

Social capital, cooperative behavior and norm-enforcement[#]

Martin G. Kocher^{*}, Peter Martinsson⁺ and Martine Visser⁺

This version: 2007-03-01 – very preliminary!

Abstract: We provide, as far as we know, the first empirical test for the influence of an individual's social environment on his or her cooperative and norm-enforcement behavior. For this end, a unique data set is created based on a series of public goods experiments conducted in Cape Town, South Africa. Our main empirical results clearly confirm that social capital variables are consistently related with human cooperative and norm-enforcement behavior. Moreover, we find that their impact is even able to overpower typical group variables.

JEL classification: C72, C91, H41, Z13

Keywords: cooperation, public goods, punishment, experiment, social capital, South Africa

[#] We would like to thank Olof Johansson-Stenman and participants of the ESA World Meeting 2006 at Atlanta as well as the European ESA Meeting 2006 at Nottingham and North American ESA Meeting 2006 at Tucson for helpful comments as well as Benedikt Herrmann for suggestions regarding the research design. We are also indebted to the Western Cape Department of Education in South Africa for facilitating this research. Financial assistance from the Swedish International Development Cooperation Agency (SIDA) and from Jubileumsfonden at Göteborg University is gratefully acknowledged. Kocher also acknowledges financial support from the ENABLE Project under the European Union 6th Framework Program. The paper reflects the views of the authors, and the European Community is not liable for any use that may be made of the information contained herein.

^{*} University of Amsterdam, Department of Economics, CREED. Roetersstraat 11, NL-1018 WB Amsterdam, Netherlands, and University of Innsbruck, Department of Economics. Universitaetsstr. 15/4, A-6020 Innsbruck, Austria. E-mail: martin.kocher@uibk.ac.at.

⁺ Department of Economics; Göteborg University, Box 640, 405 30 Göteborg Sweden. E.mail: peter.martinsson@economics.gu.se; martine.visser@economics.gu.se (corresponding author).

1. Introduction

Cooperative behavior is an important component in humans' daily lives, ranging from activities such as food sharing and teamwork to keeping the environment clean, using common resources diligently, collective action and voting. In economics the nature of cooperation and its patterns are usually studied in the context of social dilemmas, with the special case of the private provision of a public good. It is a well-documented fact that people contribute more to public goods, on average, than predicted by the selfish and rational model of the homo oeconomicus but full cooperation can usually not be sustained. In the context of public good provision, the literature, therefore, also studies how cooperative behavior can be enforced by informal decentralized mechanisms such as sanctions (e.g., Fehr and Gächter, 2000; Andreoni et al., 2003; Masclet et al., 2003; Güreker et al., 2006).¹ Again, the standard model cannot explain the use of these informal sanctions that, however, have been shown to be able to sustain cooperation on high levels.

One very important conclusion from the literature is that individuals are heterogeneous in their inclination to cooperate (e.g., Fischbacher et al., 2001) and to invest in a costly norm-enforcement device. Individual heterogeneity may be manifested in different preferences for fairness (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Falk et al., 2005; Sutter et al., 2006), different preferences for reciprocity (Rabin, 1993; Charness and Rabin, 2002; Dufwenberg and Kirchsteiger, 2004; Falk and Fischbacher, 2006; Fischbacher and Gächter, 2006), or different emotional responses (Bosman and van Winden, 2002; de Quervain et al., 2004; Hopfensitz and Reuben, 2005).

Although it seems intuitive and very straightforward that there is also a potential link between cooperative and norm-enforcement behavior, on the one hand, and an individual's social environment and cultural background, on the other hand, and that this connection is one of the main reasons for the observed heterogeneity of behavior, we are only aware of very few studies that address this connection directly. Almost all of them focus on cross-cultural differences in behavior (Brandts et al., 2004; Henrich et al., 2005; Gächter and Herrmann, 2006) on a *collective* level. In contrast, in this paper we provide, as far as we

¹ In political science or social psychology, related studies have been conducted even earlier by Yamagishi (1986) or Ostrom et al. (1992), for example.

know, the first empirical test for the influence of an *individual's* social environment on his or her cooperative and norm-enforcement behavior.²

In accordance with the literature, we will also use the term *social capital* (Putnam, 1993) for the set of variables that determine one's *individual* social environment. Since the concept of social capital is not well defined in the literature, it is important to state clearly what we think it comprises. In the context of our study, social capital is seen as a combination of the following social environment variables: (i) attitudinal and behavioral measures of trust, (ii) behavioral measures of the individual level of integration into one's peer group and community (social integration), and (iii) attitudinal as well as behavioral measures on norm-violation and norm-enforcement in one's peer group and community.

Our main empirical results clearly confirm that social capital variables are consistently related with human cooperative and norm-enforcement behavior. Moreover, we find that their impact is even able to overpower typical group variables. Social identity theory (see Haslam, 2001) postulates that membership in a social group transforms individuals, leading to internalized roles, norms and values that affect behavior (Götte et al., 2006). We are, however, able to show that once one controls for social capital variables on the individual level, the group variables that at first sight seem to be important in driving individual cooperative and norm-enforcement behavior (informal punishment, in our experiment) lose significance. Hence, while we do not want to argue that social identity does not play any role in shaping cooperative and norm-enforcement behavior, the individual influence of the social environment seems to be stronger than the collective influence, or, put differently, a seemingly significant influence of group membership on behavior can be traced back to individual characteristics or attitudes.³ Of course, this claim hinges on the exact distinction between group variables and individual variables. In our case this is quite straightforward – which will become clear in the following paragraph – but it is important to note that the consequence from our approach is a rather restricted set of group variables.

For the empirical test underlying our results, we created a unique data set based on a series of experiments conducted in Cape Town, South Africa. Participants in the

² We think that it is important to test for both cooperative and norm-enforcement behaviour because both are relevant for almost all real-world applications.

³ In a similar vein, Henrich et al (2001) argue for a two-layer approach in analyzing cultural impacts on behavior, distinguishing the individual level (e.g., age, gender) and the group-level (e.g., market integration).

experiments were high school students before graduation, coming from four selected high schools: (i) a school from one of Cape Town's White high income neighborhoods; (ii) a school located within a Colored middle income neighborhood; and (iii) and (iv) two schools which represent the low income African community, with one school being situated in an older neighborhood where most of the housing development is permanent, while the catchment areas for the other high school are three different neighborhoods where housing development is classified as informal. For purposes of elucidation these schools are labeled as (i) White, (ii) Colored, (iii) African Permanent and (iv) African Informal. Due to the legacy of Apartheid, high-income and middle-income people on the one hand and low-income on the other hand are still distinctly divided along ethnic groups, and, thus, our groups were very homogenous.⁴

Obviously, this setup is almost ideal to test for the comparative influence of group variables (the four high schools with different "cultural" background in our case) and individual variables that determine social capital (collected in a post-experimental questionnaire). In case of any significant difference in behavior across groups, the group variable is a natural suspect when searching for a source. We are, however, also able to check by using questionnaire data (that are not collected in a comparable comprehensiveness in related experiment) whether individual variables concerning one's own social environment can overpower statistically the pure effects of group membership. Note that there are two features in our design that make the group variable very salient: First, in contrast to other experiments, we keep the social distance of individuals constant, i.e. subjects in the experiment know that they interact with a member of their group. Second, we deliberately chose high school students as subjects, because once finishing high school, it is likely that one gets a job outside the own local community and this may, then, create additional heterogeneity that may weaken the group identity and would be difficult to control for empirically.

