WORKING PAPERS

N° 15-25

Social connectedness improves co-ordination on individually costly, efficient outcomes

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INSTITUTE for ADVANCED STUDY in TOULOUSE

Social connectedness improves co-ordination on individually costly, efficient outcomes *

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Abstract

We study the impact of social ties on behavior in two types of asymmetric coordination games. Social ties are varied by making players interact with partners from different in-groups (fellow members of their own sports team, members of their sports club, students of their university). Subjective social ties are further measured by direct questionnaires.

We find that smaller and more salient in-groups lead to significantly more group beneficial choices. The same effect is observed for players that report high values of their subjective social ties. We discuss the implication of these results for theories assuming that socially tied individuals follow some group beneficial reasoning.

JEL classification numbers: C72, C91, C92.

Keywords: Social ties, group identity, coordination, experiment.

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*We thank seminar participants at Norms, Actions and Games (London), the Thurgau Experimental Economics Meeting, the ESA meeting in New York for comments, and the Institute for Advanced Studies Toulouse (IAST) for support. Funding through the ANR 2010 JCJC 1803 01 TIES is gratefully acknowledged.

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1 Introduction

Behavior in interactions requiring coordination is intrinsically difficult to predict. While participants in coordination problems clearly prefer to coordinate, reaching this state in the absence of communication is not trivial. Focal points help in symmetric games but might not be strong enough when games are asymmetric (Crawford et al., 2008). Incidentally human interactions are never completely void of information about interaction partners. When we interact with others, we take into account people's nationality, looks, gender, political preferences, or favorite sports team. Group membership of others leads us to anticipate certain behaviors or influences our concerns for their welfare. These effects have, over the last years, received increased attention in economics and psychology. Specifically recent experimental evidence has investigated the importance of a joint social identity on coordination among multiple Pareto ranked equilibria (Chen and Li, 2009).

In this paper, we investigate how the level of connectedness with others influences coordination in a setting where coordination comes at a cost for the individual. Our results show that even in asymmetric games where one player has to accept an individual cost, coordination on a group beneficial outcome is increased with increasing connectedness. We investigate this effect with two games: an asymmetric coordination game (baseline game) and an extension of this game where one player has to make a conscious choice to enter the coordination game (the entrance game). The entrance game enables us to investigate how social connectedness influences the interpretation of moves by the other. We observe that stronger social connectedness increases players' beliefs that others will focus on group beneficial outcomes.

The importance of social identity in economics has been pointed out by the seminal work of Akerlof and Kranton (2000). Social identity theory based itself on the assumption that an individual is not characterized by one unique 'personal self', but rather by many 'selves' that correspond to overlapping circles of group identities. Different cues might trigger the individuals to act and feel on their personal, family or national 'level of self' (Turner et al., 1987).

While social identity theory clearly considers the importance of different levels or 'strength' of social identity, the main experimental approach has focused on identifying a 'minimal group' level, which allows us to observe discriminatory behavior. Primarily based on this 'minimal group paradigm', a large body of evidence has been collected in psychology (e.g. Brewer, 1979, 1999; De Dreu, 2012; De Dreu et al., 2012; Tajfel and Turner, 1979; Yamagishi and Kiyonari, 2000) and economics (e.g. Bernhard et al., 2006; Buchan et al., 2006; Chavanne et al., 2011; Goette et al., 2012) on in-group vs out-group behavior. Since the seminal work by Tajfel et al. (1971), results support the idea that even minimal group membership enhances behavior beneficial for group members, sometimes at the expenses of the out-group (i.e., people who are not members of the group).

In our own experimental investigation, we aim at getting back to the initial concerns of social identity theory for different 'levels' of identity. The question is how behavior is changed when we interact with a person we know very well compared to a person we are only minimally tied with. What to expect is not immediately obvious. Stronger ties with others might influence our concerns for their outcome according to existing theories of social preferences (e.g. Charness and Rabin, 2002; Fehr and Schmidt, 1999). Alternatively, stronger ties might lead to better predictions of choices or preferences of others. Finally, stronger connectedness might induce other types of reasoning that focus on the group's outcome (e.g. Bacharach, 1999; Sugden, 2000, 2003).

