Homophily& Strategic Behavior in Social Interactions: Evidence from a Lab Experiment

By

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Abstract

Social networks play an important role in human interactions. It is possible for social differentiation and segregation to discourage links that are desirable from an efficiency point of view, or for social matches to encourage them. In this study, I have studied how individual behavior and diffusion of demographic information impacts social interactions. I assessed the three important determinants of social interactions: homophily, preference for fairness and past behavior via a controlled lab experiment. The subjects were divided into three treatment groups; representing an out-group and two degrees of in-group pairings. I conclude that participants show less homophily towards an in-group match when they know their partner cannot influence their outcome. However, if there is chance of the behavior being reprimanded, the opposite is true. Lastly, I highlight that there is strong evidence in favor of reciprocity and coordination because participants are responsive to their partner's decision in prior interactions.

Keywords: social interactions, homophily, cooperation, preference for fairness.

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1. Introduction

Social interactions are the prime source of exchange of information and efficient diffusion of information demands a powerful network structure. The efficiency of information networks is crucial and well-organized information networks maximize the value of information excluding the diffusion cost (Bala & Goyal, 2000). If, for example, an individual does not have any connections, the diffusion of information can be partial. On the other hand, if the linkages are too long, the diffusion can be sluggish. Consequently, the on-goings of various markets will be adversely affected leading to deterioration of economic outcomes.

Lab experiments have recently gained popularity when measuring social networks. Social interaction can depend on individual preferences, opportunities and is sometimes strategy-driven. Previous research has shown that it is difficult to distinguish between preferences and opportunities in the field. Simply put, in the field people might have a 'preference' to interact with others just because they live in the same neighborhood. Controlled laboratory experiments can allow the researcher to separate and measure these forces as well as their interaction with each other (Currarini & Mengel, 2016). During these experiments, the researcher is able to control for several variables (e.g. costs, benefits, information & timing) that are likely to impact individual and/or aggregate behavior that can sometimes be very challenging or even impossible to measure or control in the field (Kosfeld, 2003).

In this thesis, I attempt to look at whether social interactions are driven by a preference to deal with members of own group or whether they are driven by a strategic thought process that anticipates future reward and/or punishment. In the context of this study, social interaction is represented by how individuals choose to interact with their partners in matters of money.

The study uses data from a lab experiment whereby the participants – university students who have studied together for at least a year – were paired up to play certain experiments that required of them to make decisions influencing monetary transactions between them. Homophily, preference for fairness and coordination based on reciprocal considerations are the three important determinants of social interactions that have been assessed via a controlled lab experiment. Experiment participants were randomly divided into three distinct groups – individuals matched with a 'computer' (T1) were told the computer would use a database of past responses to react to their decisions. Individuals in two other groups were matched with other lab experiment participants - those who knew only the class section of the partner (T2), those who knew the gender and the class section of their partner (T3). We would expect homophily and reciprocity to matter in pairing where the partner is a human; more so if students are expected to act with greater altruism towards friends (T2). A comparison to the T3 results measures if a gender bias exists. I conduct standard experiments found in literature – altruism, ultimatum and prisoner's dilemma, customized to the local context. Existing studies have used the activities to measure generosity, preference for fairness or reciprocity and coordination, respectively, in different contexts.

The results suggest that participants are likely to show more generosity towards a stranger than towards an in-group match when they also know their partner cannot influence their personal outcome (game winnings). It is noteworthy that contrary to the findings of this study, literature suggests that even when their partner cannot influence their personal outcomes, participants are generous towards people they know. However, participants tend to play safe or make a higher monetary offer if there is a chance of the behavior being reciprocated by reward or punishment; and this holds true in this study as well. Results indicate that social interactions are

not preference driven rather they are strategic; participants do not obtain pure utility out of interacting with someone of their own social group any more than they do out of interacting with a stranger in the same setting.

The results of this study can provide interesting insights into the functioning of social groups. It is important and helpful to understand how social networks play out in this setting especially as these students are likely to enter the labor market in a few years. Social capital can be a useful asset in labor markets social capital (Lin, 2001); information regarding job vacancies travels rapidly through social networks that can be less costly to form compared to professional networks or formal job searching techniques (Granovetter, 2005).

Examples of group-specific deterrents to information sharing can be found in the Small and Medium Enterprise (SME) sector as well. Large firms have conventionally relied on formal processes (internal skills) for technological advancements. On the other hand, SMEs are have limited capacity for implementation because of resource inadequacy. Information diffusion through social networks can play a valuable role here. For instance, Iturrioz et al (2015) talk about the ability of social capital to reduce cooperation risks and costs. Information will be shared and more members would be willing to innovate which will stimulate shared innovation process in the network. Similarly, when trying to study how long farmers take to adopt a new technology, Ma et al (2014) find that farmers make the same adoption decision as their neighbors. Group dynamics, affected by the characteristics and preferences of the group-members, may therefore either inhibit or promote network formation and the sharing of information in these groups.

This study aims to assist in analyzing segregation and preference for interacting with people of similar characteristics. The results will also be useful when trying to formulate policies related to discrimination or social and/or economic segregation; from making decisions regarding matching workers in a production team to the choice of schools children are sent to. Choice over who to work with, for instance, may impact the level of in-group discrimination and productivity of the group and hence understanding of such social networks and the nature of underlying motivations are important to realize.

2. Literature Review

Different studies have measured social networks differently depending on the nature of the research. Some studies use panel data to difference out the unobservable fixed effect. Many studies employ Randomized Control Trials (RCTs) for the same reason and compare the results of treatment and control group and identify the network effects. Empirical studies of networks in Pakistan have concluded that social networks and networks at work can directly facilitate or hinder adoption of technology.

Most of the studies that use data from Pakistan have used firms as the unit of analysis. Ma et al (2014), however, conducted an individual level analysis trying to identify the role of social networks in learning externalities in the case of agricultural technologies. They evaluated the introduction and implementation of BT (Bacillus Thuringiensis) cotton in Pakistan and concluded that information asymmetries and linkages hamper farmers' ability to make use of new technology and get the maximum benefit out of it. Here, again, it is important to mention that networking between employees and employers directly influences technology diffusion. One explanation for limited technology adoption is that the initial implementation of a new

technology leads to an increase in the working hours of the employees, however, if the employer does not compensate them sufficiently for this increase, the former are more likely to misinform the latter about the value of the technology (Atkin, Chaudhry, Chaudry, Khandelwal, & Verhoogen, 2015). If the information network is inefficient, the two parties (e.g. employer and employees) will be unable to negotiate a mutually beneficial sharing of gains, the adoption of technology will be slow or hampered and hence the process of innovation will be sluggish. However, much of the empirical literature on the role of networks in information diffusions fails to address the reason for why this diffusion may be slow.

While traditional economic theory ascertains that individuals seek to maximize their individual utility, evidence from behavioral economics suggests that people are willing to share generously even when contributions are unknown (DeScioli & Krishna, 2013). That is, regardless of any social group they perceive they belong to; or any future reward or punishment they expect driving their current behavior, individuals have been shown to be generous to others. In other words, behavioral economics suggests that individuals may obtain utility from pure altruism. Having said that, a study conducted at Tilburg University and the University of Amsterdam with first year undergrad students of economics, indicates that individuals are likely to be generous towards those they know. If their behavior can be reciprocated, strategy crowds out generosity (Charness & Gneezy, 2008). However, this study attempts to further shed light on whether these altruistic tendencies differ when individuals are interacting with social peers.

