

# Trust, voluntary cooperation, and socio-economic background: survey and experimental evidence

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## Abstract

We report survey and experimental evidence on trust and voluntary cooperation from more than 630 non-student and student participants in rural and urban Russia. Our subjects have a diverse socio-economic background that we relate to the answers of a survey on trust attitudes and to contribution behavior in a one-shot public goods game. We find that the socio-economic background affects trust attitudes, but we find no separate influence of socio-economic variables on cooperative behavior in a one-shot public goods experiment. However, cooperation is significantly positively correlated to trust toward strangers and beliefs about the fairness and helpfulness of others.

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## 1. Introduction

A large part of economic production requires the voluntary cooperation of economic agents simply because many contracts are incomplete and efficient behavior cannot be

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enforced formally. For this reason, economists have become interested in trust and “social capital” as determinants of successful cooperation and, hence, good economic prospects (Knack and Keefer, 1997; La Porta et al., 1997; Zak and Knack, 2001; Bowles and Gintis, 2002; Sobel, 2002). There are plenty of definitions of social capital, most referring to trust and cooperation as important ingredients. However, most papers concentrate much more on trust than on cooperation. The main contribution of this paper is to shift the focus toward multilateral cooperation. We are interested in trust and cooperation because many important problems in society revolve around issues of multilateral cooperation with free-rider incentives. Most people who cooperate expect others to cooperate as well and therefore trust others not to exploit them. Hence, trust may engender cooperation, despite the free-rider incentives.

In this paper, we empirically investigate the link between trust and voluntary cooperation. Specifically, we report (i) experimental evidence on cooperative behavior in a three-person one-shot public goods experiment with strong free-rider incentives and (ii) survey evidence on trust attitudes. We take the trust survey questions from the General Social Survey (GSS) as well as from the trust questionnaire by Glaeser et al. (2000). The participants of our study are 630 urban and rural dwellers in Russia and Belarus who are between 15 and 70 years old and come from all walks of life. For instance, many of our participants were raised under communist circumstances in the former Soviet Union and are suffering the hardships of the transition to a market economy.

We make two contributions to the literature. First, we study a large sample of student and non-student subjects that contains members of different socio-economic backgrounds rather than the (affluent Western) undergraduate subjects who take part in most studies in experimental trust and cooperation games. This also holds for those studies that investigate the link between trust attitudes and behavior in laboratory experiments (e.g., Glaeser et al., 2000; Ahn et al., 2003; Ashraf et al., 2003; Danielson and Holm, 2003).

Going beyond student subject pools is important since students are not representative of the population in many socio-economic dimensions. It is important to know to what extent results from student pools can be generalized to other subject pools. Research with non-student pools suggests that students might not be very representative for the larger society (e.g., Carpenter et al., 2002, 2004). Similarly, anthropologists found that the variance in behavior is much bigger than what is observed in the (mostly Western) undergraduate subject pools (see Henrich et al., 2001). Although our subject pool is not a fully representative sample in the technical sense, it is surely more representative of the general population than the student subject pools.

Since about half of our subject pool contains non-students with very different backgrounds, we also elicit socio-demographic information to see whether it matters. We are interested in this information because previous research on “social capital” and trust has shown that some variables are correlated with trust attitudes as measured by the GSS (see Glaeser et al., 2000, 2002).

Our second contribution links trust attitudes as measured by the popular GSS trust questions with cooperation behavior in a multilateral *public goods game* where subjects make simultaneous contribution decisions and have a strong incentive to free ride. As we will argue in Section 2, to cooperate despite the presence of free-rider incentives reflects trust. The question is *how trust attitudes and actual cooperation behavior are linked*. Looking at

public goods problems is interesting because many crucial cooperation problems are multi-lateral, not bilateral. Moreover, in many real-life multilateral cooperation problems, people have to decide simultaneously about cooperation without information about the cooperation decision of others.

A further reason to be interested in the relation between the GSS questions and multi-lateral cooperation behavior has to do with the popularity of the GSS questions in social capital research. It is important to know to what extent survey-measured trust attitudes are correlated with actual economic behavior as measured in experiments. Most of the previous literature that shares this goal has looked at the link of trust attitudes and behavior in two-person sequential trust games where a trustor can make an efficiency-enhancing trusting move that the trustee can reciprocate or not.<sup>2</sup> Our study contributes to an understanding of the scope and robustness of the relation between trust attitudes and trust behavior both across related games and across different subject pools.

We have three main results. First, with respect to trust attitudes, we find that non-students are more trusting than students, yet controlling for the socio-economic background reveals that *age* is much more important than the socio-economic status of being a white-collar or a blue-collar non-student. Second, non-students contribute more to the public good than students. However, after controlling for socio-economic differences, we find that no background variable has a significant impact on contribution behavior. Third, when we relate the trust attitude question to the cooperation decision in the public good experiment, we find that people who believe that most others are fair and do not exploit others make significantly higher contributions to the public good than those who believe that they will be exploited by others. Likewise, optimists who believe that others are helpful instead of egoistic also contribute significantly more than pessimists who hold the opposite belief. These findings are consistent with the observation that most people do not want to be the suckers in cooperative enterprises in jeopardy of free riding. People who trust strangers are also significantly more cooperative in our one-shot experiment than those who mistrust strangers. In summary, while the socio-economic background does not matter for voluntary cooperation, it influences trust attitudes, which, in turn, are correlated with the contribution behavior.

Our paper is structured as follows. Since most papers that study the link between trust attitudes and behavior have looked at bilateral sequential trust games and since we shift the focus to simultaneous multilateral cooperation problems with free-rider incentives, we devote [Section 2](#) to a discussion of the link between multilateral cooperation and trust. [Section 3](#) describes the places and the background of our participants in some detail. Against

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<sup>2</sup> The typical trust game (Berg et al., 1995), used in most experiments on trust, is a two-person game where player 1 (the trustor) can send the second player (the trustee) some money. The trustor receives the  $k$ -fold ( $k > 1$ ) increased amount of what the trustor has sent and has to decide how much to return to the trustor. To send everything is Pareto-efficient, but risky for the trustor because the trustee has an incentive to keep everything. For some recent laboratory trust game experiments using non-students, see Fehr and List (2002), Holm and Nystedt (2003), Bahry et al. (2002), Bahry and Wilson (2004), and Sutter and Kocher (2004). For some recent trust experiments with undergraduates as subjects, see, for example, Fershtman and Gneezy (2001), Bohnet and Zeckhauser (2004), Cox (2004), and Engle-Warnick and Slonim (2004). Ashraf et al. (2003), Buchan and Croson (2004), Buchan et al. (2002), Willinger et al. (2003), and Danielson and Holm (2003) are examples of studies that look at cross-cultural differences in the trust game. The studies by Bellemare and Kröger (2003) and Fehr et al. (2003) include the trust game in a large survey that is administered to a representative sample of the population.

this backdrop we outline in [Section 4](#) the two parts of our study: the questionnaire study and the one-shot public goods experiment. [Section 5](#) describes the results, and [Section 6](#) concludes.

## 2. Multilateral cooperation and trust

“We are concerned with trust and trustworthiness because they enable us to cooperate for mutual benefit. *Cooperation is the prior and central concern.* (...) Trust is merely one reason for confidence in taking cooperative risks, and trustworthiness is merely one reason such risks can pay off.”

[Emphasis in original]

Russell Hardin (2002, p. 173)

Many important real-world problems require multilateral cooperation in situations that involve free-rider incentives. The management of common pool resources, taking part in collective actions (strikes and demonstrations, trade unions, warfare), the provision of public goods (security, public broadcasting, public transport), collusion in cartels, or team compensation schemes can be modeled as social dilemmas for the parties involved. The game-theoretic representation of these situations may differ, but in all situations it holds that under standard assumptions the Nash equilibrium is inefficient: individual and collective interests do not match.

