Common Property Endowments in the Trust Game: Experimental Evidence from Bulgaria*

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Abstract

I report the results from a series of experiments designed to investigate behavior in private property and common property institutional settings. The experiments closely parallel previous studies of the trust game and were conducted with participants drawn from non-student populations in Bulgaria in the Fall of 2007. I find that levels of trust are diminished by common property institutions among among those less than 33 years old but not among older subjects.

Keywords: Property Rights, Trust, Experiment, Bulgaria

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1 Introduction

There is now a large body of political science research investigating the governance of natural resource systems (National Research Council, 1986, 2002; Ostrom, 1990, 2005). While many different types of governance arrangements have emerged across the world, much of the resource governance literature focuses on common property regimes. It has been well demonstrated that common property institutions are often, although not always, able to sustain long enduring resource systems (Ostrom, 1990; Agrawal, 2001; Dietz, Ostrom and Stern, 2003; Ostrom and Nagendra, 2006; Coleman, 2009). However, there is still a relative paucity of research demonstrating that common property rights are the cause of successful governance. Social scientists and development experts still debate the functions and limitations of different property rights regimes on human behavior, successful resource governance, and economic development (Firmin-Sellers, 1995; McKean, 2000), and despite large expenditures to change property rights arrangements in many countries the effects of doing so remain uncertain (Duch and Palmer, 2004). For example, resource decentralization, which has been implemented in many countries in the past 20 years, can be viewed as an attempt to establish common property where state property previously existed; but the evidence of successful resource decentralization is mixed at best (Andersson, Gibson and Lehoucq, 2004).

The difficult task facing property rights scholars is to evaluate the effects of property rights by constructing valid counterfactuals for different property rights systems. How would governance outcomes differ if property rights were to change for a given resource? In the field, it is often difficult to establish counterfactuals of property rights arrangements which have taken many years, and sometimes centuries, to evolve (Netting, 1981). Experimental methods are appropriate to construct such a counterfactual because in the laboratory one can randomly assign different property rights systems to groups of participants while controlling for other factors that might influence behavior. The control that can be established in an experimental lab presents a unique opportunity to isolate the effects property rights on behavior.

In this paper I use common property to refer to "a property rights arrangement in which a group of resource users share rights and duties toward the resource (McKean, 2000, p.30)." The terms common, state, and private property, however, are very general concepts. Resources have property rights bundles (Schlager and Ostrom, 1992); some rights to use the resource may be privately held while others may be commonly held by a group of people or by the state (Alchian and Demsetz, 1973; McKean, 2000). The particular rules associated with any particular use of a resource may make a large difference in how the resources is provided, produced, and used. Note that common property is a characteristic of the institutions used to manage the resource and not a characteristic of the resource itself (McKean, 2000). Common property can be used to manage private, public, toll, or common-pool resources.[1] The traditional common-pool resource experiments reported in Ostrom, Walker and Gardner (1992) and Ostrom, Gardner and Walker (1994) use common-pool resources managed with common property rights. In this paper I assess private resources managed with private property rights versus private resources managed with common property rights. It is necessary to keep the characteristic of the resource constant while varying the property regime in order to measure the effect of property.

The current paper is based upon research by Cox et al. (2009) who test if there is a difference in behavior in an experimental laboratory where they carefully control the property rights structures that subjects face. While that paper is an important first step, this paper extends that analysis by examining differences between common property arrangements and private property arrangements in a different political and cultural context (Firmin-Sellers, 1995). I report on a series of experiments conducted in Bulgaria in Fall 2007. These experiments contained two variations of the Trust Game (also known as the investment game) developed by Berg, Dickaut and McCabe (1995). In half of the experiments subjects were endowed with a resource under private property conditions (the Private Property Trust Game), as in the original Berg, Dickaut and McCabe experiments and in the remaining experiments subject-pairs were endowed with a resource under common property conditions

(the Common Property Trust Game).

In the standard Private Property Trust Game, the first mover, endowed with a private good, makes a decision that can create a surplus to be shared with a second mover. Each money unit sent to the second mover by the first mover is tripled by the experimenter. The second mover is given full ownership and full authority over the distribution of the first mover's investment and the resulting surplus. The first mover might send some positive amount if they trust that the second mover is trustworthy and will reciprocate the first mover's trust or if they derive personal satisfaction from giving to the second mover (Cox, 2004; Cox and Deck, 2005; Ashraf, Bohnet and Piankov, 2006). Following Cox et al. (2009), the common property treatment is the inverse of the standard trust game. In this treatment the initial endowment is assigned jointly to the two players. The first mover has the option of withdrawing resources from a *joint fund* and destroying the surplus. Each money unit the first mover withdraws reduces the joint fund by three units. The Common Property Trust Game is isomorphic to the Private Property Trust Game; feasible choices and payoffs for the participants are equivalent in the two games.

The Nash equilibrium strategy (assuming subjects maximize their own income) for both variants of the game is zero investment and zero reciprocity. Contrary to this prediction, all studies of the Trust Game find positive trust and reciprocity (Cardenas and Carpenter, 2008). The traditional model of own-income maximization, as well as models incorporating social preferences (e.g. Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Charness and Rabin, 2002), predict no difference in behavior between these two games because outcomes are completely isomorphic. However, the model developed in Cox, Friedman and Sadiraj (2008) predicts greater trust in the private property treatment (Cox et al., 2009). The intuition behind this model is that second movers in the private property game have the most generous endowment when the first mover *sends* everything (3× the amount sent). The second mover in the common property treatment has the most generous endowment when the first mover does nothing (thus retaining the entire initial endowment). If second

movers reciprocate acts of commission (upsetting the status quo) more generously than acts of omission (upholding the status quo) then greater reciprocity is likely to occur in the private property treatment. Anticipating a greater degree of reciprocity, first movers will send more in the private property setting than they will take in the common property setting. Thus, this theory posits a fundamental difference in expectations in the two treatments that is induced by the property rights setting.

Contrary to the theory, Cox et al. (2009) find a (marginally significant) positive common property treatment effect with Indiana University undergraduate students. However, the expected effects of the common property treatment may vary according to the subject pool, depending on how different subjects perceive the game and their specific social histories. Of particular interest in this study is the experience (or lack of experience) that players have had with common property institutions in the past.

I hypothesize an interactive relationship between subject experiences with common property and the effects of induced property rights institutions on their behavior. The experiments were conducted in Bulgaria with non-student populations in order to investigate the effects of subject experience with common property (under Communism and in transition) as a basis for their behavior in the two variants of the Trust Game. Survey research suggests that young citizens in former-Communist states generally have stronger preferences for capitalist principals such as individual accountability and private property than older citizens (Duch, 1993; Miller, Hesli and Reisinger, 1994; Gibson, 1996; Kluegel, Mason and Wegener, 1999). It is possible that aggregate age-dependent preferences are driven by the fact that older citizens were adversely affected by the transition to private property institutions (such as pensioners loosing their incomes). However, an equally likely alternative is that younger citizens have very strong preferences against state and common property. If preferences for private property rights reflect citizens' expectations about how others will behave in common and private property settings, then one can make a number of theoretical predictions about subject behavior in these games.

