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Social Background, Cooperative Behavior, and Norm Enforcement

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Abstract

Studies have shown that there are differences in cooperative behavior across countries. Furthermore, differences in the use of and the reaction to the introduction of a norm enforcement mechanism have recently been documented in cross-cultural studies. We present data that prove that stark differences in both dimensions can exist even within the same town. For this end, we created a unique data set, based on one-shot public goods experiments conducted in South Africa. Most of our group differences can be explained by variables accounting for social capital and social environment, such as trust or household violence.

Key Words: Cooperation, public goods, punishment, experiment, social capital, South Africa

JEL Classification: C72, C91, H41, Z13

Contents

Social Background, Cooperative Behavior, and Norm Enforcement[+]

Martin Kocher, Peter Martinsson, and Martine Visser[*]

Introduction

Cooperative behavior is an important component in the daily lives of humans and animals. In the case of humans, it shows up in a range of activities, from sharing food and investing effort in teamwork to keeping the environment clean, using common resources diligently, joining in collective action, and actively participating in elections. In economics, the nature of cooperation and its patterns are usually studied in the context of social dilemmas or, equivalently, in the private (voluntary) provision of a public good.[1] It is a well-documented fact from numerous experimental studies both in the laboratory and in the field that people contribute more to public goods, on average, than predicted by the selfish and rational model of the *homo economicus*, even in one-shot interactions. (For overviews, see, e.g., Ledyard 1995; Zelmer 2003.) There is also solid evidence that costly norm enforcement devices, such as decentralized sanctions that would not be used by money-maximizing agents, are very effective in raising contribution levels to a public good (e.g., Fehr and Gächter 2000; Andreoni et al. 2003; Masclet et al. 2003; Anderson and Putterman 2006; Gürerk et al. 2006; Carpenter 2007; Sefton et al. 2007).[2]

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[1] Equivalently, it has also been studied in the context of the use of a common pool resource.

[2] In political science or social psychology, related studies were conducted even earlier by Yamagishi (1986) and Ostrom et al. (1992), for example.

Recently, several studies have documented differences in cooperative behavior across countries. Cultural learning or the stronger cohesion of social norms within a culture makes such differences across countries likely. While the evidence is not yet conclusive, especially with regard to the mechanisms that shape cooperative norms or cooperative behavior in a society, cooperative behavior has been found to be related to some measurable "cultural" variables that are intuitively appealing. (See, for instance, Herrmann et al. [2008] and Gächter and Herrmann [2009].) However, more evidence is clearly necessary in order to be able to draw final conclusions on cultural influences on cooperative and norm enforcement behavior.

This paper contributes to the literature on cultural determinants of cooperation and norm enforcement. It proceeds along a different line than cross-cultural studies by focusing on differences *within a country across cultural groups*. As far as we are aware, we are the first to show that there can be stark differences in both cooperative behavior and norm enforcement behavior within the same country within a very small radius of geographical distance. However, most of the group differences can be explained by variables accounting for social capital and social environment or social background, such as trust or household violence.

More specifically, we combined a standard linear public goods experiment, conducted in four different communities in Cape Town, South Africa, with self-reported questionnaire data on individual characteristics and social background variables, which focused on school, home, and neighborhood conditions. Participants in the experiments were high school students with less than two years to graduation, attending four selected high schools: (1) a school from one of Cape Town's white high-income neighborhoods; (2) a school located within a colored middle-income neighborhood; (3) a school representing the low-income African communities located in older neighborhoods, where most of the housing development is permanent; and (4) a school located in a low-income African community where housing development is classified as informal. For purposes of identification, the schools are labeled (1) white, (2) colored, (3) African permanent, and (4) African informal, respectively.[3] Due to the legacy of apartheid, high-income and middle-income people, on one hand, and low-income people, on the other, are still mostly divided along ethnic and racial

[3] In the demographic context of South Africa, the groups we refer to as white, colored, and African are comprised of people from European, mixed, and indigenous ancestaries, respectively.

lines; thus, our groups were very homogenous.[4] In the terminology of Harrison and List (2004), we are conducting an artificial field experiment.

Three features of our design gave us a higher level of experimental control over behavior than many related studies: first, in contrast to several other experiments, and in contrast to experiments that are embedded into representative surveys, we kept the social distance of individuals constant. Subjects in our experiment knew that they would interact with members of their own groups. Second, choosing high school students as participants had the advantage that their social background, such as their integration into their communities or into school organizations, is not difficult to control for. In addition, because our subjects had not yet entered the labor market, their inter-connections with other communities were limited. Third, although we still had a salient cultural variable through the choice of schools, we avoided all the problems associated with experiments that are conducted in different countries. In fact, our four high schools were located in four different communities less than 15 kilometers apart from each other.[5]

By controlling for the social background of decision makers, we were able to go beyond most existing studies that take only a very limited number of individual determinants of behavior (such as gender, age, and similar variables) into account. Specifically, in addition to using individual socio-demographic information, we assessed the influence of social background on cooperative and norm enforcement behavior by controlling for 1) attitudinal measures of trust (*trust*); 2) behavioral measures of an individual's level of integration into one's peer group and community (*social integration*); and 3) behavioral measures on norm violation, such as the level of crime incidents in one's neighborhood (*community crime*) and norm enforcement in one's home and community (*household violence*).

Our main empirical results revealed the existence of differences in cooperative and norm enforcement behavior across the four groups. Furthermore, we were able to show that some variables accounting for social capital and social background, such as trust and household violence, are consistently related to human cooperative and norm enforcement

[4] Due to a combination of the abolishment of discriminatory legislature and employment policies, affirmative action requirements within the government, the private sector, and African empowerment initiatives, a percentage of both middle- and high-income groups from both the colored and African population has, however, emerged recently in South Africa.

[5] Ockenfels and Weimann (1999), who studied differences in cooperative behavior among individuals in former West and East Germany, also mentioned the advantage in terms of control in their experiment, compared to a multinational setting. They documented significant differences in cooperative behavior between the two groups, with subjects from West Germany being more cooperative.

behavior. Therefore, one important lesson from our study is that leaving such variables out of the analysis could have led us to premature conclusions about the level of cooperativeness and about norm enforcement of our four different communities. In other words, we would have ascribed differences to "cultural" differences across communities without knowing that at least part of the effect could also be driven by different backgrounds of the decision makers.

The remainder of this paper is organized as follows. In section 1, we give a short overview of the related literature. Sections 2 and 3 present our experiment design and its details. Section 4 gives some more information on our subject pool, followed by the results in section 5. Finally, section 6 concludes the paper.

1. A Brief Overview of Related Literature

The economics literature on cooperation and norm enforcement is huge, and the following brief overview is far from being complete. As already mentioned in the previous section, the influence of culture on cooperation is usually studied by comparing experiments conducted in several countries. A number of papers, such as Brandts et al. (2004) or Burlando and Hey (1997), have compared student samples across countries. While Brandts et al. (2004) did not report any cultural differences of behavior in Japan, the Netherlands, Spain, and the United States, Burlando and Hey (1997) found significantly more free-riding behavior among British students than among Italian students. In a more complicated game than the voluntary contribution mechanism, Cason et al. (2002) provided evidence for a behavioral difference in cooperation between American and Japanese students. In Kocher et al. (2008), the extent of unconditional cooperative behavior was the same in Austria, Japan, and the United States, but the Americans had a stronger degree of conditional cooperation. Using unusual subject pools, Henrich et al. (2005) found a difference between cooperative behavior among small-scale societies around the world, and Carpenter et al. (2004) reported extremely high levels of cooperation among individuals living in urban slums in Thailand and Vietnam.

The bulk of studies focus on cultural differences in cooperative behavior and their possible determinants, but norm enforcement behavior in social dilemmas has hardly been analyzed in the economics literature. Two notable exceptions are Gächter and Herrmann (2007; 2009). They conducted public goods experiments in Russia and found differences between rural and nonrural participants and that the efficiency-enhancing potential of punishment may be culture-specific. More specifically, they reasoned that there might be cultural factors that drive the fraction of spiteful or antisocial punishers (defined as players that punish other players who contribute at least as much as them). A high proportion of spiteful punishers can counterbalance the positive effects of punishment due to the high

efficiency costs associated with it. Another exception is Herrmann et al. (2008), who provided evidence on punishment behavior in social dilemmas in 16 places around the world. Interestingly, they found that antisocial punishment was widespread and negatively correlated with norms of civic cooperation and the strength of the rule of law in a country. Finally, Carpenter et al. (2004) provided results on punishment (termed "social disapproval" in their paper) and its determinants.