Homophily and in-group bias are two emerging phenomena in sociology and are thought to be major determinants of social interactions. Homophily refers to the idea that people prefer to interact with others who they consider to be similar(Currarini & Mengel, 2016). Recent research suggests that since societies are typically demographically stratified (e.g. age, race, gender, caste,

religion, etc.), individual preferences or biased interaction arrangements based on homophily deter the transmission of information. In other words, homophily poses a threat to the diffusion of information (Jackson & Lopez-Pintado, 2011). This in turn has the potential to impact the working of the marriage markets, labor markets (Calvo-Armengol & Jackson, 2004) and also on the economy as a whole (Granovetter, 2005). Research suggests that social networks are preferred over religion-based networks (Bandiera & Rasul, 2006).

Like homophily, in-group bias is also a significant social phenomenon with respect to social networking and interactions. In-group bias refers to the "systematic tendency to evaluate one's own membership group (the in-group) or its members more favorably than a non-membership group (the out-group) or its members" (Hewstone, Rubin, & Willis, 2002). It is a widely-accepted belief that in-group bias is majorly because of social discrimination. People have fragmented the society based on their religion, caste, etc. However, a recent study was conducted which divided the participants into two groups and tried to evaluate the role of homophily and in-group bias in social interactions. The results of the study suggest that if the participants are allowed to choose their matches, the degree of segregation increases because of homophily and simultaneously social discrimination decreases due to self-selection into groups (Currarini & Mengel, 2016). Therefore, self-selection is not always bad. This is because the level of in-group discrimination can be reduced i.e. people will self-select into a group and hence be less likely to discriminate against group members. Since similar individuals will form a group, shared values and beliefs will mean reduced intra-group conflicts and hence better group performance. This is especially relevant in labor markets when forming working groups and teams. Another important finding in this regard is that expectations regarding the behavior of in-group members compared to out-group members significantly impact the in-group bias. Individuals use group outcomes to

frame their decisions. Ioannou and Rustichini (2011) have described group outcomes as a "device that harmonizes the expectations of in-group members". Therefore, even when there is information asymmetry, the decisions and outcomes are relatively more certain and in favour of the in-group members.

Talking about the connection between homophily and in-group bias, recent literature suggests that both are closely knitted; respondents that are found to be homophilous are also likely to exhibit in-group bias (Currarini & Mengel, 2016).

In recent literature, studies have also tried to identify if biased social interactions depend on preferences, opportunities and strategic behavior. *Social preferences* refer to the idea that individuals are generally self-interested however; they are concerned about the social consequences of their actions [1](Charness & Rabin, 2002) and may act differently than predicted by traditional economic theory. For instance, people may be more likely to interact with those living close by or simply having common tastes. This implies these individuals will have greater *opportunities* to interact and form a social network and the formation of a social network will provide utility to the individual. *Strategic behavior* means that individuals have a carefully thought out process of social interaction whereby they network with those from whom they expect a favorable treatment or future payoff(Currarini & Mengel, 2016). Their expected utility is in the form of expected returns from this favorable treatment in an economic context.

Chen and Li (2009) conducted a laboratory experiment and concluded that participants are more likely to choose social welfare maximizing actions and therefore, in-group matching gives higher payoffs. In other words, participants are more likely to compensate an in-group member

[1] This research negates prior studies and highlights the idea that individuals are more concerned about social welfare rather than minimizing the difference between their payoffs. Individuals are ready to sacrifice their payoffs if it benefits the entire society especially those with lower payoffs.

for good behavior and less likely to penalize him for bad behavior. Field experiments do not allow discriminating between actions based on preferences, exploitation of opportunities and strategic behavior. Controlled lab experiments are a better option when it comes to individually identifying the role these three play in social interactions.

Individual efforts to build links lead to distinctive networks. The underlying forces of link formation directly affect the nature of social coordination; low link formation costs encourage individuals to coordinate on risk-dominant actions while high costs lead them to coordinate on efficient outcomes (Goyal & Vega-Redondo, 2005). Riedl and Ule (2002)suggest that in real life situations like prisoner's dilemma, the nature of the network structure (endogenous or exogenous) shapes up social coordination; letting participants freely choose their social links leads to higher levels of cooperation. Participants exclude those who defect and form links with the cooperators in which case the level of coordination is higher. Whether participants will choose risk-dominant or efficient equilibrium outcomes depends on the nature of the network itself; an endogenous network structure sometimes gives outcomes that are neither risk-dominant nor an efficient equilibrium action (Jackson & Watts, 2002).

3. Contribution to literature

Observational research on networks and social interactions often points to homophily and in-group bias. Through this research, I plan to study the relationship between these two ideas; whether any of the two is preference driven i.e. individuals prefer to interact with similar individuals, or if the behavior is strategic i.e. they anticipate this will lead to them being treated favorably in the future. In this study, the definition of social interaction varies for each of the three experiments. In the altruism experiment, social interaction is sharing of money between

partners when the partner cannot reciprocate. The sharing allocation here will be preference driven since the individual expects nothing in (economic) return. In the ultimatum experiment, social interaction is still in terms of sharing of money but I measure if the sharing allocation is strategic or driven by preference to acting favorably towards in-group members. Finally, prisoner's dilemma looks at social interaction in the form of simultaneous cooperation that can maximize collective return.

Field studies are unable to distinguish between preferences and strategies. In Pakistan, mostly research on networks has been conducted via surveys where the unit of analysis is either a firm or an industry. Studying individual behavior and social interactions by way of controlled laboratory experiments will be an addition to literature. By giving some of the participants' additional information, this study plans to compare the outcomes when participants have full information and partial information.

Moreover, the application of coordination experiment in this regard is a new concept especially in the case of Pakistan. When a comparison is drawn between the student and the non-student population in other contexts, literature suggests that students share less and exhibit less trust (Ashraf, Bohnet, & Piankov, 2006). In line with this literature, findings from Pakistan suggest that students may exhibit few altruistic tendencies. Chaudhry and Saleem (2011) conducted lab experiments with Pakistani students in an online classroom to measure trust. Results showed that students were willing to share little under one-third of their endowments, even when they knew partners could reciprocate. While this study has been conducted with a sample of university students, the design is fully replicable in different contexts in the labor markets; when measuring school choice; or when exploring diffusion networks and the forces that shape social networks.

4. Experimental Design

A controlled lab experiment was conducted at a computer lab at a private university in Lahore, Pakistan between May and August 2016 with students belonging to multiple majors and years. In a total of 10 sessions, 204 participants participated, with an average of 20 participants per session. In the start of the session, a short survey was carried out which had questions about basic demographics and risk preferences (Appendix C). In each session, three experiments were conducted to study altruism, preference for fairness and coordination. The order in which the following three experiments were conducted in any session was randomized. The author and two assistants conducted the session. Appendix D provides the protocol followed in each experiment session.

The participants were informed at the start of every session that they would be able to receive their respective monetary earnings from a randomly selected round of a randomly selected game. This meant that the participants had no way of knowing or predicting which of their decisions would actually earn them that amount of hard cash and so were advised to pay equal attention to each decision. The winnings for each round were instantaneously calculated by an assistant using a programmed excel file. Individuals were given their session earnings at the end of the session

The subjects are divided into three treatment groups; Computer, Section, Gender and Section.

Treatment 1 - Computer (T1): These participants were told in the beginning of the session that they are matched with the computer and that the software in the computer uses a database of responses given by people in the past to decide on what response it should give you in the current round. In the study, this group was treated as the control group. It represents the ‘out-group’ i.e.

the participant should not feel any affinity towards a stranger belonging to another group. I expect students to not have any altruistic or reciprocal feelings towards the computer.

