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Trust and Cooperation: In the Lab and in the Field

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Trust and Cooperation: In the Lab and in the Field

By

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B. A., Furman University 1996
M. A., Emory University 2008

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An abstract of
A dissertation submitted to the Faculty of the
James T. Laney School of Graduate Studies of Emory University
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Abstract

Trust and Cooperation: In the Lab and in the Field
By Kelli Floyd Lanier

Using a within-subject design in which subjects participated in a series of attitudinal surveys and the Berg, et al. (1995) investment game, in Chapter 1, I dispute the consensus that attitudinal survey measures designed to measure trust do not align with behavioral trust measures. When we control for altruistic motives, attitudinal questions do predict trusting actions as well as trustworthy behavior. Findings suggest that some researchers should "homogenize" their experiments in the field, or consider including attitudinal questions in their studies.

Previous studies have utilized investment games and the public goods game as key instruments for measuring trust and cooperation, respectively. However, experimental economists have largely ignored the relationship between cooperation and trust. Chapter 2 presents results of a within-subject study where subjects played two games designed to measure trust and one game designed to measure cooperation. Results show that behavior in each of these games can predict behavior in the other two, thereby supporting the idea that researchers may use any of these distinct games to measure pro-social behavior.

Chapter 3 reports the results of an experiment that longitudinally examines pro-social behavior and group identity in pre-existing, cross-functional teams. I conduct the experiment with MBA, JD, and science and engineering PhD students participating in the team-based academic program, Technological Innovation: Generating Economic Results (TI:GER). Even when new to their teams, these students exhibit greater pro-social behavior towards their group members than do members of a randomly assigned control group, and they treat unknown individuals no differently than the control subjects do. Members of the different functions behave similarly to one another. High identification with a group can help mitigate potential negative effects of business training and sustain pro-social behavior. This chapter contributes to existing economic literature by beginning to explore the interaction of social identity, cross-functional teams, and pro-social behavior. It also provides further insight into the effects of business training.

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This dissertation is dedicated to my parents, Wade and Ruth Floyd, who launched me on this journey; to my husband, Joe Lanier, who held my hand along the way; and to our daughters, Liza (2) and Caroline (2), who provided inspiration and incredible detours. I love you all!

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1. Attitudinal and Behavioral Measures of Trust: A New Comparison

1.1 Introduction

Trust is central to the theory of social capital, and differences in social capital are thought to explain differences in economic growth (Arrow, 1974; Knack and Keefer, 1997; Zak and Knack, 2001). Currently, most economists rely on two techniques to measure trust: surveys and games. Surveys such as the General Social Survey (GSS) and World Values Survey (WVS) yield attitudinal trust measures, and games conducted in the lab yield behavioral measures. However, according to recent experimental studies, results from these two alternative approaches do not align as closely as one might expect (see, for example, Glaeser et al., 2000; Lazzarini et al., 2005; and Johansson-Stenman et al., 2011.) This finding is important because social scientists often use responses to the GSS and the WVS to make inferences about the level of trust in a society. If, in fact, attitudes about trust cannot predict trusting actions in the least complex scenarios (i.e., the lab), should we rely upon them to accurately reflect people's level of trust in the real world?

Researchers interested in studying developing societies have found laboratory methods useful as instruments for measuring values and preferences among isolated and poor communities (see, for example, Cardenas and Carpenter, 2008; Karlan, 2005; Schechter, 2007; Barr, 2003; Buchan et al., 2006; Fehr and List, 2004; and others). To our knowledge, trust experiments have now been conducted in at least 19 developing

countries, and many more have been conducted worldwide.[1] However, a careful investigation of the games used to study trust suggests a large disparity in the experimental design and procedures used to elicit behavior. These innumerable design differences in the vast literature on trust experiments may be problematic, as they compromise the reliability of cross-country comparisons based on observed behavior in these games. For example, in a meta-analysis of 162 replications of the investment game, Johnson and Mislin (2011) found that subjects' trust varies by whether pay is random and whether play is with a real or simulated counterpart. They also found that trustworthiness varied by the amount by which the experimenter multiplied the transfer, whether subjects played both roles, and whether the subjects were students. Thus, design differences could influence how a subject plays the game.

Now, we are presented with a conundrum: survey questions that measure attitudes may not be good predictors of behavior. On the other hand, cross-country comparisons using behavioral data may be unreliable, as there is no uniformity in experimental procedures. How are we to interpret and compare results across studies? For example, Karlan's (2005) Peruvian subjects transferred 0.46 of their endowment, Schechter's (2007) Paraguayan subjects transferred 0.47 of their endowment, and Haile et al.'s (2008) South African subjects transferred 0.55 of their endowment. At first glance, we may attribute the South Africans' higher transfer to greater trust. However, design differences could also help generate these diverse transfer amounts. Karlan's (2005) design had

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[1] Cardenas and Carpenter (2008) provide a summary of results from trust games conducted in developing countries. Johnson and Mislin (2011) identify 130 manuscripts presenting results from 162 trust games conducted in a total of 35 countries.

[2] Several authors solicit subjects' expectations regarding their partners' decisions. Opinions vary regarding the best time to ask these questions. See Johansson-Stenman et al. (2011) for a discussion.

[3] In Chapter 2, I show that pro-social behavior in an investment game can predict pro-social behavior in a binary trust game, thus suggesting that some comparison across designs is reliable. However, design

limited strategy space, and he multiplied transfers by 2, rather than the standard 3. Both Schechter's (2007) and Haile et al.'s (2008) subjects played both roles in the investment game. In addition, in the Haile et al. (2008) study, Players A were asked to anticipate what they would receive in return for their transfer.[2] If we cannot rely on the accuracy of survey trust measures, and since variations in game design may alter behavioral trust measures, what advice should we give to a researcher interested in comparing levels of trust in, for example, Peru, Paraguay, and South Africa?

The main objective of this chapter is to determine if attitudinal questions of trust are indeed bad predictors of trusting actions in games. Thus, we replicate part of Glaeser et al.'s (2000) experiment. However, in doing so, we make an improvement to their design by allocating equal endowments to the investors and trustees. Another objective is to see if, when we control for altruistic motives as in Cox (2004), we can improve the predictive power of attitudinal questions. Why are providing equal endowments and controlling for altruism reasonable modifications? Experimental designs used to generate trust data need to discriminate between actions motivated by trust and actions motivated by (unconditional) altruism. When the first mover in a trust game sends money to the trustee, it is possible that she has no expectation of getting anything back. Her choice to send money may be to "help" the second mover, especially if unequal endowments, as in Glaeser et al. (2000) and Ashraf et al. (2006), are common knowledge. The wording of the GSS and WVS questions ask about how confident people feel about others. Thus, if we want to fairly evaluate the predictability of these questions, we need to have a behavioral measure of how confident people feel about others, not of how nice they

[2] Several authors solicit subjects' expectations regarding their partners' decisions. Opinions vary regarding the best time to ask these questions. See Johansson-Stenman et al. (2011) for a discussion.

would like to be to others. This, we believe, would require that we isolate altruism from trust.

Of course, the behavior of trustees matters as well. If individuals trust, but that trust is exploited, society loses. Thus, when evaluating behavior in the trust game, we are often as interested in the actions of the trustee as we are in the decisions of the first mover. Ironically, Glaeser et al. (2000) and others found that survey questions designed to measure trust actually predicted trustworthiness instead. Our final objectives, therefore, involve an analysis of our second movers' attitudes and behaviors. We compare our subjects' trustworthy behaviors with their survey responses and, like Glaeser et al. (2000), find that many of them predict second movers' behaviors. However, when we control for players' kindness towards others, we find that fewer survey questions' predict trustworthiness.

We designed a within subject study where the same subjects participated in a series of games and surveys. The surveys included behavioral and attitudinal questions aimed at capturing trust. The games provided subjects with the option of voluntarily placing resources at the disposal of another without a commitment. We used a widely studied game in the literature: the investment (or trust) game as introduced by Berg et al. (1995). As in Cox (2004), Cox et al. (2007 and 2008), Carter and Castillo (2009), and Ashraf et al. (2006), we controlled for altruism in the investment game. We find that *with* equal endowments, but *without* controlling for altruism, attitudinal and behavioral questions are poor predictors of trusting actions in the investment game. Thus, we replicate Glaeser et al.'s (2000) results. However, when we gave equal endowments *and* controlled for altruism, some survey questions do predict behavior. Like Glaeser et al.

(2000), we also find that the survey questions predict trustworthy behavior in the investment game. However, they are not as predictive when we control for altruism.

We contribute to the existing literature on trust games in the following ways: First, our results suggest that attitudes *can* predict choices in the lab. This finding is important because it informs practitioners that it is reasonable to use survey data to measure trust. An implication of this is that longitudinal studies based on attitudinal GSS questions, which have been collected since 1972, and cross-country analyses based on WVS data, which have been collected since 1981, can be reliable. Our results also suggest that more researchers who run experiments in the field may want to include surveys in their experimental designs. The prevailing use of different types of games to measure trust in the field may be necessary given the environmental constraints researchers face on location, but as stated above, the variation across designs also complicates cross-country comparisons.[3] Surveys have the advantage over experiments in that they can be implemented more easily and homogeneously across cultures. In this sense, our results support the idea put forward by Fehr et al. (2003), who also promote the integration of interactive experiments and representative surveys.

The rest of the chapter is organized as follows. In the next section we define trust and how it is measured. In Section 1.3, we describe our experimental design, and in Section 1.4, the procedures. We present our results in Section 1.5, and the last section, Section 1.6, includes a summary of our findings and a discussion of the implications and limitations of our study.

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[3] In Chapter 2, I show that pro-social behavior in an investment game can predict pro-social behavior in a binary trust game, thus suggesting that some comparison across designs is reliable. However, design differences in the field, such as allowing subjects to play both roles, providing random payments, not providing trustees an endowment, etc. may hinder accurate comparisons across studies.

1.2 Trust and how it is measured

While scholars across disciplines agree on the importance of trust in interpersonal exchanges, agreement on a precise definition of trust remains elusive (see Hosmer, 1995 for a survey of trust definitions across multiple disciplines). Despite this lack of clarity in meaning, most experimental economists have adopted Coleman's definition, as it provides a measurable definition of trust (see Coleman, 1990; and Camerer, 2003). According to Coleman, trust is an action that involves the voluntary placement of resources at the disposal of a trustee with no enforceable commitment from the trustee. A trusting action creates the possibility of mutual benefit, if the trustee is cooperative, and the possibility of individual loss, if the trustee is opportunistic.[4]

In general, social scientists measure trust through surveys that include attitudinal questions. These questions are designed to capture the degree of confidence one has in others. Indeed, it is believed that people will behave trustingly if they believe others are trustworthy (i.e., confidence in others is a necessary condition for a trusting action). One such question is the 'trust question', which was first introduced by Almond and Verba (1963) in their study of civil society in post-war Europe. The text of this question reads, "*Generally speaking, would you say that most people can be trusted, or that you can't be too careful when dealing with others?*" Individuals who answer that most people can be trusted are labeled as trusting. When aggregated, the percentage of the sampled people

[4] The interpretation of trust as an action may be somewhat controversial. However, the purpose of this chapter *is not* to develop a "best definition of trust"; here, we want to see whether widely used attitudinal questions about trust (found in the GSS and WVS surveys) can predict actions in trust games that have been widely used in the lab and in the field to measure trust, and whether these results are robust to controlling for altruism.

who say most people can be trusted forms an estimate of the level of trust in a country and serves as an indicator for national social capital. Many national and international surveys, including the GSS, the WVS, Latinobarómetro, and the Australian Community Survey include this question. Despite its popularity, problems with the trust question do exist, mainly because it does not specify who 'most people' are. Thus, a question that asks people to agree or disagree with *"You can't count on strangers anymore"* has been proposed as an alternative to the trust question, as it more narrowly identifies the people about whom one is asked to express an opinion (see Glaeser et al., 2000).

Other attitudinal questions often used in surveys include the following: "*Do you think most people would try to take advantage of you if they got the chance, or would they try to be fair?*", and "*Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?*" These two questions together with the 'trust question' are asked in the GSS and may be referred to as GSS trust, GSS fair, and GSS help questions. The WVS includes the trust and fair questions only. Notice that all of these questions ask about how the responder perceives others. Again, the idea behind using these questions is to capture how confident one feels about others, which is a necessary condition for trust.

A second form of measurement is the 'trust game', which is played by groups of subjects under lab conditions. Several variations of the 'trust game' exist, but all have the basic feature of allowing a player to transfer money to another player, who, in turn, has the option of returning some money or keeping it all. Depending on the specific type of trust game, trust is then measured by whether money is passed, or by the amount passed. One widely studied trust game is the "investment game" of Berg et al. (1995 –

hereafter 'BDM', 'investment game', or 'trust game'). This is a dynamic game of complete information between two players with identical endowments, say $\bar{x}$. The first player, called the investor, faces a choice to transfer to the second player, or trustee, any amount $x \in [0, \bar{x}]$. Then x is multiplied by t>1 and the trustee has an opportunity to transfer back any amount $y \in [0, tx]$. The payoffs for the first and second players are $\bar{x} - x + y$ and $\bar{x} + tx - y$, respectively.[5] Clearly, under the traditional game theoretic assumptions, the equilibrium amount to transfer is zero. In the lab, however, many people transfer positive amounts (see Camerer, 2003; and Johnson and Mislin, 2011, for summaries of results). The amount invested (x) is taken to be a measure of the degree of trust, and the percentage returned (y/tx) is taken to be a measure of the degree of trustworthiness.

In an influential paper on trust, Glaeser et al. (2000) provided evidence that the trust question and other standard survey measures of trust did not predict first players' actions in a version of the game described above.[6] Rather, the authors found that these questions predicted second movers' actions, or trustworthiness. Follow-up studies also supported this result (see Lazzarini et al., 2005; and Johansson-Stenman et al., 2011). As mentioned before, this discrepancy is important for two main reasons. First, trust is central to the theory of social capital, and differences in social capital are thought to explain differences in growth (Arrow, 1974). If survey questions on trust, as compiled by the WVS, do not measure trust, it would be difficult to study the hypothesis that social

[5] The investment game as described here follows the design of Berg et al. (1995). However, several variations and extensions have since been introduced, some of which we will address later in this chapter.
[6] The Glaeser et al. (2000) version of the game differed from the BDM design in several ways. In Glaeser et al. (2000), pairings were not completely random. Before the first player made a transfer, she received a 'promise' from the second player about what the return would be. The first player received $15, and second player received no endowment. Finally, transfers from the first player to the second player were multiplied by two instead of three.

capital is correlated with higher growth rates. Second, without reliable longitudinal data on trust, like that which is provided by the GSS and Latinobarómetro, one could not make a fair assessment about the changes in trust that a society experiences.

In their analysis of trust games in developing countries, Cardenas and Carpenter (2008) provided a table summarizing design features and findings in 21 studies.[7] Johnson and Mislin (2011) provided a similar table for all of the 162 replications of the trust game included in their meta-analysis. In Table 1, we present a subset of 9 trust game studies that also include surveys in their design. Seven of them specifically include the GSS questions. Holm and Danielson (2005) in Sweden, but not in Tanzania, found a positive correlation between behavior in games and attitudinal questions. Glaeser et al. (2000), Lazzarini et al. (2005), and Ashraf et al. (2006) found that GSS survey questions did not correlate with trusting actions: however, none of these authors provided both players an equal endowment. This may explain why in Glaeser et al.'s (2000) study, more than 70% of the subjects sent the maximum amount to the trustee. If first movers' motivations are also altruistic, the unequal initial endowment may generate additional incentives to pass. Unfortunately, it is difficult to say whether the discrepancies in results seen in these tables (and those presented by Johnson and Mislin, 2011; and Cardenas and Carpenter, 2008) had to do with cultural differences (subject pool), or with differences in experimental design, or both. Indeed, even in this subset of studies which includes surveys, one can see a wide variation in designs including differences in a) the strategy space of the games, b) the endowments between players, and c) the amount by which transfers are multiplied.

[7] These authors found positive correlations between WVS results and experimental measures of trust in the developing world. Similarly, they found that investment game results correlated with some real economic indicators.

[Insert Table 1 about here.]

Although, in principle, any game in which a player is given the choice of putting resources at the disposal of a trustee would qualify as a game of trust, it is not clear whether, in practice, all situations have an equal ability of isolating trust. An investor in the investment game may have other motives for transferring funds, such as (unconditional) altruism.[8] Similarly, a trustee may be motivated by altruism or reciprocity when passing positive amounts back. Cox (2004) discriminated between transfers resulting from trust or reciprocity and transfers resulting from other-regarding preferences.[9] His design, called the triadic design, consisted of three treatments: an investment game, a triple dictator game, and a modified dictator game. For the investment game, he followed closely the BDM design. In the triple dictator game each dictator was given the chance to transfer an amount $x^d \in [0, \bar{x}]$, where $\bar{x}$ was the initial endowment, to a recipient who got tx^d (t=3, thus 'triple'); the recipient made no decisions. In the modified dictator game each player transferred an amount $y^{md} \in [0, tx]$ to a recipient, who had no choice to make. Cox (2004; hereafter 'Cox') found that a portion of transfers in the investment game was due to unconditional altruism or inequality aversion, suggesting that amounts passed do not solely capture trust.

[8] Note in Table 1 that some other authors have also used the dictator game in an attempt to account for altruism in this game.

[9] Others, including Ashraf, et al. (2006), Karlan (2005) and Schechter (2007), argue that choices in a trust game may also reflect attitudes towards risk. As described in the experimental procedures, we elicited self-reported motives for transferring amounts to Players B; 58% of these subjects said that they were motivated by trust; 14% mentioned altruism or care for others. Other reasons identified included: selfishness, efficiency, safety or risk, and confusion.

1.3 Experimental Design

Our experiment consisted of games and surveys played by the same set of subjects. Like in Cox's experiment, we used the triple dictator game to isolate trust from other-regarding motives in the investment game.[10] However, unlike Cox, in our design the same subjects participated in all three games. This within subject design allowed us to control for individual differences in social preferences (see for example Andreoni and Miller, 2002). In addition, we did not use a double-blind procedure. Thus, Subjects A had the opportunity to transfer a portion of their endowments in the investment game and the triple dictator game. The portion transferred in the investment game was a measure of their trust, and we used the portion transferred in the triple dictator game as a control for altruism in an attempt to capture 'pure' trust. Players B had the opportunity to return funds in the investment game, which was a measure of trustworthiness (or reciprocity), and had the opportunity to transfer funds in the modified dictator game. Similar to our procedure with Players A data, we use Players B transfers in the modified dictator game as a control for altruism in an attempt to isolate 'pure' trustworthiness. Survey responses were used in all four analyses. Figure 1 describes our design.

[Insert Figure 1 about here.]

Despite the differences between our design and his, we were largely able to replicate Cox's results with twice the number of subjects (see Figure 2 and Table 2). We find no statistically significant difference in the amounts passed in our studies. In

[10] We are grateful to James C. Cox for generously sharing his instructions with us.

addition, as in Cox, we find that the mean amount sent by first movers in the investment game was greater than the mean amount passed in the triple dictator game (p=0.000; one-tailed). Finally, the amount transferred back to the first mover was influenced by the amount the second mover received.[11]

[Insert Figure 2 about here.]

[Insert Table 2 about here.]

The surveys in our experiment served two different purposes: to extract demographic, behavioral, and attitudinal information about our subjects and to provide a break between games. Rather than conduct one large survey at the beginning or end of each session, we divided our questions into three parts and administered them at various points throughout the sessions. The first survey (Survey A) contained primarily demographic information that we later used as control variables for our models. Here, we obtained data such as gender, year in school, race, number of siblings, frequency of church attendance, and number of alcoholic beverages consumed in a week. The answers to this last question provide a proxy for the level of social interactions of our participants. We also asked subjects how many other people they knew in the lab. The modal number of people that the subjects knew in the room was 0. The numbers ranged from 0 to 4, with 75% of the subjects knowing at most one other person in the room, and only 3 out of

[11] We estimated a linear model with amounts transferred as a dependent variable, and the amounts received and initial endowment as independent variables. After correcting for heteroskedasticity, our OLS estimated coefficients for the amount received and initial endowment were both positive and significant (coef. = 0.276 and 0.472, respectively; p = 0.000).

129 subjects knowing 4 other people in the room. Thus, it is safe to say that the games were played among strangers. About 44% of our 129 subjects were male; 26% were either freshmen or sophomores; 31% were juniors, 33% were seniors, and 10% were graduate students. While 43% of our subjects were white, the rest were from different races, including black, Hispanic, and Asian. About 38% had one sibling, 12% were only children, and 50% had two or more siblings. A description of all the behavioral/game variables (i.e., amounts passed and fractions returned in the investment and triple dictator games), their means and standard deviations can be found in Table 3.

[Insert Table 3 about here.]

In our sample, males were younger than females and drank more alcohol; non-whites drank less alcohol, had more siblings, and attended a place of worship more often than whites. Table 4 shows the pair wise correlations of the abovementioned variables. We also added the variable *membership* to Tables 3 and 4. We formed this variable by combining answers to the second survey that we administered (Survey B). In this survey, we solicited information about subjects' level of involvement (member, active member, or on the board) in organizations such as sports teams, social clubs, political parties, etc. The membership variable is considered important by several authors including Putnam (1995), who associate trust with social interactions.

[Insert Table 4 about here.]

Finally, in the third survey (Survey C), which was administered after all games in half of the sessions, and before all games in the rest to control for order effects, we gathered the bulk of attitudinal data about our subjects. Here, we included the GSS trust, fair, and help questions, as well as the trust stranger question, which asked people to agree or disagree with the statement, *"You can't count on strangers anymore."* As in Glaeser et al. (2000) and others, we also obtained behavioral information about trust. These behavioral questions determined how frequently subjects lent money or personal possessions, and we normalized the sum of responses to form a behavior index. Finally, to be consistent with others, we also asked subjects whether they considered themselves trustworthy. The description of these variables can be found in Table 3.[12]

1.4 Experimental procedures

This experiment was conducted in a dedicated experimental lab at Emory University. We recruited student subjects by making announcements in classes and via postings on a University-wide electronic bulletin board.[13] We report data from a total of 129 subjects who participated in our experiment.[14] Each subject participated in one of 12 sessions and was randomly assigned a role as Player A or Player B. All sessions lasted approximately 1.5 hours, and there were between 8 and 12 subjects in each session (inclusive). Earnings ranged from $0 to $40 plus a $3 show-up fee. Our sample included subjects who had not participated in economic experiments in the past.

[12] Table 12 in Appendix C provides a summary of the correlations between pairs of survey measures of trust.
[13] Our recruiting form and all other subject materials, including instructions and surveys, are available upon request. Please send an e-mail to klanier@emory.edu.
[14] Three subjects were excluded because they were outliers: they provided implausible answers to some of the questions (e.g., excessive consumption of alcoholic beverages/week).

Upon entering the lab, each subject chose a seat behind a closed partition. At the beginning of each session, the experimenters requested that subjects turn off their cell phones and remain quiet for the duration of the session. All instructions were distributed and then read aloud. Each session consisted of the games mentioned above designed to measure trust and trustworthiness; a dominance solvable game (where subjects had to identify a dominant strategy and that was unrelated to this project); a public goods game, a binary trust game, and a binary dictator game (which were unrelated to this chapter); the three survey sections mentioned above; and a written response section (where subjects were asked to write a comment and that was unrelated to this project). To the extent reasonable and possible, we altered the order of the games and surveys in each session in an effort to prevent order effects. Additionally, in half of the sessions we administered the third survey (Survey C) at the very beginning of the experiment, and in half of the sessions at the very end of the experiment.[15] Table 5 shows the order in which the games and surveys were presented in each of the twelve sessions.[16] Finally, after each decision subjects were given a few minutes to explain their choices in writing.

[Insert Table 5 about here.]

[15] As shown in Table 1, some researchers have implemented the surveys before the games while others after the games. The general result that survey questions do not predict behavior in the investment game seems to be independent of the order in which the surveys were run and the amount of time that separated the implementation of surveys and games. In Glaeser, et al. (2000), for example, there was a two-week separation between the experiments and surveys.

[16] Because ours is a within-subject design, and the endowments for the modified dictator game are dependent on the investment game, the first always had to follow the latter (please refer to Table 5).

At the beginning of each game, the experimenter emphasized that subjects were being matched with someone new.[17] Matches were pre-set by the experimenter, but random to the players. Subjects were also told that their results were going to be revealed only after all subjects completed all games and all surveys. By waiting until the conclusion of the session to reveal game results, we ensured that first players' decisions were never influenced by second players' decision in any prior game. However, do note that since some of these games involved sequential moves, it was sometimes necessary to inform the second movers of the first movers' choices. As we progressed through the experiment, the experimenter wrote the code name of each game on the white board at the front of the room and numbered the game in the order in which it was played during that session. Immediately following the final activity of the session, we privately told each subject the results of each game and instructed her to calculate her earnings for that game. Next, we asked for a volunteer subject to draw a numbered ping-pong ball from an envelope. The number ball that was selected corresponded to the game that would count towards subjects' earnings for that session. We gave each subject two copies of a receipt and instructed them to complete each copy. An experimenter then verified the accuracy of each subject's receipt, signed the receipt, and sent the subject to the back of the room to be paid in private by the other experimenter. Upon receiving payment, subjects left the session.

[17] As long as 12 people showed up to participate in the experiment, in the two player games, no one was matched with another more than once. When there were fewer than 12, repeat matching was necessary, but the individuals did not know at any time with whom they were matched.

1.5 Results

Table 6 shows pair-wise correlations between trusting actions and trustworthiness in the investment game with behavioral and attitudinal answers to survey questions. This table provides a rough picture of our general results. With respect to the survey questions and the investment game transfers, which measure how confident one feels about others, we were largely able to replicate Glaeser et al.'s (2000, p. 844) findings. The *GSS trust* and the variable *trust stranger* do not correlate with amounts sent by Players A in the investment game. In contrast, the variable *trustworthy,* which measures self-reported qualities about the player, does correlate with amounts sent.[18] Note that Glaeser et al. (2000) also found that agreement with the statement *"I am trustworthy"* correlated with trusting actions. Both *GSS trust* and the *GSS index* do correlate with the amounts returned in this game. Finally, the variable *behavior index* does not correlate with behavioral trust or trustworthiness measures.

[Insert Table 6 about here.]

Can attitudinal survey questions predict trusting behavior in the lab? We consider eight models shown in Table 7. Each model includes variables that other authors have identified as relevant in predicting trust. By comparing these eight models, we want to see which of the survey measures of trust predict trusting actions. Model 1 includes

[18] This positive correlation between transfers and believing oneself to be trustworthy could be explained by Self Projection Theory, which states that people assume others are like themselves. See Robbins and Krueger (2005) for a review and meta-analysis. Self Projection Theory could also help explain relationships between behavioral trust (trustworthiness) and attitudinal survey responses highlighted in Tables 8 (9, and 10).

individual background characteristics described in Table 3. Each of Models 2 through 8 contains one variable that represents responses to attitudinal or behavioral questions in surveys in addition to the aforementioned characteristic variables. The first five variables (*GSS index, fair, help, trust, and trust strangers*) provide information about how much confidence subjects had in others. The other two variables (*behavior index* and *trustworthy*) provide information about the behavior of the responder herself.

[Insert Table 7 about here.]

From the regression results we find that two control variables, *male* and *membership,* are statistically different from zero in virtually all models. Males sent on average over $2 less than females, and subjects who were more deeply involved in organizations sent more money.[19] However, none of the GSS attitudinal questions are good predictors of trusting actions in this game. (See Models 5 through 8.)

