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

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Preface

The Centre for Research in Economics and Business (CREB) was established in 2007 to conduct policy-oriented research with a rigorous academic perspective on key development issues facing Pakistan. In addition, CREB (i) facilitates and coordinates research by faculty at the Lahore School of Economics, (ii) hosts visiting international scholars undertaking research on Pakistan, and (iii) administers the Lahore School's postgraduate program leading to the MPhil and PhD degrees.

An important goal of CREB is to promote public debate on policy issues through conferences, seminars, and publications. In this connection, CREB organizes the Lahore School's Annual Conference on the Management of the Pakistan Economy, the proceedings of which are published in a special issue of the Lahore Journal of Economics.

The CREB Working Paper Series was initiated in 2008 to bring to a wider audience the research being carried out at the Centre. It is hoped that these papers will promote discussion on the subject and contribute to a better understanding of economic and business processes and development issues in Pakistan. Comments and feedback on these papers are welcome.

Abstract

Social networks play an important role in human interaction. 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. This study looks at how individual behavior and the diffusion of demographic information affects social interactions. Based on a controlled lab experiment, we assess three key determinants of social interaction: (i) homophily, (ii) preference for fairness and (iii) past behavior. Of the experiment's three treatment groups – an out-group and two variations of in-group pairings – we find that participants show less homophily toward an in-group match when they know their partner cannot influence their outcome. However, if there is a chance of the behavior being reprimanded, the opposite is true. Finally, we present 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, lab experiments.

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

1. Introduction

Social interactions are the primary source of exchanges of information. In this context, the efficient diffusion of information requires a powerful network structure. The efficiency of information networks is crucial: well-organized information networks maximize the value of information, excluding the diffusion cost (Bala & Goyal, 2000). If, for example, an individual has no connections, the diffusion of information will be partial. On the other hand, if the linkages are too long, diffusion may be sluggish. Consequently, events in various markets will be affected adversely, leading to the deterioration of economic outcomes.

Lab experiments have recently gained popularity in measuring social networks. Previous studies show that it is difficult to distinguish between preferences and opportunities in the field. Social interaction can depend on individual preferences and opportunities or may be strategy-driven. Simply put, in the field, people may 'prefer' to interact with others because they live in the same neighborhood. Controlled laboratory experiments allow the researcher to separate and measure these forces as well as their interaction with each other (Carrarini & Mengel, 2016). During such experiments, the researcher can control for several variables (e.g., costs, benefits, information and timing) that are likely to affect individual and/or aggregate behavior, which may be difficult or even impossible to measure or control in the field (Kosfeld, 2003).

We investigate whether social interactions are driven by a preference for dealing with members of one's own group or 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 sample's participants (university students who had studied together for at least a year) were paired up in a series of lab experiments that required them to make decisions influencing monetary transactions with their partners. Based on the data generated by this exercise, we assess the importance

of three determinants of social interaction that have been found significant in the literature: (i) homophily, (ii) preference for fairness and (iii) coordination. Experiment participants were divided randomly into three distinct groups. Individuals in the first group (T1) were matched with a 'computer' and told that it would use a database of past responses to react to their decisions. Individuals in the second and third groups were matched with other participants and knew *either* their partner's class section (T2) *or* his/her gender as well as class section (T3).

We would expect homophily and reciprocity to matter in pairs where one partner is human (T2 and T3) – and more so if we assume that students act with greater altruism toward their friends (T2). A comparison with the T3 results helps gauge if there is a gender bias. We conduct standard experiments drawn from the literature – altruism, ultimatum and the prisoner's dilemma, customized to the local context. Other studies have used these activities to measure generosity, preference for fairness or reciprocity and coordination, respectively, in different contexts.

Our results indicate that participants are likely to show more generosity to a stranger than to an in-group match when they know their partner cannot influence their personal outcomes (game winnings). Contrary to the findings of this study, the literature suggests that, even when their partners cannot influence their personal outcomes, participants are generous toward people they know. However, they tend to 'play safe' or make a higher monetary offer if there is a chance their behavior may be reciprocated (through reward or punishment). This holds true in our study as well. The results also show that social interactions are not preference-driven. Instead, they are strategic: participants do not obtain pure utility from interacting with someone in their own social group any more than they do from interacting with a stranger in the same setting. They do, however, consider the monetary implications of who they are interacting with.

These results 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 the students who took part in our lab experiment are likely to enter the labor market in a few years. Other studies show how social capital can be a useful asset in labor market social capital (Lin, 2001): information on job vacancies travels rapidly

through social networks, which may be cheaper to form than professional networks or through formal job search techniques (Granovetter, 2005).

Examples of group-specific deterrents to information sharing can be found in the small and medium enterprise (SME) sector. Large firms rely conventionally on formal processes (internal skills) to advance technologically, while SMEs have limited capacity for implementation because they have fewer resources. Information diffusion through social networks, therefore, can play a valuable role here. For instance, Iturrioz, Aragón and Narvaiza (2015) examine the ability of social capital to reduce cooperation risks and costs: information is shared and more members are willing to innovate, which stimulates shared innovation in the network. Similarly, in gauging how long farmers take to adopt 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's members, can therefore either inhibit or promote network formation and the sharing of information in these groups.