T2 - Section: Participants in this treatment group were told that they have been matched with someone from their section. Within the context of the sample, individuals had been in the same section for at least a year, and in some cases, for multiple years. This group is the 'in-group' and is the group with partial information regarding their partner.

T3 - Gender and Section: These participants were informed in the start of the session that they have been matched with someone from their section and were informed of the gender of this person. This group also represents the 'in-group' but allows us to test for variation in response towards the in-group partner due to the gender of the partner. Within the context of this text, I refer to this group also as the full information group (relative to T2).

i. Altruism Experiment

The base model for altruism and preference for fairness (Ultimatum game) is taken from Charness & Rabin's (2002) study[2]. Participants were provided an initial endowment of Rs. 500 and were asked to divide this initial endowment between themselves and their partner from given six options (See Table 1). In each case, the partner had no option but to accept the shares allocated. Therefore, the motivation for sharing a positive amount with the partner is meant to be purely altruistic. I test if the utility from altruistic behavior is higher towards a member of the in-group. I measure if the average share allocated to an in-group member is statistically higher than allocated to an out-group member. Therefore, the dependent variable in this context is the share

[2] The equation giving the utility of Player B is $U_B(\pi_A, \pi_B) = (\rho \cdot r + \sigma \cdot s + \theta \cdot q) \cdot \pi_A + (1 - \rho \cdot r - \sigma \cdot s - \theta \cdot q) \cdot \pi_B$ where r = 1 if $\pi_B > \pi_A$, and r = 0 otherwise; s = 1 if $\pi_B < \pi_A$, and s = 0 otherwise and q = -1 if A has misbehaved, and q = 0 otherwise. The parameters ρ, θ (distributional preferences) and σ (reciprocity) are measures of social preferences. Player B's utility is a weighted sum of his own and Player A's payoff. The weight that Player B places on Players A's payoffs depends whether A's payoff is greater than his own or if A has misbehaved.

allocated to the partner. One round was played of this game and the outcomes were not revealed to the participants so that their decisions may not be affected by their performance in other experiments.

ii. Ultimatum (preference for fairness) Experiment

In the ultimatum experiment, Player A was provided with an endowment of Rs. 500. Player A made the first move and had to choose a division of the initial endowment based on the same six options. Player B had the option to either accept or reject the offer; accepting the offer led to a division of the endowment as per Player A's offer and if it was rejected both players earned zero. One round was played of this game and the outcomes were not revealed to the participants so that their decisions may not be affected by their performance in the previous game. The outcomes of this game will show evidence for/against strategic behavior i.e. if participants know their move will be rewarded/punished by their interaction partner, how will they behave?

	First Mover (A)	Second Mover (B)	Social Preferences
Altruism	(0, 500) or (100, 400) or (200, 300) or (300, 200), (400, 100) or (500, 0)	(0, 500) or (100, 400) or (200, 300) or (300, 200), (400, 100) or (500, 0)	Altruism
Ultimatum	0 or 100 or 200 or 300 or 400 or 500	Accept or Reject the offer	Preference for Fairness

Table 1 Options for the 2 activities. Payoffs are in the format (π_A, π_B) where (π_A) is the payoff of player A.

iii. Prisoner's Dilemma Experiment

I followed the basic bimatrix game used by Kreps et. al (1982)[3] as shown in the table below:

		Player A	
		Defect	Cooperate
Player B	Defect	0, 0	2, -1
	Cooperate	-1, 2	1, 1

Table 2: A hypothetical payoff

Player A and Player B will move simultaneously, if both cooperate they will have higher payoffs. If however, Player A defects but Player B coordinates, Player A will have a higher payoff. The main idea of the game is that since Player A is not sure if Player B will coordinate, it is rational for Player A to defect. Similarly, since Player B is not sure if Player A will coordinate, so Player B will defect too. Hence, both the players will have lower payoffs and this equilibrium represents the classic coordination failure problem.

I adapted this classic experiment to local context using familiar terminology and economic stakes (Table 3). Three rounds of this game were played and the outcomes were revealed to the partners before the start of the next round. The main aim was to see whether participants converge in the direction of the Nash equilibrium towards the end of the period. Moreover, I expect rational individuals to take into account how others react to their decision therefore, dummies for rounds were added to account for average decision in each round. This will be highlighted in more detail later. By providing information on past decisions of the partner, I expect to see if it is in-group bias or homophily that drives individual decisions or strategic

[3] It is a simultaneous move game with two players, A and B. There is a unique Nash equilibrium path; each player chooses to fink (defect) at every stage of the game.

considerations i.e. based on the past interaction with the partner (who may be part of the in-group).

		Player B	
		Cooperate	Defect
Player A	Cooperate	300, 300	0, 300
	Defect	300, 0	250, 250

Table 3: Payoff matrix for Prisoner's Dilemma. Payoffs are in the format (πA, πB) where (πA) is the payoff of player A.

5. Empirical Strategy

For the sake of analysis, the results of the experiment have been analyzed through the Probit model. The simple regression equation for the study is as follows:

$$Y = \alpha_0 + \alpha_1 T_2 + \alpha_2 T_3 + \upsilon \qquad (1)$$

Where;

T_2 = Partial information

T_3 = Full information

Y = proportion shared in altruism experiment; whether individual accepts partner's offer in the ultimatum experiment/whether individuals cooperate in the prisoners dilemma experiment.

In the given equation, there are two independent variables, partial information and full information that are primarily measuring the role of in-group bias. Participants in T_2 knew that their interaction partner was an in-group member and those in T_3 knew this along with the gender of their partner. The dependent variable can take up three values; the outcomes of altruism, fairness and coordination experiments, as explained below. I control for basic demographics (age, family income bracket, gender) and study major. It is possible that participant decision may be

influenced by their preference to take risks and so I also measure risk aversion through unincentivised survey questions, and control for it in the regression analysis. However, all results discussed in the next section, are robust to the inclusion of this variable. All regressions are run with errors clustered at the individual level.

i. Research Hypothesis

I expect individuals to act altruistically and fairly towards the two 'in-groups'. Similarly, I expect coordination in the in-group to be better than the out-group. This study aims to test the following hypotheses:

$$H1_0: \ \alpha_1 = \alpha_2 = 0$$

$$H1_A: \alpha_1 \text{ and } \alpha_2 > 0$$

If α_1 and $\alpha_2 > 0$, then full information has a positive impact on altruism, fairness and coordination.

$$H2_0: \alpha_1 = \alpha_2$$

$$H2_A: \alpha_1 > \alpha_2$$

If $\alpha_2 > \alpha_1$ it suggests that full information effect is larger than the partial information effect for homophily and in-group bias. However, I also test if the full information effect differs if the gender of the participant and his/her partner is the same.

6. Results

i. Sample Demographics

A short survey was carried out at the start of the experiment where participants were asked to fill out a questionnaire. The questionnaire was designed to collect basic demographic information and ensure (unincentivised) level of risk aversion (See Appendix C). The average participant was male and 20 years of age. The median income of the participant's household was Rs. 100,000 – Rs. 250,000 and they are risk-loving on average. Detailed descriptive statistics of this data can be found in Appendix A. Students were invited to participate on the basis of their availability during the experiment time slot. All students thus invited ended up participating and participants did not self-select into the experiment sessions.

ii. Homophily and in-group bias

I begin by evaluating the presence of homophily in our experiment. Figure 1 shows that individuals give amount significantly different from 0 in altruism. However, these amounts are not significantly different over treatment groups. On average, individuals are less generous with in-group partners than out-group partners.[4] This proved to be especially true when participants knew that their behavior is not going to be reciprocated as was the case in the altruism experiment. Although the bars show an increasing trend, t test shows that the treatments are not significantly different from each other.

