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Abstract:

We show that the standard trust question routinely used in social capital research is importantly related to cooperation behavior and we provide evidence on the microfoundation of this relation. We run a large-scale public goods experiment over the internet in Denmark using a design that enables us to disentangle preferences for cooperation from beliefs about others' cooperation. We find that the standard trust question is a proxy for cooperation preferences rather than beliefs about others' cooperation. Moreover, we show that the "fairness question", a recently proposed alternative to the standard trust question, is also related to cooperation behavior but operates through beliefs rather than preferences.

JEL classification: H41; C91; C72

Keywords: Social capital, Trust, Fairness, Public goods, Cooperation; Experiment

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1. Introduction

Trust has been proposed as an important determinant of various economic phenomena, including growth (Knack and Keefer 1997, Zak and Knack 2001), financial development (Guiso, Sapienza and Zingales 2004), civic participation (La Porta et al. 1997), investment decisions and patterns of international trade (Guiso, Sapienza and Zingales 2009). Such studies suggest that survey measures of trust like the standard trust question ("Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?") is a good proxy for "social capital" and that social capital promotes economic efficiency by facilitating cooperation and the enforcement of incomplete contracts. However, this literature has been challenged on the grounds that it is unclear what survey measures such as the trust question actually measure (see e.g. Sobel 2002, Durlauf 2002, Beugelsdijk 2006). To address this critique, a growing literature combines survey measures and experimental data to shed light on the microfoundations of social capital.

This paper reports results from a large-scale experiment on cooperation in public goods games and relates cooperation behavior to survey measures of social capital, in particular the standard trust question. The experiment is run over the internet with close to 1500 randomly selected participants from the Danish population. We find that both self-reported trust and observed cooperation levels are high, and regression analysis shows that trust attitudes have a significant explanatory power for cooperation behavior. While these results are interesting per se, the main focus of this paper is to study the microfoundation of this relation. We argue that cooperation choices are driven by preferences and beliefs. Some people have no preference for cooperation, and choose to free ride regardless of the contribution level of others (15 percent in our sample are free riders), but most have a preference for cooperating given that others do (69 percent are conditional cooperators). Beliefs about other peoples' inclination to cooperate do not matter for free riders but do serve as a main determinant of contribution levels for conditional cooperators.

Our main finding is that trust attitudes are a proxy for the strength of people's cooperation preferences but not for beliefs. In particular, we show that responses to the standard trust question (*Trust* for short) explain people's level of contribution given their beliefs about others' contributions, but not how optimistic they are about other peoples' tendency to cooperate. We also show that the fairness question ("Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?"), an alternative to the

trust question that has recently been added to the World Values Survey, is a proxy for beliefs but not for preferences. In particular, we show that responses to the fairness question (*Fairness* for short) explain how optimistic people are, but do not explain the strength of their preferences for cooperation. We speculate that the two survey measures capture different aspects of social capital because *Trust* evokes thoughts about what the respondent generally does ("*you* can't be too careful") while *Fairness* evokes thoughts about how other people generally behave ("would *they* try to be fair?"). The finding that alternative survey measures capture different aspects of social capital has important implications for measurement of social capital and for policy evaluation. For example, cooperation preferences are likely to be more stable and more difficult to influence than beliefs about cooperativeness in society.[1] Thus, to reduce tax evasion, traffic rule violations or bribery, it may be easier to correct pessimistic beliefs about other peoples' compliance with cooperation norms than attempting to shape deep preferences for honesty and compliance in the population.

Our paper contributes in several ways to a recent stream of research combining survey and experimental measures of social capital. First, we relate *Trust* to cooperation behavior while the literature has focused almost exclusively on behavior in experimental trust games (notable exceptions are Ahn et al. 2003, Gächter, Herrmann and Thöni 2004). This focus on trust experiments in the literature is surprising given that "social capital" is a multifaceted concept (Dasgupta and Serageldin 1999), and that most definitions of social capital involve notions of trust and cooperation. In fact, many contributors to the economics literature see trust and cooperation as intimately related concepts (e.g. Knack and Keefer 1997, La Porta et al. 1997). In social psychology, the notions of trust and cooperation have long been thought to be closely related. For example, Yamagishi (1986: 111) argues that "mutual trust is the key to actual cooperation". The public goods game used in this study is played in groups and may therefore better reflect important aspects of everyday cooperation problems which are often multilateral rather than bilateral as in the experimental trust game.[2]

Second, we provide strong evidence that survey measures of social capital are significant predictors of cooperation behavior in the Danish population. The literature finds rather mixed

[1] Consistent with this view, Naef and Schunk (2010) report that prior experience of untrustworthy behavior affects trust in the trust game and that this effect is mainly driven by changes in peoples' beliefs over others' trustworthiness. When controlling for changes in beliefs, they find only a weak effect of prior exposure to untrustworthiness on trust, which indicates that beliefs are likely to be more easily influenced than other components of trusting behavior such as preference parameters.

[2] An additional concern with using trust games is that first-mover choices in the trust game may not only reflect genuine trust but may also be affected by risk attitudes (Karlan 2005), altruism and reciprocity (Cox 2004), and betrayal aversion (Bohnet et al. 2008).

results when relating survey and experimental measures of social capital. For example, Glaeser et al. (2000) find that *Trust* has no predictive power for trust as measured in the trust game but it predicts trustworthiness in a sample of students at Harvard University. In contrast, Fehr et al. (2003) find a relation of survey-measured trust to experimentally measured trust but not to trustworthiness in a representative German sample. Sapienza, Toldra and Zingales (2007) find that survey trust predicts trust in a sample of MBA students at the University of Chicago. Yet, Bellemare and Kröger (2007) do not find a significant relation either to trust or trustworthiness in a Dutch sample. When relating survey trust to cooperation behavior, results are equally mixed. For example, an early study by Yamagishi (1986) finds that "high-trustors" contribute more than "low-trustors" in a sample of Japanese subjects, while Ahn et al. (2003) find no relation between a survey measure of trust and cooperation behavior in a sample of US students. Gächter et al. (2004) find that *Fairness* is related to cooperation behavior in a sample from Russia and Belarus. While these studies are difficult to compare due to numerous differences in protocol, subject pool and sample size, the mixed results may well be due to cultural differences. For example, Holm and Danielsson (2005) find that survey measures of trust predict trust in an experiment in Sweden but not, using the same protocol, in Tanzania.