According to Cox, Friedman and Sadiraj (2008), the relevant difference between the effects of common and private property is how first movers in the trust game anticipate the manner in which their actions will be perceived by the second mover. I hypothesize that young subjects have different expectations of reciprocity under common and private property than older subjects. Specifically, I anticipate the following two effects: (1) young subjects will be less trusting in the common property treatment than the private property treatment, and (2) young subjects will be less trusting in the common property treatment than older subjects. I do not anticipate behavioral differences in the private property treatment between young and older subjects nor differences between common property and private property for older subjects.

The findings from this research contribute to our understanding of the effectiveness of common property institutions in different contexts. Specifically, I will argue that instituting common property in Bulgaria may not be a viable way to achieve successful resource governance in the future. Similar effects might also be present in other post-Communist states which have a poor history with common property and young citizens with preferences for private property. In the following section I describe the experimental design of both treatments of the Trust Game and review the past literature. In Section 3 I describe the experimental protocols used in this paper and in Section 4 the results. Section 5 includes a discussion of the results and the final section concludes.

2 Experimental Design

2.1 A Private Property Trust Game

The structure of the Berg, Dickaut and McCabe (1995) Trust Game follows: two subjects, Type X and Type Y are each given an endowment of $10. The Type X subject moves first and must decide how much of his initial $10 endowment to send to the paired Type Y subject. Each dollar the Type X subject sends is tripled in value. The Type Y subject

then decides how much to send back to the Type X subject. The game can be solved via backward induction. The Type Y subject has no incentive to send any money to the Type X subject, because sending money back merely subtracts from Type Y's payout. The Type X player, anticipating no return payments similarly has no incentive to send anything to the Type Y player. If monetary payoffs adequately represent utility the prediction would be that the Type X player send nothing and the Type Y player return nothing. Berg, Dickaut and McCabe (1995), however, found that 30 out of 32 subjects sent some money.[2] They interpret Type X behavior as an action of trust. Type X subjects send money to Type Y subjects anticipating they will take the Type X subject's interests to heart and "do what is right" (Hoffman, 2002). This trust is an investment. The Type Y behavior, the decision to return money, has been interpreted as reciprocity (McCabe and Smith, 2001).

2.2 A Common Property Trust Game

Many replications of the trust game have been performed.[3] Cox et al. (2009) replicated the Trust Game at Indiana University, and added another treatment. Instead of each subject being endowed with an initial $10 and asking Type X students to send some portion of their endowment to be tripled, the authors gave an initial endowment to subject-pairs in a *joint fund*. The value of the joint fund was $30. The Type X subject's decision task was now to decide how much to withdraw from the joint decision fund, knowing that each dollar withdrawn subtracted $3 from the joint fund. Mathematically, this is a simple isomorphic transformation of the Berg, Dickaut and McCabe (1995) experiment. However, the endowment was framed as a joint resource rather than private (see also Andreoni, 1995). The authors found that Type X subjects in the group ownership setting trust more than Type X subjects in the private ownership setting (although only marginally significant).

2.3 The Trust Game in the Field

The trust game has also been repeated in field settings. Harrison and List (2004) review field experiments and argue that "...lab experiments in isolation are necessarily limited in relevance for predicting field behavior, unless one wants to insist a priori that those aspects of economic behavior under study are perfectly general." If student populations accurately reflect key variables for which a researcher wishes to generalize experimental findings, then field experiments are unnecessary. However, convenience samples from student populations do not reflect key characteristics of the targeted population being studied here. Specifically, the student experiments conducted in the U.S. and in Bulgaria by Koford (2003) do not capture the comparative effects of Bulgarian citizens who have lived under a Communist legacy with those who have not.

Examples of field experiments with the Trust Game include those conducted by Barr (2004) in Zimbabwe who finds similar results to those of U.S. students in the Berg, Dickaut and McCabe (1995) experiments. Karlan (2005) conducted a number of trust games with villagers in Peru and found that trust measures from the experimental game were powerful predictors of the probability that villagers would default on microfinance loans. Schechter (2007) replicated the trust game in rural Paraguay and found that subjects' risk attitudes largely accounted for the investments in the Trust Game, contrary to Eckel and Wilson (2004). Recently, Cardenas and Carpenter (2008) have reviewed the results from twelve field experiments of the Trust Game and found a trend that field experiments generally measure lower levels of trust than laboratory experiments with students.

3 Experimental Protocols

For this paper I closely follow the protocols of Cox et al. (2009). Notable deviations from their protocols are: my absence from the room (the same native Bulgarian conducted all experiments); use of leva (the Bulgarian currency) instead of dollars; a more extensive testing

of experiment comprehension of the subjects; a more extensive post-experiment questionnaire; and, most importantly a single-blind protocol commonly used in field experiments (Barr, 2004; Bahry et al., 2005; Karlan, 2005; Schechter, 2007). Among other variables of interest, the post-experiment questionnaire includes data requests for place of residence to distinguish rural from urban subjects, age, years of schooling, gender, and answers to some of the World Value Survey questions.

The following protocols were used: Sixteen participants and three alternates were recruited for the game. Upon arrival subjects signed in and received an unconditional 10 leva (approximately 8 USD) show-up fee.[4] At the beginning of the game all subjects were given an additional 10 leva with which to play the trust game. All the subjects entered a large room in a local school where in each session the same native Bulgarian experimenter read the instructions aloud and answered subject questions. All participants randomly drew an experiment identification number and filled out a comprehension survey.[5]

Each subject was randomly assigned a role as a Type X or Type Y after completing the comprehension survey (which ensured they understood payments for both Type X and Type Y subjects). Type X subjects then stayed in one room while Type Y subjects moved to an adjacent room. Type X subjects filled out a decision form indicating an amount between 0 and 10 leva that they wished to send to the Type Y subject (or take from the joint fund). Type X subjects placed their decision sheet in an envelope which was then taken to a payment room where the decisions were checked to be within the parameters of the study. The envelopes were then randomly chosen by the Type Y subjects waiting in the adjacent room. While Type Y subjects filled out their decision form indicating the number of leva they wished to return to the paired Type X subject, Type X subjects filled out the post-experiment questionnaire. Type Y decisions were placed in a separate envelope. While payoffs for each subject were calculated Type Y subjects filled out the post-experiment questionnaire. Payoffs were placed in sealed envelopes. An experimenter then disbursed payoffs to each subject in private. Details on the experiment instructions and the comprehension surveys are found in

the Appendix.