The public goods game that we use has proved to be very useful to study issues of multilateral cooperation and free riding. In this game, which we explain in more detail below, a group of people has to decide simultaneously how much they want to contribute to a public good. Each contribution benefits all group members alike regardless of whether they have contributed or not. Incentives are such that a money-maximizing individual will free ride completely, not contributing anything to the public good. Group welfare is maximized if everyone contributes to the public good. Thus, the public goods game is an example of a social dilemma game where mutual cooperation is in the interest of the whole group, but individual interests may lead to suboptimal free riding.

The evidence of hundreds of public goods experiments shows that there exists much more cooperation than is consistent with the free-rider hypothesis. Thus, some people apparently are willing to contribute to the public good, raising the question of to what extent contribution behavior in a public goods game reflects trust. Among other things, two important elements of trust are that (i) trust is mutually beneficial (i.e., a situation in which all parties trust each other is Pareto-superior to a situation without trust) and (ii) it includes the risk of “betrayal” or exploitation. Most definitions of trust reflect this view (Deutsch, 1958; Coleman, 1990, Chapter 5; Hardin, 2002; Bohnet and Zeckhauser, 2004).<sup>3</sup> Several games have some moves that may lead to gains from cooperation and that include the risk of exploitation. The most widely studied trust game, which is a sequential-move game, is one prominent example. However, the features of gains from trusting and of an exploitation risk are not confined to trust games and exist also in simultaneous move games such as the

<sup>3</sup> It is also noteworthy that some papers concerned with “social capital” see trust and cooperation as intimately linked concepts. See, for example, Knack and Keefer (1997) and La Porta et al. (1997).

voluntary contribution game that we study. If a group of people cooperates, this is surely beneficial for both the group as a whole and each individual, compared to the defection payoff. However, whenever I cooperate, I stand the risk that someone free rides, abusing the trust placed in him or her. Thus, the definition of trust does not depend on whether the game is simultaneous or sequential.

Social psychologists have stressed the link between trust and cooperation early on (e.g., Deutsch, 1958; Dawes, 1980). The social psychological “goal/expectation theory” (e.g., Pruitt and Kimmel, 1977; Yamagishi, 1986) and more recent economic experiments on conditional cooperation are, as well, consistent with this interpretation. According to goal/expectation theory, “mutual trust is the key to actual cooperation” (Yamagishi, 1986, p. 111; emphasis in original). Pruitt and Kimmel (1977, p. 376) argue that “[s]imultaneous cooperation is assumed to arise if and when both parties have a goal of mutual cooperation and an expectation that the other is ready to cooperate.”

The results from many public goods experiments suggest that apart from a few unconditional cooperators (“altruists”), most people are *only* willing to cooperate if they expect others to cooperate as well, because they do not want to be the suckers (Sugden, 1984; Croson, 2002; Keser and van Winden, 2000; Fischbacher et al., 2001; Gächter et al., 2003). Therefore, conditional cooperators who make a contribution decision can gain from cooperation but face the risk of being exploited by the free riders. Consequently, people who contribute apparently trust the others.

We deliberately study the link between trust and cooperation in a *one-shot game* because here the trust problem is most evident. Concerning his or her material interests, each player has a strict incentive to be untrustworthy and to free ride. In repeated cooperation games the trust problem exists as well. In each iteration each player can choose to defect instead to cooperate. Yet, the *scale* of the trust problem is reduced since the strategic nature of the repeated interaction gives the players an incentive to cooperate such that even players who would defect in the one-shot game cooperate in the repeated game. This holds in particular in the indefinitely repeated cooperation game. Similarly, if punishment can discipline free riders, the trust problem is reduced as well (e.g., Yamagishi, 1986; Ostrom et al., 1992; Fehr and Gächter, 2000, 2002).

### 3. Background

#### 3.1. Places

We collected our data in the Russian cities Samara, Kursk, and Zheleznogorsk and several villages in the region of Kursk as well as in the Belarusian cities Minsk and Grodno.

*Samara*, the capital of the Samara region has a population of 1.2 million, making it the sixth largest city of the Russian Federation. *Kursk* is a typical Russian town 400 miles south of Moscow, close to the border of Ukraine with roughly 400,000 inhabitants. *Zheleznogorsk* is a smaller city with 70,000 inhabitants in the north of the Kursk region. Some of our experiments took place in seven small villages of the Kursk region. *Minsk*, the capital of Belarus, has 1.8 million inhabitants and *Grodno*, a provincial city in Belarus with 290,000 inhabitants, is located close to the border to Poland.

Table 1  
Socio-economic characteristics of our non-student and the student subjects

	Non-students ( <i>n</i> = 300)			Students ( <i>n</i> = 339)		
	Mean	S.D.	Range	Mean	S.D.	Range
Female (percent)	55.0			41.0		
Age (years)	40.2	11.23	[15, 70]	20.2	2.21	[16, 36]
Only child (percent)	10.6			12.4		
City size	2.6	1.25	[1, 4]	3.0	1.04	[1, 4]
Villager (percent)	39.7			0.0		
White collar (percent)	55.0					
Secondary school education (percent)	12.7					
College education (percent)	17.0					
University education (percent)	70.0					
Blue collar & others (percent)	45.0					
Secondary school education (percent)	37.7					
College education (percent)	38.5					
University education (percent)	20.8					
Church attendance	0.77	0.50	[0, 2]	0.86	0.51	[0, 2]
Number of memberships	0.40	0.72	[0, 4]	1.33	1.22	[0, 6]
Membership index	0.58	1.17	[0, 9]	2.01	2.13	[0, 12]

*Notes:* The dummy variables *Female*, *Only child*, *Villager*, *White collar*, and *Blue collar & others* indicate the percentage of cases that match the criteria. All non-students are either classified in one of the last two categories. The variables *Secondary school*, *College*, and *University* indicate the percentage of subjects within a job category that have the corresponding degree of education. *City size* is a categorical variable for the size of the city where the subjects had spent most of their life, ranging from 1 (up to 2000 inhabitants) to 4 (more than 100,000 inhabitants). *Church attendance* measures the frequency of church attendance, ranging from 0 (never) to 2 (at least once a week). *Number of memberships* measures the number of memberships in six possible categories of voluntary associations. Its admissible range is 0 (no membership at all) to 6 (membership in all six categories). *Membership index* measures the level of engagement, ranging from 0 (no engagement at all) to 18 (being member of the board in a voluntary association in all of the six categories). For further details see [Appendix](#).

### 3.2. Participants

In total 782 subjects, 413 students and 369 non-students from various backgrounds, participated in our study. However, for the sake of measurement accuracy, we drop all observations from subjects who indicate in the questionnaire that we cannot rely on their answer and/or who were not able to answer the control questions in the experiments correctly.<sup>4</sup> This leaves us with 639 valid observations that form the basis of our investigations. It is also worth noting that at no point during the study did we ask for a participant's name because we were afraid, given the country's past, that the participants might become suspicious about the scientific purpose of this experiment.