Finally, it is important to emphasize that the global environment such as the political system and the general economic outlook are identical across our experimental groups. Thus, we are able to keep any of those complicating effects outside our analysis that are

⁴ Due to a combination of the abolishment of discriminatory legislature and employment policies, affirmative action requirements within the government and 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 in general.

typically relevant in cross-country studies. In fact, the four high schools are located in four different communities that are less than 15 kilometers apart from each other.

Our paper is more closely related to two recent approaches in the literature. In the context of the first approach, several experimental studies use individual characteristics to explain differences in *cooperation*. Most of them do not go beyond standard socio-demographic variables such as age, gender or education (for a meta-study, see Zelmer, 2003). Anderson et al. (2004) is the only exception that we are aware of. They correlate attitudinal and behavioral trust measures as well as measures regarding the participation in voluntary activities with behavior in a linear public goods game, but report some contradictory results for measures that one would intuitively expect to be highly correlated with behavior. Regarding *norm-enforcement*⁵ and social environment, there is one more closely related paper, namely Gächter and Herrmann (2006). They run public goods experiments in Russia and show differences between rural and non-rural participants and that the efficiency-enhancing potential of punishment may be culture-specific. More specifically, they reason that there might be cultural factors that drive the fraction of spiteful punishers (defined as players that punish other players who contributed *more* than them).⁶ A high proportion of spiteful punishers can destroy the positive effects of punishment due to the high efficiency costs associated with it.

In the context of the second approach, large-scale survey data based on non-incentivized questions are used to assess the influence of social capital variables on cooperation and norm-enforcement. As far as we know, there is no large-scale survey on cooperative behavior, but there are several related ones. Among them, Dohmen et al. (2006) study the determinants of reciprocity based on a sample of 21,000 individuals in Germany. They report a higher level of positive reciprocity among women than men and an increase of positive reciprocity with age. Interestingly, they are also able to show a positive correlation between stated positive reciprocity and work hours as a measure for job effort. Related studies that combine representative survey questions and incentivized experiments are Glaeser et al. (2000) or Fehr et al. (2003) as well as Bellemare and Kröger (2007), studying the determinants of trust and trustworthiness.

⁵ The general economics literature on punishment is actually quite extensive. See, for instance, Fehr and Gächter (2002), Botelho et al. (2005), Casari and Luini (2005), Egas and Riedl (2005), Ertan et al. (2005), Nikiforakis and Normann (2005), Page et al. (2005) as well as Sefton et al. (2006) for some evidence.

⁶ This kind of punishment is also called *misdirected* or *perverse* punishment in the literature.

The remainder of this paper is organized as follows. In Section 2 we present the public goods game and our experimental design. Section 3 presents our predictions, followed by the results in Section 4. Finally, Section 5 concludes the paper.

2. The public goods game and our experimental design

2.1 *The experimental game*

Our experimental design builds on Gächter et al. (2004) and Gächter and Herrmann (2005). Let $I = \{1, 2, \dots, n\}$ denote a group of n subjects who interact only once in a one-shot simultaneous public goods game *without punishment*. 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. $C = \sum_{j=1}^n c_j$). Individual member i 's payoff from her contribution is given by

$$\mathbf{p}_i = E - c_i + \mathbf{g}C \quad (1)$$

The marginal per capita return (MPCR) from investing into this standard linear public good is denoted as \mathbf{g} , which satisfies $0 < \mathbf{g} < 1 < n\mathbf{g}$, meaning that the self-interested choice and the social optimal one are in conflict.

In the public goods game *with punishment*, subjects can punish other group members individually, after they have received information on contribution levels of their group members. 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 (2006), the unit cost per punishment point is 1, and one unit of punishment results in a deduction of 3 units in terms of payoff for the member who receives the punishment.⁷ Each subject can assign a maximum of 10 punishment points to any other member in his or her group.

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

⁷ Previous experiments have shown that punishment behavior follows the law of demand, i.e. the quantity of punishment declines with a rising price of punishment (Anderson and Putterman, 2006; Carpenter, 2006).

$$\mathbf{p}_i = E - c_i + \mathbf{g}\mathbf{C} - 3 \sum_{k \neq i} p_{ik} - \sum_{h \neq i} p_{hi} \quad (2)$$

where p_{hi} is the cost of punishment by member h to member i , and p_{ik} is the deduction in terms of payoff as a consequence of punishment points from member i to member k .

Assuming rationality and selfishness, we should neither observe any voluntary contributions in both games nor any assignment of punishment points in the public goods game with punishment according to the sub-game perfect equilibrium. General findings are, however, that subjects 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, 2006).

2.2 Details of the experiment

The parameters in our experimental sessions were set up as follows: group size $n = 3$, endowment of $E = 20$ Guilders (the experimental currency unit) and MPCR $\mathbf{g} = 0.5$. The contribution c_i was restricted to integers to facilitate calculations during the experiment. In the experiment 1 Guilder was exchanged for 1.5 South African Rand (ZAR)⁸. Subjects earned 58.35 ZAR, on average, and sessions lasted slightly more than two hours. Note that hourly wages for casual and unschooled labor in South Africa ranges from 5 to 25 ZAR (Department of Labour, South Africa, 2006). Thus, the stakes that we used for high school students were salient.

Each experimental session consisted of two parts. In *Part I* each subject had to indicate his or her preferred contribution in the one-shot public goods game without punishment. After the decision and without any feedback on the results from this first part – to avoid any order effects – subjects received experimental instructions⁹ on *Part II*. Part II consisted of a public goods experiment that was augmented by a punishment stage after the contribution stage.¹⁰ It was common knowledge that the group composition in this second

⁸ The exchange rate at the time of the experiment was 6.10 ZAR = 1 USD.

⁹ The complete experimental instructions for both parts can be found in Appendix B. The instructions were phrased in neutral terms. Participants were not instructed to maximize their earnings and no references to any specific strategies were made.

¹⁰ In Part II of the experiment the impact of punishment was capped at the amount earned in the contribution stage. However, the punisher incurred the costs of punishing even if it resulted in a loss in Part II. This

part was different from Part I and that group members would remain anonymous to each other. Thus, we obtain data for two one-shot games: (i) a standard public goods game, and (ii) a public goods game with punishment. The one-shot nature of the game rules out any strategic incentives such as reputation building.

In each high school, the experiment was conducted in a single session with 60 participations to avoid contagious effects by word-of-mouth communication between sessions.¹¹ Upon arrival to the experiment subjects were randomly assigned a seat. Then, after some pre-experimental questions mostly related to emotions, the instructions for Part I was delivered. We dedicated a significant amount of time for privately answering any questions of participants, because we consider this to be of particular importance in one-shot games. We also used a number of quiz questions to ensure that everybody understood the task completely before participants had to indicate their contributions in Part I. Decisions were taken anonymously, and communication among participants was strictly forbidden. A similar procedure was undertaken in Part II. After the contribution decisions in both parts, we elicited expectations of subjects about others' contributions. In Part II there was a second stage that included the possibility to punish other subjects of one's group. After receiving information about the other subjects' contributions, but before punishment, the subjects were asked the same set of emotions questions as before the experiment. When Part II was completed, a post-experimental questionnaire to obtain socio-economic and attitudinal variables was handed out, and as a final stage everybody was paid out privately by cash checks.

2.3 Description of the subject pool

Table 1 gives an overview of our subject pool by presenting several important summary statistics. It reveals that some of the subject pool's socio-economic characteristics are very similar – such as age and gender composition – others are very different across groups. In order to control for their influence we incorporated them in our regression models in Section 4.

procedure was common knowledge among subjects, and there was actually no case of a loss in the experiment.

¹¹ In the Colored community we had 69 participants. This gives a total of 249 subjects in the experiment.