Studies that mainly assess the impact of other-than-cultural determinants of cooperative behavior are also numerous. The evidence from the literature regarding gender is mixed, with several studies on both sides plus others that show no significant effect in either direction. (For details, see Croson and Gneezy [2009].) Age is rarely controlled for in cooperation experiments because the variance in age for the standard subject pool of students is quite small. Harbaugh and Krause (2000) reported differences between child behavior and adult behavior, but on average the inclination to cooperate has, so far, not been shown to be different across different adult age groups.

Another set of determinants for cooperative behavior is associated with the social background of an experimental subject, such as an individual's integration into one's community and an individual's level of trust towards a generalized "other," sometimes also referred to as social capital. Anderson et al. (2004) provided mixed evidence regarding the correlation between cooperation and trust. Gächter et al. (2004) found, in a one-shot public goods experiment in Russia, that the socioeconomic background affects trust attitudes, but that there is no separate influence of socioeconomic variables on cooperative behavior. Furthermore, Anderson et al. (2004) reported contradictory effects of the participation in voluntary activities on the behavior in a public goods game. Carpenter et al. (2004) used a somewhat similar approach as we did. They argued that the term social capital is poorly defined and categorizes two distinct aspects, namely behavioral social capital (the propensities of individuals to trust, cooperate, and punish other individuals who act to establish and maintain pro-social norms of behavior) and associational social capital (the community-level networks among individuals that lead to efficient outcomes when contracts are hard to enforce). However, their results were mixed: in Bangkok, those who claimed to have been active in the community also cooperated more in a repeated voluntary contribution mechanism; whereas, in Ho Chi Minh City, the relation was reversed.

2. The Basic Setup of the Experiment

Our research design builds on the experiment developed by Gächter and Herrmann (2007) and had two separate parts. Part 1 was a standard, linear, one-shot public goods experiment (the voluntary contribution mechanism) that allowed us to study determinants of

cooperation. Part 2 was a voluntary contribution mechanism augmented by an individual's possibility to punish other group members. The existence of the punishment option permits an analysis of cooperative behavior in the presence of a decentralized norm enforcement device, but more importantly, it provides the opportunity to assess the determinants of the use of norm enforcement in social dilemmas.

Specifically, let $I = \{1, 2, \ldots, n\}$ denote a group of n subjects which interact in a one-shot, simultaneous public goods game *without punishment* (Part 1). Individual $i \in I$ receives an endowment E, which can be allocated either to a private good or to a public good. The voluntary contribution of individual i to the public good c_i must satisfy $0 \leq c_i \leq E$. Let C denote the sum of all group members' contributions (i.e., $C = \sum_{j=1}^{n} c_j$). The contribution of individual member i's payoff is given by:

$$\pi_i = E - c_i + \gamma C \quad . \tag{1}$$

The marginal per capita return (MPCR) from investing in the public good is denoted by γ, which satisfies $0 < \gamma < 1 < n\gamma$, meaning that the self-interested choice and the socially optimal one are in conflict. The parameters in our experimental sessions were chosen as follows: group size $n = 3$, endowment of $E = 20$ guilders (the experimental currency unit), and MPCR $\gamma = 0.5$. The contribution c_i was restricted to integers to facilitate calculations during the experiment.

In the public goods game *with punishment* (Part 2), subjects can punish other group members individually, after they have received information on their contribution levels. The game is now a two-stage game, with a simultaneous contribution stage followed by a simultaneous punishment stage. Employing the punishment technology used by Gächter and Herrmann (2007), the unit cost per punishment point is 1 guilder, and one unit of punishment results in a deduction of 3 guilders in terms of payoff for the member who receives the punishment.[6] Each subject can assign a maximum of 10 punishment points to any other member in the group.

Taking into account the monetary consequences of the punishment stage yields the following payoff function for a group member i:

[6] We are not studying the influence of structural variables, such as the size of the marginal per capita return or the strength of the punishment mechanism in this paper (Falk et al. 2005; Sutter et al. 2006). Previous experiments have shown that punishment behavior follows the law of demand; in other words, the quantity of punishment declines with a rising price of punishment (Anderson and Putterman 2006; Carpenter 2007).

$$\pi_i = E - c_i + \gamma C \ - \sum_{k \neq i} p_{ik} - 3 \sum_{h \neq i} p_{hi} \ , \qquad (2)$$

where p_{ik} denotes the number of punishment points assigned by member *i* to member *k,* and p_{hi} is the number of punishment points that member *i* received from member *h*.

Assuming rationality and selfishness, we should neither observe any voluntary contributions in both parts of the experiment nor any assignment of punishment points in the public goods game with punishment, according to the sub-game perfect equilibrium. It is important to emphasize that there is no strategic reason to cooperate in the first part of the experiment. The details of the interaction in the second part were only made public after all decisions in Part 1 had been recorded. Subjects in the experiment knew from the beginning that there would be a second part and that it would be unrelated to the first part. Results from this first part were only revealed after the end of Part 2. Groups were assembled anew in Part 2 under the condition that no single subject met again during the experiment, and this was common knowledge.

Obviously, there was also no strategic reason to punish in Part 2 because of the one-shot nature of the interaction. General findings from a multitude of experiments show, however, that subjects increase their contributions when facing such a punishment opportunity and punish each other both in one-shot experiments as well as in multi-period experiments with stranger matching (e.g., Fehr and Gächter 2000; Gächter et al. 2004; Gächter and Herrmann 2007; Herrmann et al. 2008).

3. Details of the Experiment Design

In each high school, the experiment consisted of a single session with 60 participants (except in the colored community, where there were 69 participants) to avoid contagious effects by word-of-mouth communication between sessions. The subjects were recruited by public announcements at the schools. In both African schools (which served a larger area than the communities we focused on), we directed the announcement only to those in our target communities. We conducted the experiment in English, which is also the language used in the schools. In order to ensure complete understanding, Afrikaans-speaking helpers were used in the white and colored schools and Xhosa-speaking assistants in the African schools. We used assembly halls to guarantee anonymity and to keep the subjects far apart from each other. When they arrived for the experiment, subjects were randomly assigned a seat. The experiment was conducted with paper and pen.

At the beginning, participants learned that the experiment will consist of two independent parts and received instructions for Part 1.[7] Subjects were given time to read the instructions, which were also read aloud by the instructor. Next, participants took a written quiz that was designed to test their understanding of the experiment, and afterwards correct answers and solutions were explained on the blackboard. Finally, to make sure that everyone understood the experiment before starting with Part 1, we dedicated a significant amount of time to answering in private any remaining questions that subjects had. All submitted decisions were anonymous and subjects were aware of this fact. Communication among participants during the experiment was strictly forbidden.

We followed a similar procedure before Part 2, although we focused on explaining how punishment worked and, again, included a quiz, followed by time to ask questions in private. As already noted, we re-clustered subjects into new groups before Part 2, and they were clearly informed of this procedure.[8] After their contributions in Part 2 had been handed in, we asked subjects what they believed the average contributions of the other group members were to the public goods in both Part 1 and Part 2. We then continued with the second stage of Part 2, which included the possibility of punishing other members of their own group. Each member of the group was informed about the contributions of the other two members to the public good in Part 2 (but no information on behavior in Part 1 was revealed).

After completing Part 2, a post-experiment questionnaire to obtain socioeconomic, background and attitudinal variables was handed out and, as a final part of the experiment, everybody was paid privately in cash checks.[9] We calibrated the experiment, partly based on a small pilot study, such that the participants on average would earn quite a bit more than if they had spent the time working. One guilder in the experiment was exchanged for 1.5 South African rand (ZAR).[10]

[7] The instructions are included in Appendix 2. They were framed in neutral terms and did not contain any loaded expressions, such as “punishment.”

[8] In the instructions for Part 2, we wrote, “Note, however, that now you will be **in a group with two other people than before**” [bold used in instructions as shown], i.e., in a new group with two different people than in Part 1.”

[9] We used cash checks instead of cash for security reasons.

[10] The exchange rate at the time of the experiment was ZAR 6.10 = US$ 1.