Our results could potentially be used to analyze segregation and preferences for interacting with similar people. These results may also have implications for policies dealing with discrimination or social and economic segregation – from making decisions to match workers in a production team to the choice of schools for children. The scope for choosing whom we work with, for instance, can affect the level of in-group discrimination and group productivity, making it important to understand such social networks and the nature of underlying motivations.

The paper is organized as follows. Sections 2 and 3 discuss the literature and how this study hopes to contribute. Section 4 describes the experiment design and Section 5 presents the study's research hypotheses. Section 6 discusses the results as well as the concepts of homophily, in-group bias and preference for fairness in social interactions. Section 7 concludes the paper.

2. Literature Review

Social networks are measured differently depending on the nature of the research question. Some studies have used panel data to difference out the unobservable fixed effect. More recently, studies have employed

randomized control trials to control for unobservable characteristics and to identify network effects.

Empirical studies of networks in Pakistan conclude that social and work-related networks can directly facilitate or hinder the adoption of technology. Ma et al. (2014) use an individual-level analysis to identify the role of social networks in learning externalities in the case of agricultural technologies. They find that information asymmetry hinders the introduction and implementation of BT (*Bacillus Thuringiensis*) cotton in Pakistan, thereby constraining farmers' ability to use, and benefit from, new technology.

Other studies explore the network between employees and employers and its effect on technology diffusion. One explanation for limited technology adoption is that the initial implementation of a new technology often leads to an increase in employees' working hours: if they are not compensated sufficiently for this increase, they are more likely to misinform their employer about the value of the technology being implemented (Atkin et al., 2015). If the information network is inefficient, the two parties (employer and employees) will be unable to negotiate a mutually beneficial sharing of gains, the adoption of technology will be slow or hampered and the process of innovation will be sluggish.

Much of the empirical literature on the role of networks in diffusing information fails to address, however, *why* this diffusion may be slow. While traditional economic theory asserts 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 which social group they see themselves as part of, or any future reward or punishment they expect driving their current behavior, individuals have been shown to be generous to others.

Bandiera and Rasul (2006) suggest that social networks are preferred over religious networks. In other words, behavioral economics contends that individuals may obtain utility from pure altruism. That said, Charness and Gneezy (2008), whose sample comprises first-year undergraduate students of economics, find that individuals are likely to be generous toward those they know, but that strategy crowds out generosity if behavior can be reciprocated. The study also examines whether these altruistic tendencies differ when individuals interact with social peers.

Homophily and in-group bias, two emerging phenomena in sociology, are thought to be major determinants of social interactions. Homophily refers to the idea that people prefer to interact with others whom they consider to be similar (Currarini & Mengel, 2016). Since societies are typically stratified by demographic characteristics such as age, race, gender, caste and religion, 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 & López-Pintado, 2011). This, in turn, can potentially affect the working of marriage markets, labor markets (Calvó-Armengol & Jackson, 2004) and the economy overall (Granovetter, 2005).

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). Social discrimination is associated with in-group bias whereby society is fragmented based on differences in class, religion, caste and so forth.

Currarini and Mengel’s (2016) study divides its participants into two groups to evaluate the role of homophily and in-group bias in social interactions. Their results show that, when participants are allowed to choose their matches, the degree of segregation increases due to homophily, while social discrimination decreases simultaneously due to self-selection into groups. In such circumstances, self-selection is preferable because it reduces the level of in-group discrimination: people who self-select into a group are less likely to discriminate against group members. Since similar individuals form a group, their shared values and beliefs will mean less intra-group conflict and thus better group performance. This is especially relevant in labor markets when forming working groups and teams.

An important finding is that expectations concerning the behavior of in-group members relative to out-group members have a significant impact on in-group bias. Individuals use group outcomes to frame their decisions. Ioannou, Qi and Rustichini (2011) describe group outcomes as a “device that harmonizes the expectations of in-group members.” Thus, even when there is information asymmetry, group decisions and outcomes are more certain and more likely to favor in-group members.

Moreover, homophily and in-group bias are likely to be intertwined: people who display homophilous behavior can also be expected to exhibit in-group bias (Currarini & Mengel, 2016).

Another aspect the literature investigates is whether biased social interactions depend on preferences, opportunities or strategic behavior. Social preferences imply that individuals are generally self-interested, but are also concerned about the social consequences of their actions¹ (Charness & Rabin, 2002) and may not always act as predicted by traditional economic theory. For instance, people may be more likely to interact with others who live close by or have similar tastes. Such individuals have greater opportunity to interact and form social networks, which in turn will provide utility to the individual. Strategic behavior means that individuals follow a carefully thought-out process of social interaction whereby they network with those from whom they expect favorable treatment or future payoffs (Currarini & Mengel, 2016). In an economic context, their expected utility takes the form of expected returns from this favorable treatment.

Chen and Li's (2009) laboratory experiment indicates that participants are more likely to choose social welfare-maximizing actions and that in-group matching, therefore, yields higher payoffs. In other words, participants are more likely to compensate in-group members for good behavior and less likely to penalize them for bad behavior. It is worth noting here that field experiments do not allow one to discriminate between actions based on preferences, opportunities and strategic behavior. Controlled lab experiments are a better option when it comes to identifying the individual role that each plays in social interactions.