Table 1. Summary statistics of subject pool

	Source	White	Colored	African Permanent	African Informal
<i>Female</i>	own	0.45	0.20	0.35	0.23
<i>Age</i>	own	16.32	17.00	18.12	17.33
<i>Monthly per capita income (in Rands)</i>	CAPS	3750	1100	374	288
<i>Households in poverty</i>	Census	13.00%	14.47%	47.56%	45.95%
<i>Mothers with high school certificate</i>	CAPS	92.30%	46.15%	12.31%	15.15%
<i>Fathers with high school certificat</i>	CAPS	83.33%	53.85%	20.69%	16.59%
<i>Mothers working</i>	CAPS	69.23%	68.75%	23.44%	29.10%
<i>Father working</i>	CAPS	100.00%	84.00%	46.43%	50.94%
<i>Living in permanent building</i>	CAPS	100.00%	86.20%	68.40%	40.50%
<i>Piped water in the house</i>	CAPS	100.00%	97.94%	66.72%	27.46%
<i>Currently living with both parents</i>	own	63.35%	56.52%	23.33%	26.67%
<i>Weekly allowance</i>	own	83.20	61.42	15.16	45.81
<i>Composite generalized trust index</i>	own	23.46	21.85	22.05	20.36
<i>Composite social integration index</i>	own	1.24	0.70	0.80	0.80
<i>Composite household violence index</i>	own	0.19	0.21	0.32	0.31
<i>Composite community crime index</i>	own	0.79	1.33	1.59	1.38
<i>Household reading index</i>	own	3.26	2.42	1.33	1.48

Note: Summary statistics are percentages or averages with standard deviations in parentheses.

Sources: CAPS: Cape Area Panel Study for Young Adults in 2002; *Census:* South African census in 2001; *own:* own data from post experimental questionnaire. For more information about the composition of our indexes see Appendix A.

3. Predictions

From a theoretical perspective the endeavor to investigate societal influences on cooperation and norm-enforcement behavior can be justified by taking into account preferences that are endogenous to the societal environment (Bowles, 1998).¹² There is, however, no general economic theory how norms develop, left alone how individual and group variables influence these norms.

The basic notion of our approach is that social norms drive cooperation and norm-enforcement behavior on the individual level. These social norms are described in economic concept in economics such as inequity aversion or reciprocity and lots of others. Our setup allows to study possible determinants of the set of social norms an individual is endowed with.

¹² As pointed out by Henrich *et. al.* (2002, p.77) “judgments in welfare economics that assume exogenous preferences are questionable, as are predictions of the effects of changing economic policies and institutions that fail to take account of behavioral change. Finally, the connection between experimental behavior and the structure of everyday economic life should provide an important clue in revising the canonical model of individual choice behavior.”

What our study, thus, can provide is an analysis of the impact of organized sets of variables on cooperative and norm-enforcement behavior that can lead to a better understanding of norm development as well as norm evolution and, ultimately, in combination with other results, to the emergence of general economic theories of norms.

Since so far there are no such theories in economics – at least none that would be applicable to our environment – we can only conjecture about the influence of social capital on cooperation and norm-enforcement. Our conjectures are based on the results of empirical studies that analyze related concepts. Table 2 gives an overview of the signs of the effects that we expect.

Table 2. Predicted effects for background variables

	Effect on cooperation is ...	Effect on punishment is ...
<u>1. Individual characteristics:</u>		
<i>Gender</i>	unclear	unclear
<i>Age</i>	unclear	unclear
<u>2. Attitudinal trust:</u>		
<i>Composite generalized trust index</i>	positive	unclear
<u>3. Behavioral trust:</u>		
<i>Currently living with both parents</i>	positive	unclear
<u>4. Social integration:</u>		
<i>Composite social integration index</i>	positive	positive
<u>5. Norm-enforcement/violation:</u>		
<i>Composite household violence index</i>	unclear	positive
<i>Composite community crime index</i>	unclear	unclear

For the sake of succinctness, a more detailed discussion is relegated to the following section in which we present our results and possible interpretations as well as limitations.

4. Experimental results

4.1 Descriptive overview of basic results

We start by presenting an overview of our results. Table 3 summarizes the average levels of contributions and punishment for each of the four communities separately. Behavior in the public goods experiment without punishment (*Part I*) shows that subjects in the White community contribute least, on average only 34.40%, and this is highly significantly different from both the African permanent community (47.90%) and the African Informal (57.10%) community (two-sided Mann-Whitney-U-test; $p \leq 0.01$) as well as weakly significant differently from the 41.95% of the Colored community (two-sided

Mann-Whitney-U-test; $p = 0.06$). We cannot reject that any of the combinations of the Colored communities and the two African communities are significantly different from each other.¹³

The introduction of the punishment institution in *Part II* results in an average increase of contributions in all four communities, which is in line with previous research. The increase is however not significant on conventional levels for any of the four communities (two-sided Wilcoxon-signed-ranks tests; $p > 0.05$).¹⁴ Still, the participants from the White community (and for one comparison also the ones from the Colored community) contribute (weakly) significantly less than participants from both African communities (two-sided Mann Whitney-U-tests; $p = 0.08$ (White vs. African Permanent), $p < 0.01$ (White vs. African Informal), $p = 0.16$ (Colored vs. African Permanent) and $p = 0.01$ (Colored vs. African Informal)).

Although subjects from the White and the Colored communities contribute less to the public good, on average, punishment is significantly lower among them than among the subjects from the African community (Mann Whitney-U-tests; two sided; $p < 0.01$ (White vs. African Permanent), $p < 0.01$ (White vs. African Informal), $p < 0.01$ (Colored vs. African Permanent) and $p < 0.01$ (Colored vs. African Informal)). These initial results seem to indicate at first sight that community membership influences cooperation and norm-enforcement substantially but we will, of course, take up that issue later on.

Table 3. Average levels of contribution and punishment in the two parts

	Average contribution without punishment (<i>Part I</i>)	Average contribution with punishment (<i>Part II</i>)	Average punishment awarded (<i>Part II</i>)
<i>White</i>	6.88 (34.40%)	8.25 (41.25%)	0.49
<i>Colored</i>	8.39 (41.95%)	8.72 (43.60%)	0.61
<i>African permanent</i>	9.58 (47.90%)	10.48 (52.40%)	2.04
<i>African informal</i>	11.42 (57.10%)	11.52 (57.60%)	2.68

In Table 4, we provide a more detailed analysis of contributions by separating between free-riders and non free-riders. As shown in Table 4, the low level of contribution

¹³ We can reject the hypothesis that the four groups are from the same population distribution for contributions in Part I (two-sided Kruskal-Wallis-test; $p < 0.01$).

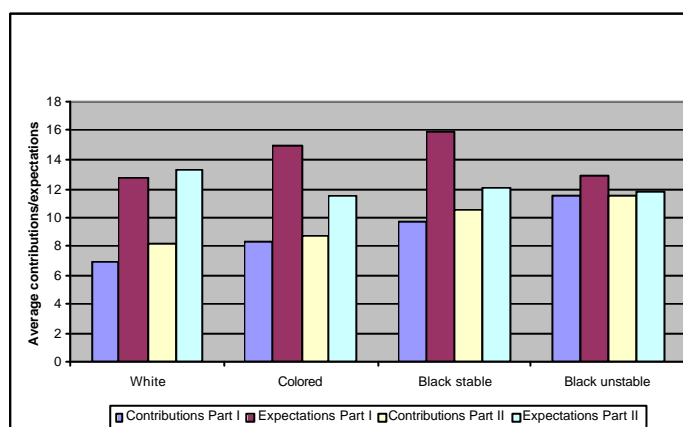
¹⁴ The Colored community comes closest with a p -value of 0.09.

in the White community is a combined effect of a higher proportion of free-riders and a lower level of contribution among non free-riders. The proportion of free-riders is significantly higher at the 5% level in Part I, and conditional contributions are significantly higher among members of the African Informal community. A similar pattern is found in Part II of the experiment.