4. Subject Pool

The experiment was conducted at four different high schools in Cape Town, which were carefully selected to capture differences in socioeconomic strata in the South African society. Table 1 gives some background information obtained from the *Cape Area Panel Study for Young Adults* (Lam et al. 2006) and the 2001 South African census (Stats SA 2003) on the communities in the catchment areas of each of the four selected high schools. Table 1 clearly shows that individuals in the white community were better off than those from the colored community; and both of these were lagged significantly by the two African communities with respect to income, education, and employment of parents, as well as housing standards.

Table 1. Descriptive Statistics of Community Data

	Source	White	Colored	African permanent	African informal
Monthly per capita income (in ZAR)	CAPS	3750	1100	374	288
Households in poverty	Census	13.00%	14.47%	47.56%	45.95%
Mothers with high school certificate	CAPS	92.30%	46.15%	12.31%	15.15%
Fathers with high school certificate	CAPS	83.33%	53.85%	20.69%	16.59%
Mothers working	CAPS	69.23%	68.75%	23.44%	29.10%
Father working	CAPS	100.00%	84.00%	46.43%	50.94%
Living in permanent building	CAPS	100.00%	86.20%	68.40%	40.50%
Piped water in the house	CAPS	100.00%	97.94%	66.72%	27.46%

Note: Summary statistics are percentages or averages.

Sources: *Cape Area Panel Study (CAPS) for Young Adults, 2006* (Lam et al. 2006), and the *South African Census 2001* (SA Stats 2003). Descriptive data have been obtained for the communities that serve as catchment areas for the schools in our experiments.

The information is also helpful in illustrating that there are, indeed, pertinent differences in the permanency of housing infrastructure between the African permanent and African informal communities in our sample. The majority of housing in the latter community was informal shacks without in-home drinking water.

5. Experimental Results

We begin this section with an overview of our results in each of the four communities. Table 2 summarizes the average levels of contributions in both public goods games, and Table 3 shows the structure of punishment among the groups.[11] In addition, these two tables also include more detailed analyses: we calculated the proportion of zero contribution and punishment, as well as conditional contribution (i.e., the average contribution, given that a positive amount was contributed) and conditional punishment levels (i.e., the average punishment level, given that a positive punishment level was chosen). Data from the public goods experiment without punishment (Part 1) show that subjects in the white community contributed the least—on average only 6.88 guilders (34.4 percent of the endowment)—compared to the contribution levels of 8.51 guilders by the colored community (42.6 percent), 9.34 guilders by the African permanent community (46.7 percent), and 11.27 guilders by the African informal community (56.4 percent).

Table 2. Average Levels of Contribution to the Public Goods, Proportion of Free-Riders, and Conditional Average Levels of Contribution

	Average contribution: No punishment (Part 1)			**Average contribution: With punishment (Part 2)**		
	Total contrib.	***Proportion of zero contrib.***	***Contrib. if contrib. > 0***	***Total contrib.***	***Proportion of zero contrib.***	***Contrib. if contrib. > 0***
White	6.88	0.30	9.83	8.25	0.17	10.69
Colored	8.51	0.16	10.16	8.85	0.20	11.33
African permanent	9.34	0.12	10.67	10.70	0.06	11.04
African informal	11.27	0.10	12.55	11.37	0.11	12.67

The null hypothesis that contributions in two independent communities are drawn from the same distribution is rejected at a 5% significance level, using a Wilcoxon-Mann-Whitney test, except for the following pair-wise comparisons: 1) colored and African permanent, and 2) African permanent and African informal (see table A2 in appendix 1). A Kruskal-Wallis test confirms, with $p < 0.01$, that the contribution levels in the four communities are not equal. Our figures can be compared to Gächter and Herrmann (2007), who used a 2*2 design, where subjects differed in age (young or mature) and location (urban

[11] A complete table of descriptive statistics for the variables used in the results section is provided in appendix 1 (table A1).

and rural). In their urban and young sample, the average contribution level was 37%, while in the other three groups, the averages ranged from 50.5% to 53.5%.

Introducing punishment possibilities in Part 2 resulted in an increase in the contributions to the public good in all four communities, which is in line with most research (with the exception of Gächter and Herrmann 2007; 2009; as well as Herrmann et al. 2008). The average increase was largest in the white community, where the average contribution increased to 8.25 (41.2% of the endowment), equivalent to an increase by almost 7 percentage units, or 19.9%. In the other three schools, the increases were more modest: 8.85 (44.2%), 10.7 (53.5%), and 11.37 (56.8%) for colored, African permanent, and African informal, respectively. The Kruskal-Wallis test that compares the four groups still indicates a significant difference ($p = 0.02$). However, we cannot reject the null hypothesis of equal contributions in Part 1 and Part 2at a 5% significance level in the four communities using a Wilcoxon-signed-ranks test, except for the white community (see table A4 in appendix 1).

In Part 2, we can also analyze the punishment stage. Although subjects from the white and the colored communities, on average, contributed less to the public good, punishment was also lower among them than among the subjects in the two African communities (as shown in table 3). We can reject the null hypothesis of an equal amount of punishment in pair-wise tests using Wilcoxon-Mann-Whitney tests at a 5 percent significance level, except for the following pair-wise comparisons: 1) white and colored, and 2) African permanent and African informal (see table A5 in appendix I). The Kruskal-Wallis test is highly significant ($p < 0.001$), rejecting the hypothesis that the four groups are equal.

Figure 1 displays the structure of the punishment points assigned to other members in the group in relation to the difference between the contribution of the punisher and the contribution of the punished. A negative number on the *x*-axis indicates that the punished subject contributed less than the punisher, and vice versa. Although there is a tendency of increased punishment of others when the negative difference between one's own contribution and that of others is increasing, this tendency is not too pronounced.

For all groups, there is some antisocial punishment, but in the African communities, there seems to be a substantial amount of this misdirected punishment. In table 3, we calculate the degree of antisocial punishment, which is measured as the ratio between mean punishment of non-negative deviations and mean punishment of negative deviations. It ranged from 0.42 to 0.53, for three of our four communities, with the African permanent group standing out with a degree of 0.94, which is higher than any of the figures in Gächter and Herrmann (2007). Their highest was in the urban-and-mature group with 0.78. Note that

the difference between the two African communities in terms of punishment behavior indicates that there seem to be fundamental differences between the two communities.[12]

Figure 1. The Structure of Punishment

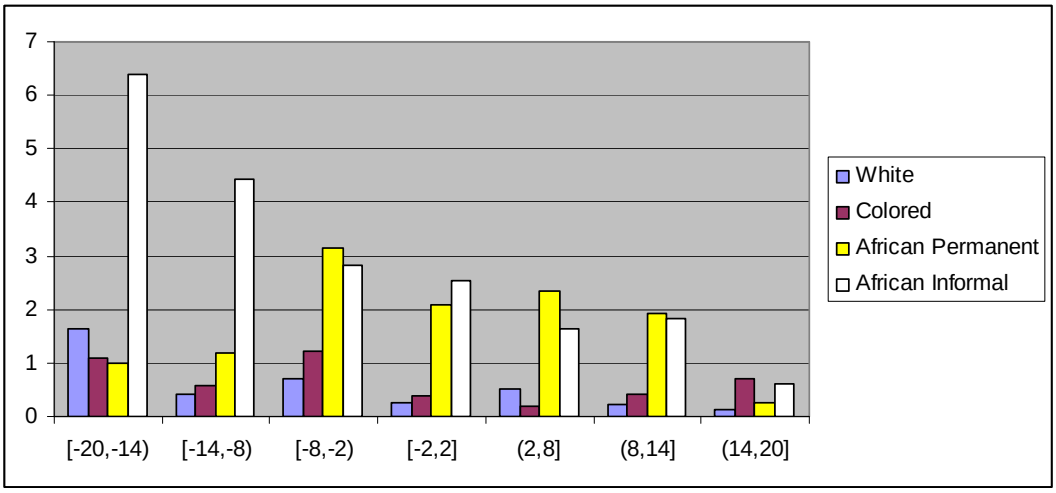

Table 3. Structure of Punishment

	Punishment	Proportion of punishment	Conditional punishment	Degree of spiteful (anti-social) punishment
White	0.49	0.75	1.96	0.42
Colored	0.62	0.76	2.58	0.46
African permanent	2.09	0.48	4.03	0.94
African informal	2.64	0.41	4.44	0.53

Note: Degree of spiteful punishment is the ratio between the average punishment of non-negative deviators and the average punishment of negative deviators.