Eight sets of experiments were conducted in three Bulgarian towns. Two sessions of the Common Property Trust Game and two sessions of the Private Property Trust Games were conducted in Plovdiv, the largest town. One session of the Common Property Trust Game and one session of the Private Property Trust Game were conducted in each of the two other small towns. Native Bulgarian research assistants recruited subjects in each town. Subjects were told they would earn between 10 and 50 leva during the experiment which would last about one and a half hours. Experimental sessions in the small towns were held in local high schools, while experiments in Plovdiv were held at the Faculty of Agriculture Economics at Plovdiv University.

Subjects were not randomly sampled from the general population of these towns. School directors helped recruit some subjects for each session with the instruction that subjects could not be related to each other, could not know each other, and had to be over 18 years old. The remaining subjects were recruited from local contacts that were not familiar with experimental protocols or objectives and were given the same instructions on recruiting. Subjects arrived independently from each other and did not appear to know each other.

The payoffs of the field experiments mentioned in the previous section range from one-half to two days wage. The average payment in the Bulgaria experiments was about 1.5 days wage according to the reported monthly income of the participants.

4 Results

4.1 Descriptive Statistics

To make data comparable across treatments, I code a variable X as the decision of the amount sent by the Type X to the Type Y in the Private Property Trust Game and as ten minus the decision of the amount to take in the Common Property Trust Game. Thus, higher values of X indicate a greater willingness to trust in both games. Summary statistics for the

Type X subjects are reported in Table 1 and for the Type Y subjects in Table 2. There is a wide variation in age, schooling, and experimental behavior. Tables 1 and 2 report means, standard deviations, and number of observations for each variable. Four experiment sessions, consisting of groups of eight Type X and eight Type Y subjects, were conducted under each treatment, for a total of 32 observations for each subject type under each treatment.

Also reported in Tables 1 and 2 are statistics from difference in means $t-$tests and Kolmogorov-Smirnov tests of difference in distribution for each variable across treatments. Characteristics of the subjects are similar across treatments, although a larger proportion of Type X subjects in the Common Property treatment believe most people are fair (DumTrust Pos) and Type Y subjects in the Common Property treatment have more schooling (School). The distribution of years of schooling appears to be different among Type Y subjects in the Common Property Trust Game than for Type Y subjects in the Private Property Trust Game. The amount returned by Type Y subjects in the Private Property treatment is greater and follows a different distribution than than the amount returned by Type Y subjects in the Common Property treatment. However, this is partly explained by the greater Type X investments in the first stage of the game.

Similar to previous research I find that most subjects send some portion of their endowment to the Type Y subject and that most Type Y subjects give some reward to this behavior. Figures 1 and 2 show the distribution of Type X decisions for the Common Property and Private Property Trust Games, respectively. Each bar displays the decision for each Type X subject, (the amount sent in the Private Property Trust Game or the amount left in the group fund in the Common Property Trust Game) as well as the corresponding decision by the partnered Type Y. The decisions are sorted from high to low, first by the X decision and then by the Y decision. Figures 3 shows a frequency distribution of Type X decisions.

The first thing to note from Figure 3 is the large proportion of Type X subjects in the Common Property Trust Game that took everything from the joint fund (i.e. $X = 0$). Twelve out of 32 subjects (37.5%) did not trust their partner at all. This contrasts with

Berg, Dickaut and McCabe (1995) where only two out of 32 subjects (6.25%) did not trust at all. Cox et al. (2009) found that only five out of 34 subjects (14.71%) did not trust at all in the Common Property Trust Game. In addition, Cox et al. (2009) found that one half of the subjects left all of the money in the Common Property Trust Game, while here only three out of 32 (9.38%) subjects left everything.

A number of anomalous observations appear in Figures 1 and 2. Sixteen Type Y subjects made decisions where they returned more in the second stage than three times the amount their paired Type X subject sent in the first stage. In some cases a Type X subject sent zero and the Type Y subject returned some positive amount. Similar results were found by a subject in Koford (2003) in his study of Bulgarian university students and by a number of subjects in Karlan (2005). The experiment went to great lengths to ensure that subjects understood the experimental protocol. I believe that the Type Y subjects understood the implications of these decisions. In the post-experiment questionnaire subjects were asked their reasons for making the decisions they made. The following reasons were given among those making anomalous decisions:

- I sent 23 because I wanted to have a friendly relation with my partner (Type X sent 10).
- I sent 1 because it is possible that I might know the other person (Type X sent 0).
- The X sent me 2 (when tripled this is 6); therefore, I think I should keep my 10 leva primary fund, and X should be rewarded for his courage (Type Y sent 6 in return).

In addition to these reasons, which emphasize that the Type Y subject wanted to make a positive statement to the Type X partner, another reason was given. In two instances subjects sought out members of the experimental team after the experiment was over to explain their reasons for rewarding the Type X person. In the first instance, a Type X had sent zero and the paired Type Y subject wanted to "play the game." In disgust with his inability to participate he simply rewarded the Type Y subject with one leva. In the second

instance, the Type X subject sent 4 to the paired Type Y. The Type Y subject explained that he was disgusted with this "lack of trust" and wanted to shame the Type X. The only means to shame the Type X subject was to over-reward them. By doing so the Type X would know they were paired with someone who was willing to reward. The Type Y subject decided to send 20 leva to the Type X. This subject is an accountant by occupation and understood the game well. Furthermore, the subject's monthly income is only 420 leva per month. Thus, the cost of the decision to shame amounted to an equivalent of 1.4 days wage.

Similar to previous field experiments, the amount sent by Type X players in the Trust Game is much less than that from experiments with university students (Cardenas and Carpenter, 2008). For example, in the Cox et al. (2009) replication, Indiana University students sent 56% of their endowment in the Private Property Trust Game and left 67% of the endowment in the Common Property Trust Game. Koford (2003) found that Type X Bulgarian University students on average sent 63% of their endowment in the Private Property Trust Game. I find that rural Bulgarians send 45% of their endowment in the Private Property Trust Game but only 33% of the endowment in the Common Property Trust Game. However, the statistics in Table 1 show that a difference of means $t-$test indicates this difference is not significant at the 0.10 level ($p = 0.156$). In addition, the distribution of Type X behavior does not appear to be different in the two games ($p = 0.197$).

4.2 Analysis

The preceding discussion examines the differences in trust and reciprocity between the two treatments and compares those results to prior research. I showed that across groups there is no significant difference in trust. My hypothesis, however, is that the treatment effects are mediated by the age of the subject. In this section I investigate those issues by first discussing the mediating effects of age, second presenting results using other control variables, and third assessing the accuracy of Type X expectations.