Table 4. Proportion of free-riders and conditional average levels of contribution.

	Proportion free-riders (Part I)	Conditional av. contribution (Part I)	Proportion free-riders (Part II)	Conditional av. contribution (Part II)
<i>White</i>	0.30	9.83	0.22	10.53
<i>Colored</i>	0.17	10.16	0.20	10.95
<i>African permanent</i>	0.12	10.85	0.07	11.23
<i>African informal</i>	0.10	12.68	0.10	12.80

Figure 1. Contributions and beliefs across communities

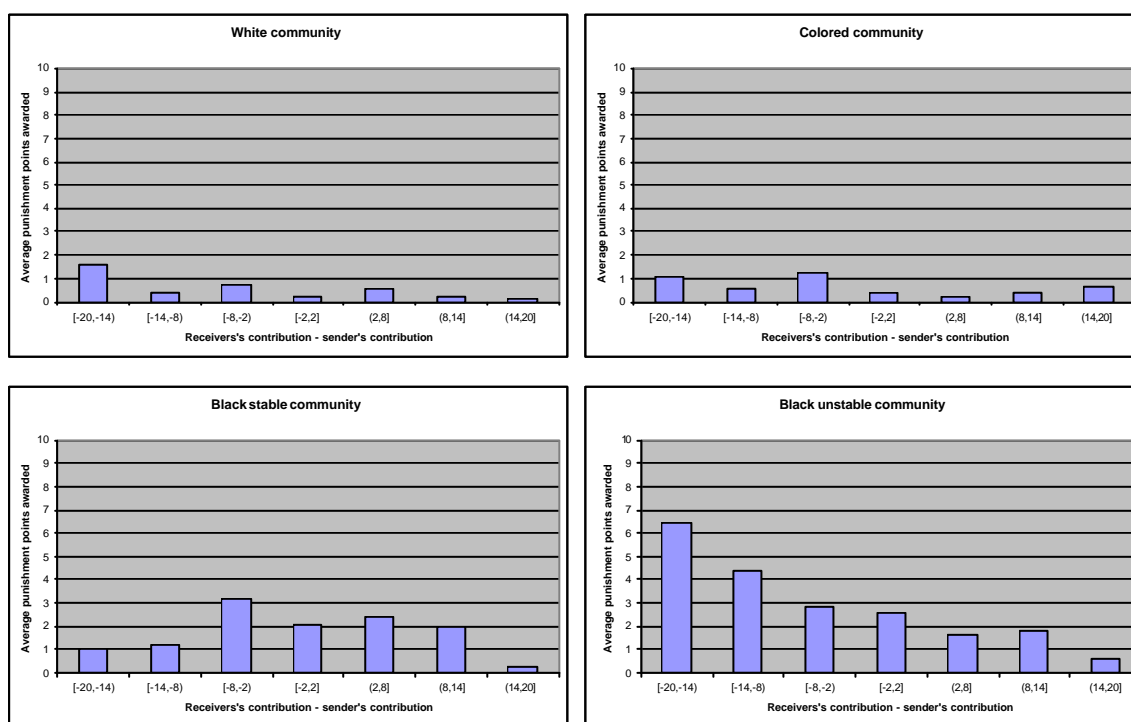


Could differences in expectations possibly account for the differences in punishment between the four communities? Already the first look at the data and Figure 1 refutes such reasoning. In Part I over-optimism about contributions is almost equally strong – on average, around 6 Guilders – among the White, the Colored and the African Permanent community. Students from the African informal community are astonishingly realistic about the contributions that can be expected already in the first part of the experiment. In Part II, where disappointed expectations could be a determinant for punishment, the wedge between actual contributions and expectations is smallest for the two African communities

– exactly those who punish most. Thus, unfulfilled expectations are not likely to be able to explain the difference in punishment across groups.¹⁵

In Figure 2 we show the structure of punishment points assigned measured as the difference between the contribution of the subject who punished and the contribution of the punished subject. A negative number on the x-axis indicates that the punished subject contributed less than the subject who punished, i.e. where we expect punishment to take place, and vice versa. Although there is a tendency of increased punishment of others when the negative difference between own and others are increasing, this tendency is not too pronounced. For all groups there is some spiteful punishment, but in the African communities there seem to be a substantial amount of misdirected punishment. It is, however, interesting to note that in the African Informal community – the group with the highest level of average punishment – is exactly the group with the most intuitive slope of the punishment function. It, thus, does not seem to be the case that there were problems in understanding the instructions or the interaction.

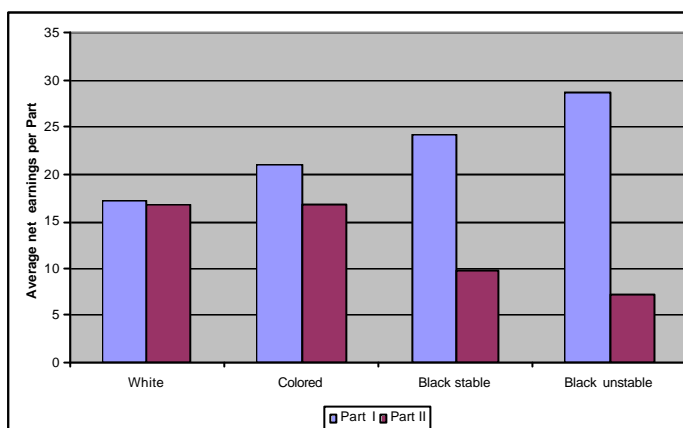
Figure 2. The structure of punishment



¹⁵ There is hardly any significant difference between expectations between the four groups. Detailed results are available on request. Given the difference in contributions, this is rather surprising.

The higher levels of punishment among the African communities have an obvious impact on efficiency. While they are earning significantly more than the White and the Colored group in Part I of the experiment, in Part II their average earnings decrease dramatically as can be seen in Figure 3.

Figure 3. Net earnings across groups



4.2 *Determinants of cooperation*

Our econometric analysis is divided into two parts. First we analyze which factors motivate the amounts contributed to the public good in Part I as well as in Part II. Then, we examine what determines the punishment points assigned to other subjects in the group. In all cases we run tobit regressions, since the dependent variable is censored on both sides.

Table 5 presents a first overview of possible determinants of contributions in the two parts, with the only explanatory variables being the dummy variables for the different communities, expectations of others' contributions, and basic socio-demographic variables, i.e. gender and age. The control group is the White community.

Table 5 conveys the impression that there is a lot of individual heterogeneity in the data. While it seems at first sight that the dummy variables for the two African communities catch up a significantly higher contribution level, controlling for only the most standard individual socio-demographic variables renders the coefficients for the dummies insignificant. Regardless of the model specification, expectations seem to be an important determinant of cooperative behavior, much in the spirit of empirical evidence on conditional cooperation (e.g., Fischbacher et al., 2001; Fischbacher and Gächter, 2006).