[4]It is possible that 'altruistic' feelings are transferred from the computer to the researcher. However, even so it is worth noting if they are more or less generous towards the researcher, whom they have not interacted with in the past, than their own class fellows.

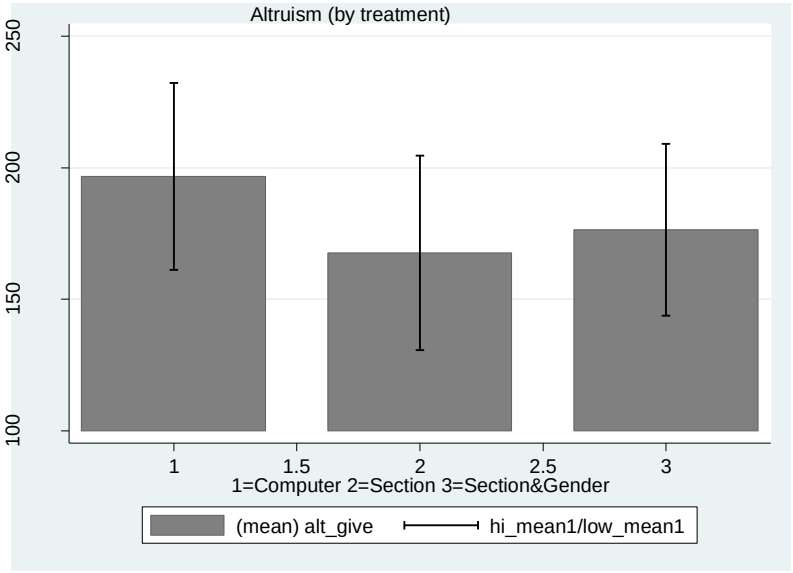

Figure 1: Level of Altruism

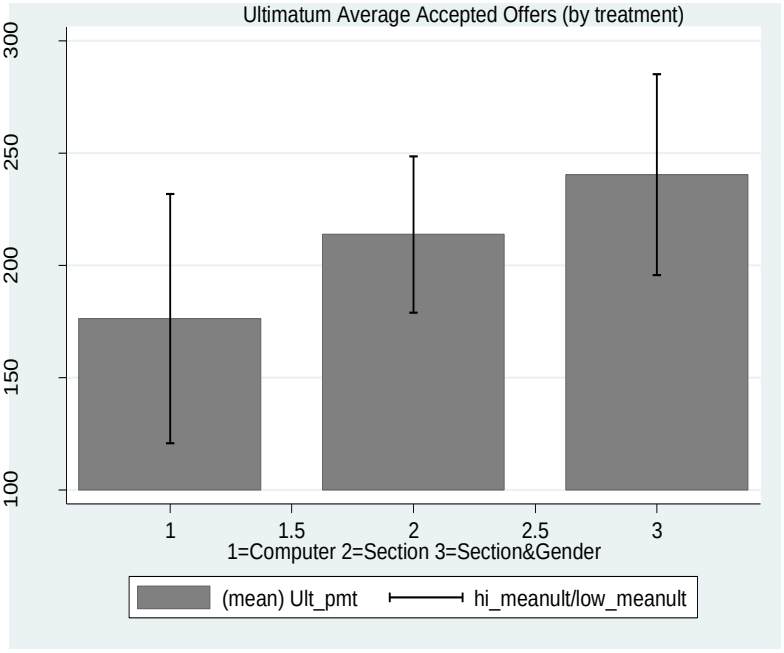

Figure 2: Ultimatum Average Accepted Offers

Table 4 confirms the result from the first game using regression analysis. Since the amounts can vary between 0 – 500 and are in multiples of 100, we use a ordered probit model for this analysis. One of the reasons could be that students are coming from a competitive setting

and are more concerned about their own progress. Hence, they are not any more generous towards someone they have had several prior interactions with and probably developed certain rapport, than they are towards someone they do not know. But the regression results discussed in the next section show evidence in favor of strategic and reciprocal behavior.

y = amount the participant is willing to share		
Variables	Coefficients	Standard Errors
Knows the partner is a class member	-0.234	0.171
Knows the gender of the partner & that s/he is a class member	-0.138	0.118
Female	-0.077	0.182
Age	-0.092	0.083
Income	0.001	0.114
Risk Aversion	0.045	0.026

Table 4: Ordered probit regression with standard errors clustered at the session, 204 observations. ***1%, **5%, *10% significance.

iii. Preference for Fairness

Next I measure the preference for fairness through the ultimatum experiment where the participants had the option to either accept or reject the offer made to them by their interaction partner. Decisions made where the agent had the option to either punish or reward their interaction partner – ultimatum game offer by Player A, show results opposite from altruism – homophily leads to greater amount provided to Player B (See Figure 2). Table 5 shows the ordered probit regression only for Player B where the dependent variable is the amount the player B has received from player A. Player A is likely to offer more to classmates when they know that Player B can reject the offer and punish them for a low offer. This is an interesting result – it suggests that students are behaving strategically, taking future decisions by the in-group partner into account, and not out of pure generosity because their partner is a member of her/his group. Knowing the gender of in-group partner does not change the amount given.

Moreover, the results do not change when the participant knows her/his partner is of the same gender (Table B1, Appendix B).

y = amount Player B has received from Player A		
Variables	**Coefficients**	**Standard Errors**
Knows the partner is a class member	0.329**	0.163
Knows the gender of the partner & that s/he is a class member	0.443	0.379
Female	0.023	0.144
Age	0.023	0.074
Income	-0.198	0.170
Risk Aversion	0.031	0.046

Table 5: Ordered probit regression with standard errors clustered at the session level, 102 individuals in the role of Player B. ***1%, **5%, *10% significance.

In order to further validate the idea that a higher offer is likely to be accepted and that interactions are strategic, I run a regression where the dependent variable is a dummy variable which holds a value of 1 if Player B accepts Player A's offer and 0 otherwise. I also include an additional independent variable, 'offer' which is also a binary variable and is equal to 1 if the amount offered to Player B is greater than the median offer value, i.e. Rs. 200. This variable tests if a higher offer is likely to be accepted more than a lower offer, as expected in theory. When it comes to giving when reciprocity is present, i.e. the partner can respond to an unfair offer as opposed to accepting whatever is offered in the altruism game, participants behave strategically – they are more likely to accept a high offer. The participants are not really concerned with who they are playing against, that is if the partner is a class member or a male/female; rather they are ultimately concerned with what offer has been made to them by their partner (See Table 6). Higher offers are more likely to be accepted..

y = 1 if Player B accepts the offer; y = 0 if Player B rejects the offer.		
Variables	**Coefficients**	**Standard Errors**
Knows the partner is a class member	0.025	0.072
Knows the gender of the partner & that s/he is a class member	0.035	0.077
Offer	0.0361***	0.090
Female	0.058	0.066
Age	-0.084	0.014
Income	0.012	0.020

Table 6: Probit Regression with standard errors clustered at the individual level, 102 individuals in the role of Player B. ***1%, **5%, *10% significance.

iv. Coordination and cooperation

I now look at the presence of coordination in individuals and whether I see presence of in-group bias or behavior that is more strategic in nature i.e. rewards or punishes past behavior. Figure 3 illustrates the results of all the three rounds of prisoner's dilemma. The y-axis reports the proportion that cooperated. On average, we find that participants are more likely to cooperate with their class mates than the computer but more likely to defect in the last round. However, none of these differences are significant in the graphs shown. .