4.2.1 The Mediating Effect of Age

The primary hypothesis of this paper is that common property endowments have a different impact on different age groups in Bulgaria—specifically that younger citizens will be less trusting and less reciprocating in the common property treatment than the private property treatment. To investigate this possibility I dichotomous the continuous age variable by separating subjects into two age groups: those under 33 years old and those over 33 years old. I choose 33 years old because this age is the median age of the subjects and because subjects would have been less than 10 years old while living under Communism. Subjects under 33 probably received pro-market education in school yet had not lived under Communism and would therefore have little experience with state and common property.[6]

Table 3 shows the effects of age and treatment on first mover behavior. This table presents the data by looking at differences in first mover behavior by age group and property rights treatment. Table 3 shows that young subjects gave about 1.9 leva in the common property treatment, but 4.6 leva in the private property treatment. The difference of approximately 2.7 leva is statistically significant at the 0.05 level. There is also a statistically significant difference between older subjects and younger subjects in the common property treatment. While younger subjects gave about 1.9 leva older subjects gave about 4.5 leva in the common property treatment for a differences of approximately 2.6 leva (significant at the 0.05 level). In fact, the amount given by older subjects in the two treatments is identical, 4.5 leva and very close to the amount that younger subjects give in the private property treatment. This provides evidence that young subjects perceive the game differently under the two treatments and particularly perceive the CPR treatment differently than older subjects.

To estimate differences in reciprocity a regression-based model is necessary as the analysis must control for the initial Type X behavior; these are reported in Table 4. Table 4 shows the common and private property treatment effects for young (Age$<$33) and older (Age$\geq$33) age groups. The baseline category is the private property treatment among older subjects. The first column of Table 4 shows that younger Type X subjects give significantly less than

older Type X subjects in the common property treatment, as also described in Table 3. The results again indicate that younger subjects give, on average, about 2.7 fewer leva in the common property treatment than they give in the private property treatment ($p < 0.01$). The estimated treatment effects of private property and common property among the older subjects are identical to two decimal places indicating that older subjects are not effected by a change in property rights.

In the third column of Table 4 I regress the amount the Type Y returns, but condition this on the amount that Type X sends or leaves. Here I also control for multiplicative heteroscedasticity following (Harvey, 1976) in the following regression model:

$$y_i = \beta_1 + x_i\beta_x + z_i\beta_z + \sigma_i\varepsilon_i, \tag{1}$$

where

$$\sigma_i^2 = exp(\gamma_1 + x_i\gamma_x + \eta_i). \tag{2}$$

In Equation 1, z is the vector of treatment and age interactions, y is the amount the Type Y subject returns, and x is the amount that the paired Type X sends (in the private property treatment) or leaves (in the common property treatment). Equation 2 models the variance of Type Y returns dependent on the first stage level of investment by the Type X subject. This is done to account for the fact that as Type X investments increase there is a greater possible range of reciprocal behavior available from Type Y subjects. This model is estimated via maximum likelihood, assuming ε and η are normally distributed. This regression also includes standard errors clustered on experimental session. In Table 4 the separate parts of the model are reported with the estimates for the β coefficients of Equation 1 in the top panel and the estimates for the γ coefficients of Equation 2 in the bottom panel of the table.

The third column of Table 4 shows a marginally significant negative effect for the young subjects in the common property treatment. Young subjects return on average 2.2 fewer leva in the common property treatment than the private property treatment, once holding the

amount sent or left by the paired Type X subject constant ($p < 0.10$). A significant effect is not found among the older subjects, although the treatment effect is large and negative in magnitude.

4.2.2 Treatment Effects Controlling for Subject Attributes

The second column of Table 4 reports regressions of the amount sent (or left) in the first stage of the game on characteristics of Type X subjects and the fourth column reports treatment effects on reciprocity once controlling for other characteristics of Type Y subjects. There is some debate on the merits of introducing additional controls when estimating treatment effects from experiments (Freedman, 2008). The key results of this paper depend on the inclusion of an important mediating variable, age, but do not depend on the inclusion of the other control variables. Nonetheless, this further analysis is included to show how subject differences change behavior in the game. Variables which measure years of schooling ($School$), income ($Income$), gender ($Male$), attitudes towards trust as measured by the World Values Survey (WVS) questionnaire (Can most people be trusted?, Do they try to be fair?) are included as controls. The effects of these variables are reported in Table 4.

The second column of Table 4 indicates that female subjects are less trusting than male subjects. I find that male subjects give more than 2 leva than female subjects, holding all else constant ($p < 0.05$). This might be explained either by differences in risk preferences between men and women (see Schechter, 2007) or as a general finding on the treatment of women in Bulgaria. Since play is anonymous, women do not know the characteristics, including gender, of their paired subject and might be less willing to engage in trust because, on average, past experiences of risking trust went unreciprocated. Schooling appears to have a positive effect on willingness to trust. The marginal effect of an additional year of school is about 0.3 leva ($p < 0.05$).

In addition, following Cox et al. (2009) I estimate the effects of the World Value Survey questions: "Generally speaking, would you say that most people can be trusted or that you

can't be too careful dealing with people?" and "Do you think that most people would take advantage of you if they got a chance or would they try to be fair?" A dummy variable is formed indicating if subjects answer positively to each question (DumTrust Pos and DumFair Pos). If these questions are highly correlated with behavior in the trust game then one might be able to more easily collect data on trust without going through the more expensive task of conducting the experiments to measure trust. However, I do not find a statistically significant correlation between these attitudinal measures and first mover behavior in the trust game—a similar to previous research by Glaeser et al. (2000).[7] The effects of the remaining variables on trust are not statistically different from zero.

The fourth column of Table 4 presents estimates of reciprocity once controlling for other subject attributes. The dominant effect in the decision to reciprocate is the amount given by the partnered Type X subject. Controlling for all other characteristics, Type Y subjects return, on average, about one leva for each leva given to them by the paired Type X subject (significant at the 0.01 level). Income has a marginally significant negative effect in the models of reciprocity. An additional one percent increase in monthly income decreases the amount reciprocated by about 0.8 leva ($p < 0.10$). The trust WVS question appears to predict behavior of the Type Y subject similar to other studies (Cardenas and Carpenter, 2008). Subjects who indicated that most people can be trusted returned about two more leva than those who did not think so or were uncertain as measured in the pooled models.

The treatment effect of common property on reciprocity for the young age group becomes insignificant at the 0.10 level once adding controls, but the magnitude of the coefficient is very similar—the standard error on the coefficient increases when adding controls. The remaining variables do not appear to be good predictors of reciprocity.

4.2.3 The Returns to Trust

In this section I pay more careful attention to the returns to trust. According the theoretical model of Cox, Friedman and Sadiraj (2008) behavior in the games differ because of differences

in reciprocity expectations—second players are predicted to be less reciprocal in the common property treatment (because they perceive a first mover take something from a joint fund and this diminishes the second players opportunity set to reciprocate) and more generous in the private property treatment (because they perceive a first mover as adding to their opportunity set to reciprocate). In the previous section I demonstrated that this, in fact, happens for young subjects. But are the expectations young subjects have about reciprocity behavior justified? That is, do second movers actually have lower rates of reciprocity in the common property treatment than the private property treatment?