Table 4 gives the average total net earnings in guilders in the two parts of the experiment at the community level. As is obvious from the results on contributions and punishment, the participants of the African communities earned more in Part 1. However, the higher levels of punishment among the African communities (which has a negative impact on

[12] A more detailed analysis of antisocial or spiteful punishment is available on request.

the earnings of both punishers and the punished) resulted in their earnings being substantially lower than for the white and colored groups in Part 2. On the other hand, the white and colored communities earned, on average, similar amounts in Part 1 and Part 2.

Table 4. Total Net Earnings in Guilders

	Part 1	Part 2
White	23.44	20.19
Colored	24.07	19.39
African permanent	25.03	7.90
African informal	25.91	4.48

5.1 Determinants of Cooperation

We studied the determinants of cooperative behavior by controlling for demographic and social background variables in an econometric analysis. First, we analyzed which factors explain the amounts contributed to the public good in Part 1 and Part 2. Then, we examined what determined the punishment points assigned to other subjects in the group (section 5.2). In all cases, we ran Tobit regressions because the dependent variables were censored on both sides (applying ordinary least squares, OLS, however, does not change our main results).

In table 5, we analyze what determined the amount contributed to the public good in Part 1. The first regression (model 1) only includes the dummy variables for the different communities (where the white community was the reference group) and the beliefs of the average contribution of other group members to the public goods. In the other regressions, we gradually include basic socio-demographic variables, such as gender, age and age squared, and a battery of other socioeconomic and background variables as specified above.

Regardless of the model specification, beliefs about the contributions of others were a consistent determinant of cooperative behavior, much in the spirit of the empirical evidence on conditional cooperation (e.g., Fischbacher et al. 2001; Croson 2007; Fischbacher and Gächter 2009; Gächter and Herrmann 2009).[13] We also found that being female increased

[13] Since we elicited beliefs on others' contributions after the decision on one's own contribution, it is possible that belief responses have been influenced by prior decisions. We are not aware of any paper that systematically compares ex ante with ex post belief elicitation in a public goods game with a public goods game that does not elicit beliefs on others' contributions.

contributions significantly and consistently in our subject pool. Croson and Gneezy (2009) argued in their authoritative overview that women are more sensitive to experimental details than men. It is difficult to interpret what that means in our context. Consequently, we do not want to over-interpret our results regarding gender differences. Furthermore, age and age squared did not show up significantly in any of the regression models, which is not surprising, given the small variation in our subject pool.

Another fact emerging from table 5 seems more striking and has an important implication: while it appeared at first sight from the dummy variables for the two African communities that contributions by these two groups were significantly higher compared to the white community, controlling for several individual socio-demographic variables discussed above and a few background variables expounded in greater detail in the following paragraph rendered the coefficients for the community dummies insignificant (see model 4).

The background variables we used are 1) attitudinal measures of trust (*trust in schoolmates*), 2) behavioral measures of an individual's level of integration into own peer group and community (*social integration*), and 3) behavioral measures on norm violation and norm enforcement (*community crime* and *household violence*). The choice of these background variables reflects their importance in influencing cooperative behavior and norm development, as well as norm enforcement. Trust, as the first variable, has been shown to be connected to cooperative behavior (e.g., Gächter et al. 2004). It seems very likely that trusting is related to conditional cooperation in the sense that cooperating, based on the expected cooperation of others, requires a certain level of trust in others. The second set of variables that capture social integration is intended to get a grip on the role of an individual's cooperative norms in daily life. The underlying hypothesis is that students who are active in their community have a stronger attachment to cooperative norms than less active students. Finally, variables on norm violation and norm enforcement should capture the daily experience of students in these two domains. Again, we expected that students who observe norm violations in their daily lives more often are more likely to punish and more likely to punish harshly.

More specifically, we used a 6-point scale trust measure with questions similar to the World Values Survey; a dummy variable for an individual's participation in school organizations; a continuous variable for the number of times the subject's household was a victim of housebreaking over the last year; a variable regarding psychological violence (i.e., swearing) by parents or adults in the household toward the subject on a scale from 1 (occurs

never) to 5 (occurs very often)[14]; and a household reading index, which is supposed to capture household literacy and household inclination to education. The latter was just the sum of dummy variables from the answers to the following four questions: 1) is there is a daily newspaper in your household? 2) does your household own an encyclopedia? 3) is there a dictionary in your house? and 4) does the family own more than 50 books?[15] (All these variables were self-reported by subjects in the post-experimental questionnaire.)

A look at models 3, 4, and 5 reveals that trust in schoolmates on the 6-point scale has the expected positive, significant, and robust effect on voluntary contributions. This is in line with related studies, but still remarkable because we also controlled for expectations. Expectations should capture, at least part if not all, the aspects of trust in others. Given our data, it obviously did not, since a higher level of trust increased contributions in addition to the conditional cooperation aspect of higher contributions with higher expectations on the contributions of others.

Our variable for social integration, however, did not come out significant. We hypothesized that people who are (more) involved in real-world organizations tend to be more cooperative than others, but that did not seem to be the case when using the variable *participate in school organization*. This could be the consequence of at least three possibilities: first, there is actually only a weak relationship between social integration and individual behavior in public goods experiments; second, the cooperative norm that we expected to be related with social integration only works in combination with an embedded enforcement mechanism; and third, we were not able to come up with the right proxy for it.[16]

The two variables *community crime* and *household violence* are both far from significant in any of the models. This is not surprising, given that it is difficult to imagine significant links between them and the voluntary contribution to a public good. We included these two variables in the regressions in table 5 for means of comparison. We use them again in section 5.2, where we discuss norm enforcement.

[14] The exact wording was: "How often did a parent, stepparent, or adult living in your home swear at you or put you down when you where younger?"

[15] A normalization procedure was performed on the household reading index that entails subtraction of the mean and division by the standard deviation.

[16] However, if we substitute the variable for other membership variables, such as political party, voluntary nonprofit organization, religious organization, and sport clubs memberships or participation in art (such as choir and orchestra), our results do not change.

Table 5. Determinants of Contributions in Part 1

Independent variable: Contributions in Part 1	Model 1	Model 2	Model 3	Model 4	Model 5
Expectations	0.30*	0.28*	0.25*	0.28*	0.27*
	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)
Colored	2.63	2.03	0.08	-0.66	-
	(1.67)	(1.69)	(1.71)	(1.77)	
African permanent	2.97*	2.73	-0.36	-2.99	-
	(1.76)	(1.76)	(1.95)	(2.27)	
African informal	5.71***	5.22***	3.83**	1.50	-
	(1.73)	(1.74)	(1.83)	(2.12)	
Female	-	2.42*	3.47***	3.28**	3.41**
		(1.36)	(1.36)	(1.37)	(1.35)
Age	-	-	14.62	11.09	8.56
			(13.15)	(13.02)	(12.92)
Age²	-	-	-0.35	-0.25	-0.19
			(0.38)	(0.37)	(0.37)
Trust: in schoolmates	-	-	0.84**	0.78**	0.68**
			(0.34)	(0.34)	(0.33)
Social integration: Participate in school organizations	-	-	-	-0.22	-0.28
				(1.14)	(1.16)
Community crime: Housebreaking	-	-	-	0.10	0.09
				(0.20)	(0.20)
Household violence: Swearing	-	-	-	0.26	0.27
				(0.48)	(0.64)
Household reading index	-	-	-	-1.84**	-1.74***
				(0.74)	(0.64)
Constant	3.86**	2.63	-146.8	-113.9	-89.0
	(1.61)	(1.75)	(114.25)	(113.2)	(112.3)
No. of observations	243	243	243	238	238
Log-likelihood	-680.9	-679.3	-669.1	-649.8	-653.3
LR chi^2	15.9***	19.1***	39.6***	47.1***	40.7***
Pseudo R^2	0.012	0.014	0.029	0.035	0.030

Notes: Tobit estimations. Standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Finally, the household reading index that should capture the household's educational background always significantly reduced the contribution level in models 4 and 5.

Our results did not change at all when we controlled for the self-reported allowances (pocket-money) and/or weekly part-time work outside school as a proxy for income. We explicitly distinguished between part-time work and (unpaid) household assistance in that respect. As sensitivity tests, we also substituted *trust in schoolmates* for general trust, the dummy variable *school integration* for the number of organizations in which the participant claimed membership, the variable *housebreaking* for "rape" (and the dummies by the number of instances over the last 12 months), as well as psychological violence in the household (*household violence*) for physical violence (*corporal punishment*). None of our conclusions changed; significant coefficients remained significant and non-significant coefficients stayed non-significant.