Table 1 shows summary statistics of the socio-economic characteristics of our participants. For a full description of the variables, see Table A.1 in the [Appendix](#). We start with

<sup>4</sup> The last item of the questionnaire asks about the reliance of the responses the subjects had given. The scale is from 1 ("You cannot rely on my responses") to 6 ("You can rely on my responses"). Eighty-six percent of the subjects indicate 5 or more. Subjects indicating 4 or less were excluded from the analysis.

the personal characteristics of our subjects. The share of *females* in our non-student subject pool is 55 percent;<sup>5</sup> in the student pool it is 41 percent. The fraction of people who grew up with no siblings is about equal in both the student and the non-student subject pool (we include this variable because it has raised some interest in social capital research; see Glaeser et al., 2002). The average *age* of the students is 20.2 years, whereas our non-students are on average almost twice as old. In some of the analysis further, we will consider three age cohorts for non-students: younger than 26 years (11.1 percent); between 26 and 45 years (60.3 percent); and older than 45 years (28.6 percent). We look at these age cohorts for the following reason: the youngest non-student age cohort is of about the same age as our student subject pool. The middle cohort (with an average age of 37 years) comprises people who mostly started their careers in the period of *perestroika* and after the demise of the Soviet Union in 1991. Most of them have established their careers by now. The third age cohort (mean age of 54 years) comprises people who are either retired or started their careers well before *perestroika* and were hence socialized in the heydays of communism and Cold War in the 1950s and 1960s. Thus, these three age cohorts have arguably quite different life experiences and personal backgrounds.

To get a proxy for the formative background of our subjects, we asked them about the size of the city where they had spent most of their lives. This variable contains four categories: (1) city size is up to 2000 inhabitants; (2) between 2000 and 10,000 inhabitants; (3) between 10,000 and 100,000 inhabitants; and (4) more than 100,000 inhabitants. The average category is 2.6 for the non-students and 2.96 for the students. However, the average *city size* is 1.47 for the 39.7 percent of villagers in our subject pool (and 3.38 for the urban non-student dwellers). Thus, the villagers have indeed spent most of their lives in small villages and the urban dwellers in larger cities.

The variables *White collar* and *Blue collar & others* relate to the non-student subject pool. Fifty-five percent of the non-student subjects can be categorized as white-collar workers and 45 percent are blue-collar and other workers. Table 1 documents the detailed job compositions and the highest education level attained.

We now turn to variables that measure religious and social activities. The variable *Church attendance* measures the frequency of church attendance. It takes on three values: 0 (never), 1 (sometimes), and 2 (at least once a week). Our students and non-student participants attend a church about equally often.

Membership behavior in civic associations is much studied by scholars of “social capital” (e.g., Putnam, 2000; Glaeser et al., 2002). We start by describing our measures of membership activities and then relate them to the socio-economic characteristics of our subject pools.

We have two measures of membership activities in civic voluntary associations, the *Number of memberships* and the *Membership index*. Both indices are based on six ‘voluntary association variables.’ For six different types of voluntary associations (political, interest groups, sports, culture, non-profits, others), subjects were asked whether they are a member (1), an active member (2), or on the board (3). No membership at all is coded as zero. The admissible sum of the *Membership index* ranges from 0 (no membership in

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<sup>5</sup> This figure is quite close to the Russian average. According to the last census in autumn 2002 the percentage of females in Russia is 53.5 percent (see <http://www.gks.ru/PEREPIS/predv.htm>).



any voluntary association) to 18 (on the board of a voluntary association of each of the six types). Our second membership indicator, *Number of memberships*, simply counts in how many associations a subject is at least a member. This index therefore ranges from 0 to 6.

Table 1 contains the average membership statistics of the student and non-student subject pools. For the *non-students* the averages of our two membership indicators are 0.40 and 0.58, respectively. This low rate of membership is consistent with observations from other studies that Russians generally have a very low engagement in any civic voluntary association (Rose, 2000a, 2000b; Hjollund et al., 2001). For instance, based on interviews conducted in 1998, Rose (2000a) reports that 80–90 percent of the Russians do not belong to any voluntary association. In our sample this holds true for 71 percent of the non-students; 93 percent are members of at most one voluntary association. By contrast, Glaeser et al. (2002, p. F456) look at data from respondents of the GSS in the US between 1972 and 1998 and find that only 29.65 percent report no membership at all; only 55.28 percent hold at most one membership.

Interestingly, the much younger *students* of our sample seem to have a higher willingness to participate in voluntary associations than the older generation of non-students. Their membership indices take on an average of 1.3 and 2.0, respectively. Only 31 percent of the students report no membership at all, and 60 percent hold at most one membership. This difference in engagement between students and non-students is for both measures significant at  $P = 0.000$  according to Mann–Whitney tests. Thus, with respect to membership the student generation seems to be much closer to the American population investigated in Glaeser et al. (2002) than to the non-students of their own society.

After this rich description of our subject pools and their backgrounds, we are now ready to proceed to the research design of our study.

#### 4. Research design

Our study consists of two elements. All subjects took part in public goods experiments. As introduced earlier, at the end of the experiment subjects were asked a set of questions about their socio-economic characteristics (see Section 3.2). We also elicited their answers to a set of questions on trust attitudes and trusting behavior. We describe first the experiment and then the trust questionnaires.

Most subjects participated in two consecutive one-shot experiments. One experiment was a standard voluntary contribution game, where groups of three members decided simultaneously on their contribution to a public good. A second experiment was a two-stage game where subjects in the first stage played the standard public goods game, and in the second stage they had the opportunity to punish other group members (see Fehr and Gächter, 2000, 2002). For half of the subjects the order in which these experiments were played was reversed. When subjects played the first experiment, they were not informed of the second experiment.<sup>6</sup>

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<sup>6</sup> Participants in Minsk and Samara played a 10 times repeated public goods experiment with and without punishment. For these subjects, we only look at their socio-economic characteristics and their trust attitudes.



In this paper, we focus on trust and voluntary cooperation in the absence of punishment. A companion paper by Gächter and Herrmann (2003) contains information on the experiments with punishment. Thus, when we analyze experimental data and the link between contribution behavior, socio-economic characteristics, and trust variables, we concentrate only on experiments where subjects first played the one-shot voluntary contribution game. This still leaves us with 308 independent observations. We now describe the experiment in more detail.

#### 4.1. The experiment

The experiment we used to measure multilateral voluntary cooperation is a one-shot public goods game with strong free-rider incentives. Participants were divided in groups of  $n = 3$  subjects and endowed with 20 tokens. A subject could either keep these tokens for him or herself or invest  $c_i$  tokens ( $0 \leq c_i \leq 20$ ) into a public good, called “project.” Decisions about  $c_i$  are made simultaneously. All subjects receive a marginal per capita return of 0.5 from any contribution to the public good, which is just the sum of all contributions to the project. The value 0.5 was chosen to make the calculations for the participants easy. The monetary payoff for each subject  $i$  in the group was given by

$$\pi_i = 20 - c_i + 0.5 \sum_{j=1}^n c_j.$$

This payoff function is widely used in public goods experiments. Under standard assumptions, it gives the subjects a dominant strategy to free ride completely (i.e., to choose  $c_i = 0$ ), since the marginal per capita return of a contribution to the public good is less than 1 and the marginal cost of contributing equals 1. The social marginal return is 1.5, which implies that the social payoff is maximized if everyone contributes his or her whole endowment to the public good.<sup>7</sup>

The subjects first had to read detailed instructions and answer a set of control questions.<sup>8</sup> We gave the subjects enough time to read the instructions and to ask questions (in private). After all participants had answered the control questions, the task and procedures were orally summarized according to a script.

Finally the subjects were anonymously paid their earnings from the experiment. During the experiment payments were calculated in an experimental currency unit. Incentives, both in Belarus and in Russia, were such that they covered well the opportunity cost of taking part in the experiment. The experiments lasted between 45 min and 1.5 h. On average, student participants earned €1.8. Non-students were paid more because of their higher opportunity cost, namely €5.8 on average.

<sup>7</sup> This decision situation is admittedly rather artificial. Yet, there is evidence that people understand the social situation of the public goods game very easily. For instance, after the experiment some of our participants noted the similarity of contributions to the project in the experiment and their own tax payments in real life. Similarly, Henrich et al. (2001) report public goods experiments in Kenya where participants, after having seen the game, dubbed it “harambee,” which stands for ‘community work.’