To assess this I examine the rates of return in both treatments unconditional on any subject attributes, including age. Because play is anonymous, Type X subjects cannot condition their behavior on any Type Y attribute. Thus, in order to assess if the returns of trust are different in the two treatments from the Type X perspective, one must assess reciprocity only in terms of the treatment conditions. Equations 3 and 4 report estimation results when separating treatments and using multiplicative heteroscedasticity consistent standard errors clustered on experimental session.

$$\begin{array}{rrcrcrl} \textit{Common Property}: & y & = & 0.749 & + & 1.139 & x \\ & & & (0.52) & & (0.10) & \end{array} \tag{3}$$

$$\begin{array}{rrcrcrl} \textit{Private Property}: & y & = & 2.767 & + & 1.142 & x \\ & & & (0.10) & & (0.23) & \end{array} \tag{4}$$

The estimated average rate of return for each leva given by a Type X player across treatments is almost identical.[8] In both instances, the rate of return is greater than zero.[9] Subjects receive about 1.4 leva, on average, for each leva they either send (in the private property treatment) or leave (in the common property treatment). However, the average rate of return is 2 leva larger in the private property treatment than the common property treatment as evidenced by an estimated constant of 2.767 in Equation 4 compared to 0.749 in Equation 3.

Thus, the pessimism about common property institutions among the young subjects seems justified.

5 Discussion and Conclusion

Levels of cooperation in the common property treatment are particularly low among young Bulgarians (as measured by first mover behavior in the trust game), but the same effect is not found among older Bulgarians. This finding is consistent with an assertion that young subjects have lower expectations of reciprocity in the common property treatment than older subjects. The expectations of the young, that reciprocity in the common property treatment is lower, also appear be more accurate.

It is helpful to discuss these results in the context of a well-studied aspect of common property arrangements in Bulgaria. Bulgaria has a long history of locally managed collective agriculture (Hanisch, 2003; Theesfeld and Boevsky, 2005). However, during communism collective farms were overtaken by the state. This top down approach to "collective" agriculture replaced norms of cooperation with fear of external punishment if production quotas went unmet (Theesfeld and Boevsky, 2005).

In transition, efforts to destroy the top down approach of communist collectives with private property were unsuccessful. In addition, many unsuccessful efforts have been advanced to reconstruct the former cooperatives (in the form of common property rights systems) because of their pre-Communist success. However, farmers have yet to reestablish norms of cooperation necessary to their functioning. Theesfeld (2004) interviewed a large number of irrigators in places where common property irrigation institutions were re-introduced after Communism. She found that young irrigators had a particularly difficult time in the cooperatives because irrigation governance was dominated by older members. Older members have more experience operating in common property institutions (from the Communist legacy) and are better able to use these forms of property rights for their advantage. Young people,

on the other hand prefer to operate individually. Referencing collective action in these common property institutions, one irrigator remarked, "I want to work 100% individually; I am sick of cooperatives and collective working (Theesfeld, 2004, p.268)."

The overall results indicate that in post-Communist societies where young people have low expectations and preferences on the performance of common property institutions, like Bulgaria, common property arrangements may not be feasible in the future. There have been massive expenditures by international donors and national governments to change property rights systems from state and common property to private property (Duch and Palmer, 2004) and to create systems of common property from formerly state or private property (Andersson, Gibson and Lehoucq, 2004). This paper provides evidence that the effects of changing property arrangements and the subsequent effects on cooperation, are dependent upon the social and political history of the target population (Firmin-Sellers, 1995). Development projects which try to induce cooperation by creating common property institutions are likely to be unsuccessful in societies with poor histories of common property management, at least among young citizens with little experience in these institutions. It is clear that young Bulgarians appear to be far less trusting with common property institutions than private property institutions.

There is great variation in behavior across different societies in the standard trust game (Cardenas and Carpenter, 2008). This paper not only demonstrates that behavior in the trust game is different in Bulgaria than in other regions of the world, but investigates specific political phenomenon that account for this difference—experience with common property in the past. While Bulgarians appear less cooperative in common property settings, other societies might behave quite differently, especially if past experiences with common property were positive. More research needs to be devoted to assess how common property endowments effect behavior in different societies, especially where policymakers are contemplating policies to change the property rights structure.

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Tables

Table 1: Distribution of Type X Subject Characteristics Across Treatments

	Common Property	Private Property	T–Test[1]	K–S Test[2]
X	3.344	4.531	−1.188	0.250
	(3.38)	(3.23)	(0.83)	
	32	32	64	
School	15.516	14.323	1.194	0.226
	(3.52)	(5.09)	(1.11)	
	31	31	62	
ln(Income)	5.204	4.724	0.480	0.188
	(1.82)	(2.32)	(0.53)	
	32	30	62	
Male	0.344	0.438	−0.094	0.094
	(0.48)	(0.50)	(0.12)	
	32	32	64	
Age	37.656	33.563	4.094	0.188
	(15.15)	(13.77)	(3.62)	
	32	32	64	
DumTrust Pos	0.323	0.188	0.135	0.135
	(0.48)	(0.40)	(0.11)	
	31	32	63	
DumFair Pos	0.323	0.065	0.258***	0.258
	(0.48)	(0.25)	(0.10)	
	31	31	62	

Notes: Means, standard deviations in parentheses, and number of observations reported for Common Property and Private Property treatments. [1]Two sided difference of means t-test, with total standard error in parentheses. [2]Kolmogorov-Smirnov difference of probability distribution test. * p <0.10, ** p <0.05, *** p <0.01

Table 2: Distribution of Type Y Subject Characteristics Across Treatments

	Common Property	Private Property	T–Test[1]	K–S Test[2]
Y Return	5.000	7.938	−2.938*	0.406***
	(6.52)	(5.75)	(1.54)	
	32	32	64	
School	13.194	15.839	−2.645**	0.419***
	(2.96)	(5.09)	(1.06)	
	31	31	62	
ln(Income)	5.517	5.487	0.030	0.186
	(1.20)	(1.79)	(0.39)	
	31	32	63	
Male	0.438	0.406	0.031	0.031
	(0.50)	(0.50)	(0.13)	
	32	32	64	
Age	36.688	37.406	−0.719	0.094
	(13.95)	(14.16)	(3.51)	
	32	32	64	
DumTrust Pos	0.500	0.387	0.113	0.113
	(0.51)	(0.50)	(0.13)	
	32	31	63	
DumFair Pos	0.313	0.484	−0.171	0.171
	(0.47)	(0.51)	(0.12)	
	32	31	63	