Table 5. Determinants of contributions I

Dependent variable:	Contributions Part I		Contributions Part II	
	[1]	[2]	[3]	[4]
Expected contribution	0.311*	0.300*	0.330***	0.339***
	(0.172)	(0.165)	(0.099)	(0.097)
Colored	2.647	-0.015	1.181	-0.478
	(1.692)	(1.735)	(1.502)	(1.592)
African Permanent	2.972*	-1.404	3.617**	0.687
	(1.786)	(2.006)	(1.573)	(1.823)
African Informal	5.580***	2.651	4.558***	2.763
	(1.849)	(1.887)	(1.643)	(1.721)
Age		2.576***		1.739***
		(0.653)		(0.601)
Female		3.474**		1.636
		(1.399)		(1.264)
Constant	3.796**	-40.109***	3.537**	-25.808**
	(1.674)	(11.021)	(1.659)	(10.168)
Observations	232	232	229	229
Log likelihood	-1296.39	-1278.42	-1311.09	-1302.3
LR $\chi^2(16)$	25.17***	61.06***	41,27***	58.7***
Pseudo R ²	0.009	0.023	0.015	0.022

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

In order to see whether it is a consistent pattern that the community dummies are insignificant for cooperation levels – i.e. the effects of individual variables overpower community membership – we add several variables on social capital such as trust, social integration and norm-enforcement or norm-violation. Table 6 presents the respective results, where Model [1] pools the data from all communities and controls for it with dummy variables and Models [2]-[5] present results separately for the four communities.

The total effect of the community dummy is taken up by individual socio-demographic and social capital variables. In our interpretation we want to focus on the pooled data because not all of the separate regressions for the communities are overall significant due to the small number of observations. We find both age and being female increases contributions significantly in the pooled sample¹⁶.

¹⁶ Age is specifically significant for the Colored and both African communities while being female has a positive and significant effect on contributions in the Colored community. While we focused on scholars in the last two years of school, there is typically a large variation in age for these classes due to high failure rates and individuals repeating grades after missing school for extended periods. This is particularly true for the African schools that have been historically disadvantaged.

Table 6. Determinants of contributions II – Part I

Dependent variable: Contributions in Part II	Pooled [1]	White [2]	Coloured [3]	African Perm. [4]	African Inf. [5]
Expectations	0.297 * (.156)	1.746 *** (.494)	0.106 (.333)	0.195 (.191)	-0.181 (.452)
Colored	-1.522 (1.772)				
African Permanent	-5.696 ** (2.315)				
African Informal	-0.735 (2.175)				
Age	2.238 *** (.637)	-0.954 (2.755)	2.836 ** (1.187)	2.483 ** (.963)	2.571 * (1.275)
Female	3.016 ** (1.33)	1.654 (2.579)	6.589 *** (2.328)	2.158 (2.195)	2.986 (5.07)
Social integration index	-2.29 ** (1.13)	-2.261 (2.056)	-3.16 (2.047)	0.148 (2.324)	-1.656 (3.31)
Household violence index	1.213 (3.79)	8.844 (13.875)	6.022 (6.654)	-0.631 (5.44)	-4.27 (8.26)
Community crime index	0.568 (.401)	-1.004 (1.768)	1.96 (.806)	** 0.196 (.585)	-0.352 (.726)
Presence of mother	-2.323 (1.497)	-1.634 (4.283)	7.845 ** (3.59)	-1.045 (2.076)	-7.105 ** (3.163)
Generalized trust index	0.237 *** (.087)	-0.007 (.241)	0.287 ** (.14)	0.521 *** (.151)	0.062 (.191)
Household reading index	-1.354 ** (.596)	-3.437 ** (1.45)	-0.898 (.728)	-0.284 (1.421)	0.483 (1.719)
Constant	-31.512 *** (11.779)	23.428 (46.516)	-58.961 ** (22.226)	-49.114 ** (19.754)	-27.995 (24.807)
Observations	223	59	67	54	43
Log likelihood	-606.5	-139.6	-174.55	-151.51	-117.49
LR $\chi^2(16)$	47.72	23.41 ***	31.57 ***	16.05* *	10.72
Pseudo R ²	0.0379	0.0773	0.082	0.0503	0.0436

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The generalized trust index,¹⁷ which is an index for trust in others in general (ranging from family to government institutions), has the expected positive and significant effect on

¹⁷ An analysis of our questionnaire data shows that amongst the White, Colored and African Permanent communities levels of trust expressed from close relations (such as family) to more distant ones (such as government) are fairly similar, with trust decreasing as social distance increases. Trust expressed by the African Informal community in our sample is, however, strikingly lower on all levels compared to the other communities.

contributions for the pooled sample, and is also significant separately for the Colored and African Permanent communities. Generalized trust in others seems to increase contributions, which is in line with related studies.

An interesting effect is associated with our social integration index. It comprises several dimensions such as the number of school friends, the number of friends outside school, as well as the number of organizations (including voluntary organizations) and teams an individual belongs to. We find that a higher level of social integration is associated with lower contributions in the public goods game. Although this sounds counter-intuitive at first sight, social integration does not necessarily have to be positively related with unconditional contributions in the absence of a sanctioning system in a one-shot game. Many real-world examples of organizations rely on conditional contributions, a formal sanctioning system and repeated interaction. With regard to sanctioning, we will take up the question again, when we study the determinants of punishment in the following section. It is, however, comforting to note that Anderson et al. (2004) – the only related study that controls for social integration – also find mixed evidence on the relation between social integration and cooperation in public goods games.

We added to interesting variables on a more exploratory basis. First, the presence of biological parents and, particularly, the presence of the mother in the subject's household does not have a significant effect on the contribution level in the pooled sample. Looking on the individual communities, however, it seems to have a potential influence. Due to the small number of observations especially in Model [5] and the ambiguous sign we want to postpone a more detailed discussion. Note in any case that the structure of African households in South Africa has little bearing on Western type nuclear families, and for a large fraction of our sample only one parent or neither is present. Thus, the variable could have had some relevance in explaining cooperative and norm-enforcement behavior. Second, the household reading index (capturing the number of books as well as the presence of an encyclopedia and a dictionary in the household) serves as a proxy for the literacy of subjects, for the education level within their family and for the extent of intellectuality in their family environment. Its negative effect that is particularly strong in the White community could capture an ability of being slightly better in understanding the dominant strategy of the game and its consequences.

Finally, note that we did not expect to obtain any significant effect of the norm-enforcement and norm-violation indexes – i.e., the household violence index and the

community crime index¹⁸ – on cooperation, and this indeed turned out to be the case. The variables are added to the models in Table 6 because we also will use them in the subsequent section on the determinants of punishment.

Table 6 reproduces the general finding of Table 5 that the community dummies lose their significance once controlled for socio-demographic and social capital variables. It even reverses the result for the African Permanent community. They are now – *ceteris paribus* – reported to contribute significantly less than the White community. Also expectations seem to become less important, which could be a consequence of expectations being fed by basic social environment variables.

In Table 7 the data for the determinants of cooperation in Part II of the experiment are presented. One can see clearly that all the effects reported for Part I remain – in terms of direction – also valid for the contribution phase in Part II, although some of the coefficients lose their significance. The explanation for this is straightforward. Since subjects knew that the contribution phase in Part II will be followed by a punishment phase, the introduction of the institution is possibly able to overshadow individual heterogeneity stemming from the social background. In other words, the introduction of a punishment option homogenizes behavior. Remember that this homogenization cannot be a consequence of learning, since subjects did not receive any feedback on the results of Part I before the end of the experiment.

Before we proceed with assessing the determinants of punishment in the following section, note that there is not a single community dummy in Table 7 that is significant on conventional levels. Hence, our main claim from the previous tables is reinforced.

¹⁸ Community crime is an index for the number of incidences of assault, robbery, shooting, rape, murder, kidnapping, burglary and housebreaking an individual heard about in his or her community in the last month. On the whole, incidents of community crime are lowest amongst the White community in our sample. On average 28% of those in the White group, 58% of the Colored group, 55% in the African Permanent and 65% of the African Informal group had heard of a murder in their neighborhood in the last month. Those who reported to have heard of incidents of other violent crimes such as rape were reported to be 15% amongst the White group, 38% amongst the Colored group, 45% amongst the African Permanent and 53% amongst the African Informal group.