Third, our findings suggest that different survey measures of social capital capture different determinants of cooperation and, thus, of social capital. More specifically, we find that *Trust* is related to cooperation preferences but not to beliefs about cooperation, while it is the other way around for *Fairness*. We are able to disentangle these two channels because we measure individual choices, beliefs and preferences along with attitudes using two versions of the public good game.[3] First, we ran a standard one-shot cooperation game which we refer to as the Standard game. In this game, participants are endowed with money, approximately $10. Participants are anonymously matched into groups of 4 and simultaneously decide how much to contribute to a common project. All contributions are doubled and equally shared among the 4 participants. Not to contribute is therefore the individually money-maximizing choice, while contributing the total amount is the efficient choice since each dollar contributed increases total group earnings by $2. Participants also indicate their expectation about the average contribution of others. In the second game, referred to as the Strategy game below (developed by Fischbacher, Gächter and Fehr 2001), participants provide a complete

[3] The need to disentangle the causal channels, but also the difficulties in doing so have been recognized by many contributors to the literature. For example, Putnam (2001: 137) notes that "The causal arrows among civic involvement, reciprocity, honesty, and social trust are as tangled as well-tossed spaghetti. Only careful, even experimental, research will be able to sort them apart definitively."

contribution schedule conditional on the contribution choices of others. That is, they decide to contribute *a*, *b*, *c given that* others on average contribute *x*, *y*, *z*. Thus, beliefs about the average contributions of others do not matter for contributions in the Strategy game by design. Other large-scale studies have not been able to distinguish between the preference and belief channels of cooperation. The closest match to our study in this respect is Sapienza et al. (2007). In contrast to our results, these authors find that *Trust* captures the belief-based component but not the preference-based component of behavior in trust games.[4] However, our finding is broadly in line with Gächter et al. (2004) who show that *Fairness* is related to cooperation behavior, and with Fehr et al. (2003) who find that the trust question remains significant for explaining trust behavior even when controlling for beliefs about the money sent back by second movers (i.e. beliefs about others' trustworthiness).

Our study uses a sample of 1488 subjects, which is unusually large and includes people from all walks of life in Denmark. Laboratory studies often use convenience samples of students which tend to be rather homogenous and do therefore not allow the researcher to capture heterogeneity in behavior and its relation to socio-economics and attitudes. This is possible in large-scale studies with heterogenous samples, and our sample is ideally suited for this purpose.[5] A potentially important advantage of a large and heterogeneous sample for our purposes is that beliefs and actions are less likely to be correlated due to "extrapolation" of one's own behavior to others. Sapienza et al. (2007) argue that this is more likely to happen in relatively homogenous samples such as groups of students recruited from within a given University.

The experiment is implemented as an "artefactual field experiment" (Harrison and List 2004) by running our experiment and survey over the internet rather than in face-to-face interaction (as is the case, for example, in the World Values Survey, Glaeser et al. 2000 or Fehr et al. 2003). Using the internet allows participants to make choices and give responses in their habitual environment (e.g. at home[6]) and the internet could arguably be seen as a more

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4 However, the studies are not directly comparable because of differences in experimental protocol (they use a trust game) and subject pool (they use a relatively homogenous student sample). In addition, their regression analysis does not include *Fairness*, which makes it hard to compare the results. Comparing the results by Sapienza et al. (2007) to our results is also difficult because they use in many specifications a measure for unconditional cooperation as a control, which is exactly what *Trust* measures according to our results.

5 Other large-scale studies are, for example, Fehr et al. (2003) with n = 429, Bellemare and Kröger (2007) with n = 499, Sapienza et al. (2007) with n = 508, and Gächter et al. (2004) with n = 782 participants.

6 Denmark has the highest broadband penetration in the world (source: EU Commission's Progress report on the single European electronic communications market 2007,13th report), and daily usage of the internet, e.g. for internet banking, is very common.

natural environment for economic experiments, as most people frequently use the internet for everyday economic transactions such as e-banking and online shopping. Taken together, the internet may help reducing the perceived artificiality of the situation while maintaining a high level of experimental control. Using the internet also guarantees perfect anonymity between subjects. The perfect anonymity and the one-shot nature of our experiment are particularly apt to capture what is sometimes called "thin" trust (i.e. trust towards a "generalized other" in contrast to "thick" trust in repeated interaction within a social network, see e.g. Putnam 2001: 136. See Andreoni 1988 for the effects of repeated interaction between "partners" or "strangers"). The closest match to our study in this respect is Bellemare and Kröger (2007) who use the Dutch Center Panel which is run over computer or TV with a set-up box and people make choices in the habitual environments.

The paper proceeds as follows. Section 2 provides a brief description of the relevant parts of our experimental design and procedures. Section 3 reports results. We first show that our survey measures of social capital are significantly related to socio-economic variables such as age, income, education and gender. Second, we relate *Trust* and *Fairness* to beliefs and behavior in the Standard game. We show that contributions in the Standard game are positively related to beliefs and that both *Trust* and *Fairness* explain contributions, controlling for socio-economics. However, only *Trust* is found to be directly related to contributions while *Fairness* is indirectly related to contributions through beliefs. Third, in the Strategy game, we find that most participants are conditional cooperators, while only few are free riders. The incidence and strength of conditional cooperation is explained by *Trust* to some extent but not by *Fairness* or socio-economic variables. Section 4 summarizes and discusses our results, including a demonstration that *Trust* is more stable over time than *Fairness* in recent waves of the World Values survey. This finding supports our interpretation that *Trust* measures relatively stable preferences rather than more fickle beliefs.

2. Design and Procedures

The data reported in this paper[7] comes from two main parts. In the experimental part, participants play two public goods games in sequence without feedback. In the survey part,

[7] The overall experiment had 6 treatments with random allocation of participants to treatments. This paper reports results only from the treatment (Give, Standard). Details about the recruitment procedures, participation, and the design of the experiment (including screenshots) can be found at in the supplementary online materials which can be downloaded from the authors' personal homepages.

participants respond to two survey questions supposed to measure social capital, and report socio-economic data.

The first public goods game (the Standard game) serves to elicit cooperation choices and beliefs. Subjects were randomly assigned to groups of 4 and endowed with 50 Danish Kroner (Dkr.), worth about $10. They could contribute an integer number of Dkr. between 0 and 50 to a public good. The total amount contributed in a group was doubled and shared equally among group members. That is, for each Dkr. a player contributed to the public good he or she earned half a Dkr. while the group as a whole earned Dkr. 2, creating a conflict between individual and collective rationality. After they had made their contribution choices, we elicited beliefs about the other group members' contributions. Participants had to indicate a belief about the average contribution of the other three group members. Participants were rewarded for belief accuracy using the quadratic scoring rule.[8]

The second game (the Strategy game) served to elicit cooperation preferences. The Strategy game had the same parameters and payoffs as the Standard game but this time, contribution decisions were elicited conditionally on the average contribution of the other three subjects in the group (following Fischbacher et al. 2001). More specifically, participants received another endowment of Dkr. 50 and they knew that they were randomly re-matched to new groups of 4 participants. All subjects indicated an unconditional contribution and a conditional contribution. The latter is a complete contribution schedule for all possible levels of average contributions by the other 3 subjects rounded to multiples of Dkr. 5. Such a conditional contribution strategy consists of 11 contribution decisions, one for each average contribution by the other 3 subjects of Dkr. 0, 5, 10,…, or Dkr. 50. A random draw then selected one subject in each group to be the conditional contributor. For all other subjects the unconditional contribution determined payoffs while the chosen subject contributed according to the average of other group members' unconditional choices and to her contribution strategy.[9]

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[8] Participants received an additional payment in Dkr. of $10 - 0.004\, d^2 \geq 0$, where d is the difference between the belief and the true value.