Notes: Means, standard deviations in parentheses, and number of observations reported for Common Property and Private Property treatments. [1]Two sided difference of means t-test, with total standard error in parentheses. [2]Kolmogorov-Smirnov difference of probability distribution test. * p <0.10, ** p <0.05, *** p <0.01

Table 3: Mediating Effects of Age on the Property Rights Treatment Effects for Trust

	Age Group		
Property Type	Age < 33	Age ≥ 33	Difference[1]
CPR	1.857	4.500	-2.642**
	(2.91)	(3.30)	(1.124)
	14	18	32
PPR	4.556	4.500	0.056
	(3.36)	(3.18)	(1.171)
	18	14	32
Difference[1]	-2.698**	0.000	
	(1.13)	(1.164)	
	32	32	

Notes: Mean trust (first mover behavior) reported with standard deviations in parentheses and number of observations on bottom. [1]Two sided difference of means t-test, with total standard error in parentheses. * p <0.10, ** p <0.05, *** p <0.01

Table 4: Treatment Effects with Controls (Multiple Regression)

	Trust	Trust[1]	Reciprocity[2]	Reciprocity[1,2]
β				
CPR and Age < 33	-2.698^{***}	-2.461^{***}	-2.200^{*}	-2.387
	(0.46)	(0.66)	(1.25)	(2.03)
PPR and Age ≥ 33	-0.056	0.288	0.081	0.060
	(0.45)	(0.55)	(1.43)	(1.65)
CPR and Age ≥ 33	-0.056	-0.482	-1.607	-1.625
	(0.94)	(1.00)	(1.27)	(2.41)
School		0.273^{**}		0.098
		(0.09)		(0.23)
ln(Income)		-0.056		-0.778^{*}
		(0.24)		(0.45)
Male		2.317^{**}		1.681
		(0.77)		(1.76)
DumFair Pos		-0.041		1.029
		(1.83)		(1.08)
DumTrust Pos		1.660		1.976^{**}
		(0.99)		(0.83)
X			1.220^{***}	1.055^{***}
			(0.10)	(0.17)
Constant	4.556^{***}	-0.176	2.479^{*}	4.662
	(0.23)	(1.26)	(1.32)	(5.40)
γ				
X			0.178^{***}	0.200^{***}
			(0.05)	(0.07)
Constant			2.017^{***}	1.734^{***}
			(0.38)	(0.41)
Log–Likelihood	-163.590	-137.400	-177.797	-157.878
N	64	58	64	59

Notes: [1] Place-specific fixed effect included but not reported. [2]Standard errors consistent with multiplicative heteroscedasticity in parentheses. All standard errors clustered on experimental session. Two-tailed hypothesis tests. * p <0.10, ** p <0.05, *** p <0.01.