There is probably one general lesson to be drawn from these results: at least with non-standard subject pools such as ours, it seems important to control for a few socio-demographic variables (and perhaps even some background variables) in order to avoid drawing premature conclusions. If we had only relied on the school dummies, we would have interpreted our results in terms of "cultural" community differences instead of being more cautious and concluding that they could also partly be driven by socio-demographic variables or social background variables. This holds especially for the African permanent community, whereas the higher level of contributions of the African informal community as such seems to be the more persistent effect.

Table 6 presents the determinants of contributions to the public good in Part 2 of the experiment, using the same regression models as in Part 1. The general picture is very similar in the two parts, which is an indication that our results seem to be robust. In particular, the predictive power of expectations and the significance for the household reading index become stronger.

The trust variables are completely insignificant in table 6. One straightforward explanation is that, in view of the punishment option that followed the contribution phase in Part 2, trust was simply not important any more for the level of contributions because subjects had a norm enforcement device at hand. Also the gender effect vanishes. It could be that men react more strongly to the introduction of the punishment option than do women, but because we did not start out from such a hypothesis, the conclusion would not be well-founded. In any case, men increased their contributions more from Part 1 to Part 2 than women did.

Table 6. Determinants of Contributions in Part 2

Independent variable: Contributions in Part 2	Model 1	Model 2	Model 3	Model 4	Model 5
Expectations	0.33***	0.33***	0.34***	0.34***	0.35***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Colored	1.14	0.98	-0.32	-1.16	-
	(1.46)	(1.49)	(1.56)	(1.62)	
African permanent	3.65**	3.57**	1.21	-1.28	-
	(1.52)	(1.53)	(1.76)	(2.07)	
African informal	4.06***	3.92***	2.32	0.27	-
	(1.50)	(1.53)	(1.66)	(1.93)	
Female	-	0.59	1.20	1.24	1.13
		(1.19)	(1.23)	(1.24)	(1.20)
Age	-	-	7.58	8.24	5.94
			(11.96)	(11.86)	(11.66)
Age²	-	-	-0.18	-0.20	-0.14
			(0.34)	(0.34)	(0.33)
Trust: in schoolmates	-	-	-0.06	-0.12	-0.16
			(0.31)	(0.31)	(0.30)
Social integration: Participate in school organizations	-	-	-	0.08	0.15
				(1.05)	(1.04)
Community crime: Housebreaking	-	-	-	0.24	0.24
				(0.18)	(0.18)
Household violence: Swearing	-	-	-	0.20	0.22
				(0.44)	(0.44)
Household reading index	-	-	-	-1.17*	-1.14**
				(0.68)	(0.57)
Constant	3.55**	3.23***	-73.7	-77.9	-57.0
	(1.60)	(1.73)	(104.0)	(103.2)	(101.4)
No. of observations	243	243	243	238	238
Log-likelihood	-698.9	-698.7	-695.3	-679.5	-680.3
LR chi^2	21.4***	21.7***	28.6***	32.6**	31.1***
Pseudo R^2	0.015	0.015	0.020	0.023	0.022

Notes: Tobit estimations. Standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5.2 Determinants of Punishment

Table 7 presents a basic set of Tobit regressions for assigned punishment points. Again, OLS yields quite similar results. Interestingly, punishment is almost uniquely explained by community dummy variables, where punishment levels in the African permanent and the African informal communities are significantly higher than in the white group. As expected, a positive deviation from one's own contribution has a negative and significant effect on punishment, while a negative deviation from one's own contribution elicits significantly higher levels of punishment. In contrast, gender did not influence punishment significantly. Age and age squared were again insignificant.

Table 7. Determinants of Punishment 1

Dependent variable: Punishment points assigned	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Positive deviation from own contribution	-0.13*	-0.12**	-0.12*	-0.11*
	(0.07)	(0.06)	(0.06)	(0.06)
Absolute negative deviation from own contribution	0.10*	0.11**	0.11**	0.10*
	(0.06)	(0.05)	(0.05)	(0.06)
Colored	-	0.19	-0.18	-
		(0.79)	(0.84)	
African permanent	-	4.13***	3.47***	-
		(0.77)	(0.89)	
African informal	-	5.09***	4.60***	-
		(0.77)	(0.82)	
Age	-	-	-1.15	-5.90
			(5.76)	(6.16)
Age^2	-	-	0.04	0.20
			(0.16)	(0.18)
Female	-	-	0.60	1.27*
			(0.61)	(0.64)
Constant	-1.43***	-3.67***	3.17	39.76
	(0.53)	(0.75)	(50.12)	(53.61)
Observations	486	486	486	486
Log likelihood	-735.5	-697.5	-696.3	-724.9
LR chi^2	12.9***	88.79***	91.14***	33.88***
Pseudo R^2	0.009	0.060	0.060	0.023

Notes: Tobit estimations. Standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Determinants of Punishment 2

Dependent variable: Punishment points assigned	**Model 1**	**Model 2**	**Model 3**
Positive deviation from own contribution	-0.11*	-0.13**	-0.13**
	(0.06)	(0.06)	(0.06)
Absolute negative deviation from own contribution	0.11**	0.11*	0.10*
	(0.05)	(0.05)	(0.06)
Colored	-0.10	-0.74	-
	(0.83)	(0.87)	
African permanent	3.69***	2.50**	-
	(0.89)	(1.05)	
African informal	4.99***	3.92***	-
	(0.85)	(0.97)	
Age	-0.65	-1.13	-6.77
	(5.74)	(5.73)	(5.95)
Age^2	0.03	0.04	0.21
	(0.16)	(0.16)	(0.17)
Female	0.60	0.34	0.64
	(0.61)	(0.62)	(0.63)
Trust in schoolmates	0.31**	0.32**	0.07
	(0.15)	(0.15)	(0.15)
Social integration: Participate in school organizations	-	-0.16	0.12
		(0.52)	(0.54)
Community crime: Housebreaking	-	-0.14	-0.02
		(0.09)	(0.09)
Household violence: Swearing	-	0.41*	0.53**
		(0.22)	(0.23)
Household reading index	-	-0.89***	-1.72***
		(0.35)	(0.32)
Constant	-2.94	2.61	51.77
	(50.06)	(49.95)	(51.87)
No. of observations	486	476	476
Log-likelihood	-694.1	-673.4	-691.5
LR chi^2	95.6***	108.5***	72.3***
Pseudo R^2	0.060	0.075	0.050

Notes: Tobit estimations. Standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

In table 8, we controlled for the same social background variables as in the regression models for cooperation. Even after doing so, both African community dummies remained significant, although some of the social background variables were in fact also important in explaining punishment behavior. Including these variables lowered the magnitudes of both African community dummy estimates.

The interpretation of most of the other results is straightforward. Higher levels of trust might create disappointment that could lead to a relative overshooting of punishment behavior (even when we controlled for the deviations from one's own contributions). Neither is it very surprising that social integration does not influence punishment behavior. In contrast to our expectations, however, variables related to community crime or violence did not influence the extent to which subjects enforce norms, either. Notably, the household violence variable exerted a significantly positive influence on sanctioning behavior. Participants who reported that they were exposed to swearing when they were young tended to punish more harshly.

There is no unambiguous explanation for the negative impact of the household reading index, but it could be related to a component of the socio-psychological literature indicating a relationship between juvenile delinquency and reading ability in adolescents (Keilitz and Dunivant 1986; Cornwall and Bawden 1992; Williams and McGee 1996). An alternative explanation is that children from highly-educated households are more able to understand that punishment in a one-shot setting is nonstrategic and therefore irrational from the standard viewpoint in economics.[17]

We also conducted similar robustness checks for norm enforcement behavior as for the determinants of cooperation. Our results and conclusions remain largely unchanged.

5.3 Reaction to the Introduction of a Norm Enforcement Device

Recall from the non-parametric analysis that only the white community increased contribution levels significantly in Part 2 compared to Part 1. In order to test the robustness of this result when using parametric analyses, we ran a series of OLS regressions with the change in contribution on the subject level between the two parts (i.e., $c_{2i} - c_{1i}$) as the dependent variable. Although a lot of subjects increase their contributions when a punishment option is introduced (with the strongest effect for the participants from the white community),

[17] However, as mentioned before, all participants had to answer a set of control questions regarding the game before it started. We thus ensured that everybody had a good understanding of the game.

the community dummies and other controls were not significant in these regressions. This is mainly due to the fact that a majority of subjects naturally did not change their contribution behavior (most of them because they had already contributed a lot in Part 1), and the remaining number of observations is not large enough to elicit significant differences between the four communities in our one-shot setting.[18] Note that it would be very surprising if subjects had changed their contributions significantly because there was no possibility to learn.