<sup>8</sup> The instructions are available at <http://www.few.unisg.ch/gaechter/sgaechter.htm>.

All experiments were run under the supervision of one of the authors, Benedikt Herrmann, who speaks Russian fluently. Local assistants supported him. We always used partitions to visually separate the participants. Experiments with student subjects were conducted in a computer lab, using the software *z-tree* (Fischbacher, 1999). Experiments with the non-student subjects were done according to the exact same instructions, parameters, and experimenter script, except that, for practical reasons, we had to conduct the non-student experiments in the hand-run mode.

Student experiments were conducted in Grodno. Participants were recruited by randomly approaching students in the corridors of Grodno State University, the Grodno State University of Agricultural Sciences, and the Grodno State Medical University. Participants met a day after recruiting in the Internet center “MODEM” located in the Medical University, where the experiments were conducted.

The experiments with the non-student subjects were conducted in Kursk and Zheleznogorsk. The subjects, predominantly urban dwellers and villagers were invited by announcements in public places and additionally via approaching people in the streets and public transport. Word-of-mouth also played a significant role and worked very well, in the sense that an almost ‘randomly’ selected set of people from all walks of life participated in the experiments. Section 3.2 describes the details of our subject pools.

#### 4.2. The questionnaire study

All subjects answered the same questionnaire, which consisted of two parts. The first part comprised a “trust questionnaire,” described in Table 2; the second part asked for the subjects’ socio-economic characteristics. We have described the socio-economic questionnaire in Section 3.2. Here, we therefore concentrate on the trust questionnaire.

Table 2  
The seven measures of trust

Variable	Description
GSS trust	“Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” (1: “most people can be trusted”; 2: “can’t be too careful”; 1.5: “depends”)
GSS fair	“Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?” (1: “would take advantage”; 2: “would try to be fair”; 1.5: “depends”)
GSS help	“Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?” (1: “try to be helpful”; 2: “just look out for themselves”; 1.5: “depends”)
GSS index	Index formed of <i>GSS trust</i> , <i>GSS help</i> , and <i>GSS fair</i>
Trust strangers	Approval or disapproval to the statement “You can’t count on strangers anymore.” Answer range is 0: more or less agree; 1: more or less disagree
Trusting behavior index	Three questions about the frequency of lending money or possessions and leaving the door open are aggregated in this index
Trustworthiness	Approval or disapproval to the statement “I am trustworthy.” Answer range from 1: “disagree strongly” up to 6: “agree strongly”

Our trust questionnaire adopts standard trust questions that have been frequently used by other researchers. The questions *GSS trust*, *GSS help*, and *GSS fair* are taken from the National Opinion Research Center's General Social Survey. Versions of the GSS trust questionnaire are widely used to measure group-level social capital (see, e.g., Knack and Keefer, 1997; Zak and Knack, 2001). The other trust questions are taken from Glaeser et al. (2000). A complete list of the questions used in this study can be found in Table A.1 in the Appendix.

## 5. Results

We begin our analysis by first focusing on questionnaire data only. We provide summary statistics for the questions and compare these with existing evidence. We also look for differences between our student and non-student subject pool. Then we connect the answers to the trust questions with the socio-economic characteristics of the subjects. Finally, after providing the experimental results, we look for a correlation between the answers on trust questions and trust shown in the economic situation of the public goods game.

### 5.1. Trust as measured by questionnaires

We start our analysis by comparing our trust measures to the existing evidence. In particular, since we have adopted the same trust questions as Glaeser et al. (2000), we can compare all our trust scores to this study. They report results from a survey and a trust game conducted with undergraduates from a Harvard introductory economics class. Another comparison is made with the data from Ashraf et al. (2003), who only asked the *GSS trust* question. They report observations from undergraduates in Moscow, Boston, and Capetown. Table 3 provides the details.

When we compare the answers to the frequently used *GSS trust* question between our subject pools and the Harvard undergraduates, we get surprisingly similar scores despite the strongly heterogeneous socio-economic backgrounds of the different student subject pools. A similar conclusion holds for the undergraduate subjects from the US, Russia, and South Africa (Ashraf et al., 2003).<sup>9,10</sup> There are also some interesting differences. For instance, with respect to *GSS fair*, our subjects are less likely than their Harvard counterparts to believe that most people would try to be fair. However, our subjects more often leave their door unlocked than the Harvard undergraduates do (see question "Door unlocked").

<sup>9</sup> In the version of GSS questions used by Glaeser et al. (2000) and Ashraf et al. (2003), the option 'depends' has been eliminated. In our version, which follows the original format (see <http://www.icpsr.umich.edu:8080/GSS/rnd1998/merged/cdbk/trust.htm>), we chose the value 1.5 for the option "depends" to make the variables as comparable as possible.

<sup>10</sup> In the table, we only show the average score from Ashraf et al. (2003). The separate means of the *GSS trust* measure for the different places are as follows: Russia, 1.51; South Africa, 1.64; US, 1.44. Notice that the average score for Russians (with students from Moscow) is the same as in our study. Gibson (2001) reports evidence from a large representative survey (from all over Russia) conducted in 1998 that includes a variant of our *GSS trust* question. The average *GSS trust* score is 1.64, which indicates that our sample (in 2002) is somewhat more trusting than the representative Russian sample (in 1998).

Table 3  
Comparisons of several trust measures in our study and two reference studies

Variable [sign indicates direction of higher trust]	Our data				Glaeser et al. (2000)	Ashraf et al. (2003)
	All	Non-students	Students	<i>P</i> -value		
Observations	639	300	339		189	359
GSS trust [–]	1.46 (0.37)	1.40 (0.38)	1.51 (0.35)	0.000	1.51 (0.50)	1.53 (0.50)
GSS fair [+]	1.46 (0.34)	1.48 (0.36)	1.44 (0.33)	0.036	1.56 (0.49)	
GSS help [–]	1.53 (0.33)	1.48 (0.35)	1.58 (0.31)	0.000	1.61 (0.49)	
Trust strangers [+]	0.49 (0.5)	0.37 (0.48)	0.63 (0.48)	0.000	0.39 (0.50)	
Door unlocked [–]	3.27 (1.29)	3.06 (1.29)	3.45 (1.27)	0.000	4.26 (1.11)	
Lend money [–]	2.93 (0.91)	3.11 (0.93)	2.77 (0.86)	0.000	2.85 (1.15)	
Lend possessions [–]	3.14 (1.01)	3.32 (0.97)	2.98 (1.01)	0.000	2.44 (1.18)	
Trustworthiness [+]	4.81 (1.35)	4.99 (1.34)	4.66 (1.33)	0.000	5.31 (0.93)	

*Notes:* We report the mean scores for our whole survey as well as for the student and non-student subject pool. Standard deviations are given in parentheses. The column ‘*P*-value’ shows the significance level of the difference between the student and the non-student observations according to a  $\chi^2$ -test (all GSS questions; *Trust strangers*) and Mann–Whitney tests (all others). Glaeser et al. (2000) and Ashraf et al. (2003) serve as two comparison studies. The [–] indicates variables where higher scores reflect less trust and [+] variables where higher scores reflect more trust.

When we compare students and non-students in our data set we find some interesting and highly significant differences on almost all trust questions. For instance, when it comes to the *GSS trust* question, our non-student subjects indicate more trust than students, but also more than any of our comparison student subject pools. Similar results hold for the other two *GSS* questions. Moreover, compared to students, our non-students (i) see themselves as considerably more trustworthy, (ii) lend money and possessions less often but (iii) are more likely to leave the door of their apartment unlocked, and (iv) indicate significantly *less* trust toward strangers.