Individual efforts to build links lead to distinctive networks. Thus, the characteristics underlying this link formation directly affect the nature of social coordination. The lower the cost associated with forming links, the more likely that individuals will coordinate with a view to taking risk-dominant actions. Conversely, higher costs may encourage them to coordinate in pursuit of efficient outcomes (Goyal & Vega-Redondo, 2005).

¹ This argument negates earlier studies and highlights the idea that individuals are more concerned about social welfare than about minimizing the difference between their payoffs. Individuals may be prepared to sacrifice their payoffs if it benefits society, especially people with lower payoffs.

Riedl and Ule (2002) suggest that, in real-life situations such as the prisoner's dilemma, the nature of the network structure (endogenous or exogenous) shapes social coordination. Letting participants freely choose their social links leads to greater cooperation. Participants exclude those who defect and form links with those willing to cooperate, in which case the level of coordination is higher. Whether they choose risk-dominant or efficient equilibrium outcomes will depend on the nature of the network. An endogenous network structure may yield outcomes that are neither risk-dominant nor associated with an efficient equilibrium (Jackson & Watts, 2002).

Finally, the literature acknowledges the differences in response between student and nonstudent populations – students generally share less and exhibit less trust (Ashraf, Bohnet & Piankov, 2006). The findings of a trust game conducted with students in Pakistan suggest that they exhibit lower levels of trust (Chaudhry & Saleem, 2011). While our experiment was conducted with a sample of university students, the design remains replicable across different labor market contexts, when measuring schooling choices and when exploring diffusion networks and the forces that shape social networks.

3. Contribution to the Literature

Observational research on networks and social interactions often points to homophily and in-group bias. We study the relationship between these two ideas and gauge if either is preference-driven (when individuals prefer to interact with similar individuals) or based on strategic behavior (when individuals anticipate that certain behavior will lead to them being treated favorably in the future). The experiments designed as part of this study test different dimensions of interaction within the same sample. In the altruism experiment, social interaction is the sharing of money between partners when one partner cannot reciprocate. The sharing allocation is purely preference-driven since one individual expects nothing in (economic) return. In the ultimatum experiment, social interaction occurs in terms of sharing money, but can have monetary repercussions for the participant. This allows us to measure if the sharing allocation is strategic or driven by a preference for acting favorably toward in-group members. Finally, the prisoner's dilemma experiment looks at social interaction in the form of simultaneous cooperation that can maximize collective returns.

Most studies of networks in Pakistan are based on surveys where the unit of analysis is either a firm or an industry. Field studies cannot distinguish between preferences and strategies. In this sense, our study of individual behavior and social interactions by way of controlled laboratory experiments will be an addition to the literature. Giving some participants additional information enables us to compare outcomes when participants have complete information and when they have partial information. The application of coordination experiments in this context is new to the literature on Pakistan.

4. Experiment Design

Between May and August 2016, we conducted a controlled lab experiment at a private university in Lahore (Pakistan) with a sample of 204 students drawn from different disciplines and years of study. The experiment comprised 10 sessions, with an average of 20 participants per session. Each session began with a short survey documenting respondents' demographics and risk preferences, followed by three experiments testing altruism, preference for fairness and coordination.² The order in which these experiments were conducted in any given session was randomized.

At the beginning of every session, participants were told they would receive their cash winnings from a randomly selected round of a randomly selected game. This meant they had no way of knowing or predicting which of their decisions would earn them that amount of cash and so, were advised to pay equal attention to each decision. The winnings for each round were calculated promptly by an assistant using a programmed Excel file. The outcome of each experiment was not revealed until all three experiments had been conducted to avoid any bias entering the decisions made in subsequent experiments. Participants' earnings were paid out privately at the end of the session.

4.1. Treatment Groups

The subjects were divided into three treatment groups and given a certain amount of information at the beginning of the session:

² The sessions were conducted with the help of two assistants. The questionnaire and experiment protocol are available on request.

- *T1: Computer.* Participants are told they have been matched with a computer that will use a database of possible responses (given by people in the past) to give them a software-generated response in that round. As the control group or out-group, participants are not expected to have any altruistic or reciprocal feelings toward the computer (representing a stranger from another group).
- *T2: Section.* Participants are told they have been matched with someone from the same section at university – they are given partial information about their partner. (As mentioned earlier, our sample comprised individuals who had been in the same section for at least a year or longer.) This group represents the in-group.
- *T3: Gender and section.* Participants are told they have been matched with someone in the same section; they are also told their partner's gender. Thus, relative to T2, they are given complete information about their partner. This group is also an in-group, but its responses allow us to test for variations stemming from the partner's gender.

4.2. Altruism Experiment

Drawing on Charness and Rabin's (2002) model for testing altruism and preference for fairness,³ participants are given an initial endowment of PRs500 and asked to divide this sum between themselves and their partner, based on six given options (Table 1). In each case, the partner has no choice but to accept the share allocated. The motivation for sharing a positive amount with one's partner is, therefore, meant to be purely altruistic. To test the relative utility obtained from altruistic behavior toward a member of the in-group, we determine if the average share allocated to an in-group member is statistically higher than that allocated to an out-group member. The dependent variable in this case is the share allocated to the partner.