[9] This procedure was common information among the participants. One might worry that cooperation choices in the Standard game spill over to the measure of cooperation preferences in the Strategy game such that the preference measure is contaminated by actual choices. Fischbacher and Gächter (forthcoming) show in a recent paper that this concern is unwarranted. They find that the Strategy game yields the same measure irrespective of whether participants played the Standard game before or after the preference elicitation.

In the survey part, subjects responded to two questions measuring attitudes towards trust and fairness. To ensure comparability with previous studies, the wording of the questions was taken from the Danish version of the World Values Survey.[10] The questions are:

Trust: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Possible answers were coded as 1 if the answer was "most people can be trusted" and as 0 if the answer was "can't be too careful";

Fairness: "Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?" Possible answers range from 1: "would take advantage of you" to 10: "would try to be fair".[11]

Furthermore, subjects took part in an incentivized risk elicitation task and completed the cognitive reflection test proposed by Frederick (2005).[12] Finally, subjects also filled in a questionnaire, providing, among other items, information about age, gender, income and education.

We recruited subjects in collaboration with Statistics Denmark (the statistics agency of Denmark). Statistics Denmark drew a random sample from the Danish population (aged 18-80) and sent out letters in May 2008 by regular mail, using the official agency letterhead. The recipients of the letter were invited to participate in a scientific experiment organized by the Center of Experimental Economics (CEE) at the University of Copenhagen in which money could be earned. The letter explained that all recipients were randomly selected from the Danish population, that the earnings from the experiment will be paid out via electronic bank transfer, and that choices are fully anonymous between subjects and between subjects and the researchers from CEE. It was possible to maintain anonymity because participants logged into the CEE webpage using a personal identification code, the key of which was only known to Statistics Denmark.

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[10] http://www.worldvaluessurvey.org/

[11] Participants also had the option to answer both questions with "don't know / don't want to answer". Only 3 percent of participants chose not to answer at least one of the questions.

[12] The risk aversion elicitation task was a modified version of the one used in Tanaka, Camerer and Nguyen (2010). Subjects were presented with a list of 10 choices between two lotteries. Each lottery had two possible outcomes and to make it as comprehendible as possible, each outcome had a 0.5 probability of being realized. The paired gambles were constructed and presented in such a way that a risk neutral individual would start choosing the games presented to the left and then switch to the gambles to the right as they moved down the list. The point where the subject switched provides information about his or her risk preferences; a later switch point indicates a higher degree of risk aversion. The cognitive reflection test is a short three-question tested aimed at capturing the individuals' ability or disposition to reflect on a question and resist reporting the first response that comes in mind. Frederick (2005) shows that the test is predictive of subjects' behavior in a wide range of decision tasks. See the online materials, available at the authors' homepages, for more information.

When participants logged into the webpage, they were provided with detailed instructions which were carefully designed for easy comprehension. For example, the written instructions were supplemented by graphical illustrations of the incentive structure (see figure A1 in the appendix). Before subjects made their choices, they had to answer a series of control questions. Throughout the experiment subjects had access to page-specific help screens and could at any stage go back to review the instructions. Subjects also had access to a profit calculator (see figure A2) to explore the relation between the payoffs and the contributions of all group members. In addition, participants were offered further assistance via phone or e-mail.[13]

Participants did not receive feedback about other participants' decisions until the very end of the experiment when they were individually paid out. Counting from the date they received the invitation letter, they were given one week to complete the experiment. During that week they could exit and re-enter the experiment as many times as they wanted. After the experiment closed, subjects were matched into groups and payoffs were calculated. Thereafter, participants could return to the website for feedback about the experimental outcome in their respective groups and their earnings. Participants were asked to state their bank account number and earnings were paid out via electronic bank transfer.

3. Results

Our sample consists of 1488 subjects, and contains all subjects that completed the cooperation games and the *Trust* and *Fairness* questions. For the regression analysis we also make use of an additional set of socio-economic control variables which reduces the sample since it was voluntary for subjects to provide this information. Our subject pool is highly heterogeneous and captures a lot of the underlying variation of the Danish population with respect to important socio-economic variables.[14] All age and educational groups are well represented, although the highly educated, the high-income earners, and middle-aged people are somewhat overrepresented.

For our estimations we use two sets of control variables. A small set contains age and gender. Slightly more than half of the 1488 participants are male (51.7 percent) and the age of the

[13] The median participant spent about 20 minutes to complete the Standard and the Strategy game, and it took a few additional minutes to fill in the questionnaire data used in this paper.

[14] See Table A1 in the appendix for a description of the socio-economic characteristics of our sample and a comparison with the entire Danish population.

participants spans from 18 to 80 years, with an average of 46.4 and a standard deviation of 14.3 years.[15] A larger set of controls contains information about education, salary, risk aversion and their score in the cognitive reflection test. We asked for participants' education on a four point scale. Participants with basic schooling (up to 10 years of schooling, 8 percent of the sample) are our baseline category in the regression analysis below. The categories comprised those with degrees from high school and vocational school (25.3 percent, variable *Education 1*), those with tertiary education up to 4 years (47.7 percent, *Education 2*), and those with a longer tertiary education of at least 4 years (16.5 percent, *Education 3*). Participants are sorted into three groups of about equal size by income. *Low income* is set equal to one for participants in the bottom group, and *High income* is set to one for those in the top income group. For the risk aversion task we used the row at which they switched as an indicator of their risk aversion (average switch point 5.14; standard deviation 3.11). Subjects that switched back and forth are excluded from the sample. We also included a variable indicating the number of correct answers in the cognitive reflection test (on average subjects answered 1.46 out of the three questions correctly; standard deviation 1.11). When including the controls of the large set we lose part of the observations, either because the participants did not answer the questions or did it inconsistently (the risk task).

Denmark is placed among the countries with the highest trust level according to the World Values Survey. We also find that a large share, 90.1 percent of the respondents, say that "most people can be trusted" and the average response to the *Fairness* question is 7.75 on a ten point scale. The two measures are distinct but positively correlated (Spearman's rank correlation: $\rho = 0.326$, $p = 0.000$).[16]

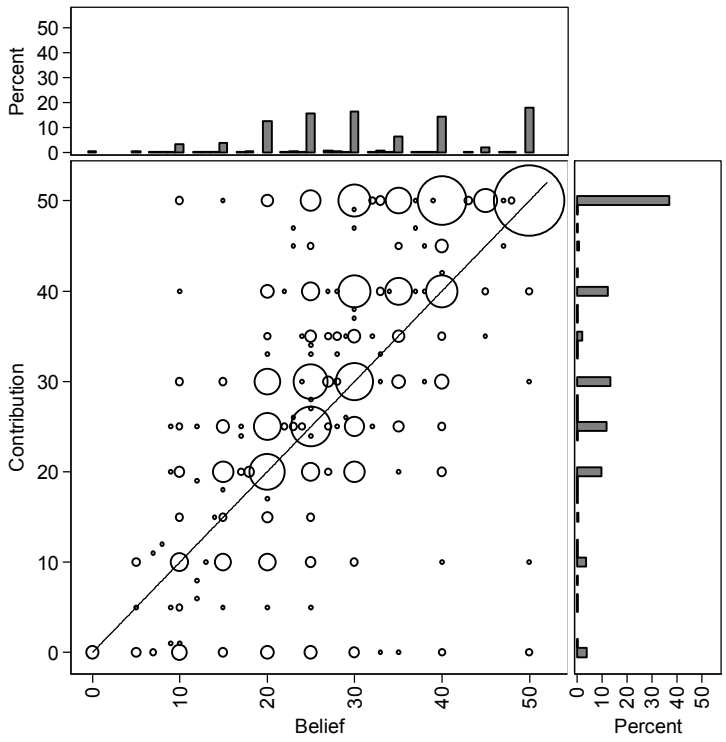
3.1 Relating *Trust* and *Fairness* to behavior in the Standard game

This section shows that beliefs are the main driver of cooperation behavior in the Standard game and that both *Trust* and *Fairness* are positively related to cooperation behavior. However, we show that *Fairness* is indirectly related to behavior through beliefs, while *Trust* is directly related to cooperation behavior.