Throughout the remaining paper we resign all trust variables such that higher positive values mean higher trust.<sup>11</sup> Most of the trust measures are significantly correlated. A very interesting observation is that most partial correlations are rather similar to the correlations reported in Glaeser et al. (2000, p. 844) for their student subject pool (see Table A.2 in the Appendix). If we compare just our student subject pools, the similarities are even more striking.<sup>12</sup> We summarize our findings in Result 1.

**Result 1.** There are no obvious cross-societal differences in measured trust between our student subjects and their western counterparts, despite the strong economic, social, and cultural differences in the compared societies. Our non-student subject pool indicates more trust than the student subject pool on all *GSS* trust questions, but trusts strangers significantly less than students. With respect to trusting behavior there are no clear-cut differences between students and non-students.

In the next step of our analysis, we examine how the socio-economic characteristics, as introduced earlier, interact with the trust measures. Table 4 shows the results of the estimations. In the case of the variables *GSS trust* and *Trustworthiness*, we apply an ordered Probit estimation. *Trust strangers* is estimated using Probit, and the remaining estimations for *GSS index* and *Trusting behavior index* are OLS regressions.

There is no difference in questionnaire-measured trust between males and females, except for *Trustworthiness*. Here, females self-report that they are significantly more trustworthy than males. Consistent with existing evidence (see, e.g., Glaeser et al., 2000) we find that older people tend to indicate more trust in two *GSS* questions and that the age effect is concave. Age is most important and significant for *GSS help* and *GSS fair*. The older people are, the more likely they are to believe that others try to be fair or helpful. This is particularly noteworthy because these two variables turn out to be important in our later

<sup>11</sup> The indices are constructed as follows: the coded answers to the single questions are first de-measured, normalized by their standard deviations and rescaled such that higher values mean higher trust. The resulting index is also de-measured and normalized for the estimations. This procedure is applied to all the indices and all non-binary variables.

<sup>12</sup> When comparing the coefficients to the results in Glaeser et al. (2000, p. 844), keep in mind that our measure *GSS trust* is signed *inversely* to theirs. We therefore have positive instead of negative correlation coefficients. All other measures have the same sign as in Glaeser et al. (2000). Specifically, they get the following partial correlations [in brackets we report the partial correlations of our students]: (i) *GSS trust* and *GSS index*,  $-0.7505$  [0.6316]; (ii) *Trust stranger* and *GSS trust*,  $-0.3665$  [0.2580]; (iii) *Behavioral index* and *GSS trust*,  $-0.2036$  [0.1079]; (iv) *Trust stranger* and *GSS index*,  $0.3530$  [0.3396]; (v) *Behavioral index* and *GSS index*,  $0.0930$  [0.1519]; (vi) *Behavioral index* and *Trust stranger*,  $0.1355$  [0.1423].

Table 4  
Measured trust and socio-economic characteristics

	Dependent variable						
	GSS trust	GSS fair	GSS help	GSS index	Trust strangers	Trusting behavior index	Trustworthiness
Female	0.147 (0.100)	−0.063 (0.108)	0.083 (0.102)	0.034 (0.098)	−0.112 (0.121)	−0.042 (0.086)	0.209 (0.095)*
Age 26–45 years	0.217 (0.230)	0.775 (0.203)**	0.356 (0.200) <sup>+</sup>	0.633 (0.183)**	0.173 (0.230)	−0.066 (0.161)	0.236 (0.190)
Age 46 years and older	0.320 (0.268)	0.999 (0.265)**	0.444 (0.256) <sup>+</sup>	0.811 (0.223)**	0.195 (0.273)	−0.270 (0.195)	0.199 (0.241)
Only child	−0.043 (0.133)	−0.011 (0.147)	−0.113 (0.146)	−0.053 (0.119)	−0.180 (0.194)	−0.065 (0.127)	−0.055 (0.133)
City size	0.023 (0.057)	−0.007 (0.060)	−0.070 (0.058)	−0.037 (0.054)	−0.015 (0.075)	−0.147 (0.050)**	0.082 (0.055)
Villager	0.044 (0.188)	0.303 (0.200)	−0.051 (0.195)	0.083 (0.174)	0.271 (0.217)	0.113 (0.160)	0.149 (0.190)
Church attendance	0.039 (0.048)	0.063 (0.055)	0.086 (0.048) <sup>+</sup>	0.066 (0.048)	0.069 (0.059)	−0.030 (0.046)	0.045 (0.044)
Membership index	0.014 (0.044)	0.042 (0.054)	−0.030 (0.051)	−0.002 (0.044)	0.008 (0.067)	0.087 (0.044)*	−0.008 (0.046)
White collar	0.131 (0.267)	−0.832 (0.241)**	0.020 (0.233)	−0.360 (0.209) <sup>+</sup>	−0.983 (0.275)**	−0.168 (0.192)	0.214 (0.228)
Blue collar & others	0.230 (0.256)	−0.640 (0.234)**	−0.145 (0.225)	−0.323 (0.207)	−0.831 (0.259)**	−0.049 (0.182)	−0.132 (0.217)
Zheleznogorsk	0.311 (0.307)	0.196 (0.307)	0.288 (0.299)	0.199 (0.310)	0.257 (0.306)	0.485 (0.211)*	−0.036 (0.316)
Minsk	0.209 (0.151)	−0.187 (0.192)	0.141 (0.185)	0.039 (0.174)		0.304 (0.154)*	−0.236 (0.152)
Samara	0.238 (0.142) <sup>+</sup>	−0.092 (0.168)	−0.190 (0.149)	−0.093 (0.144)		−0.167 (0.151)	−0.117 (0.146)
Constant				−0.177 (0.092) <sup>+</sup>	0.397 (0.110)**	0.059 (0.082)	
Observations	590	529	574	493	489	603	606
R <sup>2</sup>	0.02	0.02	0.03	0.06	0.06	0.07	0.02

Notes: All trust variables are normalized and resigned such that a higher coefficient indicates more trust. The estimations for *GSS index* and *Trusting behavior index* are OLS. The estimation for *Trust strangers* is Probit. The remaining estimations are ordered Probit. In the case of the Probit estimations, we report the pseudo R<sup>2</sup>. Robust standard errors are given in parentheses. *Female*, *Only child*, *Age 26–45 years*, and *Age 46 and older* are dummies. *Church attendance*, *Membership index*, and *City size* are de-measured and normalized by the standard deviation. *Villager* is a dummy for living in a village. *White collar* and *Blue collar & others* are dummies indicating the occupation of the non-student subjects. The variables from *Zheleznogorsk* to *Samara* are dummies for the corresponding region. The *trust strangers* question was not asked in Minsk and Samara.

<sup>+</sup> Denotes significance at 10 percent.

\* Denotes significance at 5 percent.

\*\* Denote significance at 1 percent.

analysis. However, age does not matter significantly for *GSS trust*, *Trust strangers*, *Trusting behavior*, such as lending possessions or money to other people, and *Trustworthiness*.

Having spent most of one's life in a larger city slightly, but insignificantly, reduces most GSS measures and significantly reduces trusting behavior. None of the variables *Only child*, *Villager*, and *Church attendance* has a significant influence on any of the trust measures (except for *GSS help*). The same holds true for the engagement in voluntary associations measured by the *Membership index*, except that here we have a weakly significantly positive connection with trusting behavior.

The coefficients of the non-student dummy variables *White collar* and *Blue collar & others* identify systematic subject pool effects that remain after controlling for other socio-economic characteristics. Recall from Table 3 that non-students indicated more trust than students in all the GSS questions. After adding the controls, the per se differences of being a non-student (identified by either the *White collar* or the *Blue collar & others* dummy) vanish in the case of *GSS trust* and *GSS help*. For the *GSS fair* measure the relation even changes sign (i.e., as mentioned earlier, compared to the student subject pool, white-collar and blue-collar workers have a significantly reduced belief that most people try to be fair). With regard to the variable *Trust strangers* the observation from Table 3 that non-student subjects exhibit significantly less trust towards strangers than students is also supported in the estimation. Controlling for age we find that non-students are equally trusting in general but not towards strangers. They are less confident about the fairness of others than students. Overall, the most important variable seems to be age.