³ 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; $q = -1$ 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 the weighted sum of his/her own payoff and Player A's payoff. The weight that Player B gives to Player A's payoff depends on whether A's payoff is greater than that of B or if A has misbehaved.

Table 1: Options for the two activities

	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

Note: Payoffs are of the form (π_A, π_B) , where (π_A) is the payoff to Player A.

4.3. Ultimatum (Preference for Fairness) Experiment

In the ultimatum experiment, Player A is given an endowment of PRs500. Player A makes the first move, choosing to divide this sum based on the same six options as in the first experiment. Player B has the option of either accepting or rejecting the offer: accepting the offer leads to a division of the endowment as per Player A's offer and rejecting the offer means that both players earn zero. The outcomes of this game are used as evidence for or against strategic behavior to determine how individuals behave if they know their move will be rewarded or punished by their partner.

4.4. Prisoner's Dilemma Experiment

We follow the basic bi-matrix game used by Kreps et al. (1982) as shown in Table 2.⁴ Player A and Player B move simultaneously. If both cooperate, they will have higher payoffs. If Player A defects but Player B coordinates, Player A will have a higher payoff. The idea behind 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, Player B will also defect. Hence, both players will have lower payoffs and this equilibrium represents the classic coordination failure problem.

⁴ This is a simultaneous-move game with two players, A and B, and a unique Nash equilibrium path: each player chooses to fink (defect) at every stage of the game.

Table 2: Hypothetical payoffs

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

We adapt this classic experiment to a local context using familiar terminology and economic stakes (Table 3). Three rounds of the game are played and the outcomes revealed to the partners before the next round starts. The aim is to see whether participants converge in the direction of the Nash equilibrium toward the end of the period and if they react to how their partner has behaved in the previous round. We expect rational individuals to consider how others react to their decision and include controls for each round to account for the average decision made in each. This is discussed in more detail later. By providing information on the partner’s previous decisions, we can ascertain whether in-group bias or homophily drive individual decisions or strategic considerations (based on past interaction with the partner who may be part of the in-group).

Table 3: Payoff matrix for prisoner’s dilemma

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

Note: Payoffs are of the form (π_A, π_B) , where (π_A) is the payoff to Player A.

5. Empirical Strategy

For the sake of analysis, the results of the experiment are analyzed using a probit model. The simple regression equation for the study is:

$$Y = \alpha_0 + \alpha_1 T_2 + \alpha_2 T_3 + v \tag{1}$$

where T_2 denotes partial information, T_3 denotes full information and Y represents by turn the proportion shared in the altruism experiment, whether an individual accepts his/her partner’s offer in the ultimatum experiment or whether they cooperate in the prisoner’s dilemma experiment. The two independent variables, partial information and full

information, measure primarily the role of in-group bias. Participants in T₂ know that their interaction partner is an in-group member and those in T₃ know this as well as the gender of their partner. The dependent variable can take three values: the respective outcomes of the altruism, fairness and coordination experiments.

We control for basic demographics (age, family income bracket and gender) and degree major. Since a participant's decision may be influenced by his/her preference for taking risks, we also measure risk aversion through un-incentivized survey questions and control for it in the regression analysis. However, all the 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.

We expect individuals to act altruistically and fairly toward the two in-groups. Similarly, we expect coordination within the in-group to be better than in the out-group. The hypotheses being tested are as follows:

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

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

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

6. Results

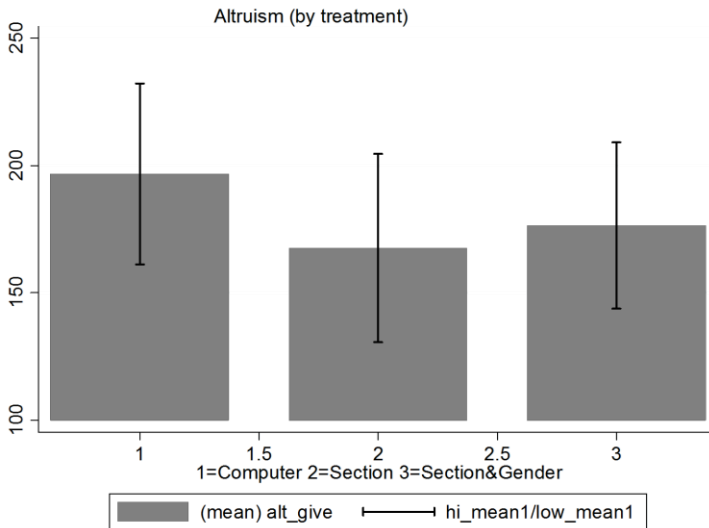
Participants were asked to fill out a short questionnaire at the start of each experiment session. The questionnaire was designed to collect basic demographic information and ensure (an un-incentivized) level of risk aversion. The average participant was male and 20 years old, with a median household income of PRs100,000 to Rs250,000. The average

participant was also moderately risk-loving (based on the un-incentivized survey question). Appendix 1 gives the sample’s descriptive statistics. Students were invited to participate based on their availability during the experiment time slot. All students thus invited ended up participating and participants did not self-select into the experiment sessions.