We can also calculate ex post, what change would have been optimal behaviorally. This requires making certain assumptions regarding the contribution behavior of other group members and taking the punishment structure contingent on contribution level as given for each of the communities. Indeed, from such an exercise, it is far from clear that an increase above the average contribution levels would have been optimal for our subjects. Ex-post money-maximizing levels of contributions for the four communities all lie between zero and 15 for the given punishment structure in the communities.

6. Discussion and Conclusion

Our study brings new insights to the difference of cooperative norms, their nature, and their determinants. We conducted one-shot public goods games with and without punishment at four schools in Cape Town, South Africa, each representing communities from different socio-demographic and population groups. By studying behavior within one geographical setting, we were able to keep differences in formal institutions, legislature, and political system constant—factors that often affect cross-cultural studies conducted in different countries. Our experiments gave us a unique data set that adds insights to the existing economics literature on cooperation and norm enforcement.

Even though the chosen schools were all within 15 kilometers of each other, we found significant differences in behavior in terms of cooperation and punishment. Hence, social norms and norms regarding the enforcement of social outcomes may be very different in different groups even in the same country. “Cultural” learning seems to establish group norms that are different within tiny geographical distances. The four groups in this study come from the white, colored, and African populations. Two locations were sampled in the African community, distinguishing areas with permanent and informal housing, in order to be

[18] Detailed results are available on request.

able to assess possible differences from the effects of housing development and associated socioeconomic conditions on behavior.

We found that participants from both African communities significantly contributed more and punished more than did the white and colored participants, with those from the African informal housing areas contributing and punishing most. A large fraction of the differences in cooperative behavior vanishes once we controlled for socio-demographics, trust, and social background variables. Gender and trust particularly seemed to play an important role in mediating the effects of the community dummies in our subject pool when it comes to cooperation.

Regarding norm enforcement behavior, or punishment, the stronger inclination to punish among the members of the two African communities did not become insignificant when we controlled for our set of background variables, even though the size of the effect decreased a bit. A higher level of trust increased punishment, as did a higher level of self-reported psychological violence or swearing in one's youth.

There are several potential reasons that could explain the observed differences between the communities. One of them has been invoked quite often in political discussions in South Africa: the concept of *Ubuntu*, a special term in Xhosa for expressing empathy and solidarity with one's group (i.e., for the whole being greater than the parts). Its prevalence among the African communities could be one explanation for (slightly) higher levels of cooperation and (strongly) higher levels of norm enforcement. However, a traditional group-oriented norm, such as Ubuntu, cannot explain the whole story, given that we observed significant differences in behavior also between the two African communities.

There is another general lesson to be drawn from our results. At least with nonstandard subject pools, it seems important to control for socio-demographic variables (and perhaps even background variables) in order to avoid drawing premature conclusions. If we had only relied on the school dummies, we would have interpreted our results only in terms of "cultural" differences among communities, instead of being more cautious and concluding that they could also partly be driven by socio-demographic variables or social background variables, especially when it came to cooperation. It seems to be the case that the average variance of behavior within a given culture, community, or group is at least as relevant as the variance across cultures, communities, or groups, and this insight should probably be taken into account to a greater extent when interpreting the results from experiments that compare the behavior of different groups of participants.

We are convinced that a better knowledge of the determinants of cooperative behavior and norm enforcement, be they socio-demographic, group-related, or experience-related, will

benefit economic understanding and modeling. In the future, researchers may be able to use larger subject pools of non-university students to address these questions. However, even though larger subject pools would allow a greater number of significant links between background and behavior to be detected, it is not clear that they would reveal a greater number of economically relevant links. Our subject pool seems large enough to be able to capture the most important factors that impact cooperation and punishment. Whether the differences between groups that we found in South African students are indicative of cooperative and norm enforcement behavior of similar groups in other countries or other population groups, however, is an empirical question to be addressed in the future.

In addition to social background variables, we think that the relationship between trust as a building block for social capital on one hand, and cooperative and norm enforcement behavior on the other hand, has to be studied in more detail. The two seem to be intimately related and they also seem to interact with (fulfilled or disappointed) expectations, but we are not aware of economic studies that go beyond establishing the empirical correlation between trust and cooperation. Our study adds an additional link, namely between trust and punishment behavior, and it suggests that understanding these mutual influences could be beneficial when it comes to understand the economics of cooperation more comprehensively.

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Appendices

Appendix 1: Variables and Non-parametric Significance Tests

Table A1. Descriptive Statistics of Explanatory Variables

Variable	White			Colored			African permanent			African informal			Pooled		
	Mean	***Min.***	***Max.***	***Mean***	***Min.***	***Max.***	***Mean***	***Min.***	***Max.***	***Mean***	***Min.***	***Max.***	***Mean***	***Min.***	***Max.***
Female	55%			80.9%			67.8%			77.9%			70.8%		
Age	16.3	15	18	17.00	15	19	18.12	16	23	17.33	15	21	17.18	15	23
Trust: in schoolmates	4.35	4.1	4.59	3.95	3.71	4.2	3.36	3.0	3.71	2.93	2.56	3.3	3.67	3.5	3.82
Social integration: Participate in school organizations	0.53	0.44	0.62	0.38	0.29	0.47	0.50	0.40	0.59	0.51	0.42	0.6	0.48	0.43	0.52
Community crime: Housebreaking	1.78	1.33	2.23	1.61	1.21	2.03	2.96	2.35	3.57	2.74	2.12	3.36	2.24	1.98	2.5
Household violence: Swearing	2.48	2.27	2.69	2.47	2.29	2.65	2.72	2.49	2.95	2.62	2.35	2.8	2.57	2.46	2.68
Household reading index	0.9	0.75	1.04	0.24	0.07	0.40	-0.7	-0.81	-0.59	-0.52	-0.64	-0.4	0	-0.89	0.89

Table A2. P-values from Pair-Wise Tests of Public Goods Contributions in Part 1

		White	Colored	African permanent	African informal
White	Contribution	x	x	x	x
	Proportion	x	x	x	x
	Conditional contribution	x	x	x	x
Colored	Contribution	0.048	x	x	x
	Proportion	0.062	x	x	x
	Conditional contribution	0.363	x	x	x
African permanent	Contribution	0.029	0.526	x	x
	Proportion	0.022	0.563	x	x
	Conditional contribution	0.432	0.725	x	x
African informal	Contribution	0.000	0.019	0.123	x
	Proportion	0.007	0.321	0.693	x
	Conditional contribution	0.017	0.029	0.111	x

Note: We applied Wilcoxon-Mann-Whitney tests to test the null hypothesis that the contributions (and conditional contributions) in two tested, independent communities are drawn from the same population. The null hypothesis of same proportion is tested by using chi-square tests.

Table A3. P-values from Pair-Wise Tests from Public Goods Contributions in Part 2

		White	Colored	African permanent	African informal
White	Contribution	x	x	x	x
	Proportion	x	x	x	x
	Conditional contribution	x	x	x	x
Colored	Contribution	0.612	x	x	x
	Proportion	0.436	x	x	x
	Conditional contribution	0.667	x	x	x
African permanent	Contribution	0.057	0.153	x	x
	Proportion	0.004	0.024	x	x
	Conditional contribution	0.911	0.637	x	x
African informal	Contribution	0.010	0.024	0.415	x
	Proportion	0.040	0.163	0.338	x
	Conditional contribution	0.154	0.171	0.105	x

Note: We applied Wilcoxon-Mann-Whitney tests to test the null hypothesis that the contributions (and conditional contributions) in two tested independent communities are drawn from the same population. The null hypothesis of same proportion is tested by using chi-square tests.

Table A4. P-values from Tests between Part 1 and Part 2

	Contribution	Proportion	Conditional contribution
White	0.063	0.225	0.162
Colored	0.739	0.527	0.462
African permanent	0.245	0.046	0.718
African informal	0.909	1.000	0.876
Overall	0.081	0.262	0.231

Note: We applied Wilcoxon matched-pairs signed-ranks tests to test the null hypothesis that the contributions (and conditional contributions) in the two parts are drawn from the same population. The null hypothesis of same proportion is tested by using McNemar tests.