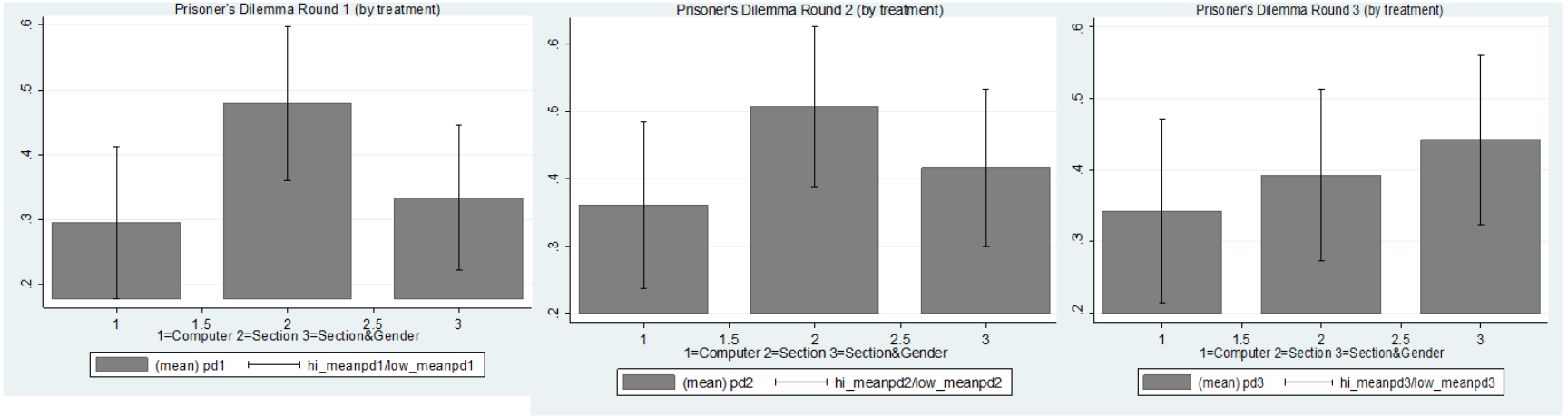

Figure 3: Prisoner's Dilemma Responses

I also test this result using regression analysis. I exploit the panel nature of our data and combine behavior in all three rounds in a random effects regression (See Table 7). The results suggest that being matched with the classmate is likely to increase the probability of defect, that is, in-group bias serves to decrease cooperation. However, when each round is analyzed in isolation, we see some interesting results.

y = 1 if player cooperates; y = 0 if player defects.		
Variables	**Coefficients**	**Standard Errors**
Knows the partner is a class member	-0.147**	0.062
Knows the gender of the partner & that s/he is a class member	-0.071	0.061
Female	0.117**	0.052
Age	0.027**	0.014
Income	-0.018	0.0344
Risk Aversion	-0.001	0.011
Constant	0.079	0.305

Table 7: Random Effects Regression with standard errors clustered by id, 612 observations for 204 individuals over 3 rounds. ***1%, **5%, *10% significance.

I next look at the decisions in each round (See Table 8). In round 2, I also include a variable to measure the effect of knowing what your partner did in the last round. Partner's decision in round 1 holds a value of 1 if the partner cooperated in the first round and 0 otherwise. I find that individuals are responsive to their partner's decision in the previous rounds – cooperation by the partner in the last round encourages participants to cooperate in the next round; vice versa, defect encourages defect. Hence, the results suggest a strong evidence in favor of reciprocating past partner behaviour – the coefficients are large and strongly significant. In fact, I see that individuals do not care about who they are paired with but are very strongly concerned with how their partner behaved in the last round. I see the same result when looking at round 3 results in isolation, controlling for partner behavior in round 2. The last column of Table

8 reports results when I include both the variables i.e. partner's decision in Round 1 and Round 2 for Round 3 decisions. It appears that participants have a short term memory. The action taken in the round preceeding the last is inconsequential and it is only the interaction partner's decision in Round 2 that seems to matter for decisions in the current round. The results reiterate that the individual's decision in round 3 is significantly impacted by their partner's decision in round 2. This implies that it is possible for such a sample to forgive past mistakes (and forget past good behavior); that pareto optimal is dependent on the immediate past and hence can be obtained quickly without relying on a long history of interactions. However, of note in these results is that homphily does not matter in obtain pareto optimality – individuals cooperate if their partners have cooperated in the past. Past behavior is a signal of good behavior by the partner and is rewarded with cooperation and higher shared returns.

y = 1 if the player cooperates; y = 0 if the player defects.						
Variables	**Coefficients**	**Standard Errors**	**Coefficients**	**Standard Errors**	**Coefficients**	**Standard Errors**
	Round 2		**Round 3**		**Round 3**	
Knows the partner is a class member	-0.142	0.126	-0.028	0.75	-0.025	0.073
Knows the gender of the partner & that s/he is a class member	-0.047	0.131	-0.065	0.086	-0.065	0.083
Female	0.133	0.037	0.066	0.071	0.065	0.071
Age	0.025	0.017	0.0367	0.029	0.034	0.029
Income	-0.019	0.050	-0.019	0.050	-0.018	0.048
Risk Aversion	-0.004	0.013	0.014	0.014	0.015	0.015
Partner's Decision in R1	0.298***	0.074	-	-	0.057	0.063
Partner's Decision in R2	-	-	0.245***	0.100	0.226**	0.099

Table 8: Probit Regression with standard errors clustered by session, 204 observations. ***1%, **5%, *10% significant

7. Conclusion

I have assessed the three important determinants of social interactions: homophily, preference for fairness and coordination based on reciprocal considerations. I conclude that participants do not show more generosity/homophily towards an in-group match than a stranger when they also know their partner cannot influence their personal outcome (game winnings).Contrary to the findings of this study, literature suggests that even when their partner cannot influence their personal outcomes, participants are generous towards people they know. However, if there is chance of the behavior will be reciprocated by being rewarded or punished, participants tend to play safe or make a higher monetary offer as in our case in order to save themselves from punishment of bad behavior. Hence, social interactions are not preference driven rather they are strategic; participants do not obtain pure utility out of interacting with someone of their own social group, anymore than they do out of interacting with a stranger in this setting. Instead it is what behavior their partner is displays that is relevant to them. Lastly I highlight that there is strong evidence in favor of reciprocal behavior because participants are responsive to their partner's decision in prior interactions and reward 'good' behavior with a 'good' response. Of note here is that participants exhibit short term memory – the interaction immediately preceding is relevant for deciding on a current course of action. Actions further in the past are not rewarded or punished. These findings support interactions within in-group lead to the pareto-efficient outcome (cooperate). Moreover, if only the interaction immediately preceding relevant and longer term history does not matter, it seems that the pareto optimal can be obtained fairly quickly.

I must acknowledge two limitations of this thesis. The experiment was initially programmed with the experimental software z-Tree (Urs, 2007). Participants were paid whatever sum of money they earned during the session in Pakistani Rupee. However, after 3 initial sessions conducted with Z-tree, technical issues with the computer connections prevented us from allowing participants to use computers to record their decisions. The remaining sessions were carried out manually. However, the same instructions were provided on a projector screen at the front of the lab; all data entry was done instantaneously by one of the assistants on a laptop (using programmed excel files). Instead of filling out an answer sheet on the computer, the participants now had to write down their answers manually. Participants were seated with a gap so that they could not overhear or see the decisions made by others. All information pertinent to the treatment groups was provided privately. In short, there may be a chance that there are biases or differences to be expected in the nature of decisions made by participants in the manual sessions versus the Z-tree sessions. However, on average, we find no differences when comparing the means of the groups that participated in either format.