Table 8 below shows results for the same models as the previous table (Table 7), but here we include the choices in the triple dictator game as a control. We call this control variable *altruism*. Again, men sent, on average, about $2 less than women and the membership variable is consistently predictive of trusting actions. However, other results differ quite drastically from those shown in Table 7. Attitudinal survey questions (Models 4 through 8) now do well at predicting trusting actions. Those who agreed with the statement "*you can't count on strangers anymore*" sent $0.57 less than those who disagreed with it. Those who believed that most people could be helpful and fair sent

[19] These results are in contrast to Glaeser, et al. (2000), who did not observe evidence that demographic characteristics predict trusting behavior.

more than their counterparts (1.51 and 1.78 dollars more, respectively). Finally, although the trust question does not predict trusting behavior, the *GSS index* does predict trusting actions. A one standard deviation increase in the *GSS index* results in an almost $1 increase in transfers. From these results we learn that when one controls for altruistic motives to transfer, most attitudinal questions are good predictors of behavior.

[Insert Table 8 about here.]

With respect to trustworthiness, we find that *GSS trust, GSS fair,* and the *GSS index* predict return ratios. Those who disagreed with the statement "*most people can't be trusted"* transferred back, on average, 17% more than those who agreed with this statement (see Table 9 for regression results). In line with others' results, we also find that none of the subject specific variables (male, year, white, alcohol, siblings, church, or membership) predict trustworthiness. Table 10 shows the determinants of trustworthiness when we control for altruism. By adding the proportion of the endowment sent in the modified dictator game as a control variable, we find that *GSS trust* does not correlate with trustworthiness (see Table 10). Note that *GSS fair* and the *GSS index* remain positive and significant. Also, when we control for altruism, frequency of church attendance becomes significant in Models 5, 7, and 8. Interestingly, agreement with the statement *"I am trustworthy"* correlates with return ratios, but the coefficient is negative! This finding provides meaning to the statement *"never trust someone who says 'trust me'."*

[Insert Table 9 about here.]

[Insert Table 10 about here.]

1.6 Discussion

We now return to our initial question: can we reliably ascertain that survey questions do not predict trusting actions in games? In a widely cited paper, Glaeser et al. (2000) found that the trust question and the *GSS index* did not predict trusting actions in the investment game. Our data support these results. In addition, like others, we find that the trust question (*GSS trust*) and the *GSS index* are both good predictors of trustworthiness. However, when we control for altruistic motives using the triple dictator game, attitudinal questions are, overall, good predictors of trust, and agreement with the statement *"I am trustworthy"* is a predictor of trustworthiness. The more one agrees with the statement, the less reciprocal one is. Table 11 summarizes our main results.

[Insert Table 11 about here.]

Our findings add doubt to the consensus that seems to have emerged among experimental economists that attitudinal survey questions are bad predictors of trusting actions. Clearly, the *GSS index* does correlate with trusting actions. These results seem intuitive. If we go back to Coleman's definition of trust (in Section 1.2 of this chapter), we see that the decision to voluntarily put resources at the disposal of another without a commitment depends on the degree of confidence one has in others. The questions that

form the *GSS* index –trust, fair, and help–ask about how much confidence one has in others.

What is the general implication of our findings? Having an adequate measurement of a society's level of trust is important because trust is a proxy for social capital, and social capital is thought to be a determinant of economic growth. As Cardenas and Carpenter (2008) highlight, conducting experiments in developing countries can be quite difficult. To obtain accurate results, researchers must effectively address potential issues with illiteracy; innumeracy; credibility with subjects; peer effects and other biases resulting from recruiting and scheduling techniques; lack of education; effective forms of payment; and cross talk (when one set of participants talks about the experiment to another set that have not yet participated).[20] By using surveys, many of these obstacles can be easily overcome. Surveys are easier to implement in the field, and they are less susceptible to design variability and experimenter-induced biases. The WVS and the GSS have been collecting responses to survey trust questions for several decades, and these data are publicly available. We do not find evidence to argue that the widely used attitudinal GSS questions should be changed; however, the widely used WVS should probably be adjusted to include the *help* question so that researchers who access the WVS data could form an index similar to the *GSS index*. Unlike others, based on our findings, we do not believe that behavioral survey questions are more reliable predictors of trusting actions. These questions do not ask subjects to form an assessment of others, which lies at the heart of trusting.

[20] Of course, these problems could also exist in developed societies. They are; however, exacerbated in the developing world.

Although our results are generally quite strong, we do have some concerns that are worth mentioning in the discussion. In an interesting study published in the *American Economic Review*, Karlan (2005) linked survey responses to *GSS trust*, *GSS fair*, and *GSS help* questions to choices in a variation of the trust game,[21] and to real life decisions.[22] Karlan found that, contrary to expectations, the sampled Peruvians who passed more in a 'trust' game were less likely to save and more likely to default on a loan. His explanation for this surprising result was that the trust game measures risk attitude, not trust. In other words, those borrowers who tended to pass more were also more "irresponsible." However, it could also be that the investment game that Karlan used was not isolating trust. For instance, in Karlan's experiments, indigenous people were passed more than Westerners, which may have been due to altruistic motives.

Even if we ignore the results from his experiment, Karlan also found that the GSS questions (trust, fair and help) were not predictive of savings in the micro-financing program he studied, but that they were highly predictive of default rates. Without further research, we cannot at this point reconcile his finding with ours. However, we can indeed say that more experiments that control for other regarding preferences, and more field studies that correlate survey questions with "real life" decisions need to be performed before we can with some confidence say "attitudinal questions do not predict trust." Meanwhile, a broader implication of our study is a cautionary one. We believe that people who run trust games in the field should be more careful about the implementation

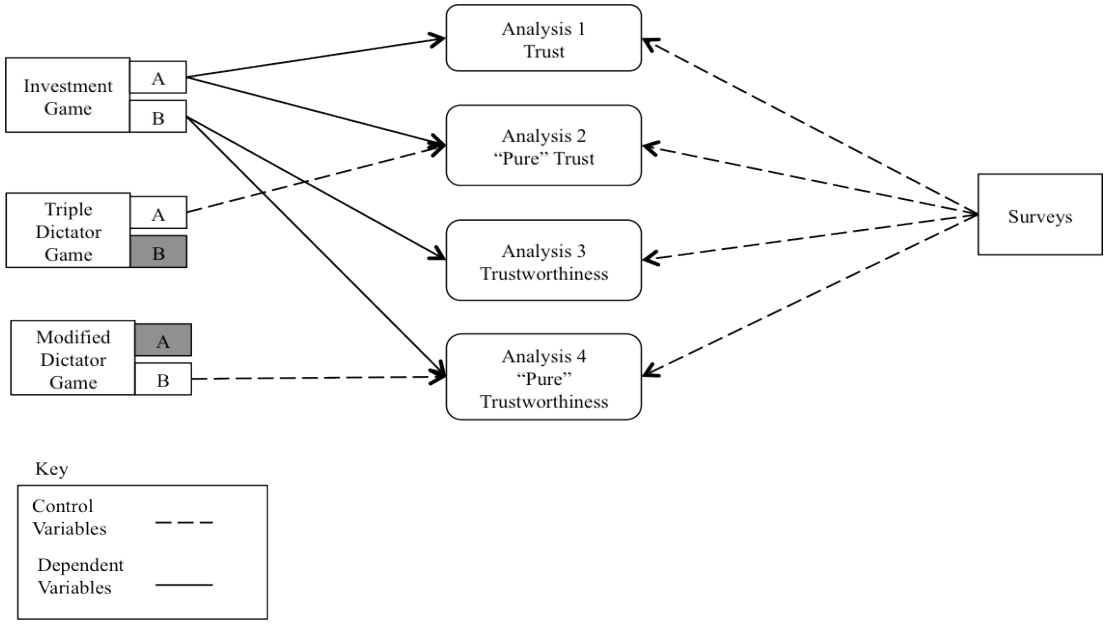
[21] The first player was allowed to pass zero, one, two, or three coins, and the experimenter matched the amount passed before allowing the second player to make a move.

[22] Karlan assumed that saving in a micro credit program was a 'real-life' measure of trusting actions because each dollar, peso or sol that an individual saved could be lost, if others defaulted (see how this is consistent with the definition of trust explained in Section 1.2), but there was a possibility of mutual gains, if they did not default. Similarly, a 'real-life' measure of trustworthiness was repayment of the loan. On the other hand, a well-known disadvantage of field experiments is the lack of control of relevant variables that may have affected the "real life" investment/default decisions.

of the games and that they should consider either conducting a dictator game in conjunction with the investment game (to control for altruism), or they should rely heavily on the GSS survey questions in their data collection. Surveys are certainly easier and cheaper to implement, and they *may*, after all, represent a more practical, homogeneous, and reliable measure of trust than certain trust games.

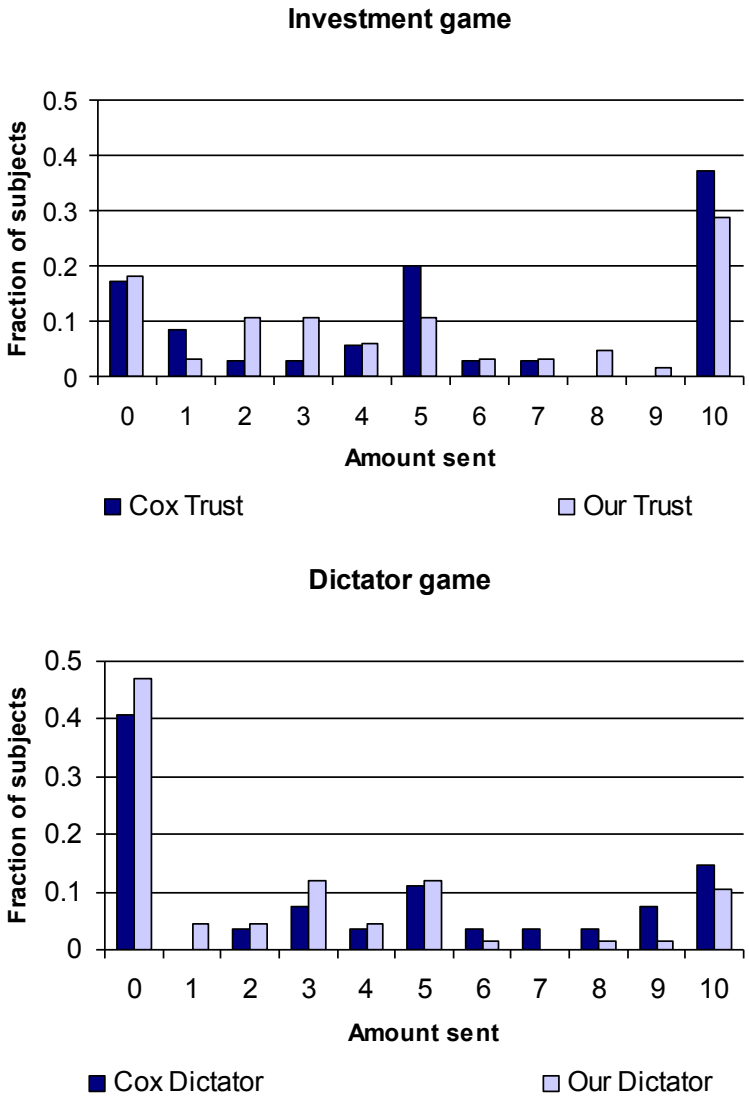
Appendix A: Figures

Figure 1: Description of Experiment



Notes: In the triple dictator game, Players B do not have a decision to make. They, rather than Players A, choose a transfer amount in the modified dictator game.

Figure 2: Comparison with Cox (2004)



Appendix B: Primary Tables

Table 1: Details of Trust Games Combined with Surveys

Study	Country	Fraction of A's Sending Zero	Fraction Sent	Fraction Returned *y/tx*	Return Ratio *y/x*	BDM	Students	Limited Strategy Space	Equal Endowments	Double Blind	Strategy Method	Multiplication of Transfer	Control for Altruism	GSS Questions	Comments
Berg et al. (1995)	USA		0.52	0.3	0.9	-	X		X	X		3x		No Survey	
Ashraf et al. (2006)[1]	Russia	0.1	0.49	0.29	0.80		X				X	3x	X		Subjects paid via random choice method.
	South Africa	0.11	0.43	0.27	0.73		X				X	3x	X		
	USA	0.09	0.41	0.23	0.58		X				X	3x	X		
Bahry et al. (2004)	Russia	0.03	0.51	0.40	1.19							3x		X[2]	Bs asked to predict transfer
Burns (2006)	South Africa	N/A	0.33	0.23	0.69	X	High School		X			3x	X		
Danielson & Holm (2007)	Tanzania	0	0.56	0.46	1.38	X			X		X	3x		X	Administered via 'take-home" packet
Ensminger (2000)	Kenya	0	0.44	0.18	0.54							3x			
Glaeser et al. (2000)	USA	0.04	0.83	0.46	0.99		X					2x		X[2]	Not anonymous, endowment = $15
Greig & Bohnet (2008)[3]	Kenya	0.13	0.3	0.41	0.82				X			2x			
Holm & Danielson (2005)	Tanzania	0.02	0.53	0.37	1.11	X	X		X			3x	X	X[4]	
	Sweden	0.05	0.51	0.35	1.05	X	X		X			3x	X	X[4]	
Johansson-Stenman et al. (2011)	Bangla-desh	0.07	0.46	0.48	1.45					X		3x		X[5]	Household heads, knew partner's religious identity
Karlan (2005)	Peru	0.23	0.46	0.43	1.11			X	X			2x		X [4,5]	
Lazzarini et al. (2004)	Brazil (Anon-ymous)	N/A	0.56	0.4	0.8		X			X		2x		X[5]	Half of the Bs could give a non-binding promise
	Brazil (Face to Face)	N/A	0.86	0.5	1		X					2x		X[5]	

Notes: All studies in this table combined attitudinal survey questions with the investment game. Some of these specifically included the GSS questions. All studies used a variation of the investment game. Unless both subjects had equal endowments and transfers were multiplied by 3, we did not categorize the game as 'BDM.' Other variations are as noted below:
1. Some of these values are taken from Cardenas and Carpenter (2008) 2. Survey was administered days or weeks before games were played. 3. These figures differ from that reported by author(s), because the author(s) allow Bs to return from total wealth, not only from amount transferred. 4. Surveys took place after the game. 5. Surveys took place before the game.

Table 2: Comparison of Results for the Triadic Design, Mean Amount Passed (Std)

Game	Cox Data	Our Data	H_o : diff. in row means = 0
Investment (first movers)	5.97 (3.87) n=32	5.03 (3.77) n=63	t=-1.135; p=0.130; two-tailed
Triple Dictator	3.63 (3.86) n=30	*2.68 (3.32) n=63	t=-1.226; p = 0.112; two-tailed
H_o : diff. in col. means = 0	t-test; p=0.010; one-tailed	p=0.000; one-tailed	
Investment (second movers)	4.94 (6.63) n=32	5.94 (6.06), n=54	t=0.719; p = 0.474; two-tailed
Modified Dictator	2.06 (3.69) n= 32	**5.24 (6.15), n=54	t=2.243; p=0.014; two-tailed
H_o : diff. in col. means = 0	t-test; p=0.018; one-tailed	p=0.169; one-tailed	

* On average, people sent about 27%, and ** 28% of the amount available for transfer.

Table 3: Description of Variables – Mean and Std for Player As, Bs, and All

Task	Variable Name	Description / range of values	Mean (Std) As	Mean (Std) Bs	Mean (Std) all
Games	Investment	Amount passed in the trust game. Maximum is 10, minimum is 0	5.03 (3.77)		
	Triple Dictator	Amount passed by As in the dictator game. Maximum is10, minimum is 0	2.68 (3.32)		
	Trustworthy	Fraction returned from available amount, 3x. Can be between 0 and 1		0.29 (0.24)	
	Modified dictator	Amount passed by Bs in the modified dictator game. Can be between 0 and 30.		5.24 (6.15)	
Survey A	Male	Sex of the student subject. Dummy: 1 Male, 0 Female	0.40 (0.49)	0.48 (0.50)	0.44 (0.50)
	Year	Year of education in college. Values range from 1: "Freshman," 2: "Sophomore," 3: "Junior," 4: Senior," and 5: "Graduate"	3.21 (1.15)	3.06 (1.09)	3.13 (1.12)
	White	Race of the student subject. Dummy: 1 White , 0 Other	0.46 (0.50)	0.39 (0..49)	0.43 (0.50)
	Alcohol	Number of alcoholic drinks consumed per week. Positive integer number.	4.14 (5.92)	4.25 (6.09)	4.20 (5.00)
	Siblings	Number of siblings. Positive integer number.	1.68 (1.29)	1.71 (1.15)	1.70 (1.22)
	Church	Answers to the question "How often do you go to church or other place of worship?" Answers are, 0: "Never," 1: "Sometimes," 2: "At least once a week."	0.89 (0.72)	0.91 (0.63)	0.90 (0.67)
Survey B	Membership	Sum of degree of involvement in associations variables. Values range from 0: "None," 1: "Member," 2: "Active member," to 3: "On the board". Values ranged from 0 to 12	5.52 (2.59)	5.92 (3.42)	5.73 (3.04)
Survey C	GSS Trust	Answers to the question "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Answers are, 1: "Can't be too careful"; 2: "Most people can be trusted"	1.27 (0.45)	1.32 (0.47)	1.30 (0.46)
	GSS Fair	Answers to the 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?" Answers are, 1: "Would take advantage of you"; 2: "Would try to be fair"	1.26 (0.44)	1.45 (0.50)	1.49 (0.50)
	GSS Help	"Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves" Answers are, 1: "Just look out for themselves"; 2: "Try to be helpful"	1.40 (0.49)	1.41 (0.50)	1.41 (0.49)
	GSS Index	Normalized sum of de-meaned and normalized data from *GSS Trust*, *GSS Fair*, and *GSS Help*	0.00 (1.00)	0.00 (1.00)	0.00 (1.00)
	Trust stranger	Disapproval or approval of the statement, "You can't count on strangers any more." Answers range from 3: "Strongly agree" to -3: "Strongly disagree". This variable was resigned for the analysis.	-0.39 (1.36)	-0.15 (1.50)	-0.12 (1.46)
	Behavior Index	Normalized sum of responses to three questions related to the frequency of leaving the door unlocked, lending money and lending possessions. Answers are positive real numbers.	0.00 (1.00)	0.00 (1.00)	0.00 (1.00)
	Trustworthy	Approval or disapproval of the statement, "I am trustworthy." Answers range from 3: "Strongly agree" to -3: "Strongly disagree"	2.16 (0.81)	2.11 (1.07)	2.13 (0.95)

Table 4: Correlations Between Pairs of Demographic Variables – All Subjects (n =129)

	Male	Year	White	Alcohol	Siblings	Church	Membership
Male	1.000	-0.441 (0.000)	0.054 (0.546)	0.224 (0.011)	-0.100 (0.259)	-0.006 (0.947)	0.002 (0.979)
Year		1.000	0.067 (0.453)	0.061 (0.491)	0.012 (0.890)	0.111 (0.209)	-0.035 (0.691)
White			1.000	0.362 (0.000)	-0.173 (0.050)	-0.198 (0.024)	-0.032 (0.723)
Alcohol				1.000	-0.045 (0.610)	-0.151 (0.087)	-0.024 (0.785)
Siblings					1.000	0.211 (0.016)	-0.039 (0.658)
Church						1.000	0.128 (0.148)
Member-ship							1.000

Notes: n = 129; Significance levels in parentheses

Table 5: Order of Games and Surveys

	Session											
	1	2	3	4	5	6	7	8	9	10	11	12
Task	PG	SC	BD	SC	PG	SC	BD	SC	PG	SC	DG	SC
	DG	PG	SA	BD	BD	PG	DG	BD	DG	PG	PG	DG
	BD	DG	DG	SA	TG	BD	PG	DG	BD	DG	BD	PG
	SB	BD	PG	DG	X	TG	TG	PG	SA	BD	SB	BD
	TG	SB	TG	PG	MD	X	SA	TG	TG	SA	TG	SB
	X	TG	X	TG	SA	MD	X	SA	X	TG	X	TG
	BT	X	CC	X	DG	SA	MD	X	BT	X	BT	X
	SA	BT	SB	CC	SB	DG	SB	MD	SB	BT	SA	BT
	TG	SA	BT	SB	BG	SB	BT	SB	TG	SB	MD	SA
	W	TG	W	BT	W	BG	W	BT	W	TG	W	MD
	SC	W	SC	W	SC	W	SC	W	SC	W	SC	W

Trust Game = TG; Triple Dictator Game = DG; Modified Dictator = MD; Binary Trust = BT; Binary Dictator = BD; Public Goods Game = PG; Survey A = SA; Survey B = SB; Survey C = SC; P-Beauty = X; Written response = W

Table 6: Pair-Wise Correlations Between Amounts Sent and Return Ratios and Responses in Surveys

	GSS Trust	GSS Index	Trust Stranger	Behavior Index	T-worthy
Investment	0.038	0.219	0.182	-0.115	0.306*
Game Transfers	(0.772)	(0.088)	(0.154)	(0.369)	(0.015)
Investment Game	0.287*	0.415*	0.409*	0.066	-0.171
Return ratios	(0.050)	(0.004)	(0.004)	(0.659)	(0.249)

Notes: Significance levels in parentheses, * = significance at the 5% level or lower. n = 63 (Players A); n = 54 (Players B).

Table 7: Investment Game as a Function of Trust Attitudes and Sender Characteristics

	Dependent Variable: Amount sent							
Ind. Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GSS Index								0.442
								(0.431)
GSS Fair							0.881	
							(1.045)	
GSS Help						1.014		
						(0.906)		
GSS Trust					-0.103			
					(0.948)			
Trust				0.448				
Strangers				(0.319)				
Behavior			0.050					
Index			(0.477)					
Trustworthy		0.951						
		(0.572)						
Male	-2.031**	-1.487	-2.037**	-1.777*	-2.219**	-2.210**	-2.018*	-2.140**
	(0.997)	(1.034)	(1.007)	(1.004)	(1.023)	(1.010)	(1.044)	(1.016)
Year	0.306	0.571	0.313	0.383	0.293	0.204	0.430	0.258
	(0.426)	(0.449)	(0.436)	(0.426)	(0.431)	(0.432)	(0.458)	(0.427)
White	0.007	-0.205	0.009	-0.230	0.191	-0.022	0.261	0.033
	(0.901)	(0.896)	(0.909)	(0.909)	(0.926)	(0.933)	(0.923)	(0.928)
Alcohol	0.038	0.044	0.036	0.021	0.037	0.033	0.034	0.033
	(0.078)	(0.077)	(0.082)	(0.078)	(0.079)	(0.078)	(0.078)	(0.078)
Siblings	-0.054	-0.074	-0.052	-0.045	-0.026	-0.016	0.021	-0.025
	(0.329)	(0.324)	(0.333)	(0.326)	(0.333)	(0.329)	(0.336)	(0.330)
Church	-0.481	-0.581	-0.466	-0.662	-0.407	-0.383	-0.424	-0.427
	(0.615)	(0.609)	(0.637)	(0.623)	(0.625)	(0.618)	(0.620)	(0.618)
Membership	0.745***	0.647***	0.746***	0.731***	0.794***	0.748***	0.792***	0.767***
	(0.170)	(0.177)	(0.172)	(0.169)	(0.178)	(0.180)	(0.176)	(0.178)
Constant	1.102	-1.283	1.065	1.331	0.827	-0.116	-1.010	1.034
	(1.721)	(2.219)	(1.772)	(1.713)	(2.013)	(1.907)	(2.708)	(1.782)
Adj R-squared	0.256	0.279	0.242	0.269	0.251	0.269	0.261	0.266
Numb. Obs.	63	63	63	63	62	62	62	62

Notes: OLS regression coefficients. Standard errors in parentheses. The data were resigned such that a higher coefficient means more trust. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 8: Investment Game as a Function of Trust Attitudes and Sender Characteristics (Controlling for Altruism)

	Dependent Variable: Amount sent							
Ind. Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GSS Index								0.934**
								(0.406)
GSS Fair							1.783*	
							(0.979)	
GSS Help						1.512*		
						(0.837)		
GSS Trust					0.887			
					(0.923)			
Trust Strangers				0.574*				
				(0.292)				
Behavior Index			-0.166					
			(0.445)					
Trustworthy		0.445						
		(0.568)						
Altruism	0.386***	0.355***	0.393***	0.415***	0.418***	0.415***	0.436***	0.467***
	(0.120)	(0.127)	(0.122)	(0.118)	(0.128)	(0.120)	(0.122)	(0.122)
Male	-2.268**	-1.993**	-2.252**	-1.958**	-2.463**	-2.411**	-2.025**	-2.280**
	(0.924)	(0.992)	(0.933)	(0.914)	(0.943)	(0.921)	(0.945)	(0.907)
Year	0.230	0.361	-0.204	0.324	0.181	0.086	0.493	0.136
	(0.394)	(0.429)	(0.404)	(0.387)	(0.398)	(0.394)	(0.415)	(0.382)
White	0.000	-0.099	-0.006	-0.304	0.088	-0.176	0.285	-0.194
	(0.833)	(0.845)	(0.840)	(0.826)	(0.852)	(0.850)	(0.836)	(0.830)
Alcohol	0.073	0.073	0.082	0.054	0.071	0.070	0.071	0.073
	(0.073)	(0.073)	(0.077)	(0.072)	(0.073)	(0.072)	(0.072)	(0.070)
Siblings	-0.070	-0.078	-0.078	-0.060	-0.044	-0.035	0.044	-0.051
	(0.304)	(0.306)	(0.308)	(0.297)	(0.306)	(0.300)	(0.304)	(0.294)
Church	-0.481	-0.528	-0.531	-0.713	-0.461	-0.386	-0.457	-0.464
	(0.569)	(0.574)	(0.589)	(0.567)	(0.575)	(0.562)	(0.562)	(0.552)
Membership	0.649***	0.611***	0.643***	0.624***	0.664***	0.612***	0.672***	0.609***
	(0.160)	(0.168)	(0.162)	(0.156)	(0.168)	(0.168)	(0.163)	(0.164)
Constant	0.816	-0.277	0.934	1.088	-0.383	-0.743	-3.008	1.138
	(1.593)	(2.122)	(1.637)	(1.558)	(1.887)	(1.745)	(2.514)	(1.590)
Adj R-squared	0.364	0.359	0.354	0.396	0.367	0.394	0.395	0.416
Numb. Obs.	63	63	63	63	62	62	62	62

Notes: OLS regression coefficients. Standard errors in parentheses. Data were resigned so that a higher coefficient means more trust.

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 9. Trustworthy: Return Rates as a Function of Trust Attitudes and Player B Characteristics

	Dependent variable: ratio of available funds returned							
Ind. Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GSS Index								0.102***
								(0.035)
GSS Fair							0.231***	
							(0.056)	
GSS Help						0.117		
						(0.073)		
GSS Trust					0.176*			
					(0.094)			
Trust Strangers				0.067***				
				(0.021)				
Behavior Index			0.018					
			(0.043)					
Trustworthy		-0.040						
		(0.034)						
Male	-0.098	-0.132	-0.094	-0.121	-0.065	-0.082	-0.084	-0.063
	(0.094)	(0.097)	(0.097)	(0.083)	(0.094)	(0.095)	(0.079)	(0.085)
Year	-0.009	-0.011	-0.009	-0.034	-0.028	-0.007	-0.030	-0.025
	(0.038)	(0.038)	(0.037)	(0.031)	(0.033)	(0.035)	(0.029)	(0.029)
White	0.075	0.034	0.072	0.087	0.048	0.064	0.055	0.045
	(0.083)	(0.084)	(0.084)	(0.080)	(0.076)	(0.078)	(0.075)	(0.073)
Alcohol	-0.001	-0.001	-0.003	-0.004	-0.005	-0.001	-0.002	-0.003
	(0.005)	(0.004)	(0.007)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Siblings	-0.019	-0.030	-0.016	-0.026	-0.022	-0.020	-0.041	-0.030
	(0.033)	(0.028)	(0.035)	(0.030)	(0.034)	(0.033)	(0.029)	(0.031)
Church	0.076	0.073	0.071	0.058	0.098	0.068	0.101	0.091
	(0.065)	(0.066)	(0.066)	(0.061)	(0.062)	(0.066)	(0.061)	(0.061)
Membership	0.012	0.011	0.011	0.006	0.012	0.008	0.013	0.009
	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Constant	0.240	0.385	0.245	0.416**	0.067	0.099	-0.017	0.319*
	(0.225)	(0.244)	(0.222)	(0.196)	(0.250)	(0.267)	(0.213)	(0.188)
R-squared	0.109	0.136	0.113	0.259	0.183	0.162	0.313	0.263
Numb. Obs.	54	54	54	54	54	54	54	54

Notes: OLS regression coefficients. Robust standard errors in parentheses. Data were resigned so that a higher coefficient means more trust.