Table 7. Determinants of contributions III – Part II

Dependent variable: Contributions in Part II	Pooled [1]	White [2]	Colored [3]	African Perm. [4]	African Inf. [5]
Expectations	0.346*** (.097)	0.547** (.238)	0.358** (.174)	0.330** (.15)	0.103 (.238)
Colored	-2.661 (1.717)				
African Permanent	-3.109 (2.214)				
African Informal	-0.411 (2.099)				
Age	1.568** (.618)	-0.707 (2.355)	2.943** (1.35)	2.058** (.894)	-0.126 (1.345)
Female	1.601 (1.269)	-2.613 (2.19)	4.645* (2.639)	2.897 (2.021)	6.772 (4.72)
Social integration index	-2.367** (1.078)	-2.848 (1.759)	-4.386* (2.309)	0.838 (2.171)	1.113 (3.205)
Household violence index	-0.51 (3.682)	-7.259 (13.18)	3.319 (7.591)	-6.885 (5.05)	18.032** (8.638)
Community crime index	0.433 (.409)	0.744 (1.517)	0.767 (.917)	-0.058 (.543)	0.633 (.872)
Presence of mother	-1.408 (1.424)	-6.557* (3.737)	0.861 (3.844)	0.263 (1.923)	-3.015 (3.049)
Generalized trust index	0.017 (.082)	0.044 (.205)	0.122 (.155)	0.025 (.132)	-0.133 (.183)
Household reading index	-0.871 (.572)	-2.418* (1.247)	-0.478 (.835)	0.336 (1.325)	-1.403 (1.807)
Constant	-16.451 (11.369)	30.959 (39.736)	-50.273** (24.756)	-31.280* (18.326)	6.661 (25.492)
Observations	220	58	67	53	42
Log likelihood	-622.9	-154.69	-181.862	-152.23353	-119.01738
LR $\chi^2(16)$	35.45***	16.57*	0.0108***	11.91	6.2
Pseudo R ²	0.0277	0.0508	0.055	0.37	0.025

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

4.3 *Determinants of punishment*

Table 8 shows the basic regressions for assigned punishment points. Interestingly, punishment is almost uniquely explained by community dummy variables with punishment levels in the African Permanent and African Informal communities being significantly higher compared to that in the White group. Without discussing this result in greater depth, we proceed by controlling for social background variables, much in the same spirit as for

contribution levels, to check whether the significance of the community dummies is a robust phenomenon in explaining punishment behavior or not.

Table 8. Determinants of punishment I

Dependent variable: Punishment points	[1]	[2]	[3]	[4]	[5]	[6]
Own contribution	0.223*** (0.064)	0.161** (0.074)	0.135* (0.073)	0.067 (0.061)	0.039 (0.070)	0.034 (0.070)
Positive deviation from own contr.	-0.012 (0.073)	-0.075 (0.088)	-0.056 (0.086)	-0.085 (0.069)	-0.120 (0.081)	-0.114 (0.082)
Abs. negative deviation from own contrib.	-0.005 (0.065)	0.082 (0.085)	0.079 (0.083)	0.079 (0.061)	0.116 (0.078)	0.113 (0.078)
Positive deviation from expected contr.		0.045 (0.083)	0.015 (0.081)		0.041 (0.076)	0.033 (0.076)
Abs. neg. deviation from expected contr.		-0.102 (0.071)	-0.083 (0.069)		-0.037 (0.065)	-0.034 (0.064)
Age			0.949*** (0.257)			0.343 (0.272)
Female			0.818 (0.626)			0.481 (0.606)
Colored				0.167 (0.785)	0.106 (0.788)	-0.242 (0.827)
African Permanent				3.967*** (0.784)	3.908*** (0.786)	3.329*** (0.894)
African Informal				4.868*** (0.787)	4.784*** (0.794)	4.373*** (0.842)
Constant	-3.615*** (0.859)	-2.770*** (0.996)	-19.357*** (4.616)	-4.238*** (0.918)	-3.860*** (1.053)	-9.673** (4.668)
Observations	486	486	486	486	486	486
Log likelihood	-729.2	-727.9	-720.8	-696.88	-696.53	-695.6
LR $\chi^2(16)$	25.35***	27.97***	42.1***	90***	90.61***	92.5***
Pseudo R ²	0.017	0.018	0.028	0.0607	0.069	0.062

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

In Table 9 we control for the same social background variables as in the regression models for cooperation. It should not be a surprise by now that, again, the inclusion of variables that capture social capital renders the community dummies insignificant. Since punishment can be directed to both other players within one's group, we are dealing with a higher number of observations now and feel rather comfortable to claim that it is a general phenomenon for cooperative and norm-enforcement behavior in our subject pool to be better explained by social environment variables than by pure community membership.

Table 9. Determinants of punishment II

Dependent variable: Punishment points	Pooled [1]	White [2]	Colored [3]	African Perm. [4]	African Inf. [5]
Own contribution	-0.015 (.0650)	-0.066 (.102)	-0.09 (.120)	0.046 (.156)	0.189 (.119)
Positive deviation from own contrib.	-0.113 (.0700)	-0.035 (.085)	-0.012 (.112)	-0.372** (.171)	0.041 (.141)
Abs. negative deviation from own contrib.	0.112* (.063)	0.273** (.114)	0.220** (.102)	-0.374** (.168)	0.244** (.103)
Colored	0.223 (1.703)				
African Permanent	2.447 (1.777)				
African Informal	0.626 (1.787)				
Age	0.15 (.281)	0.104 (.76)	0.417 (.618)	0.967* (.572)	0.183 (.400)
Female	1.585** (.646)	1.096 (.763)	0.211 (1.162)	3.778*** (1.416)	4.550*** (1.606)
Social integration index	1.151** (.524)	0.251 (.536)	2.656** (1.146)	0.604 (1.424)	1.541 (1.131)
Community crime index	-0.295 (.194)	-0.051 (.598)	-0.567 (.502)	-0.143 (.355)	-0.449 (.275)
Presence of mother	-0.875 (.648)	-1.79 (1.234)	-0.007 (1.784)	1.815 (1.222)	-4.740*** (1.029)
Generalized trust index	0.099** (.046)	0.214*** (.076)	-0.038 (.082)	0.129 (.110)	0.030 (.084)
Household reading index	-0.656** (.286)	0.827* (.440)	-0.743* (.382)	-1.225 (.899)	-0.811 (.588)
Household violence index (HVI)	-4.856 (6.027)	-4.864 (4.446)	-0.86 (4.032)	-2.782 (3.567)	11.085*** (3.035)
Colored * HVI	1.348 (7.747)				
African Perm. * HVI	4.288 (6.626)				
African Inf. * HVI	12.482* (6.735)				
Constant	-6.714 (5.431)	-10.525 (12.992)	-8.177 (11.203)	-19.023 (11.82)	-9.214 (8.192)
Observations	438	114	132	98	94
Log likelihood	-594.9	-93.9	-127.6	-174.7	-165.9
LR $\chi^2(16)$	110.25***	24.25**	18.49**	22.91**	50.96***
Pseudo R ²	0.0848	0.1143	0.0676	0.0615	0.1331

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

For most of our results interpretations are rather straightforward. It is not surprising that people who exhibit a higher degree of social integration punish more. It is very likely

that they are simply adapted to actually use informal sanctions from their daily life (such as, for instance, in team sports). In a similar vein higher levels of trust might create disappointment that leads to a relative overshooting of punishment behavior, even when we control for the deviations from one's own contributions.