We summarize our findings in Result 2.

**Result 2.** Age effects can explain differences in trust as measured by the GSS questions. Older people trust more. People who lived most of their lives in larger cities exhibit significantly less trusting behavior than small-city dwellers. After controlling for age effects, white-collar and blue-collar workers (i) exhibit less trust toward strangers than students and (ii) believe less that most people try to be fair.

## 5.2. Measuring cooperative attitudes in a one-shot public goods experiment

Before we relate contributions to our trust and socio-economic data, we first provide an overview of the experimental results. Remember that the experiment is a one-shot public goods game where each participant simultaneously decides on his or her contribution level. The dominant strategy for a money-maximizing subject is to contribute nothing to the public good. Thus, as we have argued above, the contribution in the one-shot experiment in the presence of strict free-rider incentives is a measure of trust, given that most people do not want to be the suckers. The results from the experiment suggest that on average our subjects, both students and non-students, exhibited considerable trust in this respect. The average contribution of the students was 8.81 tokens while the average non-student subject contributed even more 10.37 tokens. This difference is significant at  $P = 0.0473$  according to a two-sided Mann–Whitney test.

Fig. 1 shows the cumulative distribution of the contributions for both subject pools. The jumps in the graphs indicate the “focal points” within the possible contributions, namely 0, 5, 10, 15, and 20. The fraction of complete free riders (zero contributions) is identical



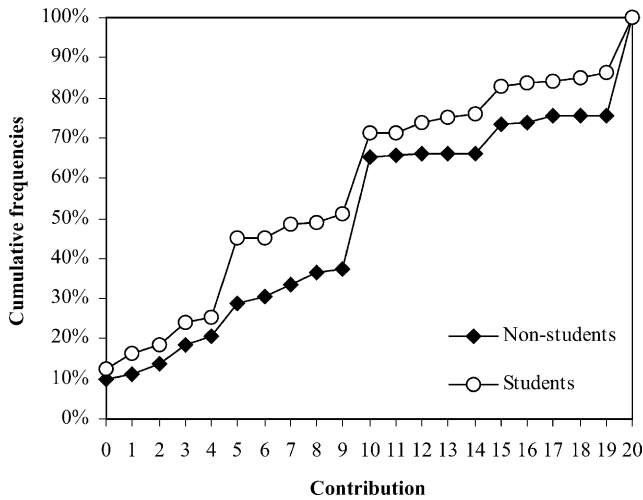


Fig. 1. Cumulative distribution of the contributions of students and non-students.

between students and non-students. More than 60 percent of the non-students contribute at least 10 tokens and roughly 23 percent contribute the full 20 tokens. The respective frequencies for students are 50 and 12 percent.

Obviously there is a lot of variation in the contribution data. In the next step we try to explain this variation by our trust and socio-economic variables. Before we proceed, we summarize our findings in result 3.

**Result 3.** Despite strong free-rider incentives, both subject groups make substantial contributions to the public good. Non-students contribute significantly more than students.

This result is interesting because it suggests that life experience does not lead to lower but to higher contributions. It also suggests that the degree of cooperativeness observed in student subject pools may be a lower bound for the cooperativeness of the general population.

### 5.3. The correlation between trust attitudes, socio-economic characteristics, and cooperation

We now turn to the question of whether the individual level of contribution is correlated with socio-economic characteristics and questionnaire-measured trust. We start by investigating the link between the socio-demographic characteristics of our participants and their contribution behavior.

Model 1 in Table 5 provides a first benchmark.<sup>13</sup> It turns out that none of the socio-economic variables, including the white-collar and blue-collar dummies, are statistically

<sup>13</sup> The control variables differ slightly from those used in the estimations of Table 4. New is the variable *No. known* that measures the number of other participants that a particular subject is familiar with in a session. The dummies *Minsk* and *Samara* drop out because we do not have observations from these places.

Table 5  
The dependence of contribution on trust attitudes and socio-economic characteristics

	Dependent variable: contribution							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GSS trust		0.325 (0.403)						
GSS index			1.199 (0.403)**					
GSS fair				1.145 (0.420)**				
GSS help					0.705 (0.387) <sup>+</sup>			
Trust strangers						1.728 (0.842)*		
Trusting behavior index							0.250 (0.429)	
Trustworthiness								0.452 (0.378)
Female	0.598 (0.803)	0.602 (0.806)	0.313 (0.860)	0.358 (0.846)	0.499 (0.821)	0.476 (0.820)	0.667 (0.823)	0.434 (0.826)
Age 26–45 years	0.401 (1.533)	0.979 (1.580)	0.411 (1.615)	−0.244 (1.676)	0.298 (1.633)	0.257 (1.512)	0.398 (1.527)	0.028 (1.541)
Age 46 years and older	−0.219 (1.781)	0.489 (1.813)	−0.783 (1.880)	−1.510 (1.944)	−0.592 (1.853)	−0.596 (1.778)	−0.115 (1.856)	−0.361 (1.833)
Only child	0.270 (1.201)	0.349 (1.211)	0.223 (1.230)	−0.059 (1.230)	0.542 (1.245)	0.149 (1.223)	0.136 (1.212)	−0.003 (1.200)
City size	0.504 (0.447)	0.538 (0.446)	0.554 (0.475)	0.418 (0.462)	0.584 (0.449)	0.482 (0.457)	0.545 (0.457)	0.518 (0.455)
Villager	1.611 (1.686)	1.156 (1.705)	2.375 (1.729)	2.438 (1.678)	1.965 (1.695)	1.451 (1.704)	1.946 (1.711)	2.124 (1.696)
Church attendance	0.209 (0.422)	0.248 (0.423)	0.599 (0.442)	0.509 (0.445)	0.264 (0.431)	0.199 (0.427)	0.275 (0.434)	0.221 (0.428)
Membership index	0.349 (0.484)	0.298 (0.492)	−0.347 (0.598)	−0.302 (0.578)	0.263 (0.512)	0.542 (0.518)	0.267 (0.488)	0.337 (0.488)
White collar	1.312 (1.774)	0.689 (1.805)	0.217 (1.855)	1.322 (1.923)	1.129 (1.863)	1.957 (1.773)	0.955 (1.792)	1.062 (1.788)
Blue collar & others	0.567 (1.696)	0.321 (1.692)	−0.786 (1.787)	−0.201 (1.867)	0.287 (1.762)	1.252 (1.743)	0.271 (1.698)	0.307 (1.704)
Zheleznogorsk	0.925 (1.616)	0.629 (1.591)	1.540 (1.734)	1.743 (1.789)	0.829 (1.608)	1.137 (1.673)	1.246 (1.827)	1.340 (1.648)
No. known	−0.004 (0.057)	0.006 (0.058)	−0.034 (0.060)	−0.034 (0.058)	−0.011 (0.058)	0.006 (0.058)	−0.009 (0.057)	−0.008 (0.058)
Constant	8.308 (0.709)**	8.339 (0.721)**	9.481 (0.784)**	9.206 (0.766)**	8.608 (0.748)**	7.173 (0.910)**	8.318 (0.710)**	8.473 (0.722)**
Observations	296	289	251	265	283	288	286	288
R <sup>2</sup>	0.03	0.03	0.07	0.06	0.04	0.04	0.03	0.03

Notes: All regressions are ordinary least squares. Robust standard errors are given in parentheses. *Female*, *Only child*, *Age 26–45 years*, and *Age 46 years and older* are dummies. *Church attendance*, *Membership index*, and *City size* are de-measured and normalized by the standard deviation. *Villager* is a dummy for living in a village. *White collar* and *Blue collar & others* are dummies indicating the occupation of the non-student subjects. *Zheleznogorsk* is a dummy for the corresponding region.