Table A5. P-values from Pair-Wise Tests from Punishment in Part 2

		White	Colored	African permanent	African informal
White	Punishment	x	x	x	x
	Proportion	x	x	x	x
	Conditional punishment	x	x	x	x
Colored	Punishment	0.894	x	x	x
	Proportion	0.892	x	x	x
	Conditional punishment	0.082	x	x	x
African permanent	Punishment	0.000	0.000	x	x
	Proportion	0.000	0.000	x	x
	Conditional punishment	0.000	0.024	x	x
African informal	Punishment	0.000	0.000	0.159	x
	Proportion	0.000	0.000	0.250	x
	Conditional punishment	0.000	0.002	0.387	x

Note: We applied Wilcoxon-Mann-Whitney tests to test the null hypothesis that the punishments (and conditional punishments) in two tested, independent communities are drawn from the same distribution. The null hypothesis of same proportion is tested by using chi-square tests.

Appendix 2: Experiment Instructions

Welcome to the experiment.

You are about to participate in an economics experiment. Depending on your decisions and the decisions of other people in the room, you may earn a considerable amount of money. The amount you make will be paid to you at the end of this experiment as a cash check, which you can exchange for cash at any ABSA bank.

The experiment consists of two independent parts: Part 1 and Part 2. Your total income from the experiment is the sum of the income in these two parts. The following pages contain the instructions for Part 1. After Part 1, you will receive the instructions for Part 2 of the experiment. During the entire experiment, communication with anybody except the research team is strictly forbidden. If you communicate with any of the other participants, we will ask you to leave the room and you will not receive any payment for the experiment. Please raise your hand if you have questions. A member of the research team will come to you and answer your question in private.

You will also have to fill in a few questionnaires during the experiments. All your answers remain confidential and anonymous (private). We will use the experiment number tag that you received on entering the room to identify you during the experiment, and this will also be used to identify you when we pay you your income after the experiment.

During the experiment, we will not speak of rands, but rather of guilders. First, your whole income will be calculated in guilders. At the end of the experiment, the whole amount you have earned in guilders will be converted to rand at the following rate and paid out as a cash check: 1 guilder = ZAR 1.50

PART ONE

Procedure of the Experiment

At the beginning of the experiment we are going to divide all participants into **groups of three**. Apart from you, there are two other members in your group. Nobody except for the experimenters will know who is in which group. You will not learn who the other two people in your group are or have been, neither during nor after the experiment.

Each member of a group receives **20 guilders** and has to decide where to put these 20 guilders. You can either:

1) **put all these 20 guilders into project A and nothing into project B**,

2) **put nothing in project A and all your 20 guilders into project B,** or

3) **you can put them partially into project A and project B**.

Therefore, **each group member has to decide for himself or herself** how much of his or her 20 guilders to put into project A and project B. Later we will ask you about your decision. We will ask you how much you would put into project B, and each guilder you do not put into project B will automatically go towards project A.

For each guilder that you choose to put in project A, you will earn 1 guilder. Once every group member has decided how much to contribute to project B, the researcher will **sum** (**add together) the guilders that all group members contributed to project B. The researcher will then add an extra 50% to the total amount that all three group members contributed to project B,** which will then be **divided between the three group members in equal parts**. This means that the total amount of guilders contributed to project B is multiplied by 1.5 to increase it by 50%. Thereafter, it is divided by 3, since there are three members in a group. **So the income each group member receives from project B is:**

$$- \frac{1.5 \times (\text{the total amount of guilders that the group put into project B})}{3}$$

$$- \frac{0.5 \times (\text{the total amount of guilders that the group put into project B})}{3}$$

For example, if you contribute 1 guilder to project B, the experimenter will add half a Guilder. So the amount of 1.5 guilders will be distributed among all three members of the group in equal parts. Therefore, each group member receives 0.5 guilders. For every 1 guilder you put into project B, you will earn 0.5 guilder. At the same time the income of each other group member will also increase by 0.5 guilders, since every group member receives the same amount of money out of project B, **no matter what his or her contribution was**. **If another member contributes 1 guilder to project B, the same reasoning holds.**

Calculation of Your Income

The total income of the three group members from Part 1 of the experiment will be calculated in the same way. Each member's income consists of two parts:

1. **Guilders from project A**
2. **Guilders from project B, which will be calculated in the following way**:

(1.5/3) * (total amount of contributions to project B by all group members) =

0.5 * (total amount of contributions to project B by all group members)

Your **total income is the sum of your income from project A and project B.** So, your total income from Part 1 is:

= Income from Project A + Income from Project B

= (20 – your contribution to project B) + 0.5 * (the total amount that the group contributed to project B)

The following examples will help you gain some understanding about the calculation of your income:

Example 1. If the three group members each contribute 0 guilders to project B, their income will be equal to the 20 guilders that they put in project A. Nobody receives anything from project B, since nobody contributed to it. The total income of each member is therefore 20 guilders.

Calculation of total income for each participant:

=	(20 – 0)	+	0.5 * (0)	=	20

Example 2. If the three group members each contribute 20 guilders to project B, then the income from project A is 0. The total contribution to project B is 60 guilders. So, each member gets an income from project B of 0.5*60 = 30 guilders.

Calculation of total income for each participant:

=	(20 – 20)	+	0.5 * (60)	=	30

Example 3. If you contribute 20 guilders to project B, the second member contributes 10 guilders, and the third member contributes 0 guilders, this will result in the following incomes. Since you and the second member put a total of 30 guilders into project B and the third member contributed nothing, each of the three group members will get 0.5*30 = 15 guilders from project B.

Since you contributed all 20 guilders to project B, you receive a total of 15 guilders because you have no income out of project A.

The second member put 10 guilders into project A and therefore gets 10 guilders from project A. This member also gets 15 guilders from project B. So she receives 10 + 0.5*30 = 25 guilders, in total.

The third member, who contributed nothing to project B, gets 20 guilders from project A, but also gets 15 guilders from project B, like each of the other members. His total income is therefore 20 + 0.5*(30) = 35 guilders.

Calculation of your total income:

=	(20 – 20)	+	0.5 * (30)	=	15

Calculation of second member's total income:

=	(20 – 10)	+	0.5 * (30)	=	25

Calculation of third member's total income:

=	(20 – 0)	+	0.5 * (30)	=	35

Example 4. The other two members contribute 20 guilders to project B; you decide to contribute nothing. The total amount in project B is therefore 40 guilders, so each person receives 0.5*40=20 guilders from project B. The other two members put everything in project B, so these 20 guilders is all the income they receive. You put nothing in project B, so you get 20 guilders from project A, as well as, 20 guilders from project B. In this case the incomes are calculated as follows:

Calculation of total income for the 2nd and 3rd member:

=	(20 – 20)	+	0.5 * (40)	=	20

Calculation of total income for you:

=	(20 – 0)	+	0.5 * (40)	=	40

For your decision, you will receive the following sheet (shown here only as an **example**):

Your experiment number: _____

Decision Sheet – Part 1:

Please write down how many guilders you want to put **into project B**:

_____ guilders (maximum: 20 guilders; use only whole numbers; the rest is automatically put into project A)

Soon you will be given a sheet, like the one above, and you will be asked to fill in the amount you want to contribute to project B. After you have made your decisions, please put the sheet into the envelope. **Your decision remains confidential and anonymous**. The experimenter will then collect the envelopes. You will receive information about your income after Part 2 has finished. After making your decision we will hand out a form which you should fill in, where we ask you how much you expect the two other members contributed on average from their 20 Guilders to project B.

This part of the experiment will be done only once! In other words, we will not repeat this part of the experiment.

Do you have any questions? Please raise your hand; a member of the research team will come to you and answer your question in private.

Questions

Please answer all the questions and write down your calculations. These are just examples and serve only to help you to understand about the calculation of your income. We will later come and check your answers, and thereafter go through the calculations on the board.

Remember your total income from Part 1:

=	Income from Project A	+	Income from Project B
=	(20 – your contribution to project B)	+	0.5 * (the total amount that the group contributed to project B)

Also remember: **1 guilder = ZAR 1.50**

Question 1. Each group member has 20 guilders. Nobody (including you) contributes to project B.

What will your total income be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the income of each of the other group members be in guilders?

