

Business practitioners agree that "work morale" (i.e., loyalty, initiative, creativity, helping others, zest for the job etc.) is crucial for productivity (Bewley 1999; 2005). Our models predict that work morale is strongly shaped by the behavior of management and co-workers. First, there may be social interaction effects in that people adapt their work morale to those of their peers. Empirical evidence supports this prediction (Ichino and Maggi 2000; Falk and Ichino 2006).

Second, our leadership model, discussed in section 3.4, and further experiments on leadership (e.g., Potters et al., 2004; Güth et al. 2004) suggest that managers may strongly

influence morale and voluntary cooperation. To our knowledge, there is no systematic evidence available, but some telling anecdotal evidence supports the point. For instance, Lawrence Weinstein, the Head of Unisys, said about ethical standards in companies in the wake of the Enron scandal: "Once you as a CEO go over the line, then people think it's okay to go over the line themselves."[7] This quote clearly expresses the conviction that leading by example matters for the ethical behavior of employees. Moreover, our results from section 3.4 suggest that the CEO's behavior may have long-lasting consequences on company morale and culture because of path-dependency effects.

Third, our result from section 3.3 that group composition matters may explain why companies sometimes fire workers, despite that firing looks like a policy of management by threats. Yet, Bewley (1999) notes that companies fire shirkers and incompetents to reestablish the work morale of the rest. Our models can explain this. Recall that the experimental findings reported above suggest that in heterogeneous groups contributions decline to low levels because the conditional cooperators stop cooperating once they experience free riding. If conditional cooperators know that they are among "like-minded" cooperators, cooperation can be established at very high levels. In a company context, this may mean that even a few shirkers can undermine work morale. Motivated workers may prefer that "bad apples" are fired because they do not like being "suckered" by their colleagues and because it reestablishes beliefs about others' team-spirit.

5. Consequences for public policy and management

I briefly discuss policy implications in this section that follow from the experimental findings and the four behavioral models discussed above. I first look at implications for public policy (section 5.1) and then at consequences for management (section 5.2).

5.1 *Public policy*

Public policy is relevant mainly in the domains covered in the examples of sections 4.2 and 4.3. A first observation is that behavior by leaders – politicians and top officials – may matter strongly for the morale of the citizens. Leaders are "belief managers", among other things. Leading by example strongly shapes beliefs about what others are doing as the experiments of section 3.4 have shown. Therefore, there is a "multiplier effect", because a bad example (dishonesty in tax matters, corruption, and unethical behavior in other domains) may not only have direct effects on the concerned individual but may also have indirect belief

[7] Quoted after The Economist, July 27, 2002, p.58.

effects about how others will react. Moreover, there may be strong path-dependency effects, which may adversely affect morale in the long-run. Leaders should thus be role models for whom higher moral standards should hold than for normal citizens. Leaders in particular should be forced to resign quickly if there is confirmed evidence of dishonesty and inappropriate behavior.

Belief management happens not only through leaders, but also through effects like the perceived fairness of the tax system, fair treatment by authorities, and direct-democratic participation rights. The experimental results discussed above suggest that these factors are very important and should be strengthened. Tax reforms should improve the fairness of the tax system (based on careful evidence on how fairly the tax system is perceived) not only because fairness is desirable in its own right, but also because of its indirect effect on the beliefs about other citizens' tax morale. A similar conclusion holds for the reform of tax authorities. How tax authorities publicly deal with tax evasion may strongly shape people's beliefs about the prevalence of tax evasion and thereby, as shown by Frey and Torgler (2004), influence tax morale (see also Kahan 2005). For instance, tax authorities should not only put the "black sheep" of tax evaders into the limelight, but also communicate that the large majority of citizens pay their dues.[8] Direct-democratic participation rights may also have a strong effect on tax morale (see, e.g., Feld and Frey 2002; Tyran and Feld 2002; Torgler 2005; Torgler and Schaltegger 2005). First, people value participation for reasons of procedural fairness (Benz 2005). Second, the results of referenda communicate people's norms and values in many issues and thereby shape people's beliefs about others' norms and values. For constitutional reasons, granting direct-democratic rights is admittedly not an easy task in representative democracies.