6.1. Homophily and In-Group Bias

We begin by evaluating the presence of homophily in the lab experiment. Figure 1 shows that the amount given by individuals in the altruism experiment is significantly different from 0. However, these amounts are not significantly different over treatment groups. On average, individuals are less generous toward in-group partners than out-group partners.⁵ This proves to be especially true when participants know that their behavior is not going to be reciprocated – as evident from the altruism experiment. Although the figure indicates an increasing trend, the t-test value shows that the treatments are not significantly different from each other.

Figure 1: Levels of altruism



⁵ Participants’ altruistic feelings may be transferred from the computer to the researcher. Even so, it is worth noting if they prove more or less generous toward the researcher (with whom they have not interacted) or toward their classmates.

Table 4 confirms the results of the first game using regression analysis. Since the amounts can vary between 0 and 500 and are in multiples of 100, we use an ordered probit model for this analysis.

Table 4: Ordered probit regression with standard errors clustered by session, 204 observations

Variable	Coefficient	Standard error
Knows that partner is a class member	-0.234	0.171
Knows partner's gender and 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

Note: y = amount the participant is willing to share.
 *** 1 percent, ** 5 percent, * 10 percent significance.

One possible reason is that students are already used to a competitive environment and more concerned about their own progress. Hence, they are not any more generous toward someone with whom they have interacted and probably developed a certain rapport, than they would be toward someone they do not know. The regression results discussed in the next section, however, give evidence in favor of strategic and reciprocal behavior.

6.2. Preference for Fairness

Next, we measure the preference for fairness through the ultimatum experiment in which participants have the option to either accept or reject the offer made to them by their interaction partner. Relative to the altruism experiment, decisions in which the agent has the option of either punishing or rewarding his/her interaction partner (the ultimatum game offer by Player A) yield the opposite result: homophily leads to Player B receiving a larger share of the endowment (Figure 2).

Figure 2: Ultimatum experiment, average accepted offers

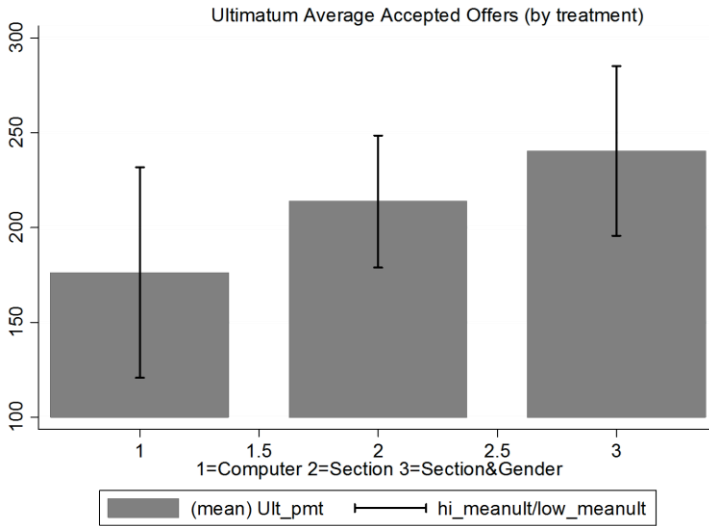


Table 5 gives the ordered probit regression results for Player B, where the dependent variable is the amount s/he receives from Player A. Player A is likely to offer classmates a larger share when s/he knows that Player B can reject the offer and punish Player A for a low offer. This is an interesting result: it suggests that respondents behave strategically, taking into account their in-group partner’s future decisions and not acting merely out of generosity because their partner is a fellow group member. Knowing the gender of their in-group partner does not change the sum that respondents allocate, nor does knowing that their partner is the same gender (see Table A1, Appendix 2).

Table 5: Ordered probit regression with standard errors clustered by session, 102 individuals in the role of Player B

Variable	Coefficient	Standard error
Knows that partner is a class member	0.329**	0.163
Knows partner’s gender and 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

Note: y = amount Player B has received from Player A.
 *** 1 percent, ** 5 percent, * 10 percent significance.

To further validate the idea that a higher offer is likely to be accepted and that interactions are strategic, we run a regression in which the dependent variable is a dummy variable equal to 1 if Player B accepts Player A's offer and 0 otherwise. We include an additional independent variable, *offer* – a binary variable equal to 1 if the amount offered to Player B is greater than the median offer value (PRs200). The *offer* variable tests if a higher offer is more likely to be accepted than a lower offer, as expected in theory.

In the presence of reciprocity, i.e., when partners respond to an unfair offer rather than accepting whatever is offered in the altruism game, participants behave strategically: they are more likely to accept a higher offer. In this case, participants are not as concerned with whom they are playing against – whether their partner is a classmate or male/female – as much as with the offer made by their partner (Table 6). Higher offers are more likely to be accepted.