<sup>+</sup> Denotes significance at 10 percent.

\* Denotes significance at 5 percent.

\*\* Denote significance at 1 percent.

significant. Put differently, the socio-economic characteristics of the subject pool do not matter for contribution behavior. Since contributions are different, motivations to contribute may be different between subjects, but these motives are unrelated to the socio-economic characteristics of the participants.

**Result 4.** The socio-economic differences of our subjects are unrelated to contribution behavior.

In a next step, we investigate the correlation of the trust variables with contribution behavior. Models 2–8 in Table 5 show separate estimations for each of the seven trust measures. All estimations are OLS.<sup>14</sup> For all models 2–8, we find that the socio-economic controls remain jointly insignificant (the *P*-values of the respective *F*-tests range from 0.50 to 0.89).<sup>15</sup> In our discussion, we therefore concentrate on the trust variables.

We start in model 2 with the most popular variable in social capital research: the *GSS trust* measure. We find a positive but insignificant influence on the contribution level, yet, in model 3 the combined *GSS index* (which is formed of *GSS trust*, *GSS fair*, and *GSS help*) is highly significantly positively correlated with contributions. Subjects who indicate one standard deviation more trust according to the *GSS index* contribute 1.2 tokens more to the public good. This stands in contrast to the findings of Glaeser et al. (2000) who find no predictive power of the *GSS index* in their trust game. Likewise, Ahn et al. (2003) find no explanatory power of the trust index on the behavior in prisoners' dilemma games.

Since the *GSS index* is strongly correlated with the contribution in our public goods game, we now decompose it in order to see which of the questions are correlated with behavior. Models 4 and 5 report the results. We find that both *GSS fair* and *GSS help* are significantly correlated with the contribution to the public good. Both indices have a much larger coefficient and a higher significance level than *GSS trust*.

We also find that the variable *Trust strangers* (model 6) is significant. People disagreeing with the statement “You can't trust strangers any more” contribute 1.73 tokens more than people who agree with this statement. This is interesting because most people in our experiment, with the exception of the villagers, were indeed strangers to one another.

Interestingly, the *Trusting behavior index* (model 7) has no significant influence on voluntary cooperation. This observation is in contrast to the findings of Glaeser et al. (2000) who conclude from their study that asking subjects about trusting behavior is more precise than asking about trust attitudes. Finally, *Trustworthiness* (model 8) is not significantly correlated with contributions.

We summarize these observations in Result 5.

<sup>14</sup> Since our dependent variable is censored at 0 and 20, we also ran Tobit estimations. The results are almost identical.

<sup>15</sup> If we run separate regressions with the respective trust variable as the sole regressor, we get coefficients (standard errors) that are very similar to those reported in Table 5. Specifically, *GSS trust*: 0.563 (0.374); *GSS index*: 1.356\*\* (0.372); *GSS fair*: 1.182\*\* (0.394); *GSS help*: 0.878\* (0.372); *Trust strangers*: 1.253 (0.761); *Trusting behavior index*: 0.169 (0.402); *Trustworthiness*: 0.458 (0.194). \*\* (\*) Denotes significance at the 1 percent (5 percent) level.

**Result 5.** Trust as measured by the popular GSS trust question is not significantly correlated with cooperative behavior. By contrast, the more people believe that most others are fair (as measured by GSS fair) or the more they believe most others are helpful (GSS help) the more they contribute to the public good. Furthermore, the more people trust strangers, the more they contribute to the public good. Measures of trusting behavior and actual contribution behavior in the experiment are not significantly correlated.

#### 5.4. Discussion

A couple of interesting observations can be derived from our results. First, it is noteworthy that the socio-economic characteristics do not per se influence voluntary contributions to a public good, despite some strong socio-economic differences of our subject pools. However, the socio-economic variables influence trust attitudes, which are correlated with people's contribution behavior. Most notably, the socio-economic background strongly influences people's trust in other people's fairness and the fear of being exploited by other people. The older people are, the less likely they seem to be afraid of being exploited, and this trust in the fairness of others is strongly positively correlated with cooperative behavior. In other words, people who trust that others do not exploit them display a higher voluntary cooperation than those who hold the contrary belief. A similar reasoning holds for people's belief about other people's helpfulness.

These findings are consistent with evidence reported above that many people are conditional cooperators who are prepared to cooperate if they believe that others cooperate as well. Remember that *GSS fair* asks whether people believe that others mostly try to take advantage of one or would try to be fair. Likewise, *GSS help* asks for the belief that others are mostly helpful instead of just thinking for themselves. In the presence of free-rider incentives, both beliefs are directly relevant for conditional cooperators who want to avoid being the sucker.

The result that socio-economic characteristics are not correlated with contribution behavior but are correlated with trust attitudes, which in turn are correlated with contributions, looks puzzling at first sight, yet it suggests that in an anonymous situation of mutual one-shot cooperation among strangers (such as our lab situation), one's *general* trust attitude, as it is measured by the trust questions, is triggered. The general trust attitude (the image people have about others being helpful and fair, or the opposite, and their trust toward strangers) matters much more in the very moment of decision making than the socio-demographic characteristics. However, the socio-demographic characteristics influence the trust attitudes that people have acquired in life, which is why we and other researchers find a correlation between trust attitudes and socio-demographic characteristics, most notably age.

Second, our results with students and non-students complement the findings from student subjects by Glaeser et al. (2000). They were interested in the link between trust attitudes and trusting behavior as measured by questionnaires and trustful and trustworthy behavior as observed in a trust experiment. Their main results were that the widely used *GSS trust* question does not predict trusting behavior in the trust game. We get the same result for our public goods game. Glaeser et al. (2000) found that questions asking for *trusting behavior* actually predict trusting behavior in the experiment; our results suggest that this behavioral

link does not exist for contribution behavior in public goods experiments. Glaeser et al. find that the more people *trust strangers*, the more they trust in the trust experiment; we find that trusting strangers leads to more cooperation in the one-shot public goods experiment. The *GSS index*, in particular the questions that ask about beliefs about the fairness and helpfulness of others (*GSS fair* and *GSS help*, respectively), turn out to be significantly positively correlated to cooperative behavior in our experiment. This result stands in contrast to Ahn et al. who do not find a correlation between cooperation in a prisoners' dilemma and their *GSS index*.<sup>16</sup> However, our results are consistent with Yamagishi who found that "high-trustors" contribute more to the public good than "low-trustors." In Glaeser et al. (2000), the *GSS index* does not predict trusting behavior in the trust game, but trustworthiness. The upshot of both studies is that, out of several questions that measure trust attitudes, the widely used *GSS trust* question least accurately reflects actual trusting and cooperative behavior. The *Trust strangers* and the *GSS fair* and *GSS help* questions seem to reliably reflect trusting and cooperative behavior.<sup>17</sup>

Finally, there is a caveat in order. Despite the fact that some trust measures are significantly correlated to cooperation behavior, the regressions also reveal that only a small fraction of variance is explained by the attitudinal questions (all  $R^2$  are below 10 percent). This finding is consistent with similarly low  $R^2$  in related studies (Glaeser et al., 2000; Ashraf et al., 2003; Carpenter et al., 2004), and it also reflects the observation of long research efforts in psychology that the link between behavioral measures and attitude measures may often be weak (Ajzen and Fishbein, 1980; Eagly and Chaiken, 1993).