Figure 1: Relation of contribution choices and beliefs in the Standard game

[15] One participant indicated an age of ten.

[16] This is also the case in the World Values Survey data. In wave 4 of the WVS, the Spearman rank correlation test between *Trust* and *Fairness* yields: $\rho = 0.606$; $p = 0.000$.



Top panel: Histogram of the beliefs. Right panel: Histogram of the contributions. Center panel: Bubble plot showing the relation between beliefs and contributions. Bubble size corresponds to the number of observations (n = 1488).

Figure 1 summarizes the relation between contribution choices and beliefs in the Standard game. The right panel of the figure shows a histogram of the contributions. The modal choice is full contribution (Dkr. 50), and focal contributions like multiples of Dkr. 5 account for almost all contributions. Average contributions are Dkr. 35.0 (70 percent) with a standard deviation of Dkr. 14.6. The top panel of the figure shows a histogram of beliefs about contributions by others. The average belief was Dkr. 31.8 with a standard deviation of Dkr. 12.0. The bubble plot in the center panel of figure 1 shows that there is a clear positive relation between contributions and beliefs. This finding is in line with Fischbacher and Gächter (2010) and Dufwenberg, Gächter, Henning-Schmidt (2008). However, in contrast to these studies we find that subjects tend to contribute more than they believe others to contribute (note that the mass of observations is above the 45 degree line in figure 1).

Table 1 provides results for the relation of *Trust* and *Fairness* to beliefs and contribution choices in the Standard game. Columns (1) and (2) show the results of OLS estimates explaining beliefs by trust and fairness, using either only age and gender or the larger set of control variables.[17] Columns (3) to (6) show how *Trust* and *Fairness* relate to contributions.

[17] Since the dependent variables *Belief* and *Contribution* are censored in [0,50] we also ran Tobit estimations with similar results (see Table A2 in the appendix).

Columns (3) and (4) explain cooperation choices excluding beliefs, columns (5) and (6) including them.

Columns (1) and (2) show that beliefs are not significantly related to *Trust* but are strongly related to *Fairness*. Thus, people who expect others to be fair also believe that others generously contribute to the public good. The coefficient estimate for *Fairness* in (1) implies that subjects who express full confidence in others' fairness hold beliefs that are about Dkr. 6.1 higher than subjects who are certain that others would take advantage of them. The estimated effect is even stronger when we add the additional controls for income, education, risk preferences and the cognitive reflection test score in (2). Here the estimate amounts to Dkr. 8.1 between the lowest and highest *Fairness* score. The demographic variables also explain some of the variance in beliefs. In particular, we find that female subjects express significantly lower beliefs. This effect loses significance once we add the additional controls. The effect of age is nonlinear. The coefficient estimates for *Age* and *Age squared* show that age effects are inverted U-shaped, with a maximum at the age around 48 to 52. While the effect of *Fairness* and some of our demographic controls is significant, it should be noted that all variables taken together account only for a small portion of the observed variance in beliefs which is in line with findings from related studies (e.g. Gächter et al. 2004).

Columns (3) and (4) show that contributions are positively related to *Trust* and *Fairness*. In particular, column (3) shows that trusting participants contribute about Dkr. 2.7 more than non-trusting participants. The effect of *Trust* loses significance when we use the additional controls. The effect of *Fairness* on contributions is of similar order of magnitude as the effect on the beliefs. Participants with full confidence in others' fairness contribute about 16 to 18 percent (Dkr. 5.8 to 6.5) more than those who think that others will take advantage of the situation if they get a chance. The influence of our demographic controls on contributions mirrors the estimates for the beliefs. Gender effects are significant as long as we do not add the additional controls,[18] and age has an inverted U-shaped influence on contributions. That is, contributions rise in age until they reach a maximum at age of about 46 to 49, and fall thereafter.[19]

[18] The experimental literature on gender effects in public goods games finds varying results (see Croson and Gneezy 2009 for a survey). For example, Gächter et al. (2004) find no effects, Nowell and Tinkler (1994) find that all-female groups are slightly more cooperative than all-male groups. Andreoni and Vesterlund (2001) and Solow and Kirkwood (2002) find no unambiguous gender effects. Bellemare and Kröger (2007) find that women exhibit significantly higher trust levels than men in their experimental trust games.

[19] Bellemare and Kröger (2007) report similar age effects for their trust games.

Table 1: Determinants of Beliefs and Contributions

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable					
	Belief		Contribution			
Trust	0.718	-1.594	2.775**	1.845	2.109**	3.332***
	(1.114)	(1.576)	(1.359)	(1.911)	(0.883)	(1.221)
Fairness	0.683***	0.905***	0.644***	0.717**	0.010	-0.128
	(0.201)	(0.274)	(0.245)	(0.332)	(0.160)	(0.213)
Belief					0.928***	0.933***
					(0.021)	(0.026)
Female	-2.343***	-1.304	-2.284***	-0.419	-0.109	0.797
	(0.623)	(0.897)	(0.760)	(1.087)	(0.496)	(0.695)
Age	0.400***	0.443*	0.571***	0.653**	0.200**	0.240
	(0.122)	(0.251)	(0.148)	(0.304)	(0.097)	(0.195)
Age squared	-3.887***	-4.570	-5.887***	-7.034**	-2.279**	-2.770
	(1.301)	(2.840)	(1.587)	(3.443)	(1.034)	(2.203)
Controls	No	Yes	No	Yes	No	Yes
Constant	17.613***	20.666***	15.988***	14.654**	-0.360	-4.628
	(2.921)	(5.648)	(3.564)	(6.847)	(2.343)	(4.406)
F-test	9.1	2.7	8.8	2.2	356.1	104.5
Prob > F	0.000	0.001	0.000	0.010	0.000	0.000
R2 adjusted	0.027	0.023	0.026	0.016	0.589	0.598
N	1488	904	1488	904	1488	904

The table shows OLS estimates for *Belief* and *Contribution* in the first experiment. Dependent variable is *Belief* or *Contribution* in the first experiment, censored at 0 and 50. Independent variables are *Belief*, a dummy for *Trust* and the *Fairness* score. Further controls include a gender dummy *Female*, the *Age* of the participants, as is and squared. *Controls* contains variables for education, salary, risk preferences, and the score in the cognitive reflection test. The figures reported are coefficients, with corresponding standard errors are given in the parentheses.; * denotes significance at 10 percent, ** at 5 percent, *** at 1 percent.