Table 6: Probit regression with standard errors clustered by individual, 102 individuals in the role of Player B

Variable	Coefficient	Standard error
Knows that partner is a class member	0.025	0.072
Knows partner's gender and that s/he is a class member	0.035	0.077
Offer	0.036***	0.090
Female	0.058	0.066
Age	-0.084	0.014
Income	0.012	0.020

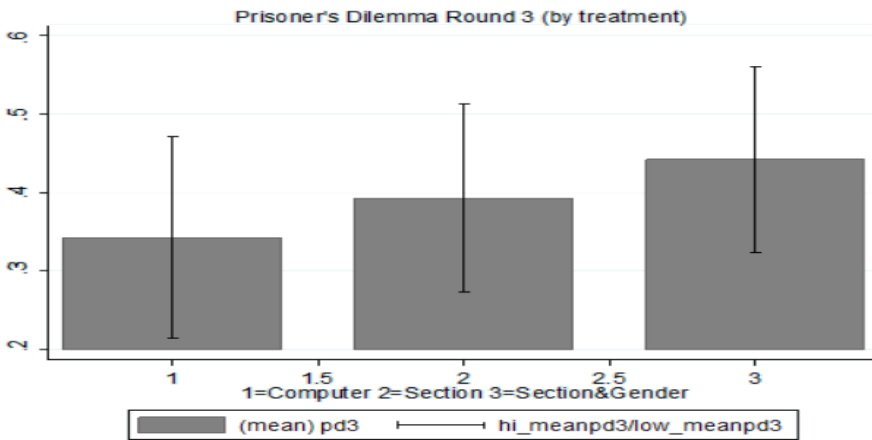
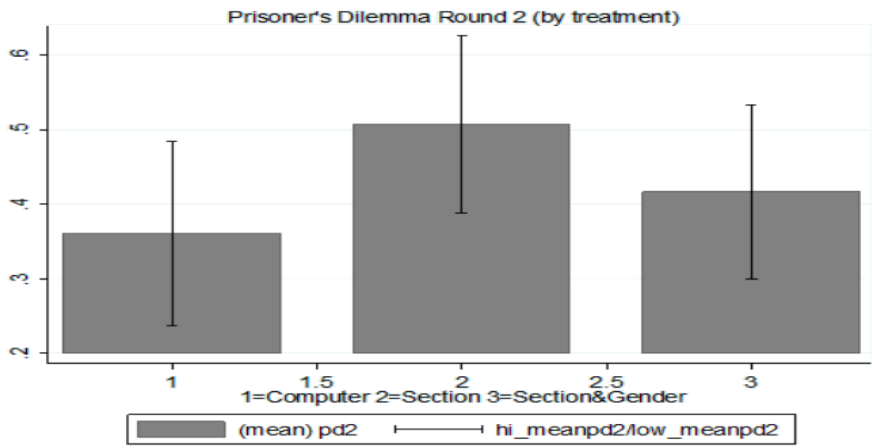
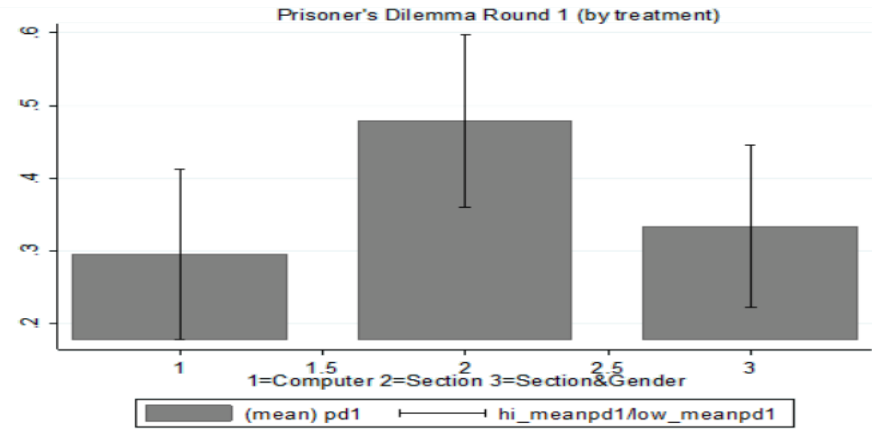
Note: $y = 1$ if Player B accepts the offer, $y = 0$ if Player B rejects the offer.

*** 1 percent, ** 5 percent, * 10 percent significance.

6.3. Coordination and Cooperation

We look at the presence of coordination among individuals and whether their behavior has an in-group bias or is strategic (rewards or punishes past behavior). Figure 3 illustrates the results of all three rounds of the prisoner's dilemma experiment. The y-axis indicates the proportion of respondents who cooperated. On average, we find that participants are more likely to cooperate with their classmates than with the computer, but are more likely to defect in the last round. However, none of these differences is significant.

Figure 3: Prisoner's dilemma responses



We exploit the panel nature of the data and combine participants' behavior in all three rounds in a random effects regression (Table 7). The results suggest that being matched with a 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.

Table 7: Random effects regression with standard errors clustered by id, 612 observations for 204 individuals over three rounds

Variable	Coefficient	Standard error
Knows that partner is a class member	-0.147**	0.062
Knows partner's gender and that s/he is a class member	-0.071	0.061
Female	0.117**	0.052
Age	0.027**	0.014
Income	-0.018	0.034
Risk aversion	-0.001	0.011
Constant	0.079	0.305

Note: $y = 1$ if player cooperates, $y = 0$ if player defects.