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 10: Trustworthy: Return Rates as a Function of Trust Attitudes and Player B Characteristics (Controlling for Altruism)

	Dependent variable: ratio of available funds returned							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Ind. Variables								
GSS Index								0.081**
								(0.035)
GSS Fair							0.186***	
							(0.061)	
GSS Help						0.104		
						(0.071)		
GSS Trust					0.113			
					(0.094)			
Trust Strangers				0.026				
				(0.027)				
Behavior Index			0.002					
			(0.038)					
Trustworthy		-0.052**						
		(0.025)						
Altruism	0.739***	0.752***	0.738***	0.668***	0.680***	0.698***	0.623***	0.630***
	(0.142)	(0.134)	(0.143)	(0.162)	(0.136)	(0.135)	(0.145)	(0.137)
Male	0.022	-0.015	0.023	0.002	0.033	0.018	-0.002	0.017
	(0.082)	(0.079)	(0.087)	(0.077)	(0.087)	(0.077)	(0.077)	(0.077)
Year	-0.035	-0.037	-0.034	-0.040	-0.046	-0.030	-0.044	-0.042
	(0.031)	(0.033)	(0.033)	(0.031)	(0.033)	(0.031)	(0.033)	(0.032)
White	0.100	0.050	0.010	0.106	0.077	0.081	0.045	0.052
	(0.084)	(0.084)	(0.085)	(0.086)	(0.078)	(0.078)	(0.078)	(0.076)
Alcohol	-0.003	-0.002	-0.003	-0.005	-0.005	-0.004	-0.001	-0.004
	(0.005)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
Siblings	0.018	0.001	0.018	0.009	0.014	0.024	0.003	0.014
	(0.034)	(0.029)	(0.035)	(0.032)	(0.033)	(0.034)	(0.030)	(0.030)
Church	0.079	0.076	0.079	0.073	0.100**	0.073	0.102**	0.097*
	(0.045)	(0.046)	(0.048)	(0.045)	(0.049)	(0.048)	(0.049)	(0.048)
Membership	0.006	0.005	0.006	0.004	0.004	0.004	0.011	0.006
	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Constant	0.018	0.200	0.018	0.109	-0.069	-0.106	-0.179	0.100
	(0.197)	(0.193)	(0.199)	(0.188)	(0.219)	(0.219)	(0.187)	(0.189)
R-squared	0.525	0.569	0.525	0.538	0.545	0.557	0.624	0.596
Numb. Obs.	44	44	44	44	44	44	44	44

Notes: OLS regression coefficients. Robust standard errors in parentheses. Data were resigned so that a higher coefficient means more trust.

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 11: Summary of Relevant Results from Regressions (Trust = Amount Sent; T-worthy = Return Ratio)

		Investment Game (OLS)		Investment Game (controlling for Altruism) (OLS)	
Survey Variable		Trust	Trustworthiness	Trust	Trustworthiness
Attitudinal	GSS Index		+	+	+
	GSS Trust		+		
	GSS Fair		+	+	+
	GSS Help			+	
	Trust Stranger		+	+	
Behavioral	Behavior Index				
	I am T-worthy				–

Appendix C: Supplementary Table

Table 12: Correlations Between Different Survey Measures of Trust

	GSS Trust	GSS Help	GSS Fair	GSS Index	Trust Stranger	Behavior Index
GSS Trust	1.000	0.403*	0.489*	0.797*	0.089	0.209*
		(0.000)	(0.000)	(0.000)	(0.320)	(0.018)
GSS Help		1.000	0.427*	0.771*	0.065	0.079
			(0.000)	(0.000)	(0.469)	(0.375)
GSS Fair			1.000	0.807*	0.004	0.069
				(0.000)	(0.963)	(0.493)
GSS Index				1.000	0.630	0.147
					(0.481)	(0.097)
Trust Stranger					1.000	0.093
						(0.256)
Behavior Index						1.000

Notes: Significance levels in parentheses. * = significant at the 5% level or lower. n = 129

2. Trust, Trustworthiness and Cooperation: Are the Trusting and Trustworthy Cooperative?

2.1 Introduction

Economic agents rarely enjoy the benefit of complete information when engaging in transactions. Because most contracts are incomplete, each individual must rely on some level of confidence in the other party's ability and willingness to honor a commitment, thereby filling the 'gap' in the contract and ensuring an efficient exchange. Social scientists frequently refer to trust and cooperation when trying to understand the successes or failures of exchanges as they relate to this gap. Experimental economists have studied both of these concepts extensively and have developed games to measure levels of trust and cooperation in a variety of societies and settings. Data show, for example, that sex (Buchan et al., 2008), religion (Tan and Vogel, 2008), and ethnicity (Buchan et al., 2006) influence trust. We have also learned that cooperators will punish non-cooperators at a cost to themselves (see, for example, Dawes et al., 1986; Yamagishi, 1986, 1988a, b; Ostrom et al., 1992) and that when such costly punishment is permitted, cooperation does not diminish over time (Fehr and Gächter, 2000).

Indeed, previous work has helped us measure trust and determine who is trusting or trustworthy, and it has helped us design ways to identify the cooperative from the uncooperative. However, to our knowledge, little research linking measures of trust and cooperation together exists. Though there have been hundreds of studies evaluating levels of trust and hundreds of studies analyzing levels of cooperation, only Karlan

(2005) and Cardenas et al., (2009) examined these two behaviors simultaneously.[23] Yet Karlan's (2005) primary goal was to determine whether experimental measures of social capital could predict real-world financial decisions,[24] and the primary goal of Cardenas et al. (2009) was to characterize Latin American cities based on their social preferences.[25] With the exception of these two studies, both of which had different primary goals from ours, no one has specifically studied whether subjects make consistent pro-social decisions across games intended to measure related behaviors.

In this chapter I present results of a within-subject study in which subjects played two distinct games designed to measure trust – a binary trust game and the investment game – and a public goods game commonly believed to measure cooperation.[26] In each of these games, subjects could choose to transfer control of a portion or all of their resources to other players without a reciprocal commitment from them. We find that pro-social behavior was generally consistent across games. More specifically, trust in the binary game predicted trust in the investment game, and vice versa; and trusting and trustworthy actions predicted cooperation in the public goods game, and vice versa. These results suggest that these popular games can be used interchangeably when needed.

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[23] Gächter et al. (2004) compared a behavioral measure of cooperation with attitudinal trust measures. Carpenter et al. (2004) examined experimental behavioral measures of cooperation in relationship with other behavioral measures of social capital.

[24] Karlan's (2005) group sizes varied from 9 to 29, depending on the attendance at the microfinance meeting on the day of the game.

[25] Group sizes for this public goods game were not specified; however, an example using 10 individuals per group was provided.

[26] Although we generally refer to contributions in the public goods game as a measure of cooperation (see, for example, Chaudhuri, 2009; Ledyard, 1995; and others), there may be other motives for contributing, such as altruism, a tolerance for free-riding, conditional cooperation, etc. (A verbal protocol analysis of subjects' motivation for their decisions in this game could yield insight regarding which attributes drive their behaviors.) Other games for measuring cooperation exist. A possible extension of this chapter could be to compare behavior across these games.

We also gathered responses to motivational questions, which suggest that confidence in the others' willingness to reciprocate was the main driver of cooperation and trust.

The rest of the chapter is organized as follows. In the next section we discuss trust and cooperation and how they are measured. In Section 2.3, we describe our experimental procedures. We present our results in Section 2.4, and the last section, Section 2.5, includes a discussion of our findings and the implications of our study.

2.2 Trust and Cooperation

Trust lessens the need for written contracts, encourages innovation, helps preserve property rights, and facilitates growth. While scholars agree on trust's myriad benefits, an exact definition of this value varies across social sciences.[27] Like us, most experimental economists adopt Coleman's definition (Coleman, 1990) because it provides a measurable description of trust. Coleman states that trust is an action that involves the voluntary placement of resources at the disposal of a trustee with no enforceable commitment from the trustee. Trust creates the potential for loss if the trustee is opportunistic but for mutual benefit if the trustee reciprocates. Thus, the willingness to put oneself in such a vulnerable position is determined by the amount of confidence one has in others.

Because this definition suggests a method of measurement, most experimental economists use it as the basis for organizing games aimed at measuring trust (see Camerer, 2003). Since the introduction of trust experiments in the mid 1990s, there have been a plethora of papers on the topic. Most of these papers used variations of trust games to identify demographic factors such as nationality, culture, race, age, or sex that

[27] Hosmer (1995) provides a survey of definitions of trust across multiple disciplines.

influence trust (see Johnson and Mislin, 2011 for a meta-analysis). A second area explores the link between trust game(s) and survey questions designed to reveal trusting attitudes. A goal for this line of research is to find the most accurate tool for measuring trust (see Glaeser et al., 2000; Fehr et al., 2002; and Chapter 1).

The large amount of literature on trust reveals numerous variations of games designed to measure it (see Chapter 1). Here, we focus on two specific designs. The first is the binary trust game as in Güth et al. (1997), which is the simplest way of behaviorally measuring trust. In this game, a player decides whether she passes a fixed amount of her endowment to the trustee, who can choose to reciprocate. The second is the investment game of Berg et al. (1995), in which a player chooses an amount from her initial endowment to send to the trustee, who then can choose an amount to send back. We seek to determine whether behavior in one of these games can predict behavior in the other. If behavior in the binary trust game and the investment game is consistent, then we may compare results across trust games that have different strategy spaces. Several authors have altered the investment game for the specific purposes of robustness checks. For instance, Anderson et al. (2006) varied the endowments for subjects, Eckel and Wilson (2002) allowed players to choose their own partners, Burks et al. (2003) let subjects play both roles, and Anderhub et al. (2002) implemented a repeated trust game with incomplete information. Variations of the kinds described above yielded different findings. However, to our knowledge, we are the first to study whether the simplest version of a trust game with discrete strategy space will produce results that are consistent with those from an investment game.[28]

[28] For example, Barr's (2003) experiment in Zimbabwe and Mosley and Verschoor's (2005) experiment in Uganda used limited strategy space. If the binary trust game correlates with the investment game, then in

In addition to trust, scholars and society alike attribute positive economic outcomes to cooperation. Many real world problems require not sequential trust or trustworthiness between two people, but a simultaneous decision among multiple parties to put the interest of the group above their own. Thus, cooperation requires someone to give up personal gains to improve the group's gains. Examples of problems requiring cooperation to overcome free-riding incentives include provision of public goods (such as security and public television) as well as collective actions (such as strikes or demonstrations). In each of these scenarios, cooperating individuals sacrifice their own time/money/interests in anticipation that other individuals will do the same to the benefit of everyone involved. They 'trust' that other individuals will sacrificially contribute as well. Most scholars would argue that trust (putting oneself in a vulnerable position) and trustworthiness (the decision not to exploit others' vulnerability) are key components of cooperation. As Hardin (2002) and Gächter et al. (2004) emphasize, as a society, we are primarily interested in trust and trustworthiness for the contribution they make toward cooperation, which is society's central concern.

Despite the numerous studies on the provision of public goods, economists have not emphasized the link between cooperation and trust measured experimentally. As mentioned above, notable exceptions are Karlan (2005) and Cardenas et al. (2009), although the main objectives of their studies were not to correlate such behaviors. Others such as Gächter et al. (2004) and Carpenter et al. (2004) compared cooperative actions to subjects' socio-demographic characteristics and/or to their responses to survey questions regarding trust attitudes and behaviors. Gächter et al. (2004) found that people who

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principle, we could compare the behavior of these participants with, for example, that of Tanzanians (Danielson and Holm (2005, 2007)) or South Africans (Ashraf et al. (2006), Burns (2006)).

claimed to trust strangers and believed others to be helpful and/or fair contributed more to the public good than those who did not. This result supports the argument that cooperation and trust may correlate. Carpenter et al. (2004) discovered that contributors to the public good were willing to sacrificially punish non-contributors, and that cooperative behavior correlated with various demographic and behavioral characteristics such as past participation in community projects, community leadership, and the relationship between players and their neighbors. However, the literature currently lacks a detailed analysis of the relationship between trusting and cooperative decisions in *experimental games*. We seek to determine experimentally whether trusting individuals are also cooperative.

2.3 Experimental Design and Procedures

Since we wish to compare different measures of pro-social behavior, our specific goals are to determine how decisions in the binary trust game compare to decisions in the investment game and how each of these choices compares to decisions in the public goods game, which measures cooperation. We designed an experiment where the same set of subjects participated in a series of games and surveys. Among the games, we included the binary trust game, the investment game, and the public goods game. The surveys were designed to collect demographic and association/membership information about our subjects.

Figure 3 shows the binary trust game, which provides the most basic experimental measure of trust. Here, the first player, Player 1, has the task to either stop (S) or continue (C) the game. If Player 1 stops, then the game is over, and each player receives

an amount equal to s. However, if she continues, then Player 2 can choose to either reciprocate (R) or exploit (E). The sub-game perfect equilibrium in this game is for Player 2 to choose E and for Player 1 to choose S, because payoff values are r<s<t<u. In our experiment, r = 5, s = 10, t = 15, and u = 20. The payoffs were chosen so as to match the incentives in the investment game described below. A decision by Player 1 to continue the game represents confidence that Player 2 will reciprocate towards a mutually beneficial outcome. Similarly, a Player 2's decision to choose R represents trustworthiness.

[Insert Figure 3 about here.]

While the binary trust game does provide insights into the presence or absence of trust and trustworthiness, its binary nature prohibits a measure of the *degree* of trust or trustworthiness one player has towards another. In contrast, the investment game is a dynamic game of complete information between two players with identical endowments, say $\bar{x}$. The first player, called the investor, faces a choice to transfer to the second player, or trustee, any amount $x \in [0, \bar{x}]$. The experimenter multiplies x by t>1, and the trustee has an option to transfer back any amount $y \in [0, tx]$. The payoffs for the first and second players are $\bar{x} - x + y$ and $\bar{x} + tx - y$, respectively.[29] While game theoretic assumptions suggest no transfers should occur in equilibrium, in the lab subjects frequently transfer positive sums of money. Commonly the amount, x, transferred by the first player represents her level of trust, and the percentage returned, y/tx, signifies her degree of trustworthiness. In our experiment, all players received an endowment of $10. The first

[29] The investment game as described here follows the design of Berg et al. (1995). However, several variations and extensions have since been introduced.

players were allowed to transfer any amount up to \$10 to the second player. All transfers were tripled before the second player made his decision to pass back.

In a public goods game, players simultaneously decide how much of an initial endowment they would like to invest into a public project (i.e. group fund). The marginal return from investing in the public project is lower than the marginal return from not investing; however, the aggregate amount invested benefits all the players in the group. We endowed each subject with 10 dollars. Subjects could keep or contribute any amount between \$0 and \$10; most subjects contributed integer amounts. Keeping a dollar was like contributing to a private fund with a constant marginal return equal to 1, whereas contributing to the group fund had a constant marginal return equal to 0.5. Thus, the payoff function for each subject, *i,* was equal to the following expression:

$$\Pi_i = (10 - c_i) + 0.5\sum_{j=1}^{3} c_j$$

where Π_i and c_i represented subject *i*'s payoff and contribution to the group fund, respectively with *i* and *j* =1, 2, or 3. In this game, it is a dominant strategy to contribute nothing to the group fund, as an additional 0.5 dollars are earned for every dollar one excludes from the group fund; however, the Pareto optimal solution is for each group member to contribute 100% of their endowment. Figure 4 depicts the cumulative contributions of Players A and Players B. Our pattern of contributions for both players resembles those of many other authors, including Gächter et al. (2004), who have conducted one-shot public good games (see also Camerer, 2003). The pattern highlights important individual differences in contribution amounts (see Ledyard, 1995).

[Insert Figure 4 about here.]

Table 13 provides a description and summary statistics of the relevant choice variables, including amounts passed and fractions returned in the investment game, decisions to stop or continue in the binary trust game, and amounts contributed in the public goods game.

[Insert Table 13 about here.]

We recruited subjects via postings on a University-wide electronic bulletin board and conducted this experiment in a dedicated experimental lab.[30] Each subject received a random assignment to the role of either Player A or Player B. All sessions lasted approximately 90 minutes, and there were between 8 and 12 subjects in each session (inclusive). Earnings ranged from $0 to $40 plus a $3 show-up fee. Our sample included subjects who had not participated in economic experiments in the past.

To ensure privacy and to prevent communication, each subject sat behind a closed partition, and the experimenters requested that all subjects turn off their electronic devices and remain silent during each session. Experimenters distributed all instructions and read them aloud so that all information was common to all subjects. Each session consisted of the games mentioned above designed to measure trust, trustworthiness, and cooperation. We also included a dominance solvable game (where subjects had to identify a dominant strategy and that was unrelated to this project), survey questions (for demographic control variables), and a written response section (where subjects were asked to write a comment and that was unrelated to this project). Because our within-subject design could potentially create order effects and thus bias results, to the extent

[30] Our recruiting form and all other subject materials, including instructions and surveys, are available upon request. Please send an e-mail to klanier@emory.edu.

reasonable and possible, we altered the sequence of the games in each session. Moreover, the demographic and behavioral questions that we posed to subjects provided a 'cushion' because they were separated into three distinct surveys that we administered between games. (We also varied the order in which we administered the three surveys.) After each decision, subjects were given a few minutes to explain their choices in writing.

Because we desired to analyze behavior in one-shot scenarios, prior to reading the instructions for each game, the experimenter emphasized that subjects were being paired (or in the case of the public goods game, matched) with a new player(s).[31] All matchings were pre-set by the experimenter, but random to the players. To prevent the results of one game from influencing decisions in a subsequent game (or at least to minimize the potential for influence), decisions were revealed only at the end of the session. (In the trust games, Players B had to be informed of Players A's decisions before making their own.) As each game was played, the experimenter assigned the game a number and wrote its code name on the white board in front of the room. At the conclusion of all parts of the experiment, the experimenters privately revealed the results of each game to each subject and aided her in calculating her earnings for each game. A volunteer subject randomly drew a ping-pong ball from an envelope. The number written on the drawn ball indicated the game that would count towards the subjects' earnings for that session. Each subject was paid privately and given a receipt as she exited the room.

[31] As long as 12 people showed up to participate in the experiment, in the two-player games, no one was matched with another more than once. When there were fewer than 12, repeat matching was necessary, but the individuals did not know at any time with whom they were matched. For the public goods game, we matched three players; all were either A or B.

Our data include responses from a total of 129[32] subjects who participated in one of 12 sessions. Because we are interested in subjects' tendencies to trust and cooperate with people, in general, rather than with specific 'others' we wanted our subjects to interact with unknown individuals. To assure this was the case, we asked subjects how many other people they knew in the lab. Seventy-five percent of the subjects knew at most one other person in the room, with the modal number of people in the room whom the subjects knew being 0. Only 3 out of 129 subjects knew 4 other people in the room. Thus, it is safe to say that the games were played among strangers. About 44% of our 129 subjects were male; 26% were either freshmen or sophomores; 31% were juniors, 33% were seniors, and 10% were graduate students. Fifty-seven percent (57%) of our subjects were black, Hispanic, or Asian, and the remainder were white. About 50% of our subjects had two or more siblings, 38% had one sibling, and 12% were only children. The description of the demographic variables, mean values and standard deviations can be found in Table 13.

In our sample, males were younger than females and drank more alcohol; non-whites drank less alcohol, had more siblings, and attended a place of worship more often than whites. Table 14 shows the pair-wise correlations of the abovementioned variables. Each of these variables has been analyzed in other research (see Glaeser et al., 2000; Glaeser et al., 2002; Gächter et al., 2004; Chapter 1).

[Insert Table 14 about here.]

[32] Three subjects were excluded because they were outliers; they provided implausible answers to some of the questions (e.g., excessive consumption of alcoholic beverages/week).

In a second survey, we asked subjects to indicate their level of involvement in a variety of clubs and organizations. Specifically, participants circled an involvement level of *none*, *member*, *active member*, or *on the board* for each of the following: sports club, choir or orchestra, political party or lobbying group(s), non-profit organization, social club, or other. We assigned each response a value between 0 (no involvement) and 3 (on the board). While the maximum possible level of involvement was 21, our values ranged from 0 to 12 with a mean value for all subjects combined of 5.73. Because previous research cited above suggests that individuals more heavily involved in social activities will exhibit a higher level of pro-social behavior, we anticipated that this membership variable would help to explain subjects' decisions in the games.

2.4 Results

The analysis of our data consists of determining whether actions in these three games correlate, and whether pro-social behavior in one of the three games can predict pro-social behavior in the other two. In addition, we analyze each game individually to identify other observable variables that can predict subjects' choices in these games.

Table 15a provides a summary of the pair-wise correlations between pro-social actions in games. The following is noteworthy: a decision to trust (continue) in the binary trust game is correlated with the amounts that Players A transferred in the investment game, and the amounts they contributed in the public goods game (coef. = 0.382 and 0.404, respectively). Similarly, trusting decisions in the investment game correlate, although weakly, with decisions to contribute in the public goods game (coef. = 0.274).

[Insert Table 15a about here.]

While we view Player A's decisions in the binary trust game and investment game as measures of trust, the decisions made by Player B indicate her level of trustworthiness. In Table 15b, we present the pair-wise correlations between a subject's trustworthiness and her level of cooperation in the games. Similar to our findings with Players A, here we find that a player's decision to reciprocate in the binary trust game positively correlates with her rate of return (trustworthiness) in the investment game and her contribution in the public goods game (coef. = .411 and .378, respectively). We also find a positive correlation, although weaker, between trustworthiness in the investment game and cooperation in the public goods game (coef. = 0.300).

[Insert Table 15b about here.]

Can pro-social behavior in one game predict pro-social behavior in another? In analyzing the predictive powers of the games, we will first discuss choices made by Players A. We will then turn to analyzing decisions for Players B.

[Insert Table 16a about here.]

From the probit regression results for the binary trust game, we find that *male* is negative and significant in all models. The predicted probabilities of trusting for males are around 0.30 in all three models; females' predicted probabilities are around 0.60. None of the other explanatory variables help to explain subjects' decisions in this game. In particular, the variable *membership*, which measures degree of socialization, is not predictive of trusting actions.

Models 2 and 3 depicted in the table show that subjects' pro-social choices in both the investment game and the public goods game, respectively, are good predictors of trusting actions. Those who transferred more in the investment game were more likely to choose continue (trust = continue / not trust = stop). Those who contributed more in the public goods game were also more likely to choose continue. Specifically, the predicted probability of trusting is 0.74 for someone who made the maximum contribution of $10. In contrast, a contribution of $1 results in a 0.29 predicted probability of trusting.

[Insert Table 16b about here.]

For the investment game (see Table 16b), we find that the variable *male* is statistically significant in two of the three models, while *membership* is significant in all of the models. Males trusted less, and those who claimed more involvement in social activities transferred more in this game. From Model 2, we also observe that subjects who trusted in the binary trust game passed $2.10 more in the investment game than subjects who did not trust. Model 3 reveals that subjects who contributed to the public good tended to transfer about 22 cents more in the investment game, although the effect is relatively weaker.

[Insert Table 16c about here.]

Interestingly, in the trust games we studied, responder characteristics, such as sex and level of socialization (proxied by membership involvement in organizations), are important determinants of trust. In contrast, in the public goods game, and in accordance with the findings of Gächter et al. (2004), these variables are generally unrelated to

contributions. However, as shown in Table 16c, choices in the binary trust game (Model 2) and the investment game (Model 3) can predict a subject's decision in the public goods game. Those who trusted in the binary trust game contributed more than those who stopped the game (did not trust). Similarly, the trustees in the investment game who sent more also contributed more to the public goods game. Thus, by choosing to trust, a player indicated her propensity to cooperate.

We now turn our attention to the behaviors of the subjects labeled 'B' in our sessions. These subjects were the second movers in each trust game, and their decisions indicate their levels of trustworthiness. Table 17a shows the results of a probit regression with "trustworthy" as the dependent variable. Models 2 and 3 tell us that subjects who transferred more money back in the investment game and subjects who contributed more to the public goods game tended to be more likely to reciprocate in the binary trust game. More specifically, the predicted probability of reciprocating is 0.81 for those who contributed the maximum amount of $10 compared to a predicted probability of 0.31 for those who contributed $1. None of the demographic variables explain trustworthy behavior.

[Insert Table 17a about here.]

Turning to results for the investment game, Table 17b, we find similar results. Subjects who reciprocated in the binary trust game and those who contributed more in the public goods game were more likely to transfer money back in the investment game (coef. = 0.172 and 0.022, respectively). In Model 2, we observe that both *white* (coef. = .194)

and regular church attendance (coef. = .241) indicate higher contribution levels in this game.

[Insert Table 17b about here.]

Finally, the results shown in Table 17c indicate that subjects who are trustworthy also cooperate. Model 2 shows that subjects who reciprocated in the binary trust game contributed more to the public goods game than those who did not reciprocate. Similarly, Model 3 shows that those trustees who sent money back to the investor contributed more in the public goods game.

[Insert Table 17c about here.]

Taken all together, our data strongly suggest that pro-social behavior is consistent across games. One additional question we wanted to explore was: what motivated our subjects' pro-social behaviors? To explore this idea, we categorize Players A based on their behavior in the binary trust game. We label those who chose to 'continue' as trusting, and those who chose to 'stop' as not trusting. Once categorized by their decisions, we can more clearly see that these groups of subjects behaved quite differently from each other in the remaining two games.

[Insert Table 18 about here.]

The 31 "trusting" subjects transferred, on average, $6.48 in the investment game and contributed $6.03 in the public goods game. This group's most frequent transfer and contribution was $10, the maximum amount. For the fifty-one percent of subjects who

chose to 'stop', the mean transfers in the investment game and contributions in the public goods game were $3.63 and $3.38, respectively. The mode transfer/contribution for this group in both of the other games was zero, the minimum amount. What can explain such disparity between these two groups? In an attempt to gain further insight into subjects' actions, after making each decision, we asked participants to explain their choices. Before discussing their comments, we will provide a brief description of verbal protocol analysis.

For several decades researchers have relied upon verbal protocol analysis to gain insight into the thoughts and motivations behind their subjects' behaviors. To conduct this type of analysis, the researcher records, transcribes, and analyzes the subjects' comments regarding their task and thereby obtains more information than would be available through observation of the subjects' actions or decisions.[33] While the goal of verbal protocol analysis is to understand the subjects' cognitive processes, there are two primary schools of thought regarding when this data should be obtained. With *concurrent* verbal protocols, the participants share their thoughts, unprompted, as they complete the assigned task(s). Under this approach, subjects can either think aloud while problem solving or they can explain or rationalize their behavior. Because having subjects describe their actions forces them to think about what they are doing, there is a possibility that this style of concurrent verbal protocol can alter behavior and thus change the outcome of the activity (see Ericsson and Simon, 1993). With *retrospective* verbal protocols, subjects share their cognitive processes after completing the task by answering specific questions posed by the experimenter. For example, they may be asked, "How

[33]Ericsson and Simon (1993) and Austin and Delaney (1998) discuss the theoretical background of using verbal protocols and typical verbal protocol procedures.

did you solve this problem?" However, as Nisbett and Wilson (1977) report, a problem with this retrospective approach is that subjects may not be capable of motivating their decisions. We did not wish to risk altering our subjects' decisions. Because each game involved only one decision task for each player, we believed that most subjects would be able to clearly articulate their motive for action. Consequently, we opted to use *retrospective* protocols rather than have subjects describe their decisions while playing the games. Thus, after each game choice was recorded and collected, we asked our participants to write the answer to the following question, "Why did you transfer the amount that you did in this game?"