It is also not surprising that women – who had contributed significantly more – have a greater tendency to punish. What we, however, find interesting is the fact that this tendency is most pronounced amongst the two African communities, indicating that there punishment might be a very important mechanism for women to sustain cooperation. In line with previous studies we also find that negative deviations from one's own contribution naturally triggers punishment. There is no unambiguous explanation for the negative impact of the household reading index, but it could be related to a strand of the socio-psychological literature which shows that children in households that read are better able to verbalize or express themselves and are, hence, less inclined to violent behavior.

Coming to our variables that take up the effects of norm-enforcement and norm-violation, we see that the hypothesized effect of the household violence index cannot be substantiated. If we, however, interact the variable with the community dummies, it has a marginally significant effect on the African Informal group. Also the community crime index as a proxy for norm-violation experience does not happen to be significant for the pooled data (even though it has the same sign in all five models). Whether it is difficult in general to capture norm-enforcement behavior by background variables or whether the variables we have chosen are simply not predictive and there would have been better ones, cannot be answered in the context of this study.

It is important to note finally that we checked for the influence of several other variables on cooperation and punishment, but since they did not turn out to be significant in any of the models we decided against reporting models with them in the paper. Among the variables are subjects' weekly allowances, the order of siblings with the family, the size of the household, self-reported levels of family wealth or emotional states.

5. Discussion and conclusion

This study brings to light new insights into the nature of social norms and its determinants. One-shot public goods games with and without punishment were conducted

at four schools in Cape Town, South Africa, each representing communities from different socio-demographic and population groups. By studying normative behavior within one geographical setting, we are able to keep constant differences in formal institutions, legislature and political system that often affect cross-cultural studies conducted in different countries.

Even though the schools in question are all within 15 km of each other, we find significant differences in behavior between each of these groups in terms of cooperation and punishment. The four groups in this study draws from the White, Colored and African populations. Two locations were sampled in the African community to distinguish possible differences in the effect of housing development and associated socio-economic conditions on behavior.

We find that both African communities from Permanent and Informal areas contribute and punish significantly more than those from the White and Colored groups, with those from informal areas contributing most. Some studies have indicated that social norms are culturally defined. If cultural norms or tradition is strongly entrenched in individuals' behavior, one possible explanation for the differences we observe here would be to argue that one of the most distinct social norms in African society, commonly known as Ubuntu, is responsible for strong preferences for pro-social behavior exhibited by both African groups. Ubuntu is a special term in Xhosa for expressing empathy and solidarity with one's group – for the whole being greater than the parts. While this explanation may be intuitively appealing, very little empirical evidence for or against this norm in present-day South Africa is available.¹⁹ But a traditional group-oriented norm such as Ubuntu cannot explain the whole story, given that we also observe significant differences in behavior between the White and Colored groups as well as differences between the African Permanent and Informal groups.

A stronger argument against the relevance of group-oriented norm, however, is our finding that, once one controls for individual social background variables, the community dummies cease to be significant for almost all regression models that we estimate. This

¹⁹ Sociologists in South Africa agree that if a norm such as Ubuntu exist its effect in a modern multi-cultural and pluralist cities may have become highly dispersed, with many other motivations affecting individual behavior. If Ubuntu does exist in present day South Africa, it is thought to be more prevalent among rural subsistence communities.

holds both for cooperation as well as for punishment. Thus, we can provide evidence that the average variance of behavior within a given culture or group is at least as relevant as the variance across cultures or groups. Our results also indicate some interesting avenues for further research in the context of norm development in cooperative and norm-enforcement behavior.

6. References

- Anderson, C.M., Putterman, L. (2006), Do non-strategic sanctions obey the law of demand? The demand for punishment in the voluntary contribution mechanism. *Games and Economic Behavior* 54: 1-24.
- Anderson, L.R., Mellor, J.M., Milyo, J. (2004), Social capital and contributions in a public-goods experiment. *American Economic Review Papers and Proceedings* 94: 373-376.
- Andreoni, J., Harbaugh, W., Vesterlund, L. (2003), The carrot or the stick: Rewards, punishments and cooperation. *American Economic Review* 93: 893-902.
- Bellemare, C., Kröger, S. (2007), On representative social capital. *European Economic Review*, forthcoming.
- Bolton, G., Ockenfels, A. (2000), ERC: A theory of equity, reciprocity and competition. *American Economic Review* 90: 166-193.
- Botelho, A., Harrison, G. W., Costa Pinto, L. M., Rutström, E. E. (2005), Social norms and social choice. University of Central Florida, Working Paper.
- Bowles, S. (1998), Endogenous preferences: The cultural consequences of markets and other economic institutions. *Journal of Economic Literature* 36: 75-111.
- Brandts, J., Saijo, T., Schram, A.J.H.C. (2004). A four country comparison of spite and cooperation in public goods games. *Public Choice* 119: 381-424.
- Carpenter, J. (2006), The demand for punishment. *Journal of Economic Behavior and Organization*, forthcoming.
- Casari, M., Luini, L. (2005), Group cooperation under alternative peer punishment technologies: An experiment. University of Siena, Working Paper 2/2005.
- Charness, G., Rabin, M. (2002), Understanding social preferences with simple tests. *Quarterly Journal of Economics* 117: 817-869.
- Clacherty et al. (2005)
- Department of Labour, South Africa (2006), Basic conditions of employment amendment act, 2002. <http://www.labour.gov.za/>.
- de Quervain, D., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., Fehr, E. (2004), The neural basis of altruistic punishment. *Science* 305 (27 August 2004): 1254-1258.
- Dohmen, T., Falk, A., Huffman, D., Sunde, U. (2006), Homo reciprocans: Survey evidence on prevalence, behavior and success. Discussion Paper 2205. IZA Bonn.

- Dufwenberg, M., Kirchsteiger, G. (2004), A theory of sequential reciprocity. *Games and Economic Behavior* 47: 268-298.
- Egas, M., Riedl, A. (2005), Cooperation and punishment in the Dutch: Evidence from a large internet experiment. University of Amsterdam, Working Paper.
- Ertan, A., Page, T., Putterman, L. (2005), Can endogenously chosen institutions mitigate the free-rider problem and reduce perverse punishment? Brown University, Working Paper.
- Falk, A., Fehr, E., Fischbacher, U. (2005), Driving forces behind informal sanctions. *Econometrica* 73: 2017-2030.
- Falk, A., Fischbacher, U. (2005), A theory of reciprocity. *Games and Economic Behavior*, forthcoming.
- Fehr, E., Fischbacher, U., von Rosenblatt, B., Schupp, J., Wagner, G.G. (2003). A nationwide laboratory. Examining trust and trustworthiness by integrating behavioral experiments into representative surveys. Working Paper 141. University of Zurich.
- Fehr, E., Gächter, S. (2000), Cooperation and punishment in public goods experiments. *American Economic Review* 90: 980-994.
- Fehr, E., Gächter, S. (2002), Altruistic punishment in humans. *Nature* 415 (10 January 2002): 137-140.
- Fehr, E., Schmidt, K. (1999), A theory of fairness, competition and cooperation. *Quarterly Journal of Economics* 114: 817-868.
- Fischbacher, U., Gächter, S. (2006), Heterogeneous social preferences and the dynamics of free riding in public goods. CeDEx Discussion Paper No. 2006-01, University of Nottingham.
- Fischbacher, U., Gächter, S., Fehr, E. (2001), Are people conditionally cooperative? Evidence from a public goods experiment. *Economic Letters* 71: 397-404.
- Gächter, S., Herrmann, B., Thöni, C. (2004), Trust, voluntary cooperation, and socio-economic background: Survey and experimental evidence. *Journal of Economic Behavior and Organization* 55: 505-531.
- Gächter, S., Herrmann, B. (2006), The limits of self-governance in the presence of spite: Experimental evidence from urban and rural Russia. Working Paper 2006-13, University of Nottingham.
- Glaeser, E.L., Laibson, D., Scheinkman, J.A., Soutter, C.L. (2000), Measuring trust. *Quarterly Journal of Economics* 115: 811-846.