Columns (5) and (6) of table 1 show estimates of contribution choices when participants' beliefs are included as explanatory variable. Accounting for beliefs dramatically affects results.

First, it increases the share of the explained variance from about 2 percent in (3) and (4) to around 60 percent in (5) and (6). The coefficient for *Belief* is close to unity and highly significant. Thus, beliefs about other participants' contributions are a very strong predictor for contribution choices. This finding underscores the visual impression from figure 1 and lends support to the importance of conditional cooperation discussed in more detail in the next section.

Second, and more important for our purpose, is the differential effect of beliefs on the coefficients of *Trust* and *Fairness* in columns (5) and (6). *Fairness* now has no explanatory power at all, indicating that the expected fairness of other people only indirectly affects behavior in the Standard game. That is, the effect of *Fairness* on contributions is belief-

mediated. Accounting for beliefs in the regression has different consequences in the case of *Trust*. While the effect of *Trust* on beliefs was insignificant [see (1)], the effect on contributions is strong in (3) and survives the inclusion of the belief variable in (5) and (6). Thus, *Trust* does not seem to capture beliefs about others' behavior but rather about participants' own behavior. In the Appendix we provide two robustness checks for the results reported in Table 1. Table A2 reports OLS models using either *Trust* or *Fairness* as explanatory variables. Table A3 reports the same models as Table 1 but uses Tobit estimations.

Third, we note that the age effects identified in (3) and (4) lose their significance once *Belief* is included as an explanatory variable in (5) and (6). The reason is that age is strongly related to beliefs as seen in (1) and (2) indicating that people around the age of 45 contribute more than others because they are more optimistic about other peoples' contributions. The coefficients for female gender become positive but remain insignificant. Education tends to increase contributions but income does not affect contributions in any systematic way.

3.2 Relating *Trust* and *Fairness* to behavior in the Strategy game

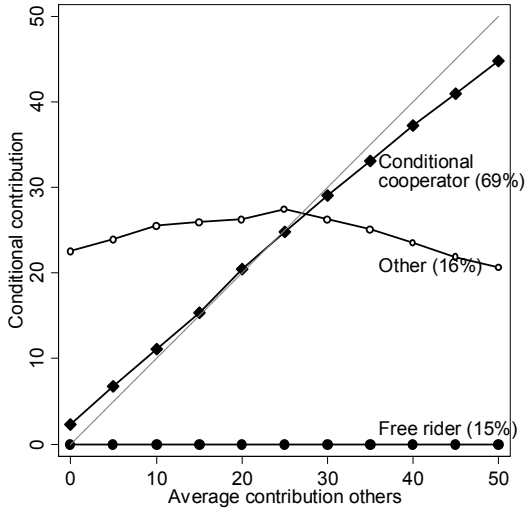
Cooperation in the Standard game is driven by preferences and beliefs. Our results from the Standard game suggest that the *Fairness* question captures beliefs while the *Trust* question captures preferences for contributing. Our Strategy game allows us to test this claim in more detail. The Standard game offers only limited information to identify preferences for contributing because we observe only one contribution decision for each participant. The Strategy game, in contrast, is designed to identify contribution strategies rather than single actions. We conclude from our analysis of the Strategy game below that the *Trust* question indeed measures preferences while the *Fairness* question measures beliefs.

A strong majority of 69 percent of our participants are Conditional cooperators according to the classification developed by Fischbacher et al. (2001). As suggested by the name, conditional cooperators condition their contribution on the other group members' contributions. Their willingness to contribute to the common project increases with the contributions of the other members of the group. More specifically, a participant is classified as a conditional cooperator if his contribution is weakly increasing in the average contribution of the other group members (with at least one strict increase). A participant is also classified as conditional cooperator if the correlation between the participant's contributions and the

average contributions of the other group members is significant and positive.[20] Participants who contribute Dkr. 0 at all levels (15 percent) are called *Free riders*.[21] The remaining 16 percent do not fit into either category. For convenience, we call them *Other*.[22]

Figure 2 shows average contribution profiles for each preference type. The horizontal axis shows the average contribution of the other group members and the vertical axis the conditional contribution.

Figure 2: Cooperator types



The figure shows average contribution in Dkr. conditional on average contribution by other group members, by cooperator type. The diagonal indicates the locus of a perfect match between own and others' average contribution (n = 1488).

Tables 2 and 3 investigate how *Trust* and *Fairness* relates to cooperation preferences in two ways. First, we use the cooperator types as defined above and ask what determines whether a person is classified as *Conditional Cooperator*, relative to the other two categories. Second, we construct a measure of the "strength" of conditional cooperation and ask to what

[20] We adapt the classification of Fischbacher et al. (2001) to account for the fact that we observe fewer data points per participant. In Fischbacher et al. the subjects indicated their conditional contribution for 21 contribution levels, while we have only 11 observations per subject. The original criterion of a 1-percent significant Spearman rank correlation is thus much more restrictive in our case. We therefore reduced the requested significance level to 10 percent. For the vast majority of observations the classification does not depend on the specific significance level. If we apply the 1-percent criterion to our data, we classify 67% as *Conditional cooperator*s. Interestingly, many conditional cooperators (45.8 percent) perfectly match the other group members' average.

[21] Our classification results are comparable to those found in other studies. Variation in the shares is likely to be due to differences by country. For example, the shares for *Conditional cooperators* and *Free riders* are in Fischbacher et al. (2001) 50% and 30% for Swiss subjects, in Herrmann and Thöni (2009) 56% and 6% for Russian subjects, in Kocher et al. (2007) 81% and 8% for US subjects, in Burlando and Guala (2003) 76% and 9% for Italian subjects.

[22] Classifications often also include a third type, the Triangle contributors, who, in response to increasing contribution levels, increase their contribution up to some maximum and decrease it afterwards. About a third of the subjects we classify as *Others* fall into this category.

extent it can be accounted for by *Trust* and *Fairness*. We find that *Trust* is significant in both cases, while *Fairness* is not. These findings from the Strategy game support our interpretation of results from the Standard game that *Trust* captures cooperation preferences.

Table 2: Characteristics of *Conditional cooperators*

	(1)	(2)
	Probit for Conditional Cooperator	
Trust	0.076	0.385**
	(0.123)	(0.171)
Fairness	-0.030	-0.026
	(0.022)	(0.031)
Female	0.126*	0.056
	(0.069)	(0.101)
Age	0.006	-0.005
	(0.014)	(0.029)
Age squared	-0.146	0.036
	(0.145)	(0.325)
Controls	No	Yes
Constant	0.689**	0.715
	(0.331)	(0.650)
Model chi-square	19.0	18.1
Prob > chi2	0.002	0.112
Pseudo R-squared	0.010	0.016
N	1488	904

The table shows probit estimates for being classified as *Conditional cooperator*. Classification is according to the conditional contribution scheme in the Strategy game. Independent variables are a dummy for *Trust* and the *Fairness* score. Further controls include a gender dummy *Female*, the *Age* of the participants and its square. *Controls* contains variables for education, salary, risk preferences, and the score in the cognitive reflection test. The numbers reported are coefficients, with the corresponding standard errors shown in the parentheses.; * denotes significance at 10 percent, ** at 5 percent, *** at 1 percent.