Fifty-three percent of participants (17 of the 32) who chose to stop the binary trust game claimed they did so out of a lack of trust in their partner. Four subjects stated they were risk averse, and three chose what they believed was fair. Ten of these same subjects chose to transfer nothing in the investment game. Most of these ten referred to a lack of trust as the motivator of their action; however, a few (3) cited a desire to avoid risk or to make a 'safe' choice. Subjects labeled as non-trusting by their actions in the binary trust game who chose to make a positive transfer in the investment game supported their decisions with a "hope" for reciprocity (7 of 32), or a desire to take a small risk (7 of 32). Only one of the 'non-trustors' who also chose to contribute nothing to the public good did so solely out of risk aversion. The primary motive for (5 of the 9 of) these subjects who made a zero contribution in the public goods scenario was a desire to maximize own earnings or to be greedy. Many (10) of those who chose to contribute something to the public good used the terms 'risk' or 'safe' when explaining their less-than-full cooperation. Thus, we see a general tendency of individuals exhibiting little

trust or cooperation to focus on a lack of confidence in others as a primary reason for their actions.

A large portion of subjects (42%) who chose to 'continue' in the binary trust game recognized their choice as trusting. Another forty-two percent (42%) of them cited either a hope for larger earnings or a desire to take a risk as the motivation for their action. Four subjects recognized a potential to maximize mutual benefit. Eleven of these 'trustors' chose to transfer their full endowment of $10 in the investment game. Their reasons included a desire to maximize total earnings and a combination of trust and risk. Many of those who transferred less than $10 did so out of a desire to balance 'playing it safe' with a hope for reciprocity. Six subjects who chose 'continue' in the binary trust game transferred the full amounts in both of the other two games. Primary reasons for contributing large amounts in the public goods game included a desire for efficiency and a desire to maximize group welfare. We've labeled these individuals as 'trustors,' and it appears that their actions are indeed motivated by a combination of confidence in others and a desire for economic efficiency.

2.5 Conclusion

Table 19 summarizes the relevant results from our regressions. Clearly, pro-social behavior in one game is related to pro-social behavior in the other games. In our experiment, those who trusted, trusted more, or were trustworthy also cooperated more.

[Insert Table 19 about here.]

Why are these results relevant? Experimental economists have designed these games specifically to measure trust and cooperation in an effort to gauge levels of pro-social behavior. Because subjects play these games similarly and provide similar terms to explain their motives, we can confidently say that these games individually are indeed capturing an individual's pro-social preferences. This level of assurance has many benefits. For example, we can compare trusting actions of subject groups even when their decisions have been collected across diverse strategy spaces. Levels of trust inferred from choices in the binary trust game can be compared with levels of trust inferred from the investment game. We can also compare trusting actions of one group with cooperative actions of another. Since we know subjects behave similarly in these games, when provided with an individual's level of trust (cooperation) we can anticipate her level of cooperation (trust). Finally, when researchers are interested in measuring pro-social behavior longitudinally with the same set of subjects, we can now confidently interchange these games and thereby prevent results from being confounded with the effects of repetition (see Chapter 3).

Future studies in this area could continue to use verbal protocols to examine subjects' perceptions of these games and of the intent demonstrated by subjects' choices. For example, we have two participants who made almost identical decisions, but through verbal protocol, we learn that they had quite different motives. Both subjects chose to 'continue' the binary trust game. Subject 1 continued because she wanted to take a risk. Subject 2 continued due to hope and trust for higher earnings. When choosing to transfer $5 in the investment game, Subject 1 was motivated by altruism, and Subject 2 was motivated by trust. In the public goods game, Subject 1 contributed $5 - again, out of

altruistic motives, and Subject 2 contributed $6 in order to improve the group's earnings. In analyzing their game choices, we view these individuals identically; however, with more thorough analysis, we can perhaps better understand the implications of these choices on external events and future decisions.

Appendix C: Figures

Figure 3: The binary trust game, with parameters r < s < t <

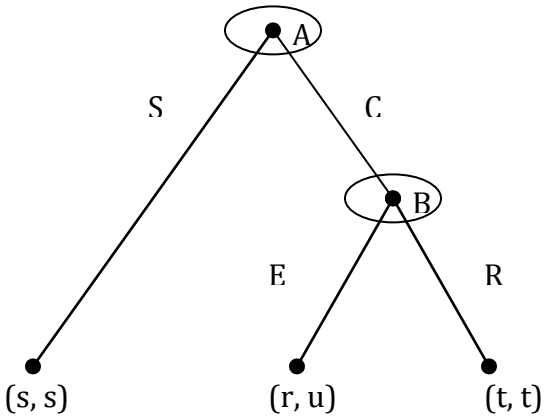
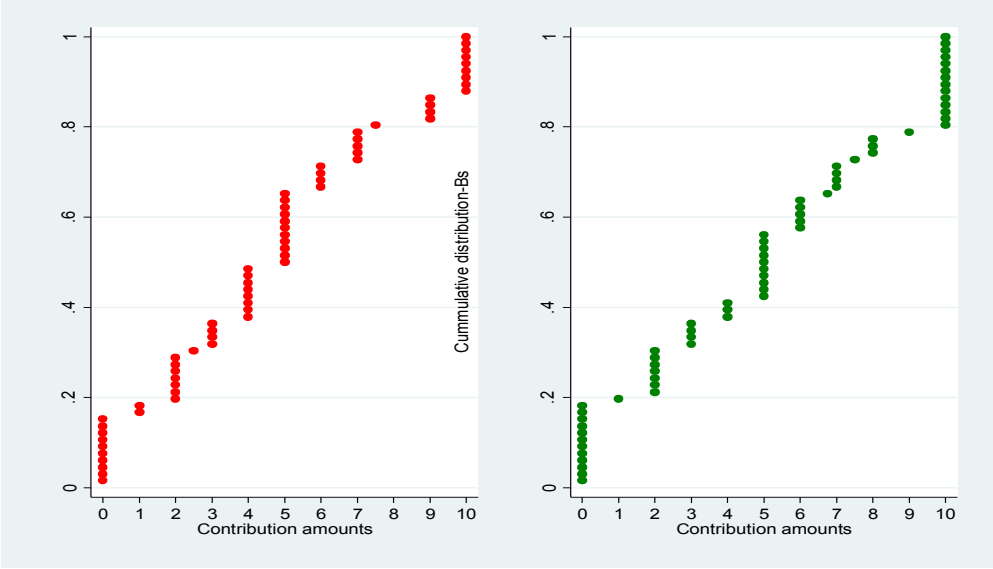


Figure 4: Cumulative distribution of contribution amounts in the public goods game



Appendix D: Tables

Table 13: Description of Variables – Mean and Std for Player As, Bs, and All

Task	Variable Name	Description / range of values	Mean (Std) As	Mean (Std) Bs	Mean (Std) all
Games	Investment	Amount passed in the trust game. Maximum is 10, minimum is 0	5.03 (3.77)		
	Binary trust	Continue or Stop the game for As. Dummy variable: 1 continue, 0 stop	0.49 (0.50)		
	Public goods	Amount contributed to a public project. Values allowed range between 0 and 10	4.68 (3.31)	5.06 (3.55)	4.88 (3.43)
	Trustworthy	Fraction returned from available amount, 3x. Can be between 0 and 1		0.29 (0.24)	
Survey A	Male	Sex of the student subject. Dummy: 1 Male, 0 Female	0.40 (0.49)	0.48 (0.50)	0.44 (0.50)
	Year	Year of education in college. Values range from 1: "Freshman," 2: "Sophomore," 3: "Junior," 4: Senior," and 5: "Graduate"	3.21 (1.15)	3.06 (1.09)	3.13 (1.12)
	White	Race of the student subject. Dummy: 1 White , 0 Other	0.46 (0.50)	0.39 (0..49)	0.43 (0.50)
	Alcohol	Number of alcoholic drinks consumed per week. Positive integer number.	4.14 (5.92)	4.25 (6.09)	4.20 (5.00)
	Siblings	Number of siblings. Positive integer number.	1.68 (1.29)	1.71 (1.15)	1.70 (1.22)
	Church	Answers to the question "How often do you go to church or other place of worship?" Answers are, 0: "Never," 1: "Sometimes," 2: "At least once a week."	0.89 (0.72)	0.91 (0.63)	0.90 (0.67)
Survey B	Membership	Sum of degree of involvement in associations variables. Values range from 0: "None," 1: "Member," 2: "Active member," to 3: "On the board". Values ranged from 0 to 12	5.52 (2.59)	5.92 (3.42)	5.73 (3.04)

Table 14: Correlations Between Pairs of Demographic Variables – All Subjects (n =129)

	Male	Year	White	Alcohol	Siblings	Church	Membership
Male	1.000	-0.441 (0.000)	0.054 (0.546)	0.224 (0.011)	-0.100 (0.259)	-0.006 (0.947)	0.002 (0.979)
Year		1.000	0.067 (0.453)	0.061 (0.491)	0.012 (0.890)	0.111 (0.209)	-0.035 (0.691)
White			1.000	0.362 (0.000)	-0.173 (0.050)	-0.198 (0.024)	-0.032 (0.723)
Alcohol				1.000	-0.045 (0.610)	-0.151 (0.087)	-0.024 (0.785)
Siblings					1.000	0.211 (0.016)	-0.039 (0.658)
Church						1.000	0.128 (0.148)
Membership							1.000

Notes: n = 129; Significance levels in parentheses

Table 15a: Correlations Between Trusting Actions in Different Games – Players A

	Investment Game	Binary Trust Game	Public Goods Game
Investment Game	1.000	0.382* (0.002)	0.274* (0.030)
Binary Trust Game		1.000	0.404* (0.001)
Public Goods Game			1.000

* = significant at the 10% level or lower. n = 63

Table 15b: Correlations Between Actions in Different Games – Players B

	Investment Game	Binary Trust Game	Public Goods Game
Investment Game	1.000	0.411* (0.030)	0.300* (0.028)
Binary Trust Game		1.000	0.378* (0.033)
Public Goods Game			1.000

* = significant at the 10% level or lower. n = 28

Table 16a: Binary Trust Game as a Function of Other Games and Sender Characteristics (Players A)

	Dependent Variable: Dummy for trust		
Ind. Variables	Model 1	Model 2	Model 3
Public Goods Game			0.151**
			(0.060)
Investment Game		0.146***	
		(0.059)	
Male	-0.961**	-0.747*	-0.863**
	(0.413)	(0.435)	(0.439)
Year	0.044	-0.093	0.011
	(0.169)	(0.177)	(0.177)
White	0.226	0.239	0.071
	(0.369)	(0.376)	(0.392)
Alcohol	-0.051	-0.070	-0.037
	(0.038)	(0.044)	(0.040)
Siblings	-0.039	-0.035	-0.080
	(0.129)	(0.138)	(0.138)
Church	0.151	0.236	0.046
	(0.247)	(0.259)	(0.259)
Membership	0.074	-0.030	0.049
	(0.072)	(0.034)	(0.073)
Constant	0.087	-0.033	-0.537
	(0.687)	(1.719)	(0.745)
Pseudo R-squared	0.140	0.215	0.219
Numb. Obs.	63	63	63

Notes: Probit regression coefficients. Standard errors in parentheses.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 16b: Investment Game as a Function of Other Games and Sender Characteristics (Players A)

	Dependent Variable: Amount sent		
Ind. Variables	Model 1	Model 2	Model 3
Public Goods Game			0.217*
			(0.133)
Binary Trust Game		2.100**	
		(0.863)	
Male	-2.031**	-1.323	-1.749*
	(0.997)	(0.998)	(0.997)
Year	0.306	0.333	0.375
	(0.426)	(0.408)	(0.422)
White	0.007	-0.165	-0.299
	(0.901)	(0.866)	(0.907)
Alcohol	0.038	0.067	0.061
	(0.078)	(0.076)	(0.078)
Siblings	-0.054	-0.029	-0.110
	(0.329)	(0.316)	(0.326)
Church	-0.481	-0.560	-0.641
	(0.615)	(0.591)	(0.614)
Membership	0.745***	0.698***	0.702***
	(0.170)	(0.164)	(0.170)
Constant	1.102	-0.020	0.270
	(1.721)	(1.712)	(1.771)
Adj R-squared	0.256	0.317	0.277
Numb. Obs.	63	63	63

Notes: OLS regression coefficients. Standard errors in parentheses.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 16c: Public Goods Game as a Function of Other Games and Sender Characteristics (Players A)

	Dependent Variable: Amount contributed		
Ind. Variables	Model 1	Model 2	Model 3
Investment Game			0.322*
			(0.174)
Binary Trust Game		3.071***	
		(1.114)	
Male	-2.130	-1.076	-1.435
	(1.325)	(1.298)	(1.336)
Year	-0.401	-0.365	0.485
	(0.559)	(0.528)	(0.548)
White	2.009*	1.810	2.035*
	(1.191)	(1.126)	(1.161)
Alcohol	-0.156	-0.109	-0.172*
	(0.106)	(0.101)	(0.104)
Siblings	0.301	0.347	0.309
	(0.428)	(0.403)	(0.416)
Church	0.842	0.664	1.021
	(0.796)	(0.752)	(0.782)
Membership	0.323	0.248	0.702
	(0.223)	(0.211)	(0.248)
Constant	3.405	1.768	0.270
	(2.234)	(2.194)	(2.195)
Pseudo R-squared	0.037	0.062	0.048
Numb. Obs.	63	63	63

Notes: Tobit analysis with standard errors in parenthesis. Data is right- and left-censored.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 17a: Trustworthy: Binary Trust Game as a Function of Other Games and Player B Characteristics

	Dependent Variable: Dummy for trustworthy		
Ind. Variables	Model 1	Model 2	Model 3
Public Goods Game			0.167**
			(0.085)
Investment Game		3.641**	
		(1.882)	
Male	-0.113	-0.141	0.268
	(0.554)	(0.750)	(0.604)
Year	0.092	0.014	-0.018
	(0.227)	(0.320)	(0.236)
White	0.027	-0.850	-0.152
	(0.547)	(0.763)	(0.593)
Alcohol	-0.007	0.049	-0.017
	(0.042)	(0.050)	(0.048)
Siblings	-0.194	-0.187	-0.148
	(0.227)	(0.269)	(0.231)
Church	0.464	-0.508	0.106
	(0.467)	(0.689)	(0.520)
Membership	0.069	-0.029	0.103
	(0.069)	(0.099)	(0.077)
Constant	-0.577	0.165	-1.022
	(1.189)	(1.674)	(1.238)
Pseudo R-squared	0.074	0.207	0.172
Numb. Obs.	32	28	32

Notes: Probit regression coefficients. Standard errors in parentheses.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 17b: Trustworthy: Investment Game as a Function of Other Games and Player B Characteristics

	Dependent Variable: ratio of available funds returned		
Ind. Variables	Model 1	Model 2	Model 3
Public Goods Game			0.022**
			(0.010)
Binary Trust Game		0.172*	
		(0.085)	
Male	-0.098	0.023	-0.063
	(0.087)	(0.102)	(0.085)
Year	-0.009	0.026	-0.019
	(0.038)	(0.045)	(0.037)
White	0.075	0.194*	0.070
	(0.080)	(0.113)	(0.077)
Alcohol	-0.001	-0.008	-0.003
	(0.006)	(0.008)	(0.006)
Siblings	-0.019	-0.004	-0.010
	(0.034)	(0.039)	(0.033)
Church	0.076	0.241**	0.073
	(0.064)	(0.095)	(0.061)
Membership	0.012	0.022	0.014
	(0.011)	(0.014)	(0.011)
Constant	0.240	-0.273	0.134
	(0.199)	(0.240)	(0.198)
Adj R-squared	-0.026	0.324	0.048
Numb. Obs.	54	28	54

Notes: OLS regression coefficients. Standard errors in parentheses.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 17c: Public Goods Game as a Function of Other Games and Player B Characteristics

	Dependent Variable: Amount contributed		
Ind. Variables	Model 1	Model 2	Model 3
Investment Game			6.042**
			(2.858)
Binary Trust Game		3.660*	
		(0.863)	
Male	-2.236	-3.402	-2.080
	(1.624)	(0.998)	(1.719)
Year	0.961	0.955	0.527
	(0.709)	(0.408)	(0.728)
White	1.347	1.458	-0.467
	(1.497)	(0.866)	(1.583)
Alcohol	0.092	0.197	0.159
	(0.127)	(0.076)	(0.124)
Siblings	-0.776	-0.207	-0.552
	(0.657)	(0.316)	(0.667)
Church	0.355	3.188	-0.099
	(1.182)	(0.591)	(1.251)
Membership	-0.239	-0.384	0.192
	(0.198)	(0.164)	(0.211)
Constant	4.807	-0.041	3.964
	(3.672)	(1.712)	(3.916)
Pseudo R-squared	0.039	0.097	0.043
Numb. Obs.	66	32	54

Notes: Tobit analysis with standard errors in parenthesis. Data is right- and left-censored.
***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 18: Choices in Investment Game and Public Goods Game as a Function of Decision in Binary Trust Game (Players A)

	Trust (n=31)			No Trust (n=32)		
	Mean	Median	Mode	Mean	Median	Mode
Investment Game	6.48	7.00	10	3.63	2.50	0
Public Goods Game	6.03	5.00	10	3.38	3.00	0

Table 19: Summary of Relevant Results from Regressions (Trust = Amount Sent; T-worthy = Return Ratio)

	Investment Game (OLS)		Binary Trust Game (Probit)		Public Goods Game (Tobit)	
Dependent Variable	Trust	T-worth.	Trust	T-worth[†]	A	B
Investment Game	**N/A**	**N/A**	+	+	+	+
Binary Trust Game	+	+	**N/A**	**N/A**	+	+
Public Goods	+	+	+	+	**N/A**	**N/A**

Notes: Here we report variables whose coefficients are significantly different from zero at the 90% level or higher.

3. Group Identity and Pro-Social Behavior in Cross-Functional Teams

3.1 Introduction

In virtually every aspect of society and across a broad array of settings, individuals work together in pursuit of unified objectives. Teams of health-care providers collaborate to treat patients, construction workers contribute diverse techniques to build skyscrapers, and scientists join forces to further knowledge. Athletes coordinate their skills in attempts to oust their competition, and companies merge knowledge and talents of their employees to increase productivity. Even when not vital, teams often improve outcomes not only because of the multiple minds working on a project, but also because the variety of skills and talents contributed generate results that might otherwise not exist. Parker (2003) defines a team as, "a group of people with a high degree of interdependence, geared toward the achievement of a goal or the completion of a task." Team production has proven so beneficial that approximately 82 percent of companies with 100 or more employees use teams (Gordon 1992).

Not surprisingly, many teams are comprised of diverse individuals. An obvious area of diversity is social category (demographic). For example, team members may be of different sexes or races, or of different socioeconomic, cultural, or ethnic backgrounds. Given the changing demographics in America and the American workforce during the past fifty years, these differences in sex, race, ethnicity, and (cultural or socioeconomic) backgrounds have been closely studied (See Jehn et al., 1999; Eckel and Grossman, 2005; and others).

A second type of diversity, and a focus of this chapter, is functional diversity. Parker (2003) defines a cross-functional team as "a group of people with a clear purpose representing a variety of functions or disciplines in the organization whose combined efforts are necessary for achieving the team's purpose." Since no one person can embody the variety of skills nor possess the body of knowledge needed to complete all team-related tasks, members of functionally diverse teams act as complements to one-another. They ideally become more efficient by working together, and they produce more than they could individually.

According to Parker (1994), these teams bring six important competitive advantages to organizations: they accomplish tasks faster, improve the organization's ability to solve complex problems, focus the organization's resources on satisfying the customer's needs, increase creative capacity, improve overall organizational learning,[34] and promote more effective cross-team coordination by acting as a single point of contact in reference to a particular project or customer. Gordon (1992) reported that of employees who belonged to a team, 18% belonged to a cross-functional team. Companies with quickly changing markets, such as those in computer technology, telecommunications, and pharmaceutical industries, first found them most effective (Parker, 1994). However, cross-functional teams now exist in a variety of companies including 3M, Motorola, Harley Davidson, Inc., Xerox, and AT&T (Parker, 2003). These functionally diverse teams hold great promise for developing creative solutions. With input from team members they can approach problems from a variety of perspectives and make connections between seemingly unrelated pieces of information (Perry-Smith and Vincent, 2008).

[34] Organizational learning refers to the ability to develop technical and professional skills, learn more about other disciplines, and learn how to work with people who have different work styles or cultural backgrounds.

Despite many benefits resulting from their use, cross-functional teams also present unique challenges. Beyond the demographic and social differences that may exist, team members bring with them ways of thinking, behaving, and approaching problems which have been characterized by their "occupational" culture (Van Maanen & Barley, 1984). In addition, since team members from dissimilar functions may have different goals and perceptions of the environment, they may approach a task quite differently (Lovelace et al., 2001; Amason, 1996). According to Turner (1985), the power of these differences to influence results may be further amplified by the fact that an individual may identify more with their professional group than their workgroup or cross-functional team. Moreover, if they are the sole representative of their professional group, they may feel pressure to embody that profession for the workgroup (Li and Hambrick, 2005; Becker and Carper, 1965; Johnson et al., 2006; Perry-Smith and Vincent, 2008).

Regardless of the type of team (functional, cross-functional, self-directed, or other), members must recognize the team as a unit with common goals. According to Eckel and Grossman (2005), "If the maximum benefits are to be obtained from team production, it is imperative that distrust, lack of cooperation, and general unwillingness to work with others . . . be overcome." A multidisciplinary team engaged in a highly complex task requires interdependence among team members. With an increased variety of approaches, thinking, and goals of individuals from different functional backgrounds, that vital trust and cooperation across functions become more difficult to obtain (Perry-Smith and Vincent, 2008). Indeed, Parker (2003) agrees that cross-functional teams are more susceptible than functional teams to poor interpersonal relationships, conflicts among team members, and a lack of trust and candor.

Social identity theory (SIT) suggests that with transparent grouping and especially increased interaction, individuals begin to identify with a group and perceive the fate of that group as their own (Ashforth and Mael, 1989).[35] Recent research has explored the interaction of demographic differences and social identity on cooperation (see, for example, Eckel and Grossman, 2005; Goette et al., 2006; Charness et al., 2007; Brown-Kruse and Hummels, 1993; Cadsby and Maynes, 1998b; Croson et al., 2008; Cox et al., 1991; and Fershtman and Gneezy, 2001). However, there has not been significant focus to date on the impact of functional differences on group identity and pro-social behavior.

This chapter reports the results of an experiment that longitudinally examines pro-social behavior and group identity in pre-existing cross-functional teams. My objective is threefold. First, I compare (using social identity theory) pro-social behaviors of newly established teams with those of groups formed randomly in the lab. I then conduct (with an emphasis on the effects of business training) a longitudinal intra-group analysis of pro-social behaviors in cross-functional teams. Finally, I intersect these two potentially conflicting influences and examine results. I conducted the experiment with Georgia Institute of Technology (hereafter Georgia Tech) and Emory University students enrolled in the cross-disciplinary program, Technological Innovation: Generating Economic Results (TI:GER). This program consists of MBA, JD, and science and engineering PhD students who form teams at the beginning of an academic year and together complete complex assignments related to the legal and business aspects of taking technology from the lab to the market. I find that, even when new to their teams, these students exhibit greater pro-social behavior towards their group members than members of a randomly assigned control group do. However, they treat unknown individuals no differently than

[35] I will discuss social identity theory in more detail in Section 3.2.

the control subjects do. While the control subjects' pro-social behavior towards in-group members (unknown others) can predict their pro-social behavior towards unknown others (in-group members), this relationship does not hold for TI:GER students. Thus, even at the beginning of their time together, TI:GER students behave differently towards their group members than they do towards unknown others. Looking at the intra-group dynamics of these cross-functional teams, I find that members of the distinct functions initially behave no differently from one another, and MBA students' level of pro-social behavior does not diminish more than that of JD and PhD students over the course of an academic year. This finding concurs with several previous studies of the effects of business and economics training. My project contributes to existing economic literature by beginning to explore the intersection of social identity, cross-functional teams, pro-social behavior, and the effects of business training.

This chapter proceeds as follows: in Section 3.2, I discuss social identity theory and highlight recent economic research exploring this topic. In Section 3.3, I describe the TI:GER program. Section 3.4 presents the experimental design and procedures. In Section 3.5, I conduct a between-group analysis of pro-social behaviors of members of pre-existing teams versus members of randomly formed control groups. Section 3.6 presents an intra-group analysis of pro-social behaviors in a cross-functional team. Since many of my subjects are MBA students, and since all of the TI:GER students receive exposure to business training, here I place particular emphasis on the effects of business training. Section 3.7 addresses the tension that can result from the intersection of social identity theory and the effects of business training in cross-functional teams. Section 3.8 concludes with a discussion and mention of future research opportunities.

3.2 Social Identity Theory

With their introduction of social identity theory, Tajfel and Turner (1979) began to explore the psychological basis of intergroup discrimination. According to their theory, a person does not have a unique "personal self" but several selves that correspond to overlapping contexts of group membership. For example, a person may simultaneously define herself as a member of a particular race, sex, family, and organization. Social psychologists claim that once she categorizes herself with others based on perceived similarities, she will gradually stop thinking of herself as an individual and instead begin to act like a representative of that particular group (Tajfel and Turner, 1986).

Interestingly, an individual can simultaneously identify with multiple groups and may behave differently depending on which "identity" is most salient at a given time. In a study of Asian-American female undergraduates, Shih et al. (1999) found that subjects' performance on a math test varied depending on which of their multidimensional social identities was made salient through a pre-test questionnaire. Participants earned the highest test scores when the questionnaire emphasized subjects' Asian identity and lowest when it emphasized their female identity. Similarly, Benjamin et al. (2007) found that risk and time preferences conformed to common stereotypes when ethnic, gender, or racial identity was made prominent.

Since its introduction, the concept of social identity has proven influential in understanding behavior in fields such as social psychology (Espinoza and Garza, 1985; Leung and Bond, 1984), sociology (Stets and Burke, 2000), anthropology (Sokefeld, 1999), political science (McDermott, 2009), and accounting (Towry, 2003); and

economists have recently joined the discussion. While standard economic theory has historically focused on individual-level incentives in decision-making, economists now apply social identity theory to analyses of the economics of poverty, household discrimination, and gender discrimination (Akerlof and Kranton, 2000); education (Akerlof and Kranton, 2002); and contract theory (Akerlof and Kranton, 2005). An increasing number of experimental studies also explore the effects of social identity on individuals' decisions. Within this field studies fall into two broad categories: those inducing group identity in the lab and those using natural and pre-existing identities.

The former category, experiments that induce group identity, includes studies exploring the effects of such identity on the choices of partners and prices in markets (Li et al., 2011), on social preferences (Chen and Li, 2009), on prices and earnings in markets (Ball et al., 2001), in bargaining games (McLeish and Oxoby, 2007), and on cooperation (Eckel and Grossman, 2005; Charness et al., 2007; Capra and Li, 2006). These studies used a variety of means to induce group identity, such as making random assignments to rooms (which would be a very loose group identity) or sorting individuals based on their preferences for abstract art or their performance on trivia questions.[36] Results indicate that although merely being identified with a group is often sufficient to encourage pro-social behavior, the strength of social identity does affect subjects' choices (Eckel and Grossman, 2005).