= (20 –__) + 0.5 * (__) = __

What will your total income be in ZAR? _____

Question 2. Each member has 20 guilders. You contribute 20 guilders to project B. The other group members also contribute 20 guilders to project B.

What will your total income be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the total income of the other group members be in guilders?

= (20 –__) + 0.5 * (__) = __

What will your total income be in ZAR? _____

Question 3. Each member has 20 guilders. You contribute 3 guilders to project B; the second member contributes 10 guilders and the third member contributes 17 guilders to project B.

What will your total income be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the total income of the second member be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the total income of the third member be in guilders?

= (20 –__) + 0.5 * (__) = __

What will your total income be in ZAR? _____

Question 4. Each member has 20 guilders. You and the second member contribute 20 guilders to project B; the third member contributes 0 guilders to project B.

What will your total income be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the total income of the second member be in guilders?

= (20 –__) + 0.5 * (__) = __

What will the total income of the third member be in guilders?

= (20 –__) + 0.5 * (__) = __

What will your total income be in ZAR? _____

Do you have any questions? Please raise your hand; a member of the research team will come to you and answer your question in private.

PART TWO *[handed out after completion of PART ONE]*

Part 2 of the experiment will be very similar to Part 1. As in Part 1 of the experiment, you will receive 20 guilders. **This time you have to make two decisions. The first decision is identical to what you have done in Part 1.** You make a decision about how many of the 20 guilders you want to put into project B (the rest will automatically go towards project A). The income will be calculated in the same way as it was calculated in Part 1. For each guilder

that you choose to put in project A, you will earn 1 guilder. For each guilder that you contribute to project B, you and all the other group members will earn 0.5 guilders. The same reasoning is also applicable when the other members contribute to project B.

Note however, that **now you will be in a group with two other people than before**. The way we put each of you into a group is completely random. Nobody except for the experimenters will know who is in which group. You will not learn who the other two people in your group are or have been, neither during nor after the experiment. **Part 2 of the experiment will end after the two decisions and it will only be done once. When we are finished with Part 2, the experiment is over.**

What is new in Part 2?

After you have decided how much to contribute to project B (as in Part 1 of the experiment), **you will get information about the contribution to project B of the two other group members within your group.** You will therefore know how much everybody in the group contributed to project B and how much everybody contributed to project A. At this point, **you may, if you want, reduce the income of each other group member by giving deduction (subtraction) points to them.** You can also leave the income of the other members **untouched.** The other group members may also reduce your income if they wish to. The exact procedure will be described below in greater details. Next we will describe what happens to each member's income after the giving of deduction points.

To sum up: There are two decisions in this second part of the experiment:

- the first decision is about how much you will put into project B (which is exactly the same as in Part 1)
- the second decision is where you decide if you want to give deduction points to other group members and if so how many

Calculation of your income:

Any deduction point you give to another group member reduces the income of the group member that receives this point by 3 guilders. This means, if you give 1 deduction point to another group member, his or her income will be reduced by 3 guilders. If you give 2 deduction points to a member, his or her income will be reduced by 6 guilders. If you give 9 deduction points to a member, his or her income will be reduced by 27 guilders, and so on. If you give 0 deduction points to another group member, there will be no change in that member's income. So, the experimenters will reduce the income of a group member by 3 guilders for each deduction point that member receives.

You can **give a maximum of 10 deduction points** to each member.

If you give deduction points, you will also face a cost. **For each deduction point you give to another group member, you have to pay 1 guilder.** For example, if you give 3 deduction points, you will pay 3 guilders. If you give 7 deduction points, you have to pay 7

guilders, and so on. If you do not give any deduction points, you will, of course, not pay anything.

Your total income from Part 2 of the experiment will be calculated in the following way:

Total income (*TT*) from Part 2 = (Income from the first decision, *I*) minus 3 * (amount of deduction points that you received from the other two group members, *DR*) minus 1 * (amount of the deduction points that you have given to the other two group members, *D*G):

$$TT = I - 3\,(DR) - 1\,(DG)$$

If the cost of the deduction points you received (3*amount of deduction points you received) is greater than your income from the first decision in Part 2, this difference will automatically be set to ZERO. From this amount the cost for the deduction points that you have given to the other members have to be deducted.

Your total income in guilders from Part 2 of the experiment has three components: (1) your income from the first decision; (2) three times the amount of deduction points received from other group members and (3) your costs from giving deduction points to other group members. If the amount of deduction points received by you is greater than your income from the first decision, it will be set to zero by the experimenter. Independent of this, you must pay for all deduction points that you give to other members. Your total income from the experiment is the sum of the income in Part 1 and Part 2. The income is calculated in a similar manner for the other group members. Note that the income from Part 2 might be negative. In that case you will have to pay the difference with your income from Part 1.

How do you make your decision about the deduction points?

As in Part 1, all participants will, at the beginning, decide how much to contribute to project B. These decision sheets will then be collected. Before we get to the second decision we will hand out another form that you should fill in. Here we want you to write down how many of their 20 guilders you expect each of the two other group members on average have contributed to project B. Next you will get the decision sheet back, which now includes information about how many guilders the other members have contributed to project B and the guilder income you and the other group members have received from this first decision. We will ask you to study this information and then to turn over this sheet and wait while we hand out another short questionnaire. After you have filled that in and handed it back to us, you will make your second decision. At this point, you must decide, whether and, if yes, how many deduction points you will give to the other members of your group. Below you will see an **example** of the decision sheet.

Decision sheet for the second part of the experiment:

	1st member (you)	**2nd member**	**3rd member**
Contribution **to project B** (first decision)	Your contribution	Contribution of the 2nd member	Contribution of the 3rd member

Income from the first decision	Your income _____	Income of the 2nd member _____	Income of the 3rd member _____
	Deduction points that you want to give (max 10 deduct-ion points to each member)	_____	_____

Please decide how many deduction points you would like to give to the others. If you would not like to give any deduction points, please enter a zero. **You can give each group member a maximum of 10 deduction points.** You must, in any case, make an entry into the boxes.

After you have entered your decisions about deduction points on the decision sheet, put your decision sheet in the envelope. The envelope will be collected by the experimenter. After finishing Part 2, we will calculate your total income from both parts of the experiment. In the meantime we will ask you to fill in a questionnaire. When this is finished we will give you a form that contains information about your income from Part 1 and Part 2, as well as a receipt that states your total income for the experiment. You have to sign this receipt and hand it to us when you leave the room. Remember to hand us your experiment number tag, so that we know how much to pay you. You will receive an envelope with a cash check stating the amount you have earned when you hand us your experimental number tag.

Do you have any questions? Please raise your hand; a member of the research team will come to you and answer your question in private.

Questions:

Please answer all the questions below and write down your calculations. These are just examples and serve only to help you to understand about the calculation of your income. Please write down the solution in guilders. We will later come and check your answers, and thereafter go through the calculations on the board.

Question 1. You want to give the second group member 6 deduction points and the third group member 8 deduction points.

What will this cost you in guilders? _____

By how much will that reduce the income of the second group member in guilders?

_____

By how much will that reduce the income of the third group member in guilders?

_____

Question 2. You want to give the second group member 10 deduction points. You want to give the third group member no deduction points.

What will this cost you in guilders? _____

By how much will that reduce the income of the second group member in guilders?

_____

By how much will that reduce the income of the third group member in guilders?

_____

Question 3. You do not want to give any deduction points.

What will this cost you in guilders? _____

By how much will that reduce the income of the second group member in guilders?

_____

By how much will that reduce the income of the third group member in guilders?

_____

Question 4. You earned 10 guilders from the first decision. You received 2 deduction points from the second member and from the third member, you received 1 deduction points. You did not assign any deduction points to the other two members. In Part 1 of the experiment you earned 18 guilders.

By how much do the deduction points you received from other group members and the deduction points you gave to others reduce your income in guilders? _____

What will be your total income in guilders from Part 2? _____

What will be your total income in guilders from both Part 1 and Part 2?

_____

Question 5. You received 10 guilders in the first decision. In the second decision, you received 2 deduction points from the second member and 1 deduction points from the third member. You gave 5 deduction points in total to the other two members. In Part 1 of the experiment you earned 18 guilders.

By how much do the deduction points you received from other group members and the deduction points you gave to others reduce your income in guilders? _____

What will your total income from Part 2 be in guilders? _____

What will be your total income in guilders from both Part 1 and Part 2?

_____

Do you have any questions? Please raise your hand; a member of the research team will come to you and answer your question in private.