## 6. Summary

In this paper, we have analyzed the trust attitudes and the voluntary cooperation behavior in a public goods experiment with non-student and student subjects from various cities and

<sup>16</sup> One reason for this difference in results might be that "fine-tuning" is not possible in the prisoners' dilemma. In the prisoners' dilemma, subjects can only choose to cooperate or to defect, whereas in our public goods experiment subjects can choose between 21 cooperation levels. The number of participants in the Ahn et al.'s experiments ( $n = 40$ ) is also lower than in our study ( $n = 308$ ).

<sup>17</sup> It is also interesting to compare our results to recent studies by Bellemare and Kröger (2003), Fehr et al. (2003), and Danielson and Holm (2003). Danielson and Holm ran trust experiments with undergraduates in Sweden and Tanzania. They also elicited trust attitudes using, among others, the same questions as we did. They find that in Tanzania not a single trust question is correlated with trusting behavior, yet in Sweden a positive correlation exists between the *GSS index* and trusting behavior in the experiment. *Trust strangers* is insignificantly correlated with trusting behavior in both societies. Concerning trustworthiness (returning money in the trust experiment), Danielson and Holm find again a positive correlation between *GSS trust* and *GSS index* in Sweden but not in Tanzania. Thus, there appear to be important population differences in the link between trust attitudes and behavior. Bellemare and Kröger (2003) and Fehr et al. (2003) incorporated a trust game experiment into a representative nation-wide survey (in the Netherlands and Germany, respectively). Bellemare and Kröger only asked the *GSS trust* question. In contrast to Glaeser et al. (2000), they find a significantly positive correlation between the *GSS trust* question and senders' trusting behavior in the trust experiment. Fehr et al. asked a couple of trust questions that are not directly comparable to ours. In line with Glaeser et al. (2000) and our study, they find that *Trust strangers* is significantly correlated with trusting behavior.

villages in Russia and Belarus. The large questionnaire sample of more than 630 participants gives us a rich picture of the socio-economic background of our subjects. Our results suggest that with students we measure lower bounds in trusting attitudes as well as in cooperative behavior: we find that (i) students generally report that they trust less than non-students in widely used *GSS* trust attitude questions and that (ii) students contribute less than non-students to a public good. However, if we control for the socio-economic background characteristics of our subjects, we find no statistically significant differences in voluntary cooperation between students and non-students. The socio-economic background does not matter for voluntary cooperation as measured in a one-shot public goods game, but it matters for trust attitudes. We find that the dominant socio-economic variable is age: older people exhibit more trust than younger people.

A further main result is that contributions are significantly related to three trust attitude variables: *GSS fair*, *GSS help* and *Trust strangers*. The *GSS trust* question, widely used in most of social capital research, is not significantly correlated with cooperative behavior. In our multilateral cooperation experiments, people contribute more when they believe that (i) others are fair and do not exploit them, (ii) others are helpful instead of just thinking for themselves, and (iii) they trust strangers. The first two results are consistent with observations that many people are conditional cooperators who are willing to cooperate if they believe that others cooperate as well. Beliefs about the likelihood of being exploited and of the egoism of others are important when one has to make a cooperative move in a situation where one runs the risk of being exploited. Apparently, these beliefs are much more important for cooperative behavior than the socio-economic background, although this background shapes people's trust attitudes.

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## Appendix

See Tables A.1 and A.2.

Table A.1  
Description of variables

Variable	Description	Answer range	Observations	Mean	S.D.
Socio-economic variables					
Female		1: Yes; 0: no	637	0.48	0.50
Age		Positive real value	636	29.56	12.67
Only child		1: Yes; 0: no	631	0.12	0.32
City size	“What was the size of the community in which you spent most of your life?”	1: Up to 2000 inhabitants; 2: 2000–10,000 inhabitants; 3: 10,000–100,000 inhabitants; 4: more than 100,000 inhabitants	622	2.80	1.16
Villager	Dummy for the observations coming from the experiments conducted in small villages	1: Yes; 0: no	639	0.19	0.39
Church attendance	“How often do you go to church?”	0: Never; 1: sometimes; 2: at least once a week	634	0.82	0.51
Six voluntary association variables					
Sport	Sports club	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.23	0.58
Music	Choir, orchestra	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.10	0.41
Party	Political party	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.07	0.34
Interest	Lobbying groups	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.41	0.78
Non-profit	Non-profit organization	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.25	0.66
Other	Other associations	0: Nothing; 1: member; 2: active member; 3: on the board	634	0.29	0.66
No. of memberships	No. of cases where one of the six voluntary association variables is at least 1	Positive integer value in [0, 6]	634	0.90	1.12
Membership index	Sum of the six voluntary association variables	Positive integer value in [0, 18]	634	1.35	1.89



White collar	Dummy that is equal to 1 if the subject is a clerk, an executive, a civil servant or self-employed	1: Yes; 0: no	639	0.26	0.44
Blue collar	Dummy that is equal to 1 if the subject is a laborer or a farmer	1: Yes; 0: no	639	0.14	0.34
Other job	Dummy that is equal to 1 if the subject works at home or could not be categorized as blue or white collar worker	1: Yes; 0: no	639	0.08	0.26
Experimental variables					
No. known	Number of known subjects in the experimental session	Positive integer value	306	5.25	9.95
Contribution	All subjects	Integer value in [0, 20]	308	9.73	6.55
	Students	Integer value in [0, 20]	127	8.81	6.24
	Non-students	Integer value in [0, 20]	181	10.37	6.70
Trust variables					
GSS fair	“Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?”	1: Would take advantage of you; 2: would try to be fair; 1.5: depends; -: no answer/don’t know	549	1.46	0.34
GSS help	“Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?”	1: Try to be helpful; 2: just look out for themselves; 1.5: depends; -: no answer/don’t know	597	1.53	0.33
GSS trust	“Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?”	1: Most people can be trusted; 2: can’t be too careful; 1.5: depends; -: no answer/don’t know	614	1.46	0.37

Table A.1 (Continued)

Variable	Description	Answer range	Observations	Mean	S.D.
GSS index	Normalized sum of de-meaned, normalized and resigned <i>GSS fair</i> , <i>GSS help</i> , and <i>GSS trust</i>		513	0.00	1.00
Door unlocked	“How often do you leave your door unlocked?”	1: Very often; 2: often; 3: sometimes; 4: rarely; 5: never	636	3.27	1.29
Lend money	“How often do you lend money to friends?”	1: More than once a week; 2: once a week; 3: once a month; 4: once a year or less	635	2.93	0.91
Lend possessions	“How often do you lend personal possessions to friends?”	1: More than once a week; 2: once a week; 3: once a month; 4: once a year or less	625	3.14	1.01
Trusting behavior index	Normalized and resigned sum of normalized <i>Door unlocked</i> , <i>Lend Money</i> , and <i>Lend possessions</i>		622	0.00	1.00
Trustworthiness	“I am trustworthy”	1: Disagree strongly; 2: disagree somewhat; 3: disagree slightly; 4: agree slightly; 5: agree somewhat; 6: agree strongly	629	4.81	1.35
Trust strangers	“You can’t count on strangers anymore”	0: More or less agree; 1: more or less disagree	512	0.49	0.50

Table A.2

Correlation between the measures of trust and the contribution in the experiment

	GSS trust	GSS index	Trust strangers	Trusting behavior index	Trustworthiness
GSS index	0.636 (0.000)				
Trust strangers	0.145 (0.001)	0.205 (0.000)			
Trusting behavior index	0.091 (0.026)	0.116 (0.010)	0.150 (0.001)		
Trustworthiness	0.200 (0.000)	0.144 (0.001)	0.058 (0.190)	0.028 (0.483)	
Contribution	0.087 (0.131)	0.215 (0.001)	0.095 (0.101)	0.025 (0.668)	0.074 (0.203)

*P*-values are given in parentheses.

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