Recent experimental evidence has indeed observed that, for the case of symmetric games, an 'enhanced' minimal group paradigm enables coordination among multiple Pareto ranked equilibria (Chen and Chen, 2011). Similarly Gaechter et al. (2012) observe that players that score higher on a psychological measure of shared identity ('one'-ness) are more likely to coordinate on high effort levels in a weakest link game. We will base our analysis on a basic definition of a social tie between two individuals proposed in Attanasi et al. (2014). Specifically, we assume that the minimal criterion for the existence of a social tie between two individuals is for them to commonly believe that they share the same social features that define both of their social identities.

We further assume that a social tie between two individuals has a quantitative dimension. The social tie between individuals will get stronger for either a stronger objective overlapping of their aims and goals; or for a subjective stronger feeling of connectedness with the other.

The predictions derived by Chen and Chen (2011) for coordination games are based on the concept of potential games (Monderer and Shapley, 1996), which restrict the analysis to symmetric games. Asymmetric games have been investigated in the context of a minimal group paradigm by Charness et al. (2007). They show that coordination on an in-group beneficial outcome increases when a 'hosting' in-group player interacts with a 'guest' out-group player and these roles are made salient. Asymmetric games have however not yet been investigated for the case of different levels of connectedness among interacting players. Stronger connectedness might favor coordination on outcomes that are considered as better for the group. For example, take a battle of the sexes game that does not offer symmetric payoffs dependent on which outcome the players agree on. Consider the classical example of Ann and Bob that have to choose between going to the opera or to a football game. Though Ann might prefer the opera and Bob the football game, Ann might have a higher utility from the football game than Bob from the opera. Thus the overall efficiency for the couple is higher when they coordinate on the football game. Our results will show that increased group identity will indeed enhance the focal value of such group beneficial outcomes.

The rest of the article is organized as follows. Section 2 presents the two versions of an asymmetric coordination game (the baseline and entrance game) studied in this paper. We further discuss how social ties are measured. Specifically we distinguish between objective ties (which refer to the type of partners a subject interacts with) and subjective ties (which correspond to a subject's own perception about social relationships within a group). Section 3 gives the procedures of the experiment and Section 4 presents results from both coordination games, depending on both types of social ties (objective and subjective). Finally, Section 5 discusses the theoretical implications of our results.

2 Experimental Design

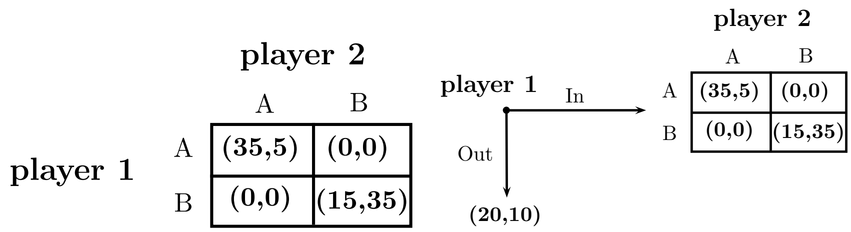
In the following, we will introduce two coordination games to study social ties: the first is a variant of the battle of the sexes game that we call the 'baseline game'; the second extends the previous game by adding an outside option and is named the 'entrance game'.

2.1 The baseline game

The coordination game that we consider is a simultaneous move game with two players (1 for row and 2 for column), each of which has to choose between two available actions A and B. The corresponding payoff matrix is represented in Figure 1(a). As in the battle of the sexes, the worst scenario for both players is to miscoordinate (i.e., playing A while the other plays B or vice versa). Furthermore, the players have diverging preferences regarding the best outcome for themselves: player 1 prefers coordination on (A,A) while player 2 prefers coordination on (B,B). However, unlike the classical battle of the sexes game, the lowest payoff is different in the two coordination outcomes: outcome (B,B) is worth more to player 1 than outcome (A,A) is worth to player 2. In spite of this difference, the game theoretic properties of this asymmetric battle of the sexes game remain as in the classical case: both (A,A) and (B,B) are the only pure-strategy Nash equilibria, which also are the only Pareto optimal outcomes.[1]