Moreover, majority of the participants are first year students - this is an important consideration in the way they responded to the experiments. This implies that the majority of the participants had known each other for only a year; the level of trust they share amongst themselves could have affected the results and may have changed if we had participants with longer associations. Though we do have a small proportion of 3rd year students, this study is underpowered to detect the effect that history of association can have on participant behavior

The findings of the study would assist social economists when studying discrimination and segregation. In research on economic segregation, this research might also help when thinking about how to improve the meeting and mixing of the rich and the poor within a society and

bridge a gap between the two social classes. Results indicate that individuals in such samples and settings are concerned with action, and not which social group a member is a part of. This is an encouraging result and points towards rational decision making that could lead to economic gains.

However, one must take into account the nature of the sample that provides us with results – students with higher education who arguably, come from and operate in, highly competitive environment. To participants in this sample, individuals respond to merit of actions than to the social group. At the same time, it is easy to extend the lessons from this sample to those who are entering the labor force or are functioning in highly competitive environments. For instance, situations that require matching of workers in a team may also become easy to handle by emphasizing the productivity and quality of co-workers than the peer or social group affinity. Efficient pairing of workers would eventually lead to increased productivity that will be beneficial for both, workers and managers.

8. References

Ashraf, N., Bohnet, I., & Piankov, N. (2006, September). Decomposing Trust and Trustworthiness. *Experimental Economics*, pp. 193-208.

Atkin, D., Chaudhry, A., Chaudry, S., Khandelwal, A. K., & Verhoogen, E. (2015). Organizational Barriers to Technology Adoption:Evidence from Soccer-Ball Producers in Pakistan. *NBER Working Paper Series*.

Bala, V., & Goyal, S. (2000). A Noncooperative Model of Network Formation. *Econometrica* , 1181-1229.

Bandiera, O., & Rasul, I. (2006). Social Networks and Technology Adoption in Northern Mozambique. *The Economic Journal*, 869-902.

Calvo-Armengol, A., & Jackson, M. O. (2004). The Effects of Social Networks on Employment and Inequality. *The American Economic Review* .

Charness, G., & Gneezy, U. (2008). What's in a name? Anonymity and social distance in dictator and ultimatum games. *Journal of Economic Behavior & Organization*, 29-35.

Charness, G., & Rabin, M. (2002). Understanding Social Preferences with Simple Tests . *Quarterly Journal of Economics* .

Chen, Y., & Li, S. X. (2009). Group Identity and Social Preferences . *The American Economic Review* , 431-457.

Cox, J. C. (2004). How to Identify Trust and Reciprocity . *Games and Economic Behavior*, 260-281.

Currarini, S., & Mengel, F. (2016). Identity, Homophily and In-Group Bias. *Europeand Economic Review* .

DeScioli, P., & Krishna, S. (2013). Giving to whom? Altruism in different types of relationships. *Journal of Economic Psychology* , 218-228.

Goyal, S., & Vega-Redondo, F. (2005). Network Formation and Social Coordination. *Games and Economic Behavior* , 178-207.

Granovetter, M. (2005). The Impact of Social Structure on Economic Outcomes . *The Journal of Economic Perspectives* , 33-50.

Hewstone, M., Rubin, M., & Willis, H. (2002). Intergroup Bias. *Annual Review of Psychology* , 575-604.

Ioannou, C. A., Qi, S., & Rustichini, A. (2011). Group Outcomes and Reciprocity. *Unpublished Manuscript (https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=res2012&paper_id=61)*.

Iturrioz, C., Aragón, C., & Narvaiza, L. (2015). How to Foster Shared Innovation within SME's networks: Social capital and the Role of Intermediaries. *European Management Journal*, 104-115.

Jackson, M. O., & Lopez-Pintado, D. (2011). Diffusion and Contagion in Networks with Heterogenous Agents and Homophily. *Unpublished manuscript*.

Jackson, M. O., & Watts, A. (2002). On the Formation of Interaction Networks in Social Coordination Games . *Games and Economic Behavior* , 265-291.

Kosfeld, M. (2003). Network Experiments. *Institute for Empirical Research in Economics University of Zurich*.

Kreps, D. M., Milgrom, P., Roberts , J., & Robert , W. (1982). Rational Cooperation in the Finitely Repeated Prisoners' Dilemma . *Journal of Economic Theory 27*, 245-252.

Lin, N. (2001). Social Capital: A Theory of Social Structure and Action. *University of Cambridge Press*.

Ma, X., Spielman, D. J., Nazli, H., Zaidi, F., Zambrano, P., & Kouser, S. (2014). The role of social networks in an imperfect market for agricultural technology products:Evidence on Bt cotton adoption in Pakistan. *Unpublished Manuscript (https://ideas.repec.org/p/ags/aaea14/175276.html)* .

Riedl, A., & Ule, A. (2002). *Exclusion and Cooperation in Social Network Experiments.* University of Amsterdam.

Saleem, M., & Chaudhry, T. T. (2011). Norms of Cooperation, Trust, Altruism, and Fairness: Evidence from Lab Experiments on Pakistani Students . *The Lahore Journal of Economics* , 347-375.

Urs, F. (2007). z-Tree: Zurich Toolbox for Ready-made Economic Experiments. *Experimental Economics 10(2)*, 171-178.

Appendix A: Descriptive Statistics

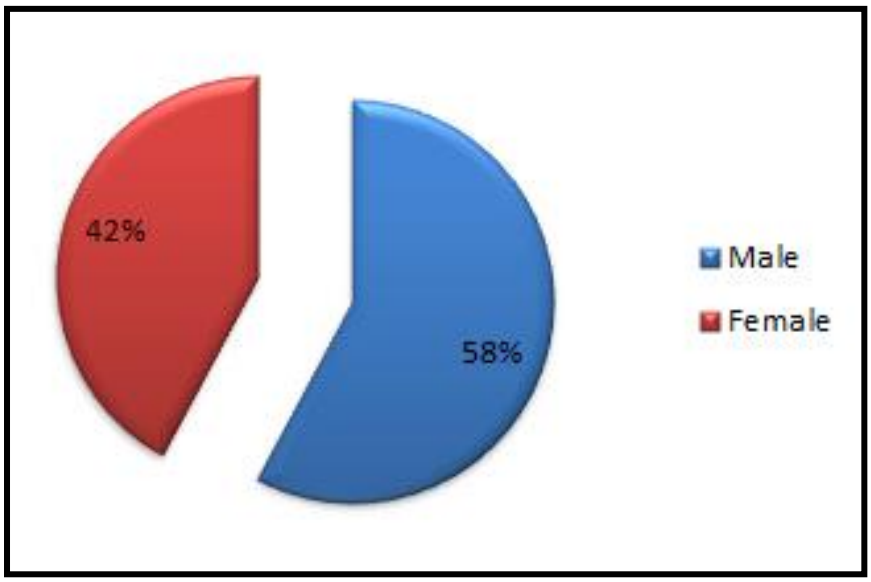

Figure 4: Gender Breakdown

The male participation rate was 16% higher than the female participation rate.