Figures

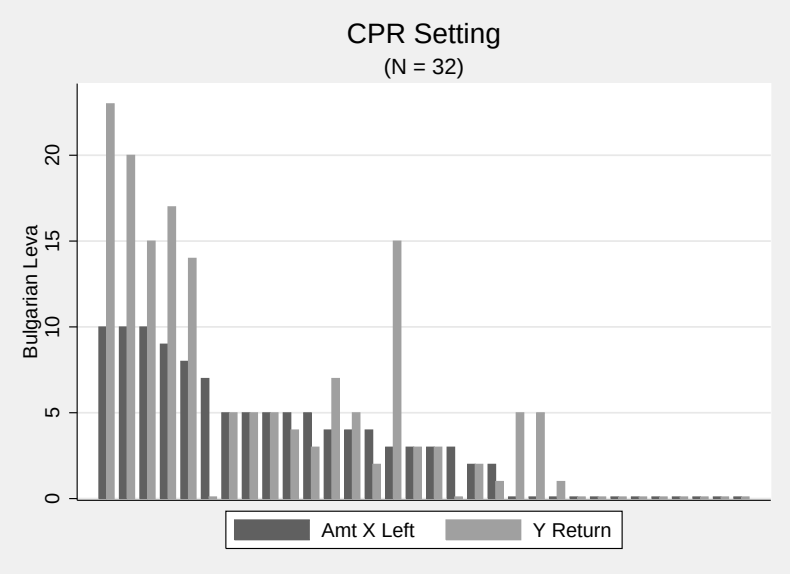

Figure 1: Distribution of Choices in the Common Property Trust Game

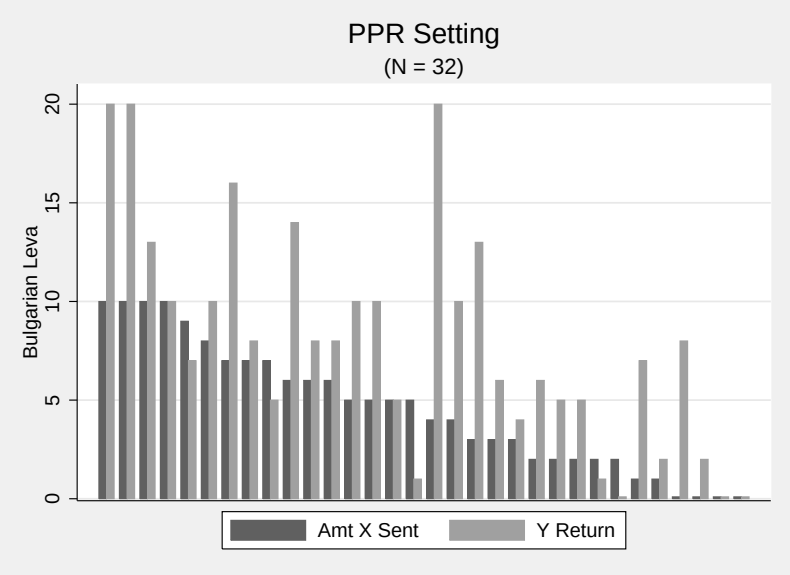

Figure 2: Distribution of Choices in the Private Property Trust Game

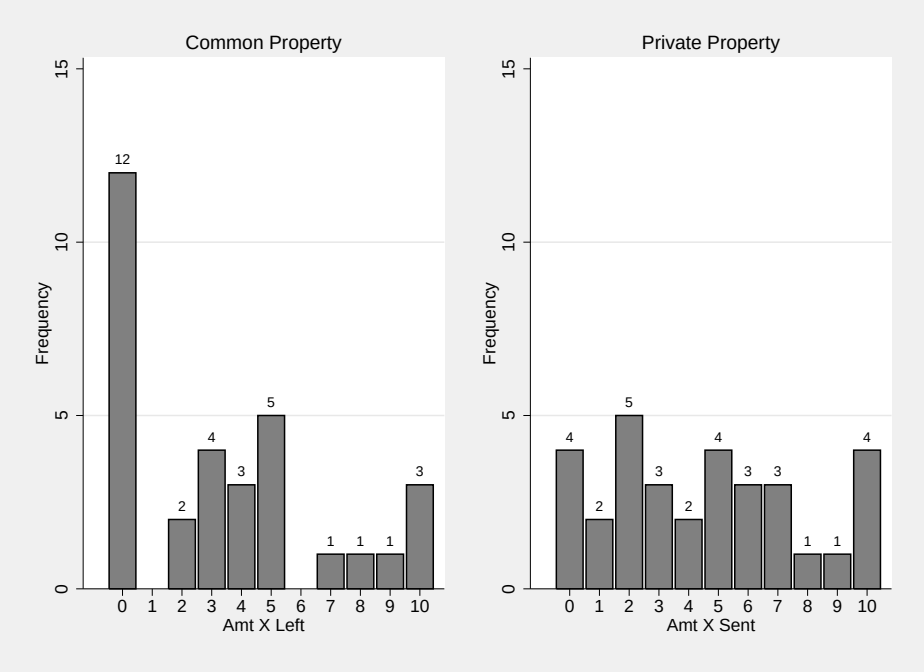

Figure 3: Frequency Distribution of Trust Across Trust Games

Notes

[1]See (Ostrom, Gardner and Walker, 1994) for a review of the different characteristics of resources based upon differences in excludability and rivalry in consumption.

[2]Koford (2003) replicated the trust game experiments in Bulgaria. He surprisingly found that Bulgarian students had very high levels of trust—higher than those found by Berg, Dickaut and McCabe (1995) for students in Minnesota. Bulgarian students, however, had much lower levels of trust in *vertical trust games*. This variation of the trust game was originally proposed by Fehr, Kirchsteiger and Riedl (1993). Among other modifications, instead of referring to subjects as Type X and Type Y, subjects are referred to as Bosses (Type X) who offer a wage and Workers (Type Y) who return some labor effort. In contrast to the standard Trust Game Koford (2003) found that Bulgarian students in this treatment exhibited very low levels of trust. He attributes this to a general distrust of authority in Bulgarian culture.

[3]See Camerer (2003), Ostrom (2005), and Cardenas and Carpenter (2008) for reviews.

[4]This cash payment was necessary to establish trust between subjects and the experimenters and to ensure the subjects that payments would be honored at the end of the game.

[5]The comprehension survey gave three random examples of decisions by hypothetical Type X and Type Y subjects and asked the subjects to calculate hypothetical earnings. An experimenter would check to make sure each subject correctly calculated the hypothetical earnings. If a subject did not understand how to calculate earnings in the first example, then the experimenter would carefully explain the process again. The subject was then asked to calculate the second example. If the subject still did not correctly calculate the hypothetical earnings the experimenter would again explain the process. Finally, the subject would calculate the earnings for the third example. Experimenters confirmed that each subject understood and correctly calculated the hypothetical payments by the third example.

[6]While there have been experiments with common property institutions since transformation to a market economy, these have largely been short-lived and have failed (see Hanisch, 2003; Theesfeld, 2004, 2005)

[7]However, that Cox et al. (2009) find that the WVS question is correlated with Type X behavior.

[8]When not correcting for multiplicative heteroscedasticity, the return rate in the Common Property treatment is 1.54 (with a standard error of 0.21). However, introducing multiplicative heteroscedasticity reduces the standard error of this estimate by a factor of more than two. While mean returns are higher in the Common Property treatment when Type X subjects leave more, there is much more variance in Type Y behavior. Once accounting for this variance, rates of return appear to be approximately equivalent across treatments.

[9]Note, however, that the average rate of return per each leva given is not significantly greater than one

at even the 0.10 level. This implies that there is not a significant earnings advantage to Type X players who give more.

A Appendix

A.1 Private Property Trust Game Instructions

Instructions

No Talking Allowed
Now that the experiment has begun, we ask that you do not talk. If you have a question after we finish reading the instructions, please raise your hand and the experimenter will approach you and answer your question in private.

Two Types
The participants in today's experiment will be randomly divided into two types, referred to as Type X and Type Y.

Random Pairing and Anonymity
Each person of Type X will be randomly paired with a person of Type Y. No one will learn the identity of the person with whom he/she is paired. As discussed below, Type X persons will make their decisions anonymously in one room, and Type Y persons in another room.

Starting Balances
Each person in a pair of decision-makers will be given a starting token fund of 10 tokens. The 10 tokens have a starting value of one leva each, for a total value of 10 leva.

The Type X Decision Task
Each person of Type X will decide whether or not to send any of his/her tokens to the paired person of Type Y. Each token that a Type X person sends reduces the value of his/her token fund by 1 leva but increases the value of the token fund of the paired Type Y person by 3 leva. A Type X person cannot send more than his initial 10 token starting balance. Four examples illustrate how the values of the tokens that may be sent by Type X are related to the value of the Type Y token fund.

- If the Type X person sends 0 tokens, that reduces the value of his/her fund by 0 leva and adds 0 leva to the value of the fund held by the paired Type Y person.
- If the Type X person sends 1 token, that reduces the value of his/her fund by 1 leva and adds 3 leva to the value of the fund held by the paired Type Y person.
- If the Type X person sends 5 tokens, that reduces the value of his/her fund by 5 leva and adds 15 leva to the value of the fund held by the paired Type Y person.
- If the Type X person sends 10 tokens, that reduces the value of his/her fund by 10 leva and adds 30 leva to the value of the fund held by the paired Type Y person.

The Type Y Decision Task
After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is to divide the value of the token fund he/she holds between his/her self and the paired person of Type X. That is, the Type Y person decides how much of the fund to keep for his/her self and how much to send back to the Type X person.

IG

Procedures

1. Each participant will now complete the experiment comprehension survey. If you have any questions, please ask an experimenter and we will approach you privately to help.

2. Each participant will draw a sealed envelope from the box. That envelope will contain a piece of paper marked with the participant's Type (X or Y).

3. All Type X decision makers will remain in this room to make their decisions. All Type Y decision makers will move to another room to make their decisions.

4. An experimenter will walk through the Type X room carrying a box containing large manila envelopes. Each Type X person can take any one of the envelopes from the box. Each envelope has a decision form with an identifying letter written on the Type X ID line on the form.

5. Each Type X person writes his/her decision on the decision form and then puts the form back inside the manila envelope. Each Type X person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.

6. An experimenter takes the box containing the manila envelopes with the decisions of the Type X persons to the Type Y room. Each Type Y person can take any one of the envelopes from the box.

7. Each Type Y person writes his/her decision on the decision form and then puts the form back inside the manila envelope. Each Type Y person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.

8. An experimenter takes the box containing the manila envelopes to another room and removes the decision forms from the envelopes. The decisions marked on the forms determine how much each person gets paid.