Table 2 shows how the type *Conditional cooperator* relates to *Trust* and *Fairness* and our socio-economic variables. The table shows probit estimates for the influence of *Trust* and *Fairness* on the probability of being a *Conditional cooperator*, with and without the additional controls. In line with the results reported in table 1, we find that *Fairness* does not predict a subject's type while we have some evidence that *Trust* is a significant predictor for being classified as *Conditional cooperator*.[23] The marginal effect of *Trust* is about 15 percentage points according to Model (2).

[23] This result is robust to estimating the influence of *Trust* and *Fairness* separately. If we remove *Fairness*, then the estimates for *Trust* is $\beta = 0.016$, se = 0.115 in Model (1) and $\beta = 0.336$, se = 0.036 in Model (2). *Fairness* remains insignificant in both models when we exclude *Trust*.

Table 3 presents results for the second way of investigating how *Trust* and *Fairness* relate to cooperation preferences. We construct a measure of the "strength" of conditional cooperation by calculating the average contribution over all 11 conditional contributions per subject and we restrict our attention to *Conditional cooperators* who account for 69 percent of our sample. The approach presented in table 3 also serves to address a potential objection to the analysis in table 2. There, we compare the type *Conditional cooperator* against a heterogeneous class of *Other* and *Free rider* types. This reference category contains a large variety of patterns, some including very high contributions. This heterogeneity in the reference category potentially blurs the results but we find that results are robust across the two approaches in tables 2 and 3.

Table 3: Relation of *Trust* and *Fairness* to strength of conditional cooperation

	Dep. var.: Av. conditional contribution	
	(1)	(2)
Trust	2.660***	3.580***
	(0.788)	(1.186)
Fairness	-0.093	-0.106
	(0.142)	(0.197)
Female	-0.598	-0.536
	(0.425)	(0.617)
Age	0.121	0.059
	(0.084)	(0.166)
Age squared	-1.168	-0.818
	(0.912)	(1.882)
Controls	No	Yes
Constant	19.974***	22.499***
	(1.960)	(3.697)
F-test	3.7	1.6
Prob > F	0.003	0.076
R2	0.018	0.031
N	1029	636

Table 3 shows OLS regressions. Dependent variable is average conditional contribution. Only data from subjects classified as *Conditional cooperator*. Independent variables are a dummy for *Trust* and the *Fairness* score. Further controls include a gender dummy *Female*, the *Age* of the participants, as is and squared. *Controls* contains variables for education, salary, risk preferences, and the score in the cognitive reflection test. The numbers reported are coefficients, with corresponding standard errors in parentheses.; * denotes significance at 10 percent, ** at 5 percent, *** at 1 percent.

Table 3 shows the results of OLS regressions explaining the average conditional contribution. In support of our conjecture that *Trust* proxies preferences we find a highly significant positive influence of *Trust* on average conditional contribution in the Strategy game in both specifications of table 3. In column (4) of table 1, we found that those who trust contribute, given their beliefs, on average between Dkr. 2.1 and 3.3 more than those who do

not. This finding is in line with the results in table 3 which show that *Conditional cooperators* who trust have average conditional cooperation schedules which are between Dkr. 2.7 and 3.6 higher than those who do not trust.

None of the other explanatory variables in table 3 are significant, meaning that *Trust* is the only variable among those considered here that explains the strength of conditional cooperation. In line with our conclusions from analyzing the Standard game, we find that *Fairness* has no systematic influence on average conditional contribution.

4. Summary and conclusions

We use data from an experiment with close to 1500 participants from all walks of life in Denmark to show that the most prominent survey measure of trust (*Trust*) is an important predictor of social capital in the guise of voluntary contributions to public goods. We contribute to the microfoundations of social capital by showing that *Trust* proxies the preference-driven component of cooperation. *Trust* is a stronger predictor of cooperation preferences than gender, age, education or income. In contrast, we find that an alternative survey measure of social capital that has recently been introduced to the World Values Survey, the *Fairness* question, primarily explains optimistic beliefs about cooperation in others. These optimistic beliefs map into increased cooperation because most participants have preferences to cooperate given that others do, i.e. because they are conditional cooperators. Apart from this belief-mediated effect, we find no direct influence of *Fairness* on cooperation.

The effects of *Trust* and *Fairness* on cooperation are statistically significant in regressions which control for socio-economic variables like age, gender, income and education. The effects we find are not only statistically significant, they are also economically relevant. For example, those who trust contribute 10 percent more than those who do not, and those who indicate full confidence in other people's fairness contribute 20 percent more than those who express minimal confidence in other's fairness. These effects are remarkably strong, both compared to findings in the literature and compared to alternative explanations. First, research in social psychology suggests that the relation between attitudes and behavior is often rather weak (e.g. Eagly and Chaiken 2003), and previous studies on the relation between survey and experimental measures of social capital find mixed effects (see introduction for a discussion and for references). Second, in line with much of the literature, we find that cooperation

behavior is mainly driven by beliefs. However, if beliefs are not accounted for in regressions, *Trust* and *Fairness* variables account for more variation than our socio-economic variables.[24]

We show that *Trust* and *Fairness* are systematically related to cooperation in a one-shot interaction with fully anonymous counterparts, i.e. in a situation without prior information about or experience with their counterparts. Thus, *Trust* and *Fairness* capture important aspects of "thin" trust towards a "generalized other" which has been found to be a relevant determinant of economic prosperity (Putnam 2001). Beliefs are likely to be particularly relevant in such anonymous one-shot interactions. After all, optimism and pessimism about others' inclination to cooperate matters most when little is known about actual cooperation. However, in everyday life, cooperation problems often loom in groups whose members repeatedly interact, as in the workplace or repeat customer relations. Based on our results, we speculate that "thick" trust which is required in this type of repeated interaction is better predicted by *Trust* than by *Fairness*. The reason is that beliefs about cooperation are adjusted to observed contributions over time and, therefore, eventually become largely irrelevant as an independent determinant of behavior.[25]

The policy relevance of the distinction of belief-driven and preference-driven social capital comes from the relative stability and malleability of the two. Economists generally believe that overly optimistic or pessimistic beliefs are easier to shape than deep preferences and policy is therefore more likely to be effective if targeting to correct overly pessimistic beliefs.[26]

We now provide a simple test for our finding that *Fairness* captures beliefs and *Trust* captures preferences by exploiting the cross-country dimension of the World Values Survey data.[27] It should be noted that our analysis below is rather preliminary and suggestive due to the limited number of countries for which data is available over time for both measures. The main reason is that the *Fairness* question has only been introduced in the two most recent waves (wave 4 and 5) and, in addition, the answer format of *Fairness* has changed from

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[24] The finding that the socio-economic variables taken together can account only for only little of the total variance is in line with, e.g. Gächter et al. (2004) and Bellemare and Kröger (2007).