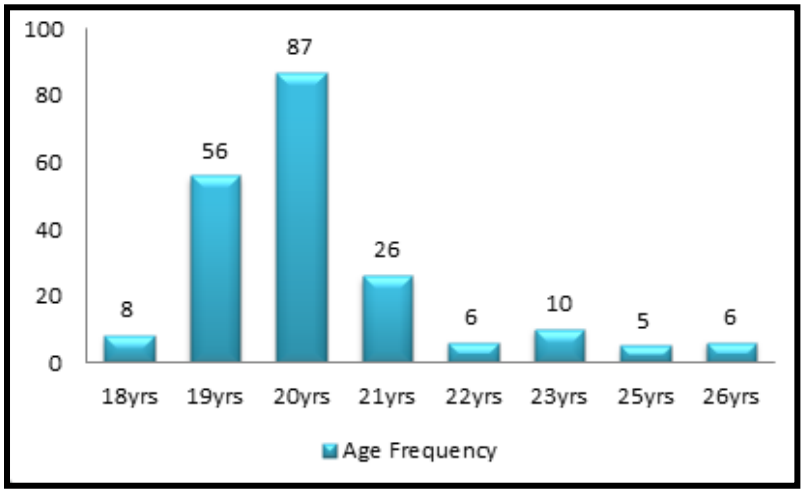

Figure 5: Age Composition

Participation popularly comprised of individuals aged between 19-21 years with 25 years being the least recurring age.

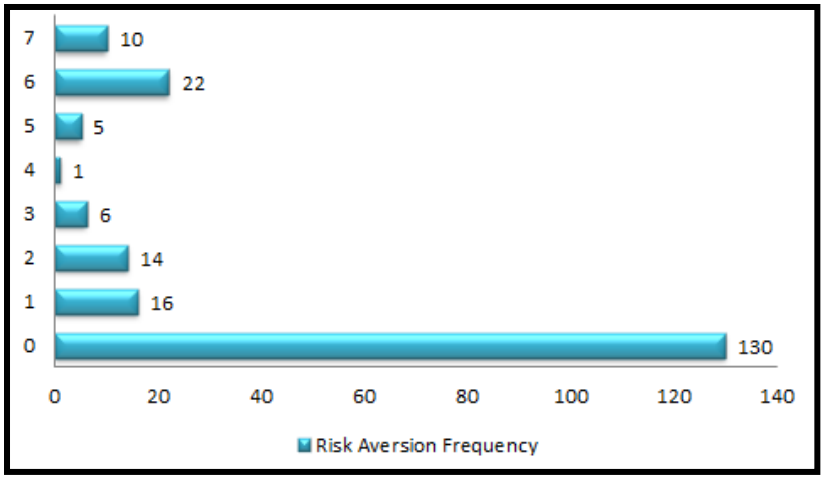

Figure 6: Level of Risk Aversion (0 being least risk averse)

Most of the participants were surveyed as least risk averse.

Variable	Mean
Risk Aversion	1.4

Table 9: Average Value of Risk Aversion

The mean of risk aversion is 1.4 which further signifies that on average the participants were risk lovers.

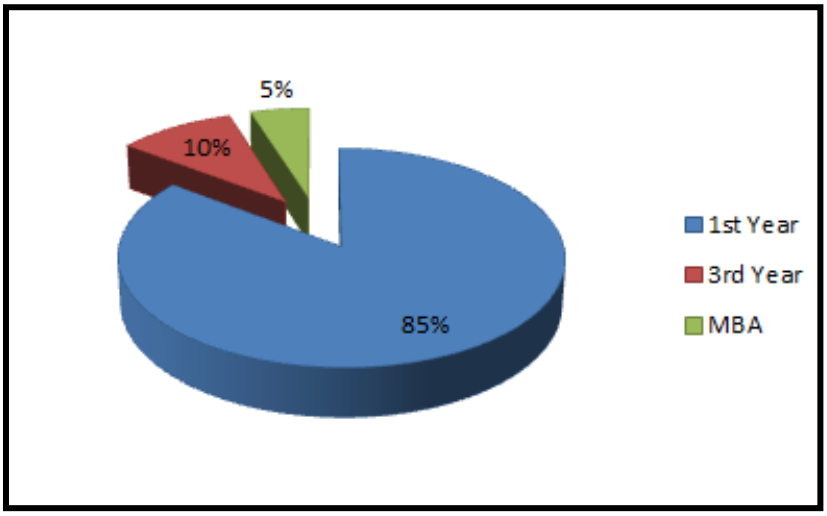

Figure 7: Year of Study

85% of the participants were 1st year students followed by 10% being 3rd year and 5% being MBA students.

Appendix B: Additional Regression Results

y = amount the participant is willing to share		
Variables	**Coefficients**	**Standard Errors**
Knows the partner is a class member	-0.116	0.073
Partner is of the same gender	-0.070	0.065
Female	-0.060	0.083
Age	-0.0149***	0.053
Income	0.002	0.037
Risk Aversion	0.027	0.017

TableB1: Probit Regression with standard errors clustered at the session level, 204 observations. ***1%, **5%, *10% significance.

Appendix C: Pre-experiment Questionnaire

Kindly answer the following questions purely for research purposes.

1. What is your gender?
    a. Male
    b. Female

2. What is your age? _____

3. What is your monthly household income?
    a. Rs. 50, 000 – Rs. 100, 000
    b. Rs. 100, 000 – Rs. 250, 000
    c. Rs. 250, 000 and above

4. What is your field of study?
    a. Business Administration
    b. Social Sciences

5. What is your class year and section? _____

Now suppose I invite you to participate in a game with me. This is hypothetical; I are not actually going to play this game.

In one of my hands behind my back, I have Rs. 500. In the other hand, I have nothing. I am not going to tell you in which hand I hold Rs. 500. If you choose the correct hand, you will receive Rs. 500; otherwise, you will receive nothing.

1) Would you prefer to play this game with me, or to receive no money?
    a. Play the game.
    b. Receive no money.
2) Would you prefer to play this game with me, or to receive Rs. 100 now?
    a. Play the game.
    b. Receive Rs. 100 now.
3) Would you prefer to play this game with me, or to receive Rs. 150 now?
    a. Play the game.
    b. Receive Rs. 150 now.
4) Would you prefer to play this game with me, or to receive Rs. 200 now?
    a. Play the game.
    b. Receive Rs. 200 now.
5) Would you prefer to play this game with me, or to receive Rs. 250 now?
    a. Play the game.
    b. Receive Rs. 250 now.

6) Would you prefer to play this game with me, or to receive Rs. 300 now?
    a. Play the game.
    b. Receive Rs. 300 now.
7) Would you prefer to play this game with me, or to receive Rs. 400 now?
    a. Play the game.
    b. Receive Rs. 400 now.
8) Would you prefer to play this game with me, or to receive Rs. 500 now?
    a. Play the game.
    b. Receive Rs. 500 now.

Appendix D: Experiment Protocol

Welcome and thanks for being a part of this experiment. Your participation in this experiment is purely for the purpose of research, your identity, decisions and earnings will not be disclosed. The session will take approximately an hour between playing the game and us to pay you. If you have any reservations and would like to not participate, you are free to leave. If you leave in the middle of the session however, I will not be able to pay you.

Before each game, I will read short instructions to help explain the game. Some instructions will also appear on your screen. There will also be other information given to you at the start of the session. This information will be confidential and I ask you to not announce it to other players in the room. This information is for your specific game only.

From here onwards, communication with other participants is not allowed. Kindly, switch off your mobile phones for now.