[36]Psychology literature often follows Tajfel and Turner's (1986) criteria for a minimal group paradigm. Minimal group paradigm requires that: 1. Subjects be randomly assigned to non-overlapping groups based on a trivial task. 2. No social interaction is allowed to take place. 3. Group membership is anonymous. and 4) The decision task requires no link between a chooser's self interest and her own choices. For a lab-formed group to be minimal, all requirements must be met. Since the fourth requirement is rarely satisfied in economics environments, economists aspiring to follow this guideline generally adhere to the other three.

Many studies, particularly those aimed at better understanding pro-social behaviors, rely on natural and pre-existing identities. Effects of natural social identities appear mixed. Cadsby and Maynes (1998b) saw no significant effect of gender on contributions in public goods games. Croson et al. (2008), Brown-Kruse and Hummels (1993), and Solow and Kirkwood (2002) did. Both Cox et al. (1991) and Fershtman and Gneezy (2001) found discrimination based on ethnicities.[37]

Instead of forming groups in the lab or relying on natural and pre-existing identities, a few studies used pre-existing groups. Each of these studies found significant effects of group identity on behavior. Solow and Kirkwood (2002) learned that members of the University of Iowa Hawkeye Marching Band contributed more towards a public goods game played with other band members than did strangers playing with each other. Using native social groups in Papua New Guinea, Berhnard et al. (2006) found that third parties judged in-group norm violators more leniently than out-group members and that they exhibited more altruism towards in-group members in a dictator game. Goette et al. (2006) had members of Swiss Army platoons play prisoner's dilemma games and found more cooperation when subjects interacted with members of their own platoon. Using the same subjects, these authors also found that subjects gave harsher punishments to violators harming in-group members as opposed to out-group members. Tanaka and Camerer (2011) learned that the status of ethnic groups affected group behavior in Vietnamese village communities. Ruffle and Sosis (2006) found that Israeli kibbutz members cooperated more with anonymous kibbutz members than with anonymous city

[37] Also see Buchan et al. (2006) for an examination of investment game behavior among American, Japanese, Korean, and Chinese students, and Carpenter and Cardenas (2004) for behavior in a common-pool-resource experiment among American and Columbian students. Several other studies also examined pro-social behaviors among diverse ethnic groups.

residents and that, when paired with them, kibbutz members' behaviors mirrored those of city residents. I further the examination of self-identity in pre-existing groups by studying the pro-social behaviors of individuals in cross-functional teams.

My study differs from prior ones in four primary ways. First, my subjects have chosen to participate in the TI:GER program and have (for the most part) self-selected into their respective groups.[38,39] A second distinction involves my choice of out-group. Unlike in Goette et al. (2006), Bernhard et al. (2006), and Tanaka and Camerer (2011), my out-group is not a separate "group" with a stated identity. Instead, it is an unknown person.[40] By removing defining features from my out-group, I can more clearly understand how group identity impacts pro-social behavior towards 'outsiders' in general rather than how it impacts behavior towards a specific 'other'. These behavioral measures more closely align with attitudinal measures of pro-social behavior provided through answers to General Social Survey (GSS) questions.[41] Third, not only do I study the aggregate effects of group membership, but I also look inside the groups and assess, based on their functional backgrounds, the diverse behaviors of the individuals comprising the groups. Analyzing the evolution of pro-social behavior is a final distinction of this chapter. Previous studies have looked at effects of social identity at a point in time: this longitudinal study measures pro-social behavior in the context of social identity at the beginning and end of an academic year.

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[38] TI:GER students complete a form with the names of their requested team-members. Program faculty then matches teams according to student requests, reconciling overlaps as effectively as possible.

[39] In this regard, my work resembles that of Solow and Kirkwood (2002) whose group members self-select to participate in a marching band and of Ruffle and Sosis (2006) whose subjects have chosen to live on kibbutzim. However, my subjects have both joined the TI:GER program and selected a particular team with which to work. I will address a potential self-selection bias regarding propensities towards pro-social behaviors in Section 3.5.

[40] In this way my work resembles Ruffle and Sosis (2006).

[41] See Section 3.4.4 for more information regarding survey measures and pro-social behavior towards 'others'.

3.3 The Institutional Setting: TI:GER

My subjects included graduate students from three separate disciplines who participated in the cross-disciplinary program, TI:GER. TI:GER joins JD students from Emory University, MBA students from Georgia Tech, and science and engineering PhD students from Georgia Tech in a classroom and research environment. Through weekly classes and team meetings, TI:GER students learn about and work together to address intellectual property protection and technology commercialization issues.[42] Faculty and academic advisors at Georgia Tech and Emory select students for the highly competitive two-year program. Within the first month of classes the students form teams of five: one PhD student, two MBA students, and two JD students. [43] Over the course of the two-year program, they work intensely with their teams to complete numerous assignments and projects related to potential commercialization of the PhD student's research. Successful completion of the program requires participants to contribute their expertise to their team and work closely with other team members who are doing the same.

I conducted the study over a period of three years and gathered data from three distinct cohorts of TI:GER students. Because TI:GER classes alternate meeting at Emory and Georgia Tech, experimental sessions were held on both campuses. Members of each cohort were given the opportunity to participate in the study twice, once soon after their entry into TI:GER (in mid-September) and again towards the end of their first year in the

[42] See the textbook for the TI:GER program, Libecap and Thursby, "Technological Innovation: Generating Economic Results" in *Advances in the Study of Entrepreneurship , Innovation and Economic Growth*. Volume 18. (2008) for more information regarding the program's curriculum.
[43] Prior to 2009 the program had one MBA student on each team instead of two. Thus, in two cohorts of my subjects, there are teams of 4 and in the third cohort, there are teams of 5.

two-year program (typically in mid-to-late March).[44] During the three-year period of my study, there were 107 TI:GER students. I report data from the 76 students who participated in both of the sessions for their cohort. Thirty-three percent of my TI:GER subjects were business students, 45% were law students, and 22% were pursuing a PhD in the field of science or engineering.

[Insert Figure 5 about here.]

3.4 Experimental Design and Procedures

My data come from two sources: experimental games to measure pro-social behavior and surveys.[45] In addition to the TI:GER students, I collected data from a control group consisting of 34 (Non-TI:GER) Georgia Tech science and engineering PhD students.

Because I am interested in the trusting behavior of each of these groups (Players A), I also recruited a separate set of subjects to be the trustees (Players B). Player B subjects included undergraduate and graduate students from both Emory University and Georgia Tech. I therefore collected data from a total of 310 individuals (91 TI:GER, 34 Control, and 185 Players B) and report data from 110 subjects (76 TI:GER and 34 Control) who participated in the experiment in the role of Player A.

[44] Although the TI:GER program lasts two years, some students choose not to participate as intensely the second year as they do in the first. To ensure as many participants in the study as possible, I followed subjects through only one year of the program. Due to scheduling conflicts with the TI:GER syllabus and calendar, one of the spring sessions was conducted in late February instead of in March.

[45] The recruiting form and all other subject materials, including instructions and surveys, are available upon request. Please e-mail klanier@emory.edu.

All sessions lasted approximately 1 hour, and there were between 54 and 68 subjects in each session (inclusive).[46] To the extent reasonable and possible, I varied the order of the games and surveys to prevent order effects. After each decision, subjects were given a few minutes to explain their choices in writing. No game results were revealed until the conclusion of each session. The experiment was conducted in an experimental currency. At the beginning of each game, each subject was endowed with 100 crowns. One crown = $0.15. At the conclusion of the session, one game was randomly selected to count towards earnings. Earnings averaged $23 and ranged from $0 to $60 plus an $8 show-up fee.

3.4.1. The Investment Game

Following Coleman (1990), I, like many other students of social science, define trust as an action that involves the voluntary placement of resources at the disposal of a trustee with no enforceable commitment from the trustee. It creates the potential for loss if the trustee is opportunistic, but for mutual benefit if the trustee cooperates.[47] It also

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[46] Because this is a longitudinal data set and I wanted to encourage subjects to provide sincere results in all sessions, I designed the study to be double-blind. My subjects of interest (TI:GER students and the control group, respectively) reported to one room, and Players B reported to a different room. Upon entering the experiment room, each subject chose a seat identified with a seat number. Although while conducting each session, the experimenter identified each subject by their seat number, I also asked each subject to label all of her decision forms with a four-digit number of her choice that she would remember for future experimental sessions. All data was recorded using subjects' four-digit codes, and data responses were never linked to names or seat-numbers. After requesting that subjects turn off all electronic devices and remain silent for the session, the experimenter distributed and read aloud the instructions. Before beginning the games and surveys, the experimenter asked for two volunteers from each session. These volunteers were led to the other experiment room to verify for subjects in their session that they would be playing these games with real people (as opposed to interacting with computers or randomized experimenter-chosen responses). In addition to verifying the existence of unseen subjects, after each game, the volunteers were responsible for collecting envelopes containing decision forms. They took these forms to a separate room where assistants tallied results and prepared payout forms to be returned to subjects at the end of the experiment.

[47] Hosmer (1995) provides a survey of definitions of trust across multiple disciplines.

involves taking a risk, and the extent of that risk is determined by the amount of confidence one has in others.[48]

Berg et al. (1995) designed the now commonly used "investment game" to measure trust. In this dynamic game of complete information between two players with identical endowments (say $\bar{x}$), the first player, called the investor, faces a choice to transfer to the second player, or trustee, any amount $x \in [0, \bar{x}]$. The experimenter multiplies *x* by t>1 and the trustee has an opportunity to transfer back any amount $y \in [0, tx]$. The first and second players receive payoffs of $\bar{x} - x + y$ and $\bar{x} + tx - y$, respectively. In this game, t = 3. Although game theoretic assumptions predict an equilibrium transfer amount of zero, in the lab many people transfer positive amounts (see Camerer, 2003, and Johnson and Mislin, 2011, for summaries of results). Generally speaking, researchers view the amount invested, *x*, as a measure of the degree of trust; and the percentage returned or *y/tx* as a measure of trustworthiness. I employ the strategy method for this game. [49]

3.4.2. The Triple Dictator Game

Because altruism may partially motivate transfers in the trust game, I control for it using results from a triple dictator game (Cox, 2004). Similar to the standard design, in this version of the game each dictator is given the chance to transfer to a recipient an

[48] Exactly whom the 'others' are is a consistent focus of discussion in the literature. As this and other research shows, attitudes and behaviors change depending on whether an individual is interacting with friends, group-members, strangers, etc. See Chapter 1 for further discussion.

[49] Some scholars believe this strategy method alters subjects' thought process and fails to provide a clear measure of trustworthiness (Roth 1995; Güth et al., 2001). However, others find that second players do not behave differently under this method (Brandts and Charness, 2000; Brandts and Charness, 2011; Charness and Rabin, 2005; and Johnson and Mislin, 2010). Regardless of its effects on Player B, using this method should not alter Player A's behavior.

amount $x^d \in [0, \bar{x}]$, where $\bar{x}$ is the initial endowment. However, here the recipient begins with an endowment equal to that of the dictator and, in addition, receives tx^d (t=3, thus "triple") the amount transferred. As with the standard game, the recipient makes no decisions. Earnings of the dictator and recipient are $\bar{x} - x^d$ and $\bar{x} + tx^d$, respectively.[50]

Before playing the investment game and the triple dictator game, the experimenter emphasized that subjects were being paired with a new player; a pairing that was pre-set by the experimenter, but random to the player.

3.4.3. The Public Goods Game

In a public goods game, players simultaneously decide how much of an initial endowment they would like to invest in a public project. Keeping a portion of one's endowment is like contributing to a private fund with a constant marginal return equal to 1, whereas contributing to the group project has a constant marginal return equal to 0.5. Thus, the payoff function for each subject, *i,* is equal to the following expression:

$$\Pi_i = (x_i - c_i) + 0.5 \sum_{j=1}^{4} c_j$$

Where π_i and c_i represent subject *i*'s payoff and contribution to the group fund, respectively with *i* and *j* =1, 2, 3, or 4.[51] In the public goods game, it is a dominant strategy to contribute nothing to the group fund, as portions of the endowment one keeps

[50] See Camerer (2003) for a review of the dictator game literature.
[51] Two sessions of this game had groups of 5 subjects because the size of TI:GER groups increased from 4 to 5 in 2009.

for oneself are worth more than those contributed to the group. Free-riding will dominate in this game unless there is both trust and trustworthiness.[52]

Before beginning the public goods game, TI:GER students were informed that they would be grouped with their TI:GER teammates.[53] Control subjects were told they would play this game with three other people in their same room.

A description of all the behavioral/game variables (i.e., amounts passed in the investment game and triple dictator game, and amounts contributed in the public goods game), their means and standard deviations for the TI:GER subjects and the control subjects can be found in Table 20. Table 21 provides identical information broken down by TI:GER discipline for both the September and March sessions.[54] (Tables 28a-28c in Appendix H provide correlations for the decisions in games for the (All) TI:GER (September), (All) TI:GER (March), and Control subjects, respectively.[55]

[Insert Table 20 about here.]

[Insert Table 21 about here.]

[52] Although we generally refer to contributions in the public goods game as a measure of cooperation (see, for example, Chaudhuri, 2009; Ledyard, 1995; and others), there may be other motives for contributing, such as altruism, a tolerance for free-riding, conditional cooperation, etc. (A verbal protocol analysis of subjects' motivations for their decisions in this game could yield insight regarding which attributes drive their behaviors.) Furthermore, because it may be presumptuous to claim 'cooperation' based on the outcome of a single game (rather than, for example, on the outcome across the public goods game and various other games designed to measure cooperation), in this chapter I will not emphasize cooperation, per se, but consider contributions in this game as general indication of pro-social behavior.

[53] TI:GER students were matched with their teammates provided all teammates were present for the experiment. Subjects were informed that if all of their team members were not participating they would be matched with other incomplete teams. Please refer to Result 6 for further discussion regarding the grouping of TI:GER students.

[54] Specific results will be discussed in Sections 3.5, 3.6, and 3.7.

[55] Correlation tables for each function within TI:GER will be provided upon request.

3.4.4. Surveys

To enhance our understanding of the differences among the functional groups in this study and in an attempt to better explain potential differences in behavioral results, I posed survey questions to subjects between games. From Survey A we learn that about 80% of the 76 TI:GER subjects (74% of the 34 control subjects) were male. Due to the nature of the TI:GER program's design, JD students were in their second year of law school, and nearly all MBA students were in their first year of business school.[56] Fifty-nine percent of TI:GER subjects were white (47% of control subjects), and the rest were from different races, including black, Hispanic, and Asian. About 8% (20% of control) are only children, 50% (30% of control) have one sibling, and 42% (44% of control) have two or more siblings. Because weekly alcoholic beverage consumption provides a proxy for the level of social interaction of participants, I asked how many alcoholic beverages subjects consume per week. TI:GER students drank more alcohol (4.94 drinks per week) than non-TI:GER PhD students (1.55 drinks per week), with MBA students consuming the most (6.17 drinks per week). PhD students attended church most frequently. The description of the variables, mean values and standard deviations for all survey variables can be found in Tables 20 and 21. Tables 29a-29c (in Appendix H) show the pair-wise correlations of the abovementioned variables.

In Survey B, I elicited information about subjects' level of involvement in a variety of extra-curricular activities. I combined the responses to form a *membership* variable (as a proxy for social interactions). This *membership* variable is considered important by several authors including Putnam (1995), Gächter et al. (2004), and Glaeser

[56] Two MBA students reported being in the second year of their program. While I collect and report data on year in graduate program, I exclude this measure from regression analyses.

et al. (2002) who associated trust with social interactions. TI:GER students were more involved in extra-curricular organizations than were control subjects, and MBA and JD TI:GER students indicated greater participation than TI:GER PhD students. Survey B also asked subjects to state the number of hours per week they spend working within an academic team. TI:GER students spent approximately 6.5 hours per week in academic teamwork, and the PhD student control group spent about 13 hours per week involved in teamwork. PhD students initially spent almost twice as much time per week in teamwork (14.06 hours) than MBA students (7.60 hours) and more than 7 times the number of hours that JD students spent working in academic teams (1.93 hours). Interestingly, these findings appear to conflict with past behavior reported by Vincent (2005). Based on her research, Vincent (2005) purports that MBA students on TI:GER teams have worked on 'substantially' more teams in the past in comparison to PhD students. It seems that although MBA students have worked in more teams, PhD students spend more time working in teams.

Through surveys such as the GSS, social scientists often determine the degree of confidence a person has towards others and then extrapolate that knowledge into an understanding of the level of trust in a society.[57] Following the lead of Glaeser et al. (2000), economists have combined GSS and other survey questions with games to

[57] Three frequently used attitudinal survey questions read as follows: GSS Trust- "*Generally speaking, would you say that most people can be trusted, or that you can't be too careful when dealing with others?*" GSS Fair- "*Do you think most people would try to take advantage of you if they got the chance, or would they try to be fair?*" GSS Help-"*Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?*" Notice that these questions refer to the way an individual views not a specific person, but 'most people'. Social scientists believe that if a person believes people, in general, to be trustworthy, fair, and helpful, then she will behave in a trusting manner. However, as with the term 'other' discussed in Footnote 48, these questions are somewhat problematic because who 'most people' are is left for individual interpretation. (See Chapter 1 for a discussion of potential concerns with these questions and the relationship between attitudinal and behavioral measures of trust).

scientifically determine if attitudinal questions can predict behavioral results. Although results using specific questions have been mixed, economists have found that by forming an index of the responses to three GSS questions, we can use these attitudinal measures to successfully predict pro-social behavior. Specifically, if a person believes that most people can be trusted (GSS trust), believes that most people are fair (GSS fair), and believes that most of the time people try to be helpful (GSS help), we can predict that this individual will trust (i.e., pass more in an investment game) (Glaeser et al., 2000; Chapter 1) and cooperate (i.e., contribute more to a public goods game) (Gächter et al., 2004; Carpenter et al., 2004).

In the third survey (Survey C), which was administered to some subjects after all games and taken by some subjects online before the games, I gathered the bulk of attitudinal data about my subjects.[58] Here, I included the GSS trust, GSS fair, and GSS help questions as well as a 'trust stranger' question, which asks people to agree or disagree with the statement, *"You can't count on strangers anymore."* Answers to these questions contain information about how much confidence subjects have in others. On average, control subjects seem to trust strangers slightly more than TI:GER students (0.35 vs. 0.15). However, the most common answer for both groups was that they mildly disagreed with the statement that strangers could not be counted on. While the majority of subjects were practically neutral regarding this 'trust stranger' question, on average, MBA and PhD students seemed to trust more in the spring than in the fall. Like Glaeser et al. (2000) and Gächter et al. (2004), I obtained behavioral information about trust.[59] Finally, to be consistent with others, I asked subjects whether they consider themselves

[58] I used SurveyMonkey to gather survey data from subjects who preferred to provide answers online.
[59] Details about these questions can be found in Tables 20 and 21.

trustworthy. These variables (*behavior index* and *trustworthy*) contain information about the behavior of the responder herself. TI:GER students claimed to be more trustworthy than control subjects. Pair-wise correlations of these variables are in Tables 30a-30c in Appendix H.

3.5 Inter-Group Analysis Based on Social Identity Theory

When researchers opt to conduct a field study rather than generate groups in the lab, they risk having biased results. Indeed, a concern of Goette et al. (2006) is that it is difficult to attribute prior findings to group membership because many pre-existing groups are not randomly assigned. They also differ in terms of demographics and cultures, which further confounds the findings. An advantage of the Goette et al. (2006) design is that participation in the Swiss army is mandatory and group members did not self-select their particular platoons. Although random assignment of groups certainly makes attributing results to group membership more straightforward, in reality many groups do form through self-selection. It is also important to understand pro-social behavior within self-selected groups.

In an effort to make pre-existing group identities salient, researchers sometimes prime subjects. Although TI:GER experiment sessions take place immediately after TI:GER classes, I chose not to specifically mention the TI:GER program (i.e. prime subjects) except in conjunction with the instructions for the public goods game. Consequently, when subjects played the investment game, they were not encouraged to behave as part of a group. Related to this topic, instructions said no more than, "You have been randomly paired with a new subject in the other room." By comparing

transfers of TI:GER subjects with the transfers of control subjects, I can determine if one set of subjects trusted more than the other. In other words, I can conclude that people who have chosen to participate in the TI:GER program are no more or less likely to behave pro-socially than control subjects who have not chosen to participate in TI:GER.

RESULT 1: *There is no difference between the level of behavioral trust (i.e., transfers in the investment game) exhibited by students in the TI:GER program towards unknown parties and the level of behavioral trust exhibited by control subjects towards unknown parties.*

As can be seen in Table 20, mean transfers for the TI:GER students in this game were 57.89 crowns (median = 50). The control subjects transferred an average of 46.47 crowns (median = 50). Non-parametric tests report no difference between these transfer amounts, thereby indicating that students in the TI:GER program trust unknown individuals no more or less than control subjects do. This result suggests that any pro-social behavior exhibited by members of the TI:GER program in this experiment can be attributed to group membership, rather than to a self-selection bias.

Figure 6 shows the transfers of crowns by TI:GER students and control subjects. Control subjects' transfers are almost equally clustered around 0, 20, 50, and 100 crowns. While a greater percentage of TI:GER students transferred their full endowment, both subject groups have transfers dispersed throughout most transfer options.[60] What motivated trusting behavior for these subjects?

[60] As will be discussed in Section 3.6, approximately an equal percentage of MBA, JD, and PhD TI:GER students transferred their full endowment.

[Insert Figure 6 about here.]

Table 22 presents OLS results for this game. The level of altruism portrayed through TI:GER students' transfers in the triple dictator game helps predict their transfers in the investment game. Transfers in this game increased by about 0.32 crowns for each crown transferred in the triple dictator game. White TI:GER students passed 17.41 crowns more than those from other races. Subjects' transfer decisions were influenced by how they view others and how they themselves behave. Contributions increased by almost 16 crowns when participants believe others to be fair, helpful, or trusting, and by more than 11 crowns when subjects leave their doors unlocked or frequently lend money or possessions. Frequency of church attendance and whether or not subjects agree with the statement, *"You can't count on strangers anymore"* also play a role in predicting trusting actions in this game; however, the effects are negative! An increase in frequency of church attendance corresponds to a decrease in transfers by almost 15 crowns. The more trustworthy subjects believe strangers to be, the less they pass. None of the dependent variables are significant for the control group.

[Insert Table 22 about here.]

Social identity theory claims that once individuals begin to perceive themselves as part of a group, they will believe the fate of that group to be their own. Consequently, while working in a team setting a person may shift her performance goals from her individual success to the success of her team. Team members will then focus more on

cooperation than on self-interested behaviors (Brewer 1979). Previous experimental research has shown that contributions to public goods games increase when subjects categorize themselves into a group with other subjects. (See, for example, Solow and Kirkwood, 2002; Ruffle and Sosis, 2006.[61]) In addition, Eckel and Grossman (2005) showed that contributions increase with increased group identity. Recall that before subjects in this experiment played the public goods game, the experimenter informed the TI:GER students that they would be matched with their TI:GER team (or other TI:GER students if their entire team were not present for the experiment), and control subjects were told they would be matched with other (unidentified) individuals within their room. Since Eckel and Grossman (2005) and others show that even minimal group interaction can affect behavior, I expect TI:GER students' pro-social behavior towards group members to reflect effects of group identity. That is, even though they were new to their teams, I expect TI:GER students (most of whom were grouped with members of their pre-existing teams) contributed more than members of groups formed randomly in the lab. Using results from the public goods game I test this aspect of social identity theory and find the following:

RESULT 2: *TI:GER students behaved more pro-socially with their group members (i.e., contributed more to the public goods game) than did members of randomly formed (control) groups. (SIT)*

The cumulative distribution functions in Figure 7 certainly indicate that, based on their within-group behavior, these are two distinct subject groups. The control subjects

[61] See Kramer and Brewer (1984); Brewer and Kramer (1986); and DeCramer and van Vugt (1998), for examples of how cooperative behavior differs when subjects are labeled as individuals vs. group members.

have contributions clustered around 50 and 100, as is typical for this game (Ledyard, 1995). However, a large percentage (52.63%) of the TI:GER subjects contributed their full endowment in the public goods game. A Wilcoxon rank-sum test between the contributions of the TI:GER students in the September sessions (median = 100; mean = 78.55) and the contributions of the control subjects (median = 50; mean = 60.00) indicates that the TI:GER students do, in fact, contribute more ($z = 3.057$, p-value = 0.0022). In her meta-analysis of public goods games, Zelmer (2003) reported that previous friendships among subjects did not have a significant effect on contributions. Consequently, we should not presume that this result occurs merely because TI:GER students know each other and control subjects do not. In fact, since control subjects were selected from among only a handful of science and engineering PhD programs, it is quite possible that some of the control subjects know each other, as well.[62]

[Insert Figure 7 about here.]

Given that there is, in fact, a difference between the behaviors of these two sets of subjects, I turn to regression analyses in an attempt to understand these differences. Each model in Table 23 presents results from a Tobit analysis including controls for individual background characteristics and variables that represent responses to attitudinal and behavioral survey questions. Model 1 presents results for TI:GER students. Model 2 presents results for control subjects.

[62] Even though these control subjects did not know the identity of their group members, if they knew other individuals in their experimental session, there was a possibility that some of these acquaintances would be in their respective groups.

[Insert Table 23 about here.]

A Tobit analysis indicates that the variables *male*, *white*, *membership*, *hours academic*, *GSS index*, *behavior index*, and *trustworthy* all help predict TI:GER students' contributions in the public goods game (Table 23 Model 1). By calculating marginal effects, I find that on average, the average male contributed 34.95 more crowns than the average female and whites, on average, contributed 12.55 more crowns than members of other races. The average TI:GER subjects contributed 8.63 more when they believed others to be trusting, fair, and helpful (*GSS index*), and 8.93 more crowns when they themselves behaved pro-socially (*behavior index*). With each additional hour spent per week working on an academic team, on average, a TI:GER student contributed 0.48 more crowns to their group. However, contributions decreased with increases in total membership (marginal effect = -1.90). Ironically, people who claimed to be trustworthy contributed less (marginal effect = -7.08)! Thus, both subjects' beliefs about others (through *GSS index*) and their own actions (*behavior index*) influenced their contributions in this game. For the control group, *male*, *white*, *siblings*, and *hours academic* all help to predict contributions. The marginal effect of being male is 46.71 and of being white is 28.10. Given that both of these subject groups were at least 75% male and that they resembled each other ethnically, we should not be surprised to see similar effects of sex and race on contribution levels for these subjects. On average, each additional sibling increased a subject's contribution by 7.08 crowns to the group fund. Each additional hour per week spent working in an academic team increased contributions by 0.96 crowns. The public goods game alludes to cooperation within a team, and for both sets of

subjects, the hours spent working in academic teams helps determine the amount they contributed in this game.

Thus far, I have shown that TI:GER and control subjects exhibited similar levels of trust towards unknown individuals. We've also learned that TI:GER groups have higher levels of within-group contribution than control groups. In Chapter 2, with undergraduate student subjects, we showed that an individual's level of trust, seen through her transfer in the investment game, could predict her contribution in the public goods game. I now use this finding to compare behaviors of subjects in the present study.

Since my control subjects have been randomly assigned to groups and since they do not know the identity of their group-mates, I expect the Chapter 2 finding to hold for these subjects. That is, I anticipate her pro-social behavior towards group members should predict her pro-social behavior towards unknown others, and vice versa when an individual does not identify with the group to which she has been randomly assigned. Using behavior in the investment game (public goods game) as a control for behavior in the public goods game (investment game) I test this proposition and find the following:

RESULT 3A: *In a randomly formed group, public goods contributions with in-group members can predict behavioral trust towards unknown others and vice versa.*

When I control for demographic, behavioral, and attitudinal characteristics, I find that, as in Chapter 2, pro-social behavior in the public goods game predicts trusting behavior in the investment game, and vice versa. (See Models 3 and 4 of Table 24.) When I add the control for behavior in the investment game I find that the hours spent working in an academic team becomes insignificant while an increase in extra-curricular

activity (*membership* variable) now has a marginal effect of 5.32 crowns. Whereas in Table 22 no independent variables explained control subjects' behavior in the investment game, when I add a control for the public goods game, both that and *membership* become significant. Here, trust decreases by 5.26 crowns with increased extracurricular involvement. It seems that, for the control subjects, when I control for trust, public goods contributions increase with increased social interaction; however, when I control for public goods contributions, trust decreases with increased social interaction.