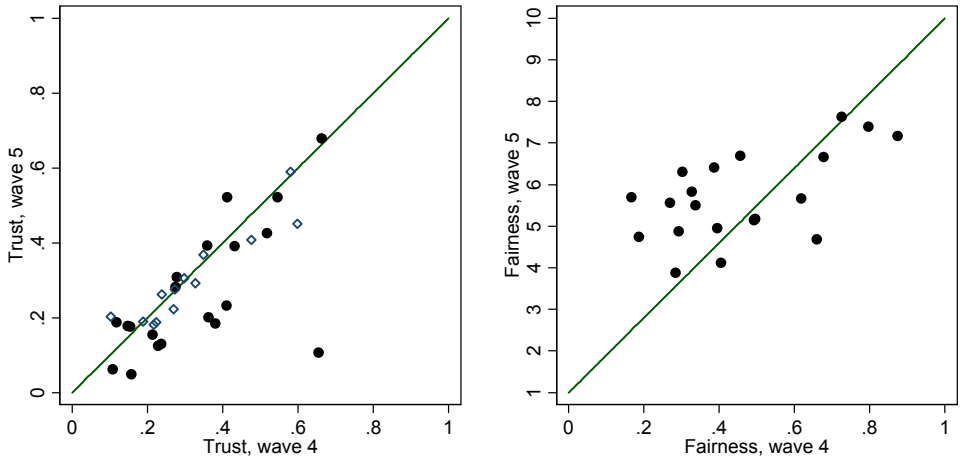
[25] This conjecture could be tested experimentally in a public goods game which is repeatedly played among the same group members. Our results suggest that *Fairness* has more predictive power for contributions in the first round than in later rounds while *Trust* should have a lasting impact in repeated games.

[26] This idea stands behind the "broken windows" theory which claims that (petty) crime is more common if signs of norm violation are highly salient. See Keizer, Lindenberg and Steg (2008) for a field experiment showing "cross-norm inhibition", i.e. that violation of one norm can induce the violation of another norm.

[27] Data from Waves 4 and 5 comes from the following sources. For Wave 4 data: European and World Values Surveys (WVS) four-wave integrated data file, 1981-2004, v.20060423, 2006. Wave 5 data: WVS 2005 official data file v.20081015, 2008. WVS Association (www.worldvaluessurvey.org).

binary in wave 4 to a ten point scale in wave 5. Information about *Trust* and *Fairness* is available for only 20 countries in both waves.

Figure 3: Stability of *Trust* and *Fairness* over time



The figure shows the relative stability of *Trust* and *Fairness* from wave 4 to wave 5 in the World Values survey for a sample of 33 (left panel) and 20 countries (right panel). Hollow symbols in the left panel stem for countries which are not present in the right panel due to missing data.

Figure 3 shows how *Trust* (left panel) and *Fairness* (right panel) relate across wave 4 (1999-2004) and wave 5 (2005-2008). Solid symbols represent the 20 countries which are present in both panels. The scatter plots indeed suggest that *Fairness* scores are more volatile than *Trust* scores. To provide a simple test, we calculate Spearman rank correlations which are invariant to different scaling of the two variables. We find that the correlation across waves is stronger for *Trust* ($\rho = 0.705$, $p = 0.000$) than for *Fairness* ($\rho = 0.467$, $p = 0.038$), suggesting that *Trust* tends to be more stable over time than *Fairness*.

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Appendix

Table A1: Representativeness of sample

	Experiment		Danish population*
	N	Fraction	Fraction
Gender			
Female	719	48.3%	50.2%
Male	769	51.7%	49.8%
Age			
18-30 years	224	15.0%	18.5%
30-44 years	443	29.8%	29.1%
45-59 years	537	36.1%	27.0%
60-80 years	284	19.1%	25.3%
Education (highest completed)			
Basic education (up to 10 years)	156	10.5%	26.3%
High school or vocational education (Education 1)	376	25.3%	45.4%
Medium tertiary education (Education 2)	710	47.7%	21.1%
Long tertiary education (Education 3)	246	16.5%	7.1%
Income			
Low Income (< Dkr. 300.000 per year)	357	34.1%	65.9%
Middle Income (Dkr. 300.000-400.000 per year)	320	30.6%	19.1%
High Income (> Dkr. 400.000 per year)	369	35.3%	15.0%

***** For gender and age, the data in the column Danish population summarizes individuals between 18-80 years of age. For education the population is restricted to individuals between 20-69.

Table A2: Determinants of beliefs and contributions

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable					
	Belief				Contribution	
Trust	2.158**		0.174		4.133***	
	(1.034)		(1.491)		(1.260)	
Fairness		0.733***		0.811***		0.835***
		(0.186)		(0.258)		(0.227)
Belief						
Female	-2.128***	-2.373***	-1.018	-1.247	-2.081***	-2.399***
	(0.622)	(0.621)	(0.898)	(0.895)	(0.758)	(0.759)
Age	0.439***	0.400***	0.534**	0.444*	0.608***	0.572***
	(0.121)	(0.122)	(0.251)	(0.251)	(0.148)	(0.149)
Age squared	-4.215***	-3.891***	-5.492*	-4.574	-6.196***	-5.903***
	(1.302)	(1.300)	(2.842)	(2.840)	(1.586)	(1.589)
Controls	No	No	Yes	Yes	No	No
Constant	20.464***	17.889***	23.606***	20.019***	18.677***	17.056***
	(2.808)	(2.889)	(5.608)	(5.612)	(3.421)	(3.530)
F-test	8.4	11.3	2.0	2.9	9.2	9.9
Prob > F	0.000	0.000	0.028	0.001	0.000	0.000
R2 adjusted	0.020	0.027	0.012	0.023	0.022	0.023
N	1488	1488	904	904	1488	1488

	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent variable: Contribution					
Trust	3.245*		2.130***		3.083***	
	(1.801)		(0.818)		(1.148)	
Fairness		0.826***		0.154		0.071
		(0.312)		(0.148)		(0.201)
Belief			0.928***	0.929***	0.931***	0.931***
			(0.021)	(0.021)	(0.026)	(0.026)
Female	-0.193	-0.485	-0.106	-0.195	0.755	0.676
	(1.084)	(1.085)	(0.493)	(0.495)	(0.692)	(0.696)
Age	0.725**	0.652**	0.200**	0.200**	0.228	0.239
	(0.303)	(0.304)	(0.096)	(0.097)	(0.194)	(0.195)
Age squared	-7.764**	-7.029**	-2.284**	-2.289**	-2.649	-2.772
	(3.433)	(3.443)	(1.031)	(1.036)	(2.193)	(2.211)
Controls	Yes	Yes	No	No	Yes	Yes
Constant	16.982**	15.403**	-0.320	0.437	-5.002	-3.227
	(6.775)	(6.802)	(2.256)	(2.323)	(4.360)	(4.392)
F-test	2.0	2.3	427.6	424.8	113.3	111.8
Prob > F	0.027	0.008	0.000	0.000	0.000	0.000
R2 adjusted	0.012	0.016	0.589	0.588	0.599	0.596
N	904	904	1488	1488	904	904