9. In the Type X room, the experimenter calls for each Type X person to come receive payment one at a time. Each person will receive an envelope with their payment. Each envelope will also include the 5 leva show up fee.

10. In the Type Y room, the experimenter calls for each Type Y person to come receive payment one at a time. Each person will receive an envelope with their payment. Each envelope will also include the 5 leva show up fee.

IG

A.2 Common Property Trust Game Instruction

Instructions

No Talking Allowed
Now that the experiment has begun, we ask that you do not talk. If you have a question after we finish reading the instructions, please raise your hand and the experimenter will approach you and answer your question in private.

Two Types
The participants in today's experiment will be randomly divided into two types, referred to as Type X and Type Y.

Random Pairing and Anonymity
Each person of Type X will be randomly paired with a person of Type Y. No one will learn the identity of the person with whom he/she is paired. As discussed below, Type X persons will make their decisions anonymously in one room, and Type Y persons in another room.

Starting Balances
Each pair of decision-makers will be given a starting balance of 40 tokens in their decision fund. The 40 tokens have a starting value of one leva each, for a total value of 40 leva.

The Type X Decision Task

Each person in Type X will decide whether or not to withdraw tokens from the decision fund. Each token that a Type X person withdraws has a value to that person of 1 leva. Each token withdrawn reduces the value of the decision fund by 3 leva. A Type X person cannot withdraw more than 10 leva. Four examples illustrate how the values of the tokens remaining in the decision fund are related to the values of the tokens that may be withdrawn:

- If the Type X person removes 0 tokens, that adds 0 leva to his/her earnings and does not change the value of tokens remaining in the fund.
- If the Type X person removes 1 token, that adds 1 leva to his/her earnings and reduces the value of tokens remaining in the fund by 3 leva.
- If the Type X person removes 5 tokens, that adds 5 leva to his/her earnings and reduces the value of tokens remaining in the fund by 15 leva.
- If the Type X person removes 10 tokens, that adds 10 leva to his/her earnings and reduces the value of tokens remaining in the fund by 30 leva.

The Type Y Decision Task

After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is to divide between his/her self and the paired person of Type X the value of the tokens remaining in the fund after the Type X person's withdrawal decision. That is, the Type Y person decides how much of the remaining value of the fund to keep for his/her self and how much to send to the Type X person.

INV-IG

Procedures

1. Each participant will now complete the experiment comprehension survey. If you have any questions, please ask an experimenter and we will approach you privately to help.

2. Each participant will draw a sealed envelope from the box. That envelope will contain a piece of paper marked with the participant's Type (X or Y).

3. All Type X decision makers will remain in this room to make their decisions. All Type Y decision makers will move to another room to make their decisions.

4. An experimenter will walk through the Type X room carrying a box containing large manila envelopes. Each Type X person can take any one of the envelopes from the box. Each envelope has a decision form with an identifying letter written on the Type X ID line on the form.

5. Each Type X person writes his/her decision on the decision form and then puts the form back inside the manila envelope. Each Type X person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.

6. An experimenter takes the box containing the manila envelopes with the decisions of the Type X persons to the Type Y room. Each Type Y person can take any one of the envelopes from the box.

7. Each Type Y person writes his/her decision on the decision form and then puts the form back inside the manila envelope. Each Type Y person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.

8. An experimenter takes the box containing the manila envelopes to another room and removes the decision forms from the envelopes. The decisions marked on the forms determine how much each person gets paid.

9. In the Type X room, the experimenter calls for each Type X person to come receive payment one at a time. Each person will receive an envelope with their payment. Each envelope will also include the 5 leva show up fee.

10. In the Type Y room, the experimenter calls for each Type Y person to come receive payment one at a time. Each person will receive an envelope with their payment. Each envelope will also include the 5 leva show up fee.

A.3 Private Property Trust Game Comprehension Survey

Experiment Comprehension Survey

Please consider the following scenarios. These scenarios have been randomly chosen and have no bearing on the outcome of the actual decisions you will make today. Please answer these questions by filling in the blank space provided. We give you an example to start. If you are confused, please ask an experimenter for clarification. DO NOT INCLUDE THE 5 LEVA SHOW UP FEE IN YOUR ANSWERS.

Example:

Suppose a Type X person decides to send 2 of his/her 10 tokens to a Type Y person, keeping the remaining 8 tokens. The Type Y person then decides to send 2 leva back.

The Type X person retains the 8 leva remaining from the initial 10 tokens. The Type X person also receives 2 tokens from the Type Y person. The total payment received by the Type X person is:

10 leva

The Type Y person retains their initial 10 leva. The Type Y person also receives 2 tokens from the Type X person. These tokens are tripled in value giving the Type Y person 6 more leva. The Type Y person now has 16 leva and decides to send 2 tokens back to the Type X person. The total payment received by the Type Y person is:

14 leva

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1. Suppose a Type X person decides to send 4 of his/her 10 tokens to a Type Y person, keeping the remaining 6 tokens. The Type Y person then decides to send 6 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

2. Suppose a Type X person decides to send 8 of his/her 10 tokens to a Type Y person, keeping the remaining 2 tokens. The Type Y person then decides to send 0 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

3. Suppose a Type X person decides to send 0 of his/her 10 tokens to a Type Y person, keeping all 10 tokens. The Type Y person then decides to send 2 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

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A.4 Common Property Trust Game Comprehension Survey

Experiment Comprehension Survey

Please consider the following scenarios. These scenarios have been randomly chosen and have no bearing on the outcome of the actual decisions you will make today. Please answer these questions by filling in the blank space provided. We give you an example to start. If you are confused, please ask an experimenter for clarification. DO NOT INCLUDE THE 5 LEVA SHOW UP FEE IN YOUR ANSWERS.

Example:

Suppose a Type X person decides to take 8 tokens from the joint decision fund, leaving 16 leva for the Type Y person. The Type Y person then decides to send 2 leva back.

The Type X person retains the 8 leva from the joint decision fund. The Type X person also receives 2 leva from the Type Y person. The total payment received by the Type X person is:

10 leva

The Type X decision to remove 8 tokens valued at 3 leva each reduces the value of the joint decision fund by 24. The Type Y person retains the remaining 16 tokens left by the Type X person in the joint decision fund. The Type Y person then decides to send 2 leva back to the Type X person. The total payment received by the Type Y person is:

14 leva

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1. Suppose a Type X person decides to take 4 tokens from the joint decision fund, leaving 28 leva for the Type Y person. The Type Y person then decides to send 6 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

2. Suppose a Type X person decides to take 8 tokens from the joint decision fund, leaving 16 leva for the Type Y person. The Type Y person then decides to send 0 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

3. Suppose a Type X person decides to take 0 tokens from the joint decision fund, leaving 40 leva for the Type Y person. The Type Y person then decides to send 2 leva back.

The total payment received by Type X is: _____
The total payment received by Type Y is: _____

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