General

For your time and participation you will receive participation fee of Rs 200. You should know this is not my money, this is money given to me by the Lahore School of Economics for research purposes. You will have the opportunity to earn more during the experiment. The amount you earn depends on the choices you make while you play. You will also be assigned a partner for these activities. So, how much you earn also depends on your interaction partner's behavior. However, regardless of how you play, you will still receive the payment for participation.

I only need 24 individuals to participate in these activities. Thus, unfortunately, not all of you will be able to participate. I will have a lottery to determine who will participate. To complete the lottery, I will take a coupon which has your number tag on it, fold the coupon in half and place it in a bag. I will then ask one of you to draw 2 pieces of paper from this bag containing your coupons. Those whose names will be drawn will receive the participation fee and asked to leave while others will stay here and participate in the activities.
[Enumerator: make participation fee payments to individuals who are not selected in the lottery, thank them for their time and ask them to leave the lab]

At the beginning of the experiment there will be a short survey that will have questions regarding basic demographics and risk aversion.

Some of you may have been provided some additional information. Do not disclose this information to anyone; this is for your specific game only. Please participate in the activities keeping this information in mind.

Introduction to activities

I will play 3 activities. The total time for the session today is expected to be 1 hour. All activities will give you a chance to earn actual money. However, please note, ***I will not be paying you for every activity but for a randomly selected round in a randomly selected activity.***

I will explain each activity and let you practice before I start playing. The practice rounds will help you understand the activity and clarify all your queries. Please pay close attention to the instructions. If anything is unclear, please raise your hand and I will be obliged to help you out during the practice rounds. I will explain each activity to you and my assistants can help you with any questions you have. Instructions for each activity will also be visible on this screen [*point towards the projector screen*].

In each activity, you will be paired with a partner. This partner will be selected by our software. Neither you, nor I, will know who your selected partner is.

Is this clear to everyone? Does anyone have any questions on what I will be doing today?

Participation Consent

If you wish to participate, please remain seated. If you do not wish to participate, please raise your hand, you will be free to leave then; you will not be able to stay in the lab if you do not wish to participate. **Anyone who does not wish to participate?**
[Enumerator: make participation fee payments to individuals who do not wish to participate, thank them for their time and ask them to leave the lab]

Please also be advised, there are no right or wrong choices, so you should choose whatever you think is best for yourself and not look at your neighbor's choices.

We are about to begin!

I will read through a script to explain all the activities that I will perform here today. As you may know, these activities are conducted on other days beside this, so it is very important that people every day receive ***exactly the same information***, and this is the reason why I must read from this script.

Important Instructions

I will now say something very important. **You cannot ask questions out loud or talk about the activities with anyone else while I are here together.If you need to ask a question at any time, please raise your hand and one of the team members will come to you so he/she can answer your question privately.Both your decisions and your payment will be private and**

confidential. Nobody, apart from a member of our team will know what you earned, and he/she will not tell anyone.

Note: Remember to add random order of activities, rounds and to explain to participants that I will not be paying you for every activity but for a randomly selected round in a randomly selected activity.

Altruism game

Now I will explain the first activity. Instructions for this activity will also be visible on the screen in front of you.

This activity will again be played between randomly selected partners, Player A and Player B. I provide Rs 500 to the pair. The purpose of the activity is to decide on an allocation of money between you and your partner. You may keep more for yourself and give less to your partner.

I will play 1 practice round and 1 actual round of this. In each of the rounds, each of you will be randomly assigned to be player A or as Player B by our software; in this particular game Player A does not make any decision. Your partner in each round will be the same. Your turn as Player A or B will also be randomly decided by the software. I will shortly inform you if you are Partner A or B.

So, Player B has to decide how to divide Rs. 500 between him/her and his/her partner. Player B can choose between 6 options: He can either give Rs.0 to his partner and keep Rs.500 for himself or give Rs.100 to his partner and keep Rs. 400 for himself or give Rs. 200 to his partner and keep Rs. 300 for himself or give Rs. 400 to his partner and keep Rs. 100 for himself or give Rs. 500 to his partner and keep Rs. 0 for himself. Player A will have no choice but to keep the amount allocated to him/her.

1. Does anyone have any questions?
2. Let's play a practice round to make sure everyone understands the activity. This round is to increase your understanding of the activity. It will not affect your earnings.
3. Once you make your decision, please wait for us to collect your decision sheets.
4. Does anyone have any questions?
5. (After answering all questions) Please press OK.

Okay, let's play the activity. I will play 1 round of this activity. The outcomes will not be revealed.

Please start!

Ultimatum game

Now I will explain the next activity. Instructions for this activity will also be visible on the screen in front of you.

This activity will again be played between randomly selected partners, Player A and Player B. I provide Rs 500 to the pair. The purpose of the activity is to decide on an allocation of money between you and your partner. The allocation depends on your attitude towards your partner.

I will play 1 practice round and 1 actual round of this activity. In each of the rounds, each of you will be randomly assigned to be player A or as Player B by our software; in this particular activity Player A makes an offer to Player B and Player B has the option to either ACCEPT or REJECT this offer. ***Remember, should your partner refuse your offer, both of you will receive nothing. Should he accept, then the Rs. 500 will be divided according to your offer.*** Your partner in each round will be the same. Your turn as Player A or B will also be randomly decided by the software. I will shortly inform you if you are Partner A or B. I

So, Player A has to decide how to divide Rs. 500 between him/her and his/her partner. Player B can choose between 6 options: He can either give Rs.0 to his partner and keep Rs.500 for himself or give Rs.100 to his partner and keep Rs. 400 for himself or give Rs. 200 to his partner and keep Rs. 300 for himself or give Rs. 400 to his partner and keep Rs. 100 for himself or give Rs. 500 to his partner and keep Rs. 0 for himself. Player B can either ACCEPT or REJECT this offer. Again, ***should your partner refuse your offer, both of you will receive nothing. Should he accept, then the Rs. 500 will be divided according to your offer.***

1. Does anyone have any questions?
2. Let's play a practice round to make sure everyone understands the activity. This round is to increase your understanding of the activity. It will not affect your earnings.
3. Once you make your decision, please wait for us to collect your decision sheets.
4. Does anyone have any questions?
5. (After answering all questions) Please press OK.

Okay, let's play the activity. I will play 1 round of this activity. The outcomes will not be revealed.

Coordination game

Now I will explain the last activity. This activity is also played between two players. Each of you will be randomly assigned a partner by our software. The identity of the partner will not be revealed to either you or me.

The purpose of this activity is to decide on an allocation of money between you and your partner. The allocation as Ill as the total amount won in this activity depends on both you and your partner's decisions.

Each of you will be making decisions at the same time so to maximize your own payoff you will have to guess what your partner is going to decide. I will play 1 practice round of this activity followed by 3 actual rounds.

If you look at your screen, you will see that left side of the screen displays YOUR payoff and the right side displays your PARTNER'S payoff. Please note, your payoffs will remain the same throughout the 3 rounds of this activity. In the center, there are two options you can choose from; Cooperate or Defect.

If you cooperate, you will either earn Rs. 300 or Rs. 0, depending on your partner's decision. If however, you defect, you will either earn Rs. 250 or Rs. 500, depending on your partner's decision.

1. Does anyone have any questions?
2. Let's play a practice round to make sure everyone understands the activity. This round is to increase your understanding of the activity, it will not affect your earnings.
3. Once you make your decision, please wait for us to collect your decisions sheers.
4. If your partner is still making the decision, you will be asked to wait. Once your partner has made their decision, I will inform you privately what that decision was and you can continue to the next round.
5. Does anyone have any questions?

Okay, let's play the activity. I will play 3 rounds of this activity. The final outcome will not be revealed.

Please start!