*** 1 percent, ** 5 percent, * 10 percent significance.

In round 2 (Table 8), we include a variable to measure the effect of knowing what one's partner did in the previous round. The partner's decision in round 1 holds a value of 1 if s/he cooperated in the first round and 0 otherwise.

Table 8: Probit regression with standard errors clustered by session, 204 observations

Variable	Coeff.	Standard error	Coeff.	Standard error	Coeff.	Standard error
	Round 2		Round 3		Round 3	
Knows that partner is a class member	-0.142	0.126	-0.028	0.750	-0.025	0.073
Knows partner's gender and 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	0.037	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

Note: $y = 1$ if the player cooperates, $y = 0$ if the player defects.

*** 1 percent, ** 5 percent, * 10 percent significance.

We find that individuals are responsive to their partner's decision in previous rounds: cooperation (defection) by the partner in a given round encourages participants to cooperate (defect) in the next round. This provides strong evidence in favor of reciprocating the partner's past behavior – the coefficients are large and strongly significant. In fact, individuals do not care who they are paired with, but they are strongly concerned with how their partner behaved in the previous round.

The results reiterate that the individual's decision in round 3 is affected significantly by his/her 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) and that Pareto optimality depends on the immediate past and can thus be obtained quickly without relying on a long history of interactions. What is worth noting, however, is that homophily does not matter in obtaining Pareto optimality – individuals will 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.

7. Conclusion

Based on the results of a lab experiment, this study assesses three key determinants of social interaction: (i) homophily, (ii) preference for fairness and (iii) coordination based on reciprocity.

7.1. Key Findings

We find that participants do not show more generosity (homophily) toward an in-group match than they would a stranger when they know their partner cannot influence their personal outcomes (game winnings). This is contrary to previous findings, which suggest that participants are generous toward people they know, even when their partner cannot influence their personal outcomes.

The study also reveals that, if there is a chance their behavior will be reciprocated, i.e., rewarded or punished, participants will play safe or make a higher monetary offer – as in our case – to save themselves from being punished for bad behavior. This would imply that social interactions are not preference-driven. Rather, they are strategic. Participants do not obtain pure utility from interacting with someone from

their own social group any more than they would from interacting with a stranger in this setting. Instead, what counts is their partner's behavior.

Finally, there is strong evidence in favor of reciprocal behavior because participants are responsive to their partner's decision in prior interactions and will reward 'good' behavior with a 'good' response. Of note here is that participants exhibit short-term memory: the interaction immediately preceding a given round determines the current course of action. Actions further in the past are not rewarded or punished. This implies that interactions within the in-group lead to Pareto-efficient outcomes (cooperation). Moreover, if it is only the interaction immediately preceding a given round that is relevant and the longer history of interactions does not matter, then Pareto optimality can be obtained quickly.

7.2. Limitations

We must acknowledge two limitations of this study. The first concerns possible differences between the online and manual protocols adopted. The experiment was initially programmed using the experimental software z-Tree (Fischbacher, 2007). Participants were paid whatever sum they had earned during the session in Pakistani rupees. However, after conducting three sessions with z-Tree, technical connection problems meant that participants could no longer use computers to record their decisions. The remaining sessions were thus carried out manually. The same instructions were provided on a projector screen at the front of the lab; the data was entered promptly into programmed Excel files by one of the assistants. Instead of filling out an answer sheet on the computer, participants recorded their answers on paper. All participants were seated far enough from one another that they could not overhear or see other people's decisions. All the information pertinent to the treatment groups was provided privately. Despite our attempt to make the online and manual protocols as similar as possible, some bias might have entered the decisions made by participants during the manual sessions versus the online sessions. Accordingly, we compared the means of the groups that participated in both protocols and found no difference, which implies that our results should hold even when we restrict the analysis to the manual sessions.

The second limitation concerns the level of trust among participants. Most of them were first-year students, which is an important consideration in the way they responded to the experiments. Since most

participants had known each other for only a year, their level of mutual trust may have been lower than if they had studied together longer. This could have affected the study's results. Although the sample included a small proportion of third-year students, the study is underpowered in terms of detecting the effect that a longer history of association can have on participant behavior.

7.3. Study Applications

Our findings may prove useful to social economists studying discrimination and segregation. In terms of economic segregation, the study's findings have a bearing on ways to improve the extent of interaction between rich and poor, helping bridge class divides. Our results indicate that individuals in such samples and settings are more concerned with their partner's action than with the social group to which s/he belongs. This is encouraging because it implies that rational decision-making can lead to economic gains.

However, one must consider the nature of the sample that yields these results – students pursuing higher education who, arguably, come from and operate in a highly competitive environment. Among the participants in this sample, individuals responded to the merit of an action rather than to the social group from which it stemmed. That said, one can easily extend the lessons from this sample to those who are entering the labor force or functioning in highly competitive environments. For instance, situations that require matching workers in a team may become easier to handle by emphasizing the productivity and quality of co-workers rather than peer or social group affinity. Pairing workers efficiently would eventually lead to increased productivity, benefiting both workers and managers.