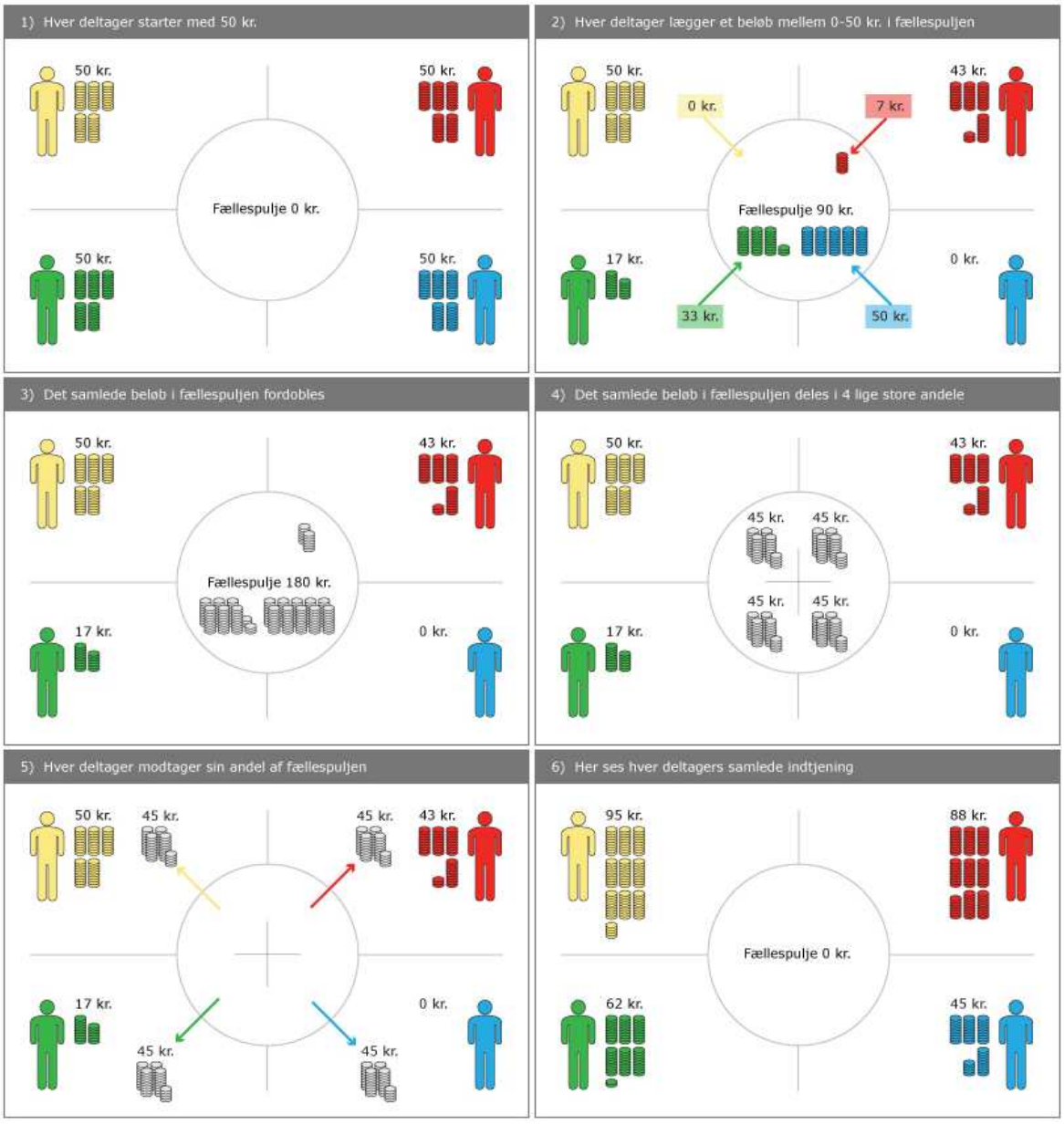
The table shows OLS estimates for *Belief* and *Contribution* in the first experiment. Dependent variable is *Belief* or *Contribution* in the first experiment, censored at 0 and 50. Independent variables are *Belief*, a dummy for *Trust* and the *Fairness* score. Further controls include a gender dummy *Female*, the *Age* of the participants, as is and squared. *Controls* contains variables for education, salary, risk preferences, and the score in the cognitive reflection test. The numbers reported are coefficients, with corresponding standard errors are given in the parentheses.; * denotes significance at 10 percent, ** at 5 percent, *** at 1 percent.

Table A3: Determinants of beliefs and contributions: Tobit estimates.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable					
	Belief		Contribution			
Trust	0.476	-2.519	3.860*	2.039	2.123	4.028**
	(1.349)	(1.959)	(2.225)	(3.309)	(1.363)	(1.980)
Fairness	0.821***	1.129***	1.063***	1.260**	0.112	0.006
	(0.244)	(0.338)	(0.407)	(0.581)	(0.252)	(0.347)
Belief					1.491***	1.539***
					(0.041)	(0.054)
Female	-2.966***	-1.849*	-4.265***	-1.434	-0.672	0.523
	(0.756)	(1.108)	(1.267)	(1.897)	(0.784)	(1.134)
Age	0.473***	0.560*	0.870***	1.095**	0.286*	0.436
	(0.147)	(0.309)	(0.246)	(0.526)	(0.151)	(0.312)
Age squared	-4.497***	-5.728	-8.910***	-11.757**	-3.168*	-4.883
	(1.579)	(3.504)	(2.638)	(5.962)	(1.628)	(3.537)
Controls	No	Yes	No	Yes	No	Yes
Constant	16.356***	19.552***	11.264*	8.983	-15.555***	-25.129***
	(3.531)	(6.966)	(5.879)	(11.815)	(3.682)	(7.138)
Sigma	14.120	14.431	22.657	23.593	13.276	13.374
Log likelihood	-5244	-3137	-4522	-2639	-3862	-2232
Chi2	45.6	33.2	41.4	24.1	1361.0	838.2
Prob > F	0.000	0.001	0.000	0.020	0.000	0.000
N	1488	904	1488	904	1488	904

The table shows Tobit estimates for *Belief* and *Contribution* in the first experiment. Dependent variable is *Belief* (Model 1 and 2) or *Contribution* (remaining Models) in the first experiment, censored at 0 and 50. Independent variables are *Belief*, a dummy for *Trust* and the *Fairness* score. Further controls include a gender dummy *Female*, the *Age* of the participants, as is and squared. *Controls* contains variables for education, salary, risk preferences, and the score in the cognitive reflection test. The figures reported are coefficients, with corresponding standard errors are given in the parentheses.; * denotes significance at 10 percent, ** at 5 percent, *** at 1 percent.

***Figure A1*:** Screenshot of graphical illustration of incentives in the Public goods game



(Translation: 1: each participant is endowed with Dkr. 50, 2: All simultaneously choose a contribution between Dkr. 0 and 50, 3: all contributions are doubled and 4: equally shared among participants, 5: Each participant gets his share, 6: final earnings)

Figure A2: Screenshot of profit calculator
(participants could explore payoffs for each participant by typing various contributions)