The in-group/out-group bias is well-documented within the social identity theory literature. Numerous social psychology experiments have indicated that even when trivial means were used to categorize individuals into groups; in allocation tasks group members made decisions that favored in-group members at the expense of out-group members (Tajfel and Turner, 1986). Goette et al. (2006) were surprised to find an in-group bias with members of their randomly designated Swiss Army platoons who had been working together for three weeks. Yet both Chen and Li (2009) and Eckel and Grossman (2005), who formed groups in the lab, found significantly different behaviors in their subjects depending on the level of group attachment. Given these prior results, it is certainly reasonable to expect that, in this experiment, an individual in an established group would behave differently towards an in-group member than she would towards an out-group member. Since my subjects played the public goods game with in-group members and played the investment game with unknown others (outsiders), a direct comparison of in-group/out-group behavior using the results from the same game is not

possible.[63] Based on the Chapter 2 results, however, I can compare behavior across these two games.

With increased group identity, in-group members tend to favor each other over out-group members. Hence, I anticipate that, unlike with the control subjects, TI:GER students' public goods contributions with their group members will not predict their behavior with unknown others (and vice versa). Using TI:GER subjects' behavior in the investment game (public goods game) as a control for behavior in the public goods game (investment game) I find the following:

RESULT 3B: *In a pre-existing group, public goods contributions with in-group members cannot predict behavioral trust towards unknown others and vice versa. (SIT)*

Models 1 and 2 of Table 24 provide public goods game and investment game results for TI:GER students. The inclusion of a control for the amount transferred in the investment game does not measurably alter regression results for the public goods game. With the exception of *'membership'*, all explanatory variables in Model 1 of Table 23 (Result 2) remain significant here and have similar coefficients. Similarly, results in Model 2 of this table closely resemble those seen in Model 1 of Table 22 (Result 1). The notable findings of this analysis, therefore, are the inability of behavior in the public goods game to predict behavior in the investment game and the inability of behavior in the investment game to predict behavior in the public goods game.

[63] To analyze this hypothesis, another option would have been to ask the participants to play one of these games twice: once with group members and again with unknown subjects. However, studies show that contribution levels in public goods games, and transfers in investment games decline with repeated play. Given that my subjects would already be playing these games twice, I wanted to minimize effects of repeated play. (Since my subjects are not always paired with the same individuals, there should be no effects of repeated play; however, subjects sometimes become confused and play as if they are not changing partners.)

In typical in-group/out-group analyses, a participant is asked to allocate to either an in-group member or an out-group member. That scenario obviously does not apply in this experiment. However, a 'bias' seems to exist here even though subjects could have shown more trust towards unknown others at no expense to their group. This difference between the control subjects' behavior and the TI:GER students' behavior suggests that while the control subjects do not identify with their randomly assigned group, the TI:GER students do: they treat their in-group differently than they do their out group.

[Insert Table 24 about here.]

3.6 Longitudinal Intra-Group Analysis Based on the Effects of Business Training

While my first three results address between-group comparisons of pro-social behaviors exhibited by members of pre-existing groups versus randomly assigned groups, the next set of results addresses differences in pro-social behaviors based on functional differences within an established group. This topic holds particular interest given the prevalence of cross-functional teams, and my subject pool provides a unique opportunity to explore it further. In regards to pedagogical difficulties in leading a cross-disciplinary program, Marie Thursby, founder of TI:GER, and her co-authors commented on the well known fact that scientists (regardless of area) tend to 'doggedly' pursue understanding of phenomena and state that the process of 'puzzle solving' motivates them as much as financial returns do. In contrast, these authors described JD students as following the 'logic' of law and anchoring on the role of precedents. Like many others, they commented on the emphasis business professionals place on financial implications of a decision (Thursby et al., 2009). Their comments specifically address diverse learning

styles of these subject groups. However, they certainly allude to potential differences in behaviors we might observe in the experimental games. Although, to my knowledge, economic research specifically focused on decisions of scientists and law students does not exist, there are several studies exploring the behavior of business students.

3.6.1. Effects of Business Training

Recent corporate scandals have plagued the business world, and some of the blame for these scandals has fallen on the academic community. "Bad for Business," an article published in the Economist in February, 2005, highlights the main points of a paper by Dr. Sumantra Goshal which was published posthumously in the March, 2005 issue of Academy of Management Learning & Education. In the article, Dr. Goshal, a former professor at the London School of Business, stated that while trying to become more scientific, business schools had based management theories on some of the more dismal assumptions and techniques developed by economists. By doing so, Dr. Goshal claimed, these schools had caused the theories to be self-fulfilling. Business schools have taught their students to behave as *homo economicus* (self-interested and utility maximizing).[64]

Whether business or economics training affects values and individual characteristics is an empirical question. Indeed, researchers have used experiments to determine whether training in economics teaches students to be individualistic and opportunistic (see, for instance, Marwell and Ames, 1981; Stanley and Tran, 1998; Laband and Beil, 1999; and others). Some of these scholars have compared students with little economics training to those who have had several courses or semesters (Carter and

[64] Also see Marglin (2008).

Irons, 1991; Frank and Schulze, 2000; and Frey and Meier, 2003), and others have compared the same set of students at the beginning and end of a semester (Frank et al., 1993 and 1996; and Yezer et al., 1996).

These studies yield conflicting results. Although they were uncertain whether the difference was due to self-selection or learning, Marwell and Ames (1981) found more free-riding among economics graduate students than their other subjects. However, Stanley and Tran (1998) saw that economics majors were less motivated by self-interest than other students at a liberal arts college. According to Laband and Beil's (1999) analysis of payments of professional association dues, professional economists were no less cooperative than political scientists and were more cooperative than sociologists. In a more recent study, Fehr and List (2004) compared the behavior of CEOs with students in the trust game and found that CEOs, in fact, were more trusting and exhibited more trustworthiness than students. Similarly, using a gift exchange game, Hannan et al. (2002) found that MBA students provided substantially more effort than undergraduate students. However, when comparing undergraduate and graduate economics and business students with nurses in a public goods game, Cadsby and Maynes (1998a) saw that the nurses cooperated significantly more than the students. Of course, a question that arises when comparing students of business with individuals in other fields is whether observed differences result from self-selection or training.

While most of the research discussed above compared individuals who had selected to pursue economics with those who had selected other disciplines, other studies compared only those students who had chosen to pursue economics. These papers looked at the behavior of students who had had several economics classes and those who had had

none. Carter and Irons (1991) conducted a robustness check of the Marwell and Ames (1981) study and found that in the ultimatum game economics students accepted less and proposed to keep more. They compared actions of freshmen and seniors (both economics and non-economics students), and found that the self-selection hypothesis held but saw no support for the learning hypothesis. In a test for corruption, Frank and Schulze (2000) found that economists pursued their own interests more consequently than other people. Because more advanced economics students did not behave differently than freshmen, their data also supported the self-selection hypothesis. In a field experiment analyzing economics students' contributions to social funds, Frey and Meier (2003) showed that business economic students gave significantly less than others, but political economists' willingness to donate money did not diminish by studying economic theory.

To my knowledge, only two groups of authors have compared experimental results of the same cohort of students; however, for both studies, the period of research was only one semester. Frank et al. (1993, 1996) and Yezer et al. (1996) voiced contradictory results. The first group of authors claimed that economics students were more likely to free ride or defect from coalitions and that cooperation decreased after students were exposed to principles of economics courses. Yezer et al. (1996), however, also conducted a survey at the beginning and end of a semester and determined that answers from students exposed to economics training were no less cooperative than those of other subjects. As these studies show, results are inconclusive: some found evidence that individuals who self-select into economics behave more like *homo economicus*, while others found this behavior only after economics training, if at all. I believe that a reason for these dissimilar results is that although previous researchers have compared

CEOs with undergraduates, economics students with non-economics students, and economics students at the beginning and end of a semester, no one has tracked the same students as they advance through an academic program.

My study contributes to this literature in a unique way. Because a subset of TI:GER participants are MBA students (predominantly in their first year of graduate school), and because I observe them in both the fall and spring of their first year of business school, I can test both the self-selection and training hypotheses. By comparing the behaviors and attitudes of MBA students in the fall with other members of TI:GER, I can comment on the level of pro-social behavior exhibited by pursuers of business training compared to individuals in other disciplines. By comparing their behavior in the spring with that of the other TI:GER participants in the spring as well as to their own previous behavior, I can better understand the effects of business training. The next part of my analysis, therefore, looks inside the TI:GER groups and compares behavior both at a point in time and longitudinally by discipline.

Twenty-three (23) of the 25 TI:GER MBA students reported being in the first year of their MBA program. If, as previous academic authors and the popular press suggest, business students are more focused on the "financial implication of various phenomena" (Thursby et al., 2009), I can anticipate that these students behaved like *homo economicus*: transferring less in the investment game and contributing less in the public goods game than their TI:GER teammates. I can also then suggest that the self-selection hypothesis (discussed by Carter and Irons, 1991; and Frank and Schulze, 2000) holds. To test the effects of business training on pro-social behaviors, I first conduct an across-discipline comparison of behaviors in each of the three games.

RESULT 4: *At the beginning of the academic year, TI:GER MBA students exhibited no more or less pro-social behavior than did TI:GER PhD or JD students.*

Figure 8 portrays the choices of the MBA, JD, and PhD students in the investment game, triple dictator game, and public goods game in September.[65] In the investment game, we see transfers for all three disciplines clustered at 0, 50, and 100. While a greater percentage of MBA students transferred 0, most positive transfers were at least 50% of their endowment. Contrast this finding with JD and PhD students' behaviors. As with the MBA students, almost 40% of representatives of both of these disciplines transferred their full amount; however, a greater percentage of these students who did not transfer their full amount transferred less than 50% of their endowment. It appears that while a large percentage (24%) of MBA students behaved opportunistically and kept their entire endowment, those MBA students who did transfer crowns recognized the opportunity for gains in efficiency afforded by larger transfers. Their mean positive transfer was 76.32 crowns.

Most subjects transferred 0 in the triple dictator game, and many gave less than fifty percent. Yet almost 20% of subjects in each discipline transferred their full endowment. As previously discussed, a large portion of TI:GER students contributed their entire endowment to their group in the public goods game. Here we see that these contributions came from a similar percentage of subjects in each discipline.

[65] Although the triple dictator game is used primarily to control for altruism in the investment game, since altruism is a pro-social behavior, and since differences in triple dictator game behavior by functional group later prove quite stark, I include these results as part of the discussion in this section.

[Insert Figure 8 about here.]

Columns 1, 2, and 3 of Table 21 provide the mean transfers in each of these games for the JD, MBA, and PhD students. Median transfer amounts can be found in the notes for Figure 8. Non-parametric tests confirm that there are, in fact, no differences between the pro-social choices exhibited by MBA students and those portrayed by other TI:GER students in the September sessions. With this subject group, the self-selection hypothesis suggested by Carter and Irons (1991), Frank and Schulze (2000), and Frey and Meier (2003) does not hold. Something to consider, of course, is that these MBA students may differ from typical MBA students in that they have chosen to participate in this program and may therefore be more inclined to pro-social behavior than MBA students who do not choose to participate in a cross-disciplinary team-focused program.[66]

TI:GER MBA students continue their regular business courses while participating in the TI:GER program. If business training does, indeed, teach subjects to behave self-interestedly, I can therefore anticipate the MBA students to behave more opportunistically (especially towards unknown individuals) in the spring than they do in the fall.[67] More specifically, I can expect their level of pro-social behavior to decline from the first observation to the second. Although they initially behave similarly as their non-MBA teammates, do MBA students behave less pro-socially over time? I compare the MBA students' behavior in September with their behavior in March and learn the following:

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[66] Future experiments with an MBA control group could shed additional light on this issue.
[67] I will address within-group behavior with Result 6.

RESULT 5A*: TI:GER MBA students exhibited less altruism towards unknown subjects in March than they did in September; however, there was no statistically significant change in behavioral trust. (Effects of Business Training)*

Figure 9 presents longitudinal comparisons of MBA students' transfers in the September and March sessions of the experiment. In the investment game, 36% of them transferred their full endowment in the fall, and 36% kept their full endowment in the spring. In the spring, seven (7) of these students transferred the entire 100 crowns. Whereas a sizeable number of MBA students initially transferred at least half of their endowment, at the end of the academic year most of them transferred less than 50%. From Column 2 of Table 21, we see that the average fall investment game transfer was 58.00 crowns (median = 60), and in the spring (Column 5) it was 40.80 crowns (median = 30). Non-parametric tests suggest that this decline is not, however, significant. It appears that MBA students' trust towards unknown individuals has not declined.

[Insert Figure 9 about here.]

Using results from the triple dictator game, I compare the level of altruism extended by MBA subjects at the beginning (mean = 26.40 crowns, median = 10) versus the end (mean = 12.40 crowns, median = 0) of their first year in business school. This greater than fifty percent decline in altruism is significant (Wilcoxon signed-rank test: z=2.622, p-value = 0.0087). The second graph in Figure 9 shows that more than 70% of MBA students kept their entire endowment in this game. Figure 10 provides decisions of individual MBA subjects. Here we see that only one MBA subject passed more in this

game in the spring sessions than he did in the fall. Twelve (12) of the 14 students who did not change their transfer from fall to spring passed zero in both sessions. While the self-selection hypothesis regarding the effects of business training does not hold, it appears that the learning hypothesis has merit, at least in regards to these students' altruistic preferences.[68]

[Insert Figure 10 about here.]

As part of the TI:GER program the PhD and JD students also receive (limited) business training. For example, they participate in a lecture discussing Porter's Five Forces, which implies that firms are not just competing with their existing within-industry rivals to succeed but that they are also working against suppliers, customers, potential new entrants, and producers of substitute products to ensure success. In addition, TI:GER students discuss frequently and in great detail the process by which they can obtain financial success with their team's project. It is therefore conceivable to anticipate that *all* of the TI:GER students, not just those pursuing a MBA degree, would become more focused on their personal financial gain in the second experimental sessions than they were in the first. Using their experimental game results, I find the following:

[68] A second possible reason for the decline in contributions in the investment game could be learning effects from subjects' experiences in September sessions of this game. However, given TI:GER students are playing this game with new subjects, the fact that this game is repeated should not affect their behavior. Also, when I asked students to explain the motive of their action, only a couple referred to their previous experience. Given that these subjects are the only ones making a decision in the triple dictator game, the result of their previous experience should in no way impact their decision here.

RESULT 5B: *JD and PhD students exhibited no change in mean behavioral trust towards unknown subjects from the beginning to the end of an academic year; however, their levels of altruism declined over time.*

In the first column of Figure 11, we see the distribution of investment game transfers in both the fall and spring for the JD students (top) and PhD students (bottom). Transfers for both functional groups remain widely dispersed. As reported in Table 21 (Column 1), the JD students transferred an average of 58.24 crowns (median = 50) in September and 55.00 crowns (median = 50) in March. Non-parametric tests indicate no difference in these amounts. The PhD students transferred, on average, 57.06 crowns (median = 50) in September and 41.76 crowns (median = 30) in March. According to non-parametric tests, these values do not differ significantly either. Subjects across all three disciplines exhibited similar levels of trust in both September and March. Despite business training, behavioral trust did not change through the year.

[Insert Figure 11 about here.]

In the second column of Figure 11 we find the distribution of JD and PhD students' transfers in the triple dictator game. Like their MBA teammates, a greater percentage of these subjects transferred zero in the spring. A comparison of mean September and March results from this game indicates how levels of altruism changed over time. All TI:GER students gave less in the spring than in the fall. (See Table 21.) What is particularly interesting, however, is to compare the relative sizes of the declines in altruism. As discussed in Result 5a, in March the MBA students gave slightly less

than 50% of their September transfers, and PhD students gave only 20% of their September transfers (Wilcoxon signed rank test: $z = 2.441$, p-value = 0.0146). However, while JD students also gave less in the spring than they did in the fall (Table 21: Columns 1 vs. 4) (Wilcoxon signed-rank test: $z = 1.857$, p-value = 0.0633), their spring transfers were still approximately 90% as much as their fall transfers! In Figure 12 we see this contrast more clearly.

[Insert Figure 12 about here.]

Whereas in March all but one of the PhD students transferred 10% or less of their endowment in the triple dictator game, about one-sixth of the JD students gave their full amount. Despite a decline in mean transfers, we see more altruism from the JD students than the others.

Recall that TI:GER JD students are in their second year of law school and that a goal of the TI:GER program is to expose all TI:GER students to legal aspects of taking research to the market. While the JD students are already somewhat familiar with patent laws and protecting proprietary information, this emphasis on securing rights to intellectual property is most likely new to MBA and PhD students. Perhaps I see less of a decline in altruism of JD students because they are not as influenced by proprietary discussions as are the MBA and PhD students for whom such concepts may be new.[69]

[69] To my knowledge there is no experimental research specifically addressing pro-social behavior and the effects of legal training. Given the findings of this chapter, further research in this area could be merited.

3.7 Longitudinal Intra-Group Analysis Based on the Intersection of Social Identity Theory and the Effects of Business Training

Research suggests that individuals become increasingly opportunistic with exposure to business training, and social identity theory purports that within-group cooperation improves with higher levels of group identity. Results 2 and 3 certainly indicate that, even at the onset of their time in the TI:GER program, effects of social identity theory apply to these subjects. By their second experimental session, TI:GER teams have had several months' worth of (almost) weekly meetings and have jointly produced several complex deliverables for faculty and industry advisors. In accordance with social identity theory, I would therefore expect group members' level of pro-social behavior to increase from September to March. On the other hand, during this time these students, especially the MBA subset, have received business training. Results 5a and 5b indicate a decline in levels of altruism (all functions) towards unknown individuals. By comparing the September and March contribution amounts in the public goods game, I evaluate the tension between these two influences:

RESULT 6: *Contributions by members of the TI:GER program to their groups do not significantly change over time.*

[Insert Figure 13 about here.]

Figure 13 shows the cumulative distribution functions for the TI:GER students' contributions to the public goods game in the fall and in the spring. The number of 100% contributions increased from 40 (52.63%) to 52 (68.42%). As previously discussed,

TI:GER participants contributed an average of 78.55 crowns in the September sessions. In the March sessions, they contributed an average of 81.91 crowns. Although contributions did increase, a Wilcoxon signed-rank test indicates that this increase is not significant. A closer examination of the data, however, yields interesting insights. Behaviors vary by discipline, and subjects who participated in the game with their complete TI:GER team contributed more than those whose team members were not all present for the experiment.

Figure 14 provides September and March public goods game decisions for JD, MBA, and PhD students, respectively. The majority of subjects in each discipline contributed their full endowment in the fall, and the number contributing their full endowment in the spring is even higher. I find that MBA students contributed, on average, 77.00 crowns (median = 100) to their team in September and slightly less, (mean = 76.80 crowns, median = 100) in March. Not surprisingly, non-parametric tests confirm that this decline is not significant. Although a slightly higher percentage of MBA students contributed nothing, the percentage giving 100% of their endowment increased. Given that MBA students' transfers in the triple dictator game decreased significantly over time and their mean contributions to the public goods game did not, I find indication that the 'positive' effects of group membership somewhat mitigate the 'negative' impact of business training on pro-social behavior.

[Insert Figure 14 about here.]

In contrast to the MBA students, (although the changes are slight and also insignificant) both the JD and PhD students contributed more, on average, towards their groups in the spring than they did in the fall. JD students' mean contributions increased from 76.76 crowns to 81.47 crowns. PhD students' mean contributions increased from 84.12 crowns to 90.59 crowns. (Median contributions for both of these disciplines were 100 in both the September and March sessions.) While the distribution of JD students' contributions does not visibly change much, in their Figure 14 graph we see a 'rightward' shift in PhD students' contributions. There were no differences among any of the disciplines' contribution levels in September or March.

Figure 15 provides individual subjects' public goods game decisions across all three disciplines. At first glance, we see again that a large percentage of subjects (over 40%) contributed their entire endowment to their team in both sessions of the experiment. Nine (9) JD students, 6 MBA students, and 8 PhD students increased their contribution, while 7 JDs, 5 MBAs, and 2 PhDs decreased their contribution. More MBA and JD students had greater 'swings' in their choices than the PhD students did. According to Thursby et al. (2009) we should not be surprised to find such high levels of contribution to the group in the public goods game. Through their survey of students in the TI:GER program, these authors found that seventy-two percent (72%) of respondents identified teamwork as one of the most important aspects of the program. Fifty-five percent (55%) of seventy respondents claimed the team experience to be 'very useful' to them, and 84% stated it was either 'very' or 'moderately' useful. According to these authors, the PhD students seem to benefit most from TI:GER's team experience. Fifteen (15) of the 18 PhD survey respondents stated that the interdisciplinary team experience was 'very useful'

to them. Spring contributions of an average of over 90 crowns in the public goods game tend to reflect these students' opinion of their group experience in this program.

[Insert Figure 15 about here.]

As discussed in Section 3.4, in the public goods game TI:GER students were grouped with their TI:GER team as long as all team members were present for the experiment. When team members were absent, other TI:GER students, whose team members were also absent, completed the experimental group. In the September sessions, 64 TI:GER subjects were in groups comprised of at least 75% of their TI:GER team. Fifty-eight (58) of these subjects were matched with their entire TI:GER team. To determine if being matched with team members had an effect on contribution decisions, I created dummy variables to identify complete (75% complete) teams. Models 1 and 2 of Table 25 present these results. With the exception of the *membership* variable in Model 2, the regression results in these models closely resemble those presented in Model 1 of Table 23 (where I did not control for the presence of team members).[70] Interesting to note here is that neither the dummy variable indicating a 75% complete TI:GER team nor the dummy variable indicating a complete TI:GER team is significant. While TI:GER subjects contributed more than the control group in the September sessions, it appears that this higher level of contribution was based on subjects' identification with their classmates in the TI:GER program. It did not matter if they were grouped with team members or not.

[70] Here, in Model 2, *membership* loses significance.

[Insert Table 25 about here.]

Contrast those results with what we see in the spring of the academic year. In the March sessions, 61 subjects had more than half of their TI:GER team in their experimental group, and 38 participants played the game with their complete TI:GER team. Mean contributions across all TI:GER students in the spring were almost 82 crowns (Table 20: Column 2) (median =100). However, when all team members were present, mean contributions increased to 90.79 crowns. Models 3 and 4 in Table 25 confirm that in March, the participation of a complete TI:GER team mattered. The marginal effect of having all team members present is 9.38 crowns. When most or all of the TI:GER team comprised the public goods game group, the marginal effect is 13.10 crowns. In the spring results, I also find that *membership*, hours spent working in an academic team, and the *GSS index* lose significance; however, the marginal effect of an additional alcoholic drink per week on contributions is 1.78 crowns and of disagreeing with the statement, "*You can't count on strangers anymore*" is 3.27 crowns.

Overall, increased group identity seems to have mitigated potential decline in exhibited pro-social behavior of TI:GER students towards one another during the course of an academic year. In fact, looking specifically at the MBA subset of participants, I can suggest that teamwork plays a stronger role than business training in its influence on behavior. Subjects who were grouped with their entire TI:GER team proved particularly pro-social.

3.8 Discussion and Conclusion

To date there is not a clear understanding in the social psychology literature of exactly what generates group effects; that is, we do not have a clear explanation for the higher levels of pro-social behavior seen among TI:GER students in this experiment. One hypothesis is simply categorization, meaning that when an individual relates to, or is categorized with, another individual (or multiple individuals), she will begin to favor that individual (those individuals) more than those with whom she does not identify (Tajfel and Turner, 1986). However, a second hypothesis involves expectations of generalized reciprocity among in-group members (Yamagishi and Kiyonari, 2000). Does social identity change behavior by influencing an individual's expectations about other in-group members' behaviors? Social psychologists' goal/expectation theory identifies mutual trust as the key to cooperation. (Yamagishi, 1986). Results of recent economic experiments concur with this theory. In a survey of the public goods literature, Chaudhuri (2011) claimed one of his most notable findings to be that individuals behaved as 'conditional cooperators': their contributions to the public good were positively correlated with their beliefs about other group members' contributions. (See also Meier, 2006.)

While I did not inform subjects of how previous individuals have played these games (or of how their teammates were playing these games), after subjects made their allocation decisions I did ask them to state what they expected other players in their group to contribute (public goods game) or how much they expected to be returned to them (investment game).[71] Table 26 presents these results for TI:GER (September) vs.

[71] Several authors solicit subjects' expectations about their partners' decisions. See Johansson-Stenman et al. (2011) for a discussion.

control subjects. About 82% of TI:GER subjects and about 85% of control subjects transferred a positive amount in the investment game. Of those who transferred crowns, TI:GER students' mean transfer was approximately 71 crowns, and control subjects' mean transfer was about 55 crowns. Recall that in this game, the experimenter multiplies transfers by three, so Player A can receive as much as 300% of her transfer in return if Player B keeps none for herself. TI:GER subjects, on average, expected to receive 1.3 times their transfer in return, and control subjects expected to receive 1.1 times their transfer in return. Thus, similar percentages of these groups decided to make positive transfers, and they expected similar returns from unknown others.

Turning to the public goods game, I find slightly different results. About 95% of TI:GER students chose to contribute positive amounts to the public good in September, and 97% of the control subjects made positive contributions. Of those making positive contributions, TI:GER students sent, on average, 83 crowns. This contribution was much higher than control subjects' approximate 62 crowns. Both TI:GER and control subjects, on average, expected they were contributing more than other members of their group, and TI:GER students expected higher contributions from their group members than did control subjects.[72] Yet control subjects had a higher expectation to contribution ratio than the TI:GER students did. That is, their contributions tended to more closely 'match' what they expected their teammates to contribute. [73]

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[72] The fact that subjects expected they were contributing more than their group members may be an indication of their tolerance for free-riding.

[73] Remember that this choice of control group differs somewhat from a typical control group. In Chapter 1, we found mean transfers of undergraduates in an investment game to be 50.3% (of the endowment) and mean contributions in a public goods game to be 48.8% (of the endowment). These results, while typical, differ somewhat from the results obtained in this control group. Mean control group transfers in this study were 46.47 in the investment game and 60.00 in the public goods game. While the investment game contributions are somewhat similar, the control group comprised of science and engineering PhD students contributed, on average, approximately 11% more of their endowment than does the typical undergraduate

[Insert Table 26 about here.]

Table 27 provides similar information for the September and March sessions for each of the TI:GER disciplines. Interesting to note here is that while a smaller percentage of MBA students in the September session transferred positive amounts in the investment game (76% of MBAs vs. about 82% of JDs and 88% of PhDs), the MBA students have the highest mean positive transfer. They also have the highest mean expectation/transfer ratio. MBA students expected to get 1.73 times their transfer in return; however, PhD students expected 1.33 and JD students only 1.09 times their transfer in return. These high expectations help to explain the finding in Result 4 that many MBA students, who chose to transfer crowns, transferred at least 50% of their endowment. In the March sessions, the MBAs' expectations have decreased to below those of their classmates.

In the public goods game, the MBA students who contributed expected only slightly more from their teammates than their classmates did. In the spring, the contributing MBA students' level of expectation increased; however, 16% of these students chose not to contribute to their team. When asked to explain in writing why they made their particular choice in this game, one MBA student who contributed nothing replied, "because my teammates will contribute, and I'll outsmart them." Another MBA student, who contributed 100 wrote, "I have faith that they will do the same – can't trust a lawyer, though."