The experimental results from sections 3.1 and 3.3 suggest that free riders trigger reduced cooperation. Cooperation unravels in the absence of punishment of free riders, because the conditional cooperators reduce their cooperation as well. Experiments have shown that this result can be overturned if targeted punishment of free riders is possible (e.g., Fehr and Gächter 2000) or if the free riders are excluded from the group (Gächter and Thöni 2005 – see section 3.3; Cinyabuguma et al. 2005). If there is punishment, free riders have an incentive to cooperate and cooperators do not feel "suckered". Cooperators therefore are happy to

[8] An anonymous referee suggested the following anecdotal evidence that communication might be very important. India's tax amnesty in 1997 has been seen as a financial success (it raised 2.5 billion dollars from over 350'000 individuals). The tax amnesty was accompanied by intensive media activities. Celebrities such as sport and film stars promoted the participation in the amnesty program, which contributed greatly to the success of the tax amnesty program.

cooperate. This suggests that policy should aim to punish free riding (i.e., tax evasion, benefit fraud, and corruption). The experiments described above suggest that the goal should be to punish the free riders and at the same time to maintain the optimistic beliefs of the cooperators, by reassuring them that they will not be "suckered" by the free riders, so that they continue to uphold their morale together with other "like-minded cooperators".

Yet, apart from the legal implementation (which might be relatively simple) this is no easy task at all, given the behavioral regularities discussed above. The reason is that punishment may entail monitoring and a general distrust of the citizens. This is problematic for two reasons. First, there is evidence that monitoring may crowd out intrinsic motivation and reciprocal behavior (Frey 1993, 1997; Bohnet, Frey and Huck 2001; Fehr and Gächter 2002). Second, monitoring may express distrust, which, in addition to the crowding out effect, may have detrimental effects on the beliefs about the tax morale of other tax payers. Thus, in order to avoid the negative side effects of distrusting most citizens, policies should aim at punishing the big offenders severely and treat the mild offenders (provided they are no serial offenders) mildly (by not using the full force of penal law, for instance). This has two advantages. First, strong sanctions have a deterrence effect, and they also reassure the honest citizens that large-scale anti-social behavior will be punished, which reduces the "sucker effect". Second, by trusting citizens and by fostering the fairness of the tax system and the tax authorities, crowding out effects of intrinsic motivation and voluntary cooperation may be avoided.

The problem is complicated by the possibility that the game people actually play is one with multiple equilibria (see also Kahan 2005). Endemic cheating is an equilibrium, since conditional cooperators will also cheat if everyone else cheats. With multiple equilibria different policies may be required, depending on the equilibrium that is currently played. A society that plays the good equilibrium of high trust, good tax morale and low corruption must secure this equilibrium through policies that selectively punishes the cheaters and maintain the good faith of the conditional cooperators. If a society is trapped in a bad equilibrium straightforward penalties and monitoring may be required to get to better equilibria. Yet, much more research is needed to understand how an optimal policy looks like in the presence of preference heterogeneity and multiple equilibria.

5.2 *Management*

The conclusions for management are very similar to those for public policy. First, (top) managers should be aware that they are role models who set an example and may strongly

shape corporate cultures for reasons of path dependency in behaviors. Like politicians, they should therefore be held to high ethical standards.

Second, the problem of punishment of shirkers in an organization is also similar to the problems of how to treat anti-social behavior in the public policy domain. Management by threats will not create loyalty and may undermine intrinsic motivation and voluntary cooperation. Therefore, firing shirkers according to procedurally fair standards (see Bewley 1999 and Benz 2005) may help maintaining high work morale among the team-spirited workforce.

Third, since group composition effects matter strongly for cooperative behavior hiring of team-spirited people is crucial if teamwork is important on the job. Composing teams of like-minded team players can help maintaining high cooperation levels without any threat and negative side effects of monitoring and distrust.

6. Concluding remarks

In this paper I discussed experimental evidence from the lab and the field that many people are conditional cooperators, whereas others are best characterized as free riders. I believe that this sort of preference heterogeneity helps us better understanding important phenomena in the field, like tax morale and attitudes toward the welfare state. Since beliefs about others' behavior are highly relevant for voluntary cooperation if many people are conditional cooperators, policy should not only take into account the incentive effects on the behavior of an individual, but also how policy affects the beliefs and behavior of the majority of citizens who are conditional cooperators. The evidence discussed in this paper can only be considered as a starting point. Much more research is needed in particular for a proper understanding of the policy consequences of conditional cooperation and preference heterogeneity.

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