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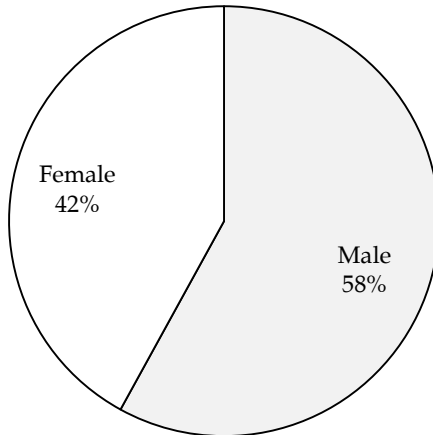
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Appendix 1: Descriptive Statistics

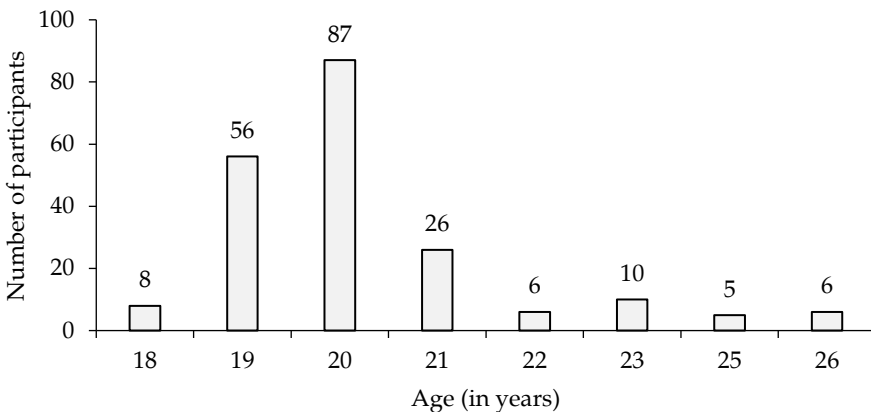
The male participation rate is 16 percentage points higher than the female participation rate (Figure A1).

Figure A1: Sample gender composition



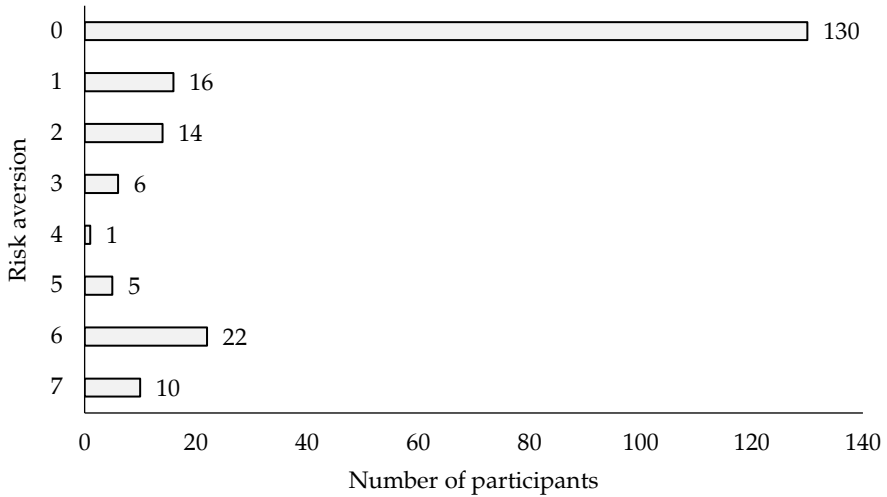
The sample comprises primarily individuals aged 19–21 years, with 25 being the least recurring age (Figure A2).

Figure A2: Sample age frequency



Most of the participants surveyed are classified as 'least risk-averse' (Figure A3). The mean of risk aversion is 1.4, which confirms that, on average, participants are risk lovers.

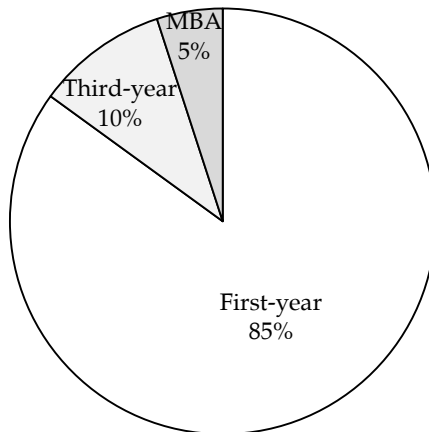
Figure A3: Sample risk aversion frequency



Note: 0 = least risk-averse.

Of the total sample, 85 percent of participants are first-year university students, followed by 10 percent who are in their third year and 5 percent who are MBA students (Figure A4).

Figure A4: Sample composition, by year of study



Appendix 2: Additional Regression Results**Table A1: Probit regression with standard errors clustered by session, 204 observations**

Variable	Coefficient	Standard error
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	-0.015***	0.053
Income	0.002	0.037
Risk aversion	0.027	0.017

Note: y = amount the participant is willing to share.

*** 1 percent, ** 5 percent, * 10 percent significance.

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