- Götte, L., Huffman, D., Meier, S. (2006), The impact of group membership on cooperation and norm enforcement: Evidence using random assignment to real social groups. *American Economic Review Papers and Proceedings* 96: 212-216.
- Güererk, Ö., Irlenbusch, B., Rockenbach, B. (2006), The competitive advantage of sanctioning institutions. *Science* 312 (7 April 2006): 108-111.
- Haslam, S.A. (2001), *Psychology in organizations: The social identity approach*. Thousand Oaks, CA: Sage Publications.
- Henrich, J., Boyd, R., Bowles, S., Camerer, C., Gintis, H., McElreath, R., Fehr, E. (2001) In search of homo economicus: Experiments in 15 small-scale societies. *American Economic Review* 91: 73-79.
- Henrich, J., Boyd, R., Bowles, S., Gintis, H., Fehr, E., Camerer, C., McElreath, R., Gurven, M., Hill, K., Barr, A., Ensminger, J., Tracer, D., Marlow, F., Patton, J., Alvard, M., Gil-White, F., Henrich, N. (2005), Economic man' in cross-cultural perspective: ethnography and experiments from 15 small-scale societies. *Behavioral and Brain Sciences* 28: 795-855.
- Hopfensitz, A., Reuben, E. (2005), The importance of emotions for the effectiveness of social punishment. Tinbergen Institute Discussion Paper 2005-075/1, Amsterdam.
- Masclet, D., Noussair, C., Tucker, S., Villeval, M.-C. (2003), Monetary and nonmonetary punishment in the voluntary contributions mechanism. *American Economic Review* 93: 366-380.
- Masclet, D., Villeval, M.-C. (2004), Is peer pressure in teams motivated by inequality aversion. University of Lyon, Working Paper.
- Nikiforakis, N. (2005), Punishment and counter-punishment in public-good games: Can we really govern ourselves? Royal Holloway, University of London, Working Paper.
- Nikiforakis, N., Normann, H.-T. (2005), A comparative statics analysis of punishment in public-good experiments. Royal Holloway, University of London, Working Paper.
- Ostrom, E., Walker, J., Gardner, R. (1992), Covenants with and without a sword: Self-governance is possible. *American Political Science Review* 86: 404-417.
- Putnam, R.D. (1993), *Making democracy work: Civic tradition in modern Italy*. Princeton: Princeton University Press.
- Rabin, M. (1993), Incorporating fairness into game theory and economics. *American Economic Review* 83: 1281-1302.

- Sefton, M., Shupp, R., Walker, J. (2006), The effect of reward and sanctions in the provision of public goods. University of Nottingham, Working Paper.
- Sutter, M., Haigner, S., Kocher, M.G. (2006), Choosing the carrot or the stick? – Endogenous institutional choice in social dilemma situations. CEPR Working Paper 5497, London.
- Yamagishi, T. (1986), The provision of a sanctioning system as a public good. *Journal of Personality and Social Psychology* 51: 110-116.
- Yen, I.H. and Syme, S.L. (1999), The social environment and health: a discussion of the epidemiologic literature. *Annual Review of Public Health* 20: 287-308.
- Zelmer, J. (2003), Linear public goods experiments: A meta-analysis. *Experimental Economics* 6: 299-310.

Appendix A: Background data and composition of empirical indexes

In Table A-1, we summarize the degree of trust in different dimensions, and worth to notice is the lower degree of trust that is reported in the African Informal community.

Table A-1. Trust towards different groups reported on a five-point scale.

Trust...	White	Colored	African Perm.	African Inf.
Extended family	4.49	3.67	4.55	1.68
Neighbors	3.48	3.41	3.21	1.85
School mates	4.35	3.94	3.47	1.78
Members of your own race	3.97	3.47	3.30	1.81
Members of other races	3.70	3.38	3.15	1.72
Strangers	2.08	1.65	2.29	2.00
Local government officials	2.68	3.12	3.12	1.86
National government to keep promises	2.55	2.65	3.34	1.97

We asked how safe the subjects felt in their community on a six-point scale ranging from very safe to very unsafe, with averages of 4.88 in White, 3.90 in Colored, 3.82 in African Permanent and 3.98 in African Informal. The proportion of subjects that have heard of different criminal incidents in their community over the last month is reported in Table A-2. The main difference is the lower proportion of individuals in the White community that have heard about incidents from murder to housebreaking.

Table A-2. Proportions that have heard of incidents in their community

Type of incident	White	Colored	African Perm.	African Inf.
Assault	32%	49%	47%	50%
Robbery	63%	71%	80%	78%
Shooting	30%	83%	70%	70%
Rape	15%	38%	45%	53%
Murder	28%	58%	55%	65%
Kidnap	13%	26%	25%	23%
Burglary	57%	52%	40%	37%
Housebreaking	62%	61%	82%	90%

Appendix B: Experimental instructions (not necessarily for publication)

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 cheque, 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 experimenters 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 have 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 cheque:

1 Guilder = R 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 (i) put all these **20 Guilders into project A and nothing into project B**, (ii) **put nothing in project A and all your 20 Guilders into project B** or (iii) **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 experimenter will **sum (add together) the Guilders that all group members contributed to project B**. **The experimenter 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**

$$\begin{aligned} &= \frac{1.5 \times (\text{the total amount of Guilders that the group put in project B})}{3} \\ &= 0.5 \times (\text{the total amount of Guilders that the group put in project B}) \end{aligned}$$

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:

$$(1.5/3) * (\text{total amount of contributions to project B by all group members}) =$$

$$0.5 * (\text{total amount of contributions to project B by all group members})$$

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

$$= \boxed{\text{Income from Project A}} + \boxed{\text{Income from Project B}}$$

$$= \boxed{(20 - \text{your contribution to project B})} + \boxed{0.5 * (\text{the total amount that the group contributed to project B})}$$

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:

$$= \boxed{(20 - 0)} + \boxed{0.5 * (0)} = \boxed{20}$$

Example 2. If the three group members each contribute 20 Guilders to project B. 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:

$$= \boxed{(20 - 20)} + \boxed{0.5 * (60)} = \boxed{30}$$

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:

$$= \boxed{(20 - 20)} + \boxed{0.5 * (30)} = \boxed{15}$$

Calculation of second member's total income:

$$= \boxed{(20 - 10)} + \boxed{0.5 * (30)} = \boxed{25}$$

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 this 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 I:

$$= \text{Income from Project A} + \text{Income from Project B}$$

$$= (20 - \text{your contribution to project B}) + 0.5 * (\text{the total amount that the group contributed to project B})$$

Also remember:

1 Guilder = R1.50

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 Rand? _____

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 Rand? _____

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 Rand? _____

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 Rand? _____

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:

1. the first decision is about how much you will put into project B (which is exactly the same as in Part 1)
2. 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 from Part 2 =

(Income from the first decision)

minus 3 * (amount of deduction points that you received from the other two group members)

minus 1 * (amount of the deduction points that you have given to the other two group members)

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:

	1 st member (you)	2 nd member	3 rd member
Contribution to project B (first decision)	Your contribution	Contribution of the 2 nd member	Contribution of the 3 rd member
Income from the first decision	Your income	Income of the 2 nd member	Income of the 3 rd member
	Deduction points that you want to give (max 10 deduction 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 I and Part II, 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 cheque 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 I 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 I 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.