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student. Could this higher level of cooperation (although it is indeed lower than the within group cooperation observed by TI:GER subjects) be partially attributed to the amount of time these PhD students spend (13.32 hours per week) working closely in a team environment? That is, could an increase in cooperation be a positive externality of teamwork? This is another potential area for further analysis.

[Insert Table 27 about here.]

This study differs from previous research in several ways. First, subjects in my pre-existing groups chose to participate in the TI:GER program and (for the most part) self-selected into their respective teams - a design feature that resembles the types of teams one might encounter in a firm. Since these subjects had high levels of contributions soon after their assignment to a team and since those levels of contributions did not deteriorate over time, I can project that other individuals who choose to participate in team activities may behave pro-socially. Second, rather than use a specific group as my out-group, I compare subjects' behavior towards in-group members to their behavior towards unknown 'others'. I find that although TI:GER students behave more pro-socially towards their in-group members than towards unknown individuals, their behavior towards unknown individuals does not differ from the control group's behavior towards unknown individuals. This finding suggests that identification with a team has no positive or negative externalities towards unknown others. It also offers assurance that pro-social behaviors observed in this experiment result from group identification rather than from self-selection into a group.

This work's most significant contributions, however, stem from the unique subject group. Since the TI:GER program includes students from three distinct academic disciplines working together in cross-disciplinary teams, I am able to look inside a cross-functional team and compare behaviors of students of different disciplines both at a point in time and longitudinally. I have examined team-members pro-social behaviors since trust and cooperation are two key elements of a successful team. Results of this study

suggest that, at least for the subset of MBA students who participated in the TI:GER program, the self-selection hypothesis that attempts to explain MBA students' homo-economicus behavior does not hold. MBA students in this study initially exhibited no less pro-social behavior than the JD and PhD students. Although MBA students did tend to decrease altruistic transfers towards unknown individuals over time and with increased business training, I find no such decrease in contributions towards teammates. These results suggest that high levels of pro-social behaviors among cross-functional teammates can be sustained.

Numerous directions for extending this research exist. Since TI:GER is an academic program and its teams receive grades and other feedback for their work, it could be interesting to check for correlations between students' performance in the course and their pro-social choices during the experiment.[74] Within cross-functional teams, one could also explore attitudes and behaviors towards risk, coordination, and norm enforcement or extend into an analysis of various approaches towards group decision-making tasks. Nalbantian and Schotter (1997) found that tournament-based group incentive mechanisms that create competition among groups resulted in higher mean outputs. Given that some TI:GER teams participate in business plan competitions, another avenue of study could be to compare behaviors of these teams with TI:GER teams who do not participate in competitions. As mentioned in conjunction with Result 5, a more thorough investigation of the effects of legal training on pro-social behavior may also prove informative.

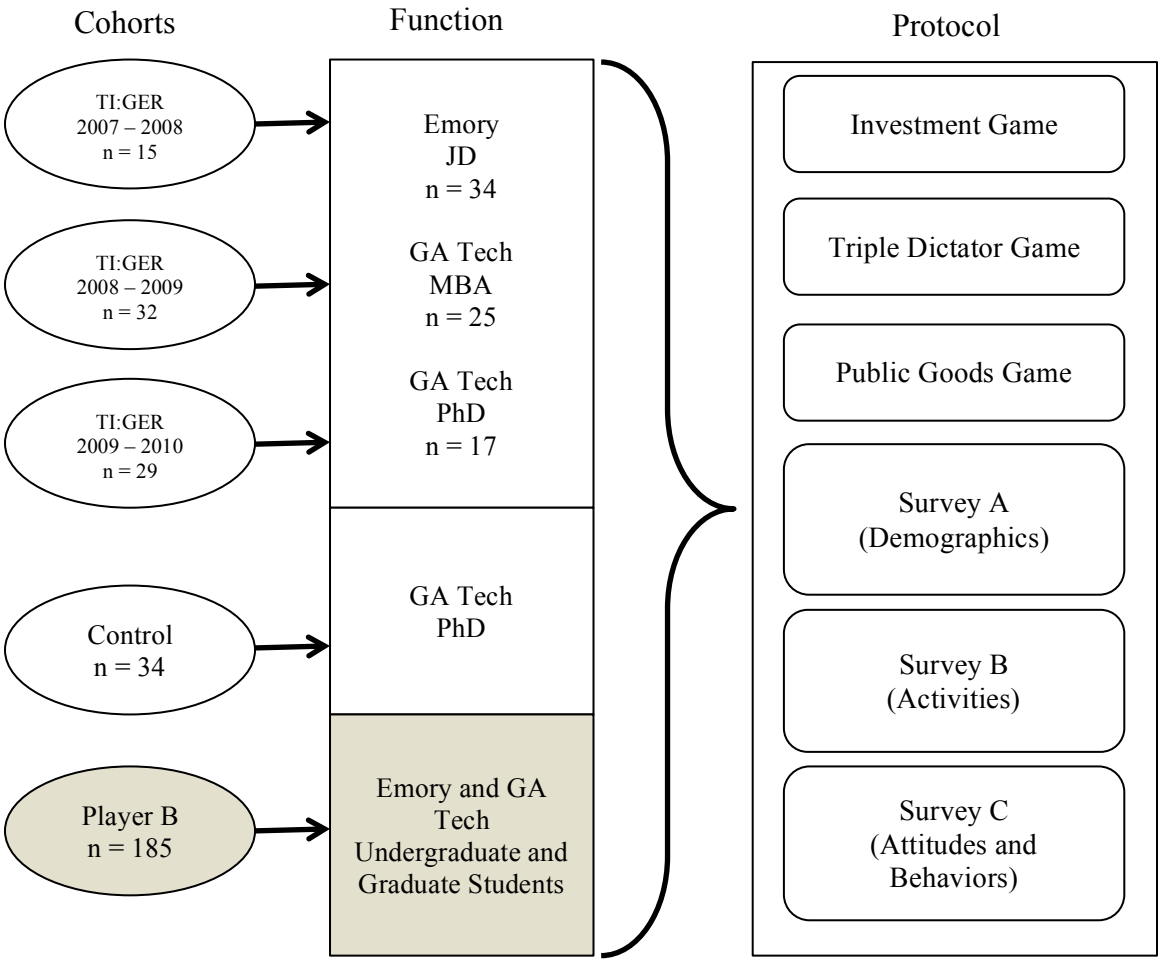
Finally, researchers may consider further analysis on distinct behaviors between groups versus teams. Parker (2003) stated that the key distinction between a *group* and a

[74] This type of analysis would, however, prohibit subjects' anonymity.

team of people is a requirement for interdependence. In this study I find that identification with the TI:GER group was initially sufficient to encourage high contributions in the public goods game, and that being matched with TI:GER teammates did not matter. However, after a year's worth of interaction and reliance on their teammates, subjects grouped with their teammates contributed higher amounts than those who were merely grouped with other members of the TI:GER program.

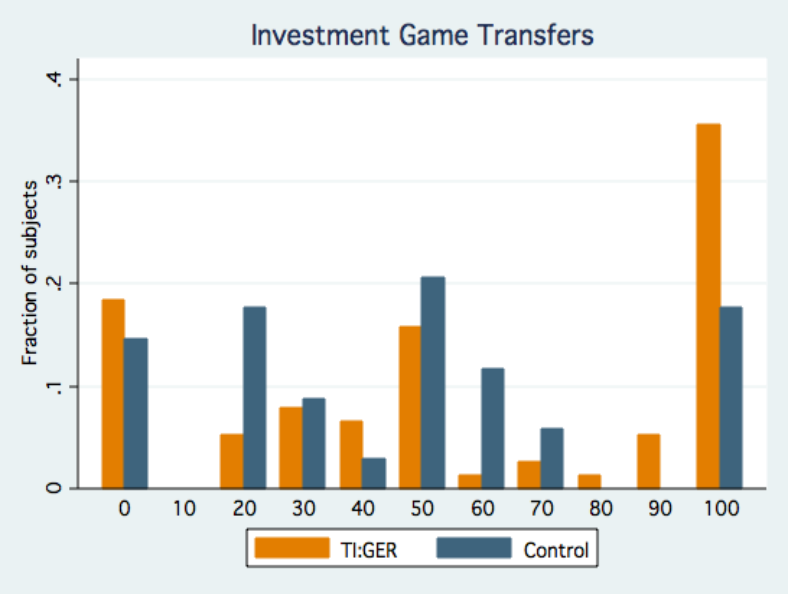
Appendix F: Figures

Figure 5: Description of Experiment



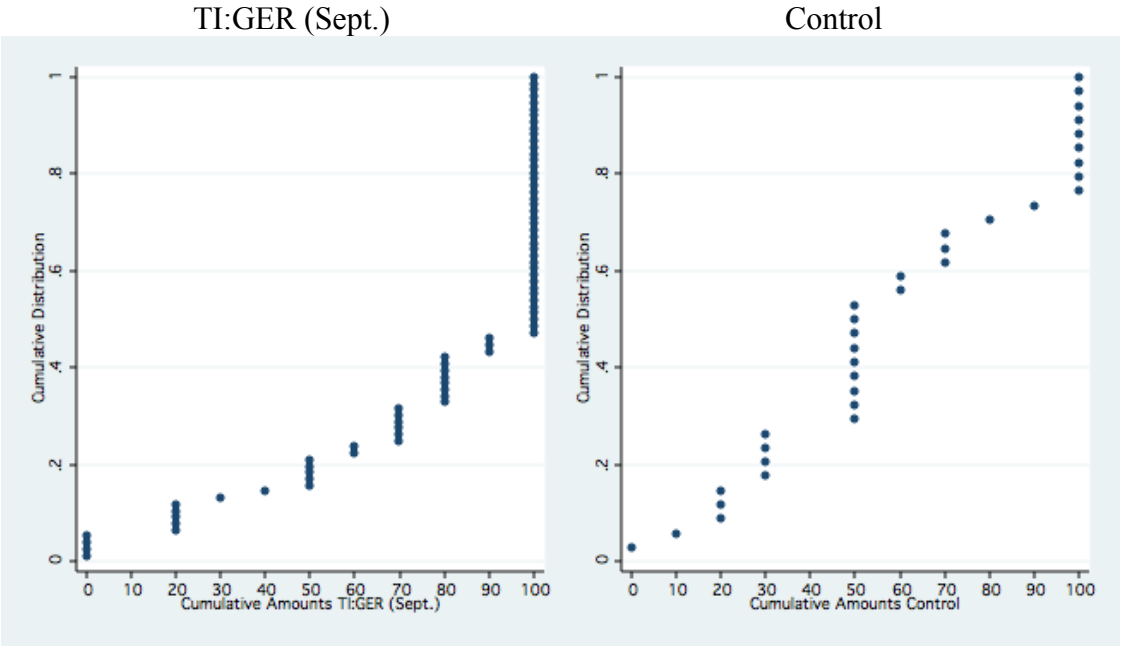
Notes: TI:GER students were informed of the experiment via their course syllabus and through announcements during class. Each of their sessions occurred at the conclusion of a regularly scheduled class, and although all TI:GER faculty vacated the classroom and TI:GER students were informed that they were under no obligation to participate, about 70% of the students took part in both of the sessions for their respective cohort. Overall, I collected data from 91 TI:GER students. 68% of TI:GER JD students, 78% of TI:GER MBA students, and 68% of TI:GER PhD students participated in both the fall and spring sessions of the study. For the control subjects, I emailed invitations to participate through the departments of various science and engineering PhD programs at Georgia Tech. For the sessions held at Georgia Tech, I recruited Player B subjects by making announcements during classes, and at Emory University, I recruited Player B subjects by making announcements in classes and via postings on a University-wide electronic bulletin board. I have more control subjects than TI:GER subjects because although the TI:GER students are part of the longitudinal study, I had no need to require Player B subjects to return for follow-up sessions and therefore recruited new Player B subjects for each experimental session.

Figure 6: Investment Game: TI:GER (Sept.) and Control



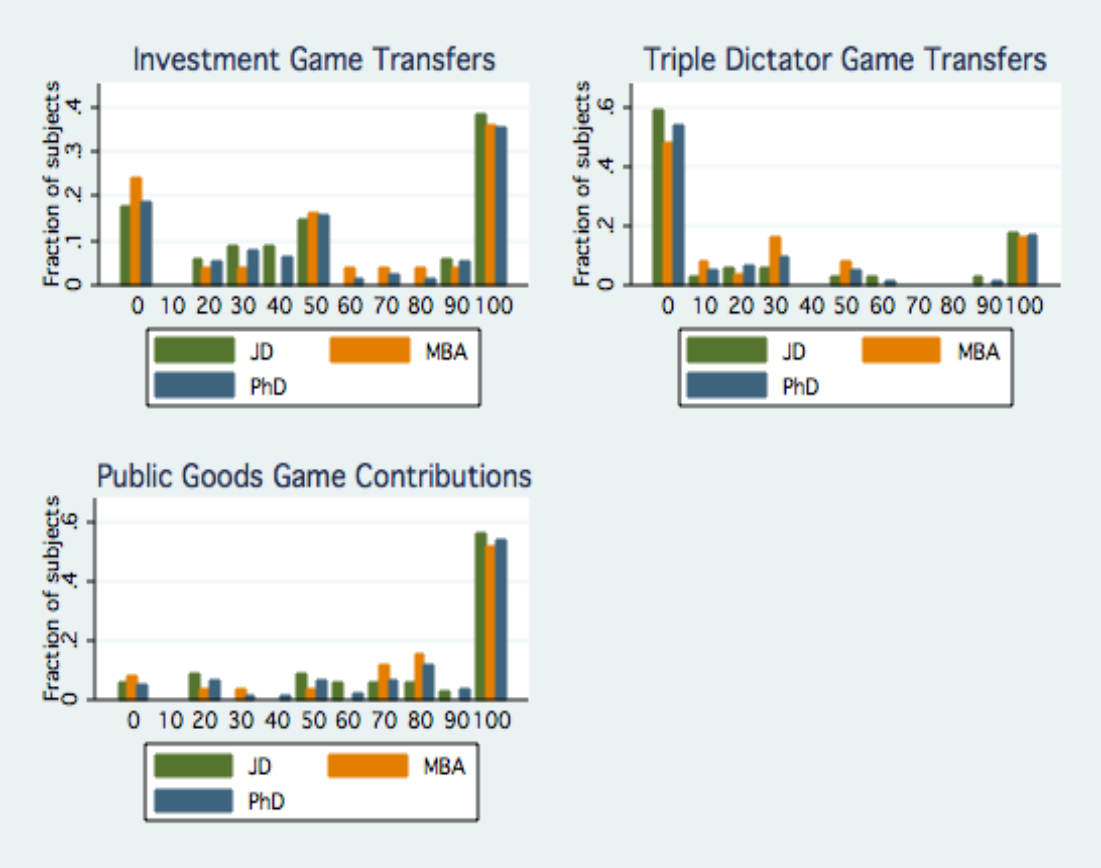
Notes: Median transfers for both TI:GER and control subjects were 50.

Figure 7: TI:GER (Sept.) vs. Control Cumulative Distribution



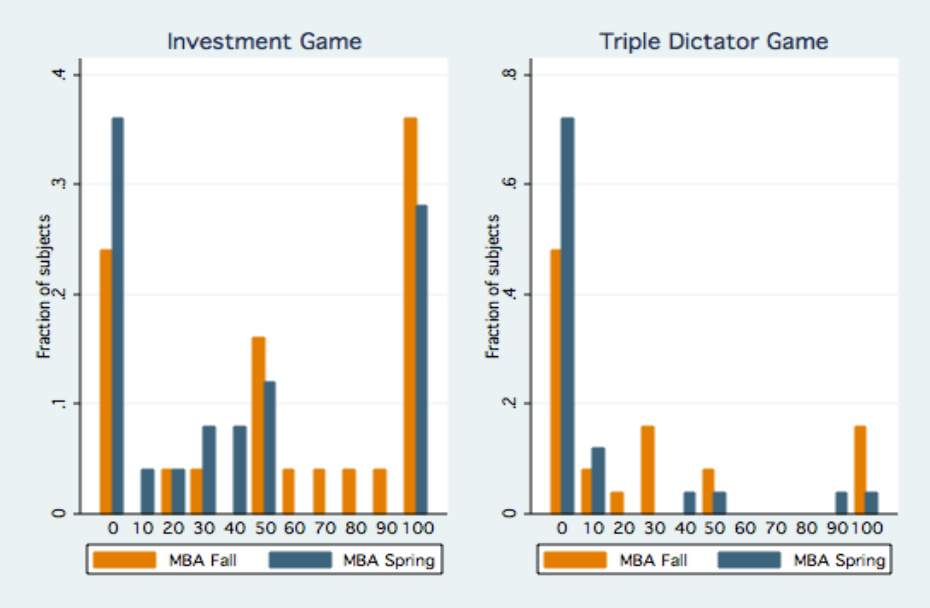
Notes: The median contribution for TI:GER students was 100. The median contribution for control subjects was 50.

Figure 8: Intra-Group Comparison of Behavior in Games. (Sept. Sessions)



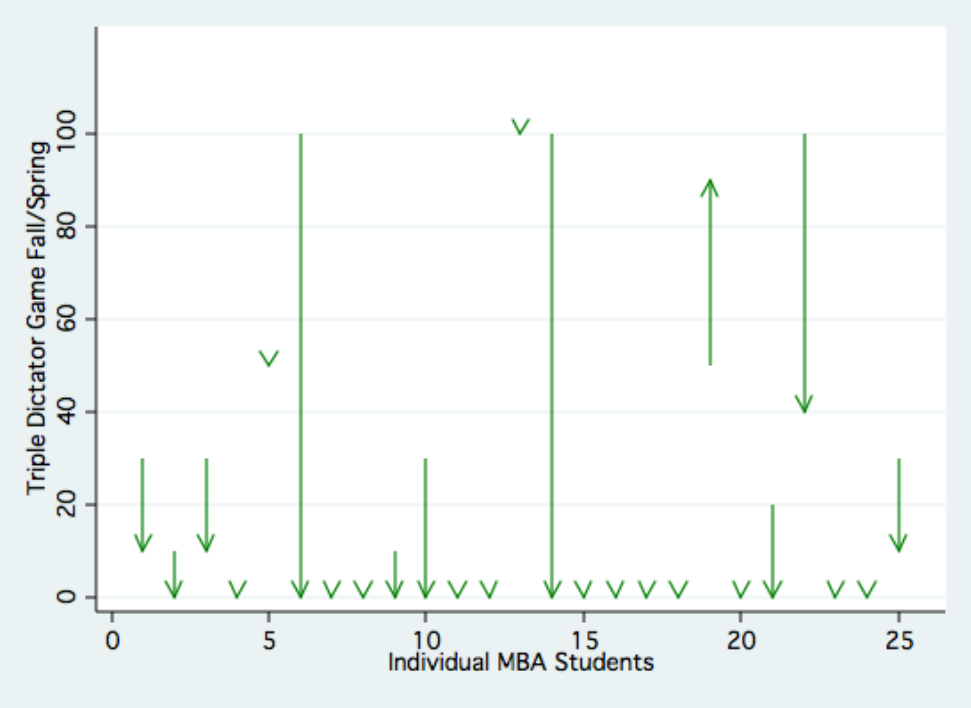
Notes: Median investment game transfers were 50, 60, and 50 for the JD, MBA, and PhD students, respectively. Median triple dictator game transfers were 0, 10, and 0 for the JD, MBA, and PhD students, respectively. Median public goods game contributions were 100 for all three disciplines.

Figure 9: Longitudinal Comparison of MBA Students' Behaviors in the Investment Game and the Triple Dictator Game



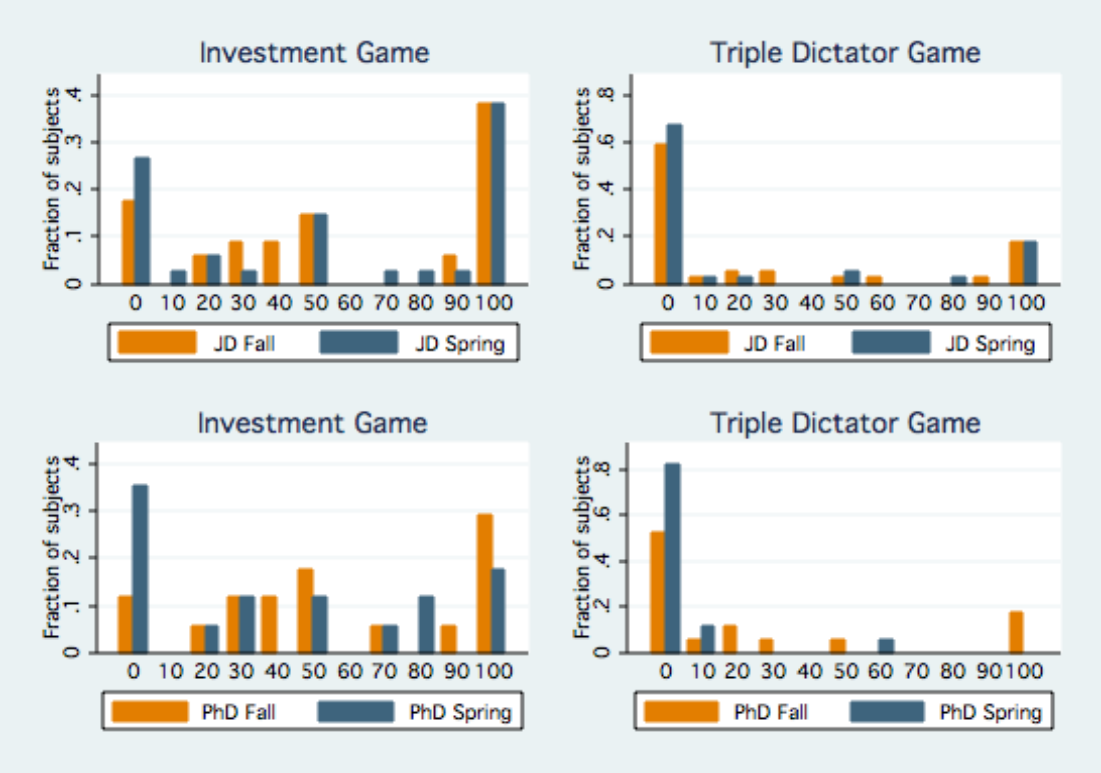
Notes: Median MBA student transfers in the investment game were 60 in the fall and 30 in the spring. Median MBA student transfers in the triple dictator game were 10 in the fall and 0 in the spring.

Figure 10: Longitudinal Analysis of Individual MBA Students' Decisions in the Triple Dictator Game



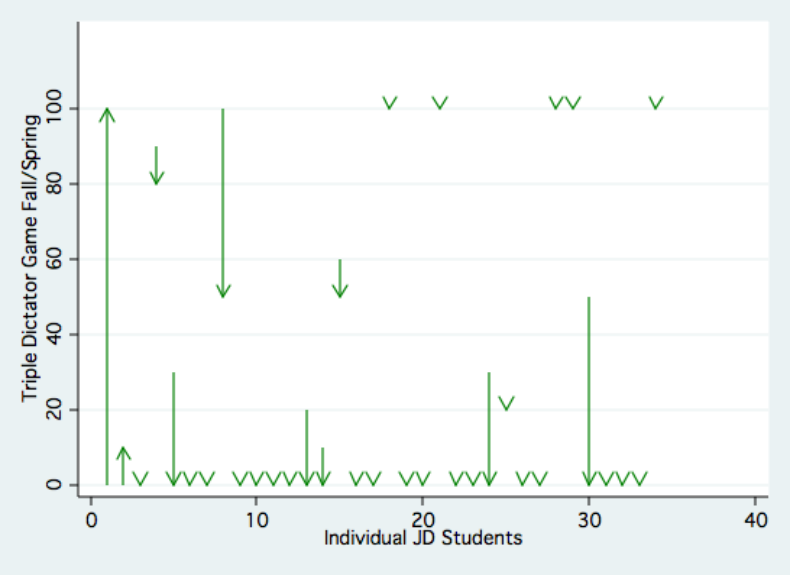
Notes: This graph shows directional changes in subjects' decisions in the triple dictator game (September vs. March). Where there is only an arrow (no line), the subject made the same choice in both sessions. A downward pointing arrow indicates a decrease from the September transfer (at the tail end of the arrow) to the March transfer (at the pointed end of the arrow). Only one subject (the 19th MBA student) transferred more in the spring than she did in the fall.

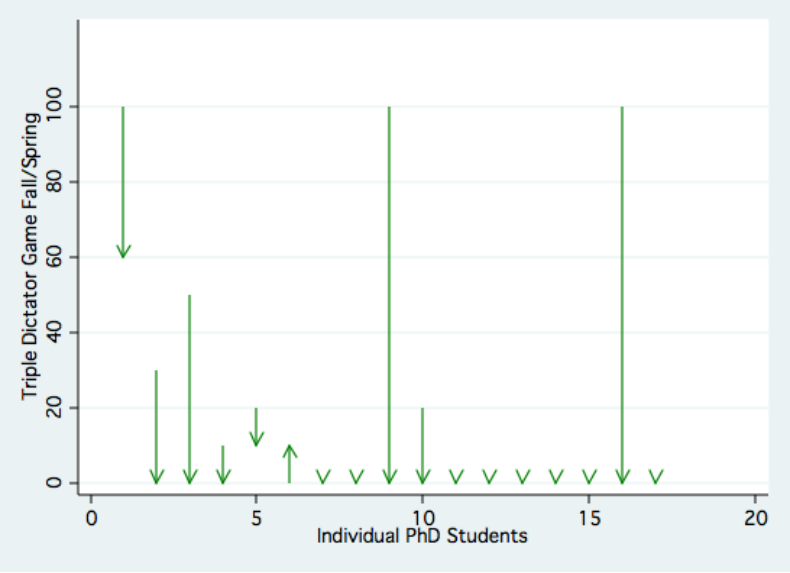
Figure 11: Longitudinal Comparison of JD and PhD Students' Behaviors in the Investment Game and the Triple Dictator Game



Notes: Median PhD student transfers in the investment game were 50 in the fall and 30 in the spring. Median JD student transfers in the investment game were 50 in both the fall and the spring. Median PhD and JD student transfers in the triple dictator game were 0 in both the fall and the spring.

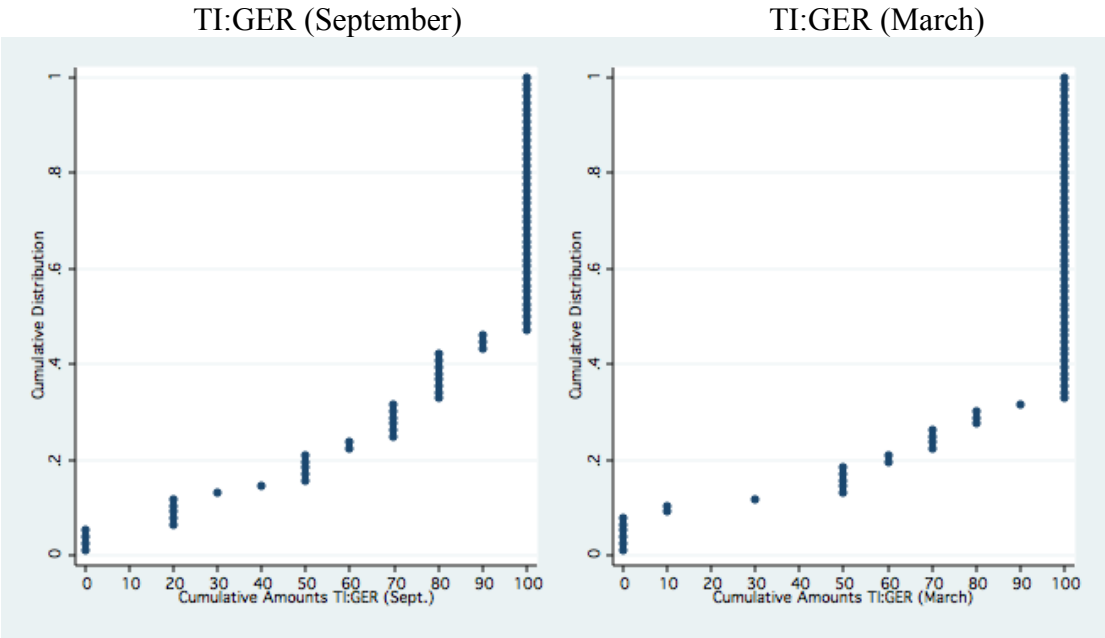
Figure 12: Longitudinal Analysis of Individual JD and PhD Students' Decisions in the Triple Dictator Game





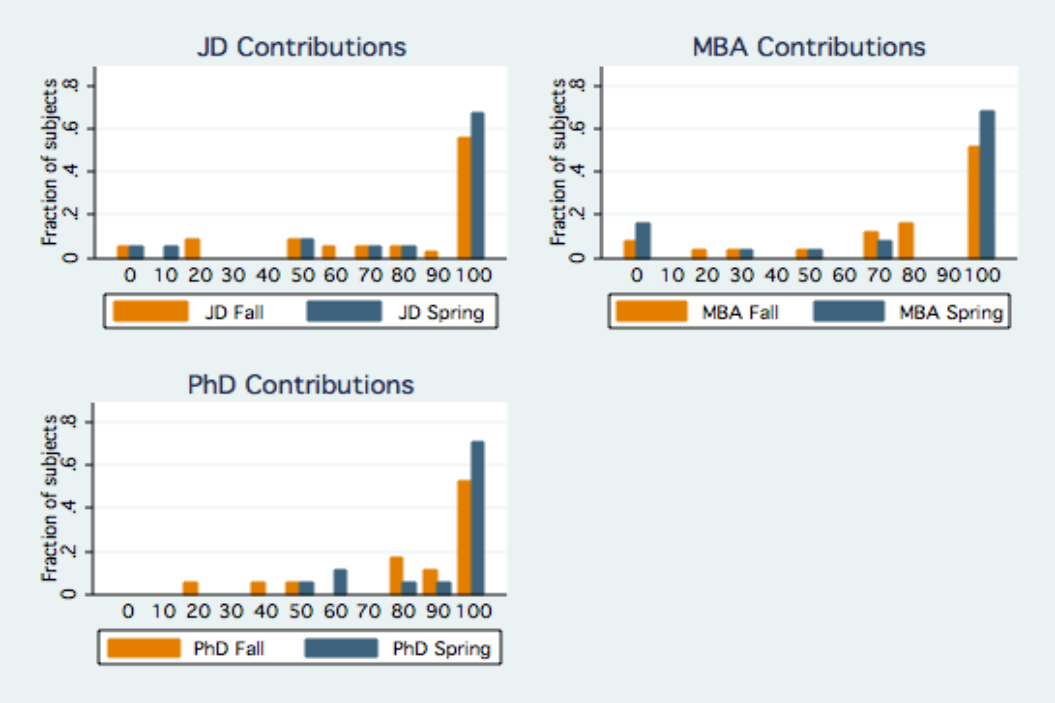
Notes: These graphs show directional changes in subjects' decisions in the triple dictator game (September vs. March). Where there is only an arrow (no line), the subject made the same choice in both sessions. A downward pointing arrow indicates a decrease from the September transfer (at the tail end of the arrow) to the March transfer (at the pointed end of the arrow).

Figure 13: Cumulative Distribution Function of Public Goods Game contributions by TI:GER (Sept.) and TI:GER (March)



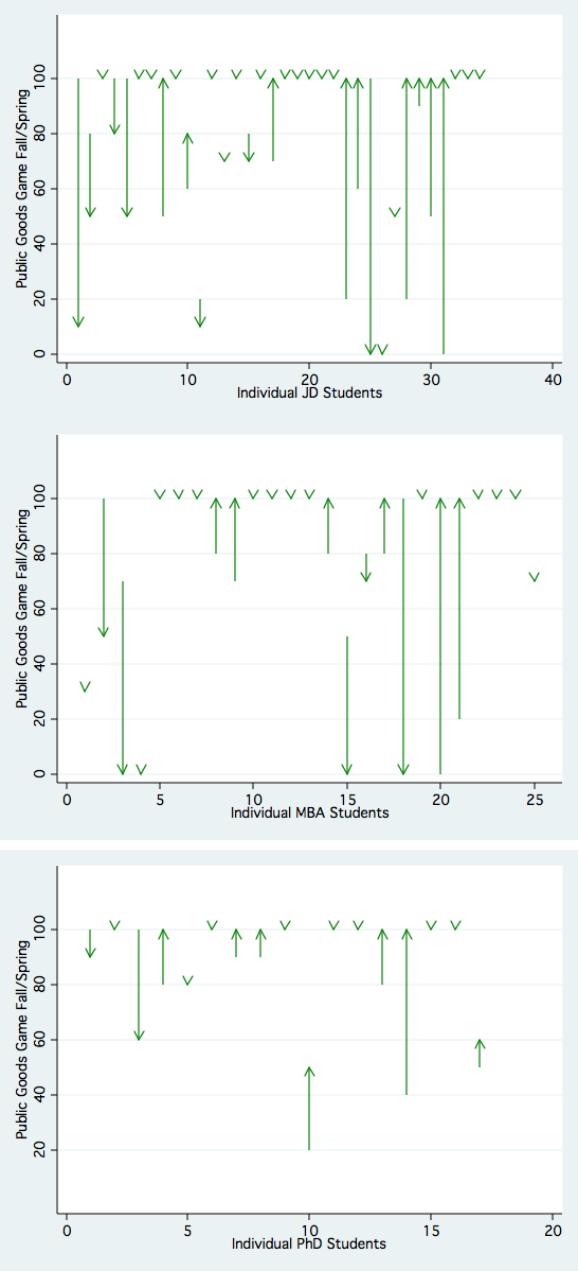
Notes: Median contributions for all TI:GER students were 100 in both September and March.

Figure 14: September vs. March Public Goods Game Contributions by Discipline.



Notes: Median contributions for JD, MBA, and PhD students were 100 in both the fall and the spring.

Figure 15: Longitudinal Analysis of Individual Students' Contributions (by Discipline) in the Public Goods Game



Notes: These graphs show directional changes in subjects' decisions in the triple dictator game (September vs. March). Where there is only an arrow (no line), the subject made the same choice in both sessions. A downward pointing arrow indicates a decrease from the September transfer (at the tail end of the arrow) to the March transfer (at the pointed end of the arrow).

Appendix G: Tables

Table 20: Summary Statistics - TI:GER and Control

Task	Variable Name	Description / range of values	(1) All TI:GER Sept. (n=76)	(2) All TI:GER March (n=76)	(3) Control (n=34)
Games	Investment	Amount passed in the Investment Game. Maximum is 100, minimum is 0	57.89 (38.72)	47.37 (41.80)	46.47 (32.56)
	Triple Dictator	Amount passed in the Triple Dictator Game. Maximum is 100, minimum is 0	26.32 (37.91)	15.79 (32.51)	17.35 (20.50)
	Public Goods	Amount contributed in the Public Goods Game. Values allowed range between 0 and 100	78.55 (30.58)	81.97 (32.04)	60.00 (30.85)
Survey A	Male	Sex of the student subject. Dummy: 1 Male, 0 Female	0.80 (0.40)	0.80 (0.40)	0.74 (0.45)
	Year	Year of graduate education. Values range from 1 to 6.	2.05 (1.08)	2.13 (1.15)	2.94 (1.46)
	White	Race of the student subject. Dummy: 1 White , 0 Other	0.59 (0.49)	0.61 (0.49)	0.47 (0.51)
	Alcohol	Number of alcoholic drinks consumed per week. Positive integer number.	4.94 (6.59)	4.56 (5.84)	1.55 (3.09)
	Siblings	Number of siblings. Positive integer number.	1.57 (1.20)	1.62 (1.18)	1.91 (1.65)
	Church	Answers to the question "How often do you go to church or other place of worship?" Answers are, 0: "Never," 1: "Sometimes," 2: "At least once a week."	0.78 (0.76)	0.76 (0.77)	1.24 (1.30)
Survey B	Membership	Sum of degree of involvement in associations variables. Values range from 0: "None," 1: "Member," 2: "Active member," to 3: "On the board". Values ranged from 0 to 12	4.62 (2.55)	4.04 (2.42)	4.18 (2.17)
	Hours Academic	Hours spent in a typical week working with a team on an academic project	6.51 (9.97)	8.58 (7.85)	13.32 (16.72)
Survey C	GSS Index	Normalized sum of de-meaned and normalized data from *GSS Trust*, *GSS Fair*, and *GSS Help*	-0.01 (1.00)	0.01 (1.00)	0.00 (1.00)
	Trust Stranger	Disapproval or approval of the statement, "You can't count on strangers anymore." Answers range from 3: "Strongly agree" to -3: "Strongly disagree". This variable was resigned for the analysis.	0.15 (1.29)	0.31 (1.35)	0.35 (1.41)
	Behavior Index	Normalized sum of responses to three questions related to the frequency of leaving the door unlocked, lending money and lending possessions. Answers are positive real numbers.	0.00 (1.00)	-0.01 (1.00)	0.00 (1.00)
	Trustworthy	Approval or disapproval of the statement, "I am trustworthy." Answers range from 3: "Strongly agree" to -3: "Strongly disagree"	2.45 (0.75)	2.37 (0.70)	2.12 (1.04)

Notes: Mean values are reported for each variable. Standard Deviations are in parenthesis. For the "Membership" variable in Survey B, participants circled an involvement level of *none*, *member*, *active member*, or *on the board* for each of the following: sports club; choir or orchestra; political party or lobbying group(s); non-profit organization; social club; or other.

Table 21: Summary Statistics by TI:GER Group Discipline

Task	Variable Name	Description / range of values	(1) JD Sept. (n=34)	(2) MBA Sept. (n=25)	(3) PhD Sept. (n=17)	(4) JD March (n=34)	(5) MBA March (n=25)	(6) PhD March (n=17)
Games	Investment	Amount passed in the Investment Game. Maximum is 100, minimum is 0	58.24 (39.58)	58.00 (40.93)	57.06 (35.84)	55.00 (42.94)	40.80 (41.53)	41.76 (39.72)
	Triple Dictator	Amount passed in the Triple Dictator Game. Maximum is 100, minimum is 0	26.76 (39.90)	26.40 (36.39)	25.29 (38.26)	23.82 (39.93)	12.40 (27.88)	4.71 (14.63)
	Public Goods	Amount contributed in the Public Goods Game. Values allowed range between 0 and 100	76.76 (32.45)	77.00 (32.34)	84.12 (24.51)	81.47 (32.39)	76.80 (38.59)	90.59 (17.13)
Survey A	Male	Sex of the student subject. Dummy: 1 Male, 0 Female	0.76 (0.43)	0.84 (0.37)	0.82 (0.39)	0.76 (0.43)	0.84 (0..37)	0.82 (0.39)
	Year	Year of graduate education. Values range from 1 to 6.	2.00 (0.00)	1.08 (0.28)	3.59 (1.18)	2.00 (0.00)	1.20 (0.41)	3.76 (1.30)
	White	Race of the student subject. Dummy: 1 White , 0 Other	0.56 (0.50)	0.68 (0.48)	0.53 (0.51)	0.59 (0.50)	0.68 (0.48)	0.53 (0.51)
	Alcohol	Number of alcoholic drinks consumed per week. Positive integer number.	5.26 (7.13)	6.17 (6.89)	2.53 (4.42)	5.65 (7.55)	4.02 (3.99)	3.18 (3.62)
	Siblings	Number of siblings. Positive integer number.	1.47 (0.79)	1.52 (1.36)	1.82 (1.63)	1.59 (0.86)	1.48 (1.19)	1.88 (1.65)
	Church	Answers to the question "How often do you go to church or other place of worship?" Answers are, 0: "Never," 1: "Sometimes," 2: "At least once a week."	0.64 (0.70)	0.88 (0.80)	0.94 (0.83)	0.62 (0.70)	0.79 (0.78)	1.00 (0.87)
Survey B	Membership	Sum of degree of involvement in associations variables. Values range from 0: "None," 1: "Member," 2: "Active member," to 3: "On the board". Values ranged from 0 to 12	4.71 (2.32)	4.96 (2.85)	3.94 (2.54)	4.00 (2.16)	4.25 (2.66)	3.82 (2.67)
	Hours Academic	Hours spent in a typical week working with a team on an academic project	1.93 (2.23)	7.60 (5.33)	14.06 (17.51)	5.40 (3.88)	11.17 (6.32)	11.29 (12.52)
Survey C	GSS Index	Normalized sum of de-meaned and normalized data from *GSS Trust*, *GSS Fair*, and *GSS Help*	-0.10 (1.06)	0.18 (0.96)	-0.09 (0.97)	-0.10 (1.06)	0.06 (0.96)	0.18 (0.97)
	Trust Stranger	Disapproval or approval of the statement, "You can't count on strangers anymore." Answers range from 3: "Strongly agree" to -3: "Strongly disagree". This variable was resigned for the analysis.	0.23 (1.31)	0.09 (1.08)	0.12 (1.58)	0.21 (1.52)	0.32 (1.21)	0.50 (1.21)
	Behavior Index	Normalized sum of responses to three questions related to the frequency of leaving the door unlocked, lending money and lending possessions. Answers are positive real numbers.	-0.16 (0.95)	0.16 (0.93)	0.08 (1.18)	-0.07 (0.89)	-0.18 (0.85)	0.30 (1.35)
	Trustworthy	Approval or disapproval of the statement, "I am trustworthy." Answers range from 3: "Strongly agree" to -3: "Strongly disagree"	2.45 (0.89)	2.52 (0.59)	2.35 (0.70)	2.36 (0.78)	2.36 (0.58)	2.38 (0.72)

Notes: Mean values are reported for each variable. Standard Deviations are in parenthesis. For the "Membership" variable in Survey B, participants circled an involvement level of *none*, *member*, *active member*, or *on the board* for each of the following: sports club; choir or orchestra; political party or lobbying group(s); non-profit organization; social club; or other.

Table 22: Investment Game as a Function of Sender Characteristics

	Dependent Variable: Amount Sent	
Ind. Variables	Model 1 TI:GER (Sept.)	Model 2 Control
Triple Dictator Game	0.318***	0.021
	(0.118)	(0.344)
Male	7.805	4.168
	(13.361)	(17.246)
White	17.414*	13.723
	(9.116)	(14.000)
Alcohol	-1.068	1.633
	(0.668)	(2.516)
Siblings	3.093	0.853
	(4.173)	(4.549)
Church	-14.713**	8.406
	(6.289)	(6.521)
Membership	-0.558	-5.340
	(1.676)	(3.168)
Hours Academic	0.093	0.630
	(0.430)	(0.484)
GSS Index	15.850***	9.729
	(5.173)	(7.142)
Trust Strangers	-6.763*	3.873
	(3.736)	(5.174)
Behavior Index	11.293**	-1.125
	(4.862)	(7.364)
Trustworthy	-1.206	3.317
	(5.761)	(6.824)
Constant	51.624**	28.377
	(20.9670)	(32.089)
Adj R-squared	0.344	0.128
Numb. Obs.	59	31

Notes: OLS regression coefficients. Standard errors in parentheses. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 23: Public Goods Game as a Function of Sender Characteristics

	Dependent Variable: Amount contributed	
Ind. Variables	Model 1 TI:GER (Sept.)	Model 2 Control
Male	61.670***	53.270***
	21.233)	(16.180)
White	30.983*	32.713**
	(15.757)	(13.678)
Alcohol	0.604	-0.409
	(1.412)	(2.088)
Siblings	-7.349	8.066*
	(6.144)	(4.323)
Church	-8.664	6.226
	(11.005)	(5.696)
Membership	-5.261*	2.865
	(2.989)	(2.757)
Hours Academic	1.324*	1.096**
	(0.704)	(0.473)
GSS Index	23.844***	2.230
	(8.723)	(6.686)
Trust Strangers	-0.190	2.097
	(6.307)	(4.810)
Behavior Index	24.663**	-6.178
	(10.926)	(6.842)
Trustworthy	-19.567*	1.519
	(10.408)	(6.255)
Constant	116.597***	-42.731
	(37.500)	(30.556)
Psuedo R-squared	0.115	0.081
Numb. Obs.	59	31

Notes: Tobit analysis with standard errors in parenthesis. Data is right- and left-censored. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

Table 24: Pro-Social Behaviors

	Dependent Variable: Amount sent			
Ind. Variables	Model 1 TI:GER Public Goods Game (Sept.)	Model 2 TI:GER Investment Game (Sept.)	Model 3 Control Public Goods Game	Model 4 Control Investment Game
Public Goods Game		0.0100 (0.196)		0.55** (0.239)
CA	0.116 (0.210)		0.569*** (0.207)	
Triple Dictator (CB)		0.318*** (0.120)		0.143 (0.313)
Male	61.469*** (21.120)	7.516 (14.710)	49.576*** (14.257)	-21.245 (19.034)
White	29.637* (15.803)	17.346* (9.317)	23.552* (12.210)	2.224 (13.538)
Alcohol	0.784 (1.442)	-1.071 (0.679)	-1.289 (1.869)	1.094 (2.273)
Siblings	-7.838 (6.189)	3.142 (4.333)	7.593* (3.830)	-2.894 (4.401)
Church	-7.329 (11.189)	-14.712** (6.359)	1.495 (5.228)	4.659 (6.083)
Membership	-4.993* (3.006)	-0.542 (1.722)	5.800** (2.641)	-6.359** (2.881)
Hours Academic	1.321* (0.701)	0.088 (0.446)	0.698 (0.430)	0.106 (0.491)
GSS Index	21.700** (9.441)	15.742*** (5.665)	-3.691 (6.230)	8.731 (6.433)
Trust Strangers	0.663 (6.484)	-6.762* (3.778)	-0.404 (4.322)	2.502 (4.688)
Behavior Index	22.864** (11.202)	11.237** (5.044)	-6.084 (5.989)	2.017 (6.757)
Trustworthy	-19.457* (10.507)	-1.112 (6.125)	-0.184 (5.503)	2.842 (6.136)
Constant	107.849*** (40.230)	50.812* (26.764)	-57.466** (27.465)	42.743 (29.505)
Adj R-squared		0.330		0.296
Psuedo R-squared	0.116		0.111	
Numb. Obs.	59	59	31	31

Notes: Models 1 and 3: Tobit analysis. Data is right- and left-censored.
Models 2 and 4: OLS regression coefficients. Standard errors in parenthesis.
***Significant at the 1 percent level, **Significant at the 5 percent level,
*Significant at the 10 percent level

Table 25: Longitudinal Analysis of TI:GER Students' Behavior in the Public Goods Game

	Dependent Variable: Amount contributed			
Ind. Variables	Model 1 TI:GER (Sept.)	Model 2 TI:GER (Sept.)	Model 3 TI:GER (March)	Model 4 TI:GER (March)
Complete Team	-9.512		63.284***	
	(17.504)		(24.519)	
75% of Team		-14.958		65.775***
		(21.023)		(25.855)
Male	60.652***	58.08***	63.641**	73.948**
	(21.092)	(21.339)	(27.201)	(29.612)
White	30.608*	30.320*	2.156	-4.614
	(15.631)	(15.543)	(19.705)	(19.991)
Alcohol	0.562	0.655	12.557**	17.273***
	(1.384)	(1.388)	(5.049)	(5.966)
Siblings	-7.341	-7.418	-3.728	-0.631
	(6.093)	(6.037)	(9.113)	(9.111)
Church	-10.270	-9.342	15.757	14.998
	(11.295)	(10.892)	(14.504)	(14.356)
Membership	-5.025*	-4.750	-5.298	-6.219
	(2.982)	(3.005)	(4.787)	(4.895)
Hours Academic	1.313*	1.309*	-0.062	-0.091
	(0.699)	(0.695)	(1.264)	(1.289)
GSS Index	24.128***	23.664***	-0.782	2.490
	(8.738)	(8.652)	(9.782)	(9.982)
Trust Strangers	-0.590	-0.082	33.869***	31.788***
	(6.317)	(6.274)	(10.554)	(10.595)
Behavior Index	25.143**	25.350**	-11.070	-11.658
	(10.966)	(11.006)	(11.084)	(11.041)
Trustworthy	-18.354*	-18.725*	-15.586	-35.087
	(10.438)	(10.296)	(18.410)	(22.442)
Constant	122.582***	128.787***	56.066	63.566
	(38.890)	(41.279)	(53.458)	(54.876)
Psuedo R-squared	0.116	0.117	0.133	0.130
Numb. Obs.	59	59	66	66

Notes: Tobit analysis with standard errors in parenthesis. Data is right- and left-censored. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

Table 26: Expectations and Transfers/Contributions – TI:GER and Control

Investment Game

	All TI:GER (Sept.)	Control
% Transferring $0	18.42%	14.71%
% Making a Positive Transfer	81.58%	85.29%
Mean Positive Transfer	70.97	54.48
Mean Expectation	101.63	71.09
Mean Expectation/Transfer	1.3	1.1

Public Goods Game

	All TI:GER (Sept.)	Control
% Contributing $0	5.26%	2.94%
% Making a Positive Contribution	94.74%	97.06%
Mean Positive Contribution	83.04	61.82
Mean Expectation	69.36	48.23
Expectation/Contribution	0.86	0.93

Table 27: Expectations and Transfers/Contributions – TI:GER (Sept.) and TI:GER (March)

Investment Game	JD (Sept.)	MBA (Sept.)	PhD (Sept.)	JD (March)	MBA (March)	PhD (March)
% Transferring $0	17.65%	24.00%	11.76%	26.47%	36.00%	35.29%
% Making a Positive Transfer	82.35%	76.00%	88.24%	73.53%	64.00%	64.71%
Mean Positive Transfer	70.71	76.32	64.67	74.80	63.75	64.55
Mean Expectation	86.73	138.53	85.63	104.60	80.00	83.41
Mean Expectation/Transfer	1.09	1.73	1.33	1.31	1.11	1.35

Public Goods Game	JD (Sept.)	MBA (Sept.)	PhD (Sept.)	JD (March)	MBA (March)	PhD (March)
% Contributing $0	5.56%	8.00%	0.00%	5.88%	16.00%	0.00%
% Making a Positive Contribution	94.12%	92.00%	100.00%	94.12%	84.00%	100.00%
Mean Positive Contribution	82.03	83.70	84.06	86.56	91.43	90.29
Mean Expectation	69.23	70.48	68.24	83.48	90.00	82.10
Expectation/Contribution	0.90	0.85	0.81	1.16	0.94	0.91

Appendix H: Supplementary Tables

Table 28a: Correlations Between Games– TI:GER Subjects: September

	Investment Game	Triple Dictator Game	Public Goods Game
Investment Game	1.000	0.502 (0.000)	0.236 (0.040)
Triple Dictator Game		1.000	0.147 (0.205)
Public Goods Game			1.000

Notes: n = 76; Significance levels in parentheses

Table 28b: Correlations Between Games– TI:GER Subjects: March

	Investment Game	Triple Dictator Game	Public Goods Game
Investment Game	1.000	0.225 (0.050)	0.149 (0.198)
Triple Dictator Game		1.000	0.054 (0.642)
Public Goods Game			1.000

Notes: n = 76; Significance levels in parentheses

Table 28c: Correlations Between Games– Control Subjects

	Investment Game	Triple Dictator Game	Public Goods Game
Investment Game	1.000	0.322 (0.064)	0.401 (0.019)
Triple Dictator Game		1.000	-0.005 (0.979)
Public Goods Game			1.000

Notes: n = 34; Significance levels in parentheses

Table 29a: Correlations Between Pairs of Demographic Variables – TI:GER Subjects: September

	Male	White	Alcohol	Siblings	Church	Membership	Hours Academic
Male	1.000	0.059 (0.610)	0.103 (0.397)	0.152 (0.191)	0.103 (0.385)	0.147 (0.204)	-0.127 (0.276)
White		1.000	0.306 (0.010)	0.124 (0.286)	-0.054 (0.648)	0.012 (0.915)	0.025 (0.831)
Alcohol			1.000	-0.084 (0.489)	-0.139 (0.250)	0.065 (0.592)	0.047 (0.702)
Siblings				1.000	0.167 (0.156)	0.146 (0.208)	0.099 (0.395)
Church					1.000	0.065 (0.582)	-0.112 (0.341)
Membership						1.000	0.040 (0.733)
Hours Academic							1.000

Notes: n = 76; Significance levels in parentheses

Table 29b: Correlations Between Pairs of Demographic Variables – TI:GER Subjects: March

	Male	White	Alcohol	Siblings	Church	Membership	Hours Academic
Male	1.000	0.073 (0.531)	0.059 (0.611)	0.177 (0.125)	0.118 (0.311)	0.244 (0.035)	-0.1034 (0.375)
White		1.000	0.261 (0.023)	0.174 (0.133)	-0.142 (0.224)	0.070 (0.549)	0.000 (0.998)
Alcohol			1.000	-0.007 (0.950)	-0.053 (0.653)	-0.070 (0.552)	-0.15 (0.188)
Siblings				1.000	0.119 (0.308)	-0.047 (0.691)	0.027 (0.821)
Church					1.000	0.229 (0.050)	-0.020 (0.869)
Membership						1.000	0.0867 (0.460)
Hours Academic							1.000

Notes: n = 76; Significance levels in parentheses

Table 29c: Correlations Between Pairs of Demographic Variables – Control Subjects

	Male	White	Alcohol	Siblings	Church	Membership	Hours Academic
Male	1.000	0.109 (0.555)	0.148 (0.412)	-0.078 (0.673)	-0.253 (0.148)	-0.200 (0.256)	-0.3524 (0.410)
White		1.000	0.368 (0.038)	-0.101 (0.591)	0.086 (0.642)	-0.137 (0.456)	-0.019 (0.916)
Alcohol			1.000	-0.232 (0.201)	-0.308 (0.081)	-0.119 (0.509)	-0.038 (0.832)
Siblings				1.000	0.277 (0.124)	0.269 (0.137)	-0.421 (0.016)
Church					1.000	0.028 (0.877)	-0.186 (0.293)
Membership						1.000	-0.108 (0.544)
Hours Academic							1.000

Notes: n = 34; Significance levels in parentheses

Table 30a: Correlations Between Pairs of Attitudinal/Behavioral Variables- TI:GER Subjects: September

	GSS Index	Trust Stranger	Behavior Index	Trustworthy
GSS Index	1.000	0.421 (0.001)	0.130 (0.304)	0.298 (0.017)
Trust Stranger		1.000	0.264 (0.026)	0.059 (0.623)
Behavior Index			1.000	0.105 (0.386)
Trustworthy				1.000

Notes: n = 76; Significance levels in parentheses

Table 30b: Correlations Between Pairs of Attitudinal/Behavioral Variables- TI:GER Subjects: March

	GSS Index	Trust Stranger	Behavior Index	Trustworthy
GSS Index	1.000	0.372 (0.002)	0.194 (0.115)	0.242 (0.047)
Trust Stranger		1.000	0.155 (0.201)	0.075 (0.536)
Behavior Index			1.000	0.072 (0.553)
Trustworthy				1.000

Notes: n = 76; Significance levels in parentheses

Table 30c: Correlations Between Pairs of Attitudinal/Behavioral Variables – Control Subjects

	GSS Index	Trust Stranger	Behavior Index	Trustworthy
GSS Index	1.000	0.417 (0.014)	0.141 (0.428)	0.179 (0.312)
Trust Stranger		1.000	0.213 (0.228)	-0.236 (0.179)
Behavior Index			1.000	-0.290 (0.096)
Trustworthy				1.000

Notes: n = 34; Significance levels in parentheses

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