The main feature of this game lies on the impact of group preferences on players' behavior. As in the battle of the sexes, being self-interested is not sufficient to guarantee coordination success. However, in our asymmetric game, one can notice the existence of a focal point for the group that is not present in the classical battle of the sexes game: out of the two pure-strategy Nash equilibria, the outcome (B,B) seems better for the group. Whether one considers the sum, the average, the difference, or the minimum value

[1] There also exists a Nash equilibrium in mixed strategies, which consists of playing A with probability 7/8 for player 1 and playing B with probability 7/10 for player 2 (in this case, the respective expected payoffs are 10.5 for player 1, and 4.4 for player 2).



(a) The baseline game (asymmetric battle of the sexes game).

(b) The entrance game (asymmetric battle of the sexes game with outside option).

Figure 1: Baseline and entrance game.

among the individual payoffs as a measure of the group's utility, this outcome always outperforms every other solution. In fact, the asymmetry in the players' payoffs creates some incentives for them to favor the group as a whole, which might allow them to also maximize their self interest (any coordination is always better than miscoordination). Both players may then consider this solution as a focal point that can be used to reach coordination. However, one should note that, as the corresponding solution (B,B) favors player 2 more than it favors player 1 (what is best for the group is also best for player 2), coordination is not guaranteed. We will investigate whether participants in the role of player 1 detect and follow the focal point (B,B), and which factors weaken or strengthen the focus on it.

2.2 The entrance game

We extend the asymmetric game presented above to the 'entrance game' by adding an outside option (see Figure 1(b)). In this two-player game, prior to playing the coordination game itself, player 1 is offered the possibility of a fixed outside option. If he chooses to enter the coordination game (play 'In') both players play the asymmetric battle of the sexes game as described in the previous section. If he takes the outside option (play 'Out'), the game ends with player 1 earning 20 and player 2 earning 10.

The outside option makes participation in the coordination game a voluntary decision by player 1. Entering the game can therefore be interpreted as a signal to play a certain strategy. How this signal is interpreted will depend on player 2's beliefs about player 1's motivations: specifically if player 1 is expected to be self-interested or to take the group interest into account.

Before expanding this forward induction argument, let us notice that the entrance game contains three Nash equilibria in pure strategies: ((In,A),A), ((Out,A),B), ((Out,B),B).[2] Considering subgame perfect Nash equilibria by backward induction allows us to rule out the solution ((Out,A),B).[3]

Forward induction then allows us to restrict the set of subgame perfect Nash equilibria to those solutions that survive the iterated elimination of weakly dominated strategies. Initially player 1's strategy (In,B) is weakly (and strictly) dominated by any strategy involving Out. Then player 2's strategy B becomes weakly dominated by A. Thus player 1's strategies (Out,A) and (Out,B) are both weakly (and strictly) dominated by (In,A). Therefore, the unique forward induction solution is ((In,A),A).

Indeed, assuming common knowledge that both players are fully rational and motivated by their own self interest, this solution should be played. When playing In, player 1 signals that he intends to play A in the subgame (if he intended to play B, he would have been better off playing Out in the first place). Therefore, as a best response, player 2's unique rational move is to play A. Finally, since outcome ((In,A),A) is better for player 1 than selecting Out, he chooses (In,A).[4]

The interesting characteristics that this analysis brings about is that the validity of this forward induction argument is independent of player 2's preferences. This therefore suggests that such a game introduces some 'first mover' advantage, assuming there is common knowledge that both players are self-interested agents. Let us also point out that such a forward induction argument has already received wide experimental support in the literature (e.g. Brandts

[2]Moreover, the entrance game also has Nash equilibria in mixed strategies, which consist of player 1 always playing Out (i.e., selecting either strategy (Out,A) or strategy (Out,B) with probability 1) and player 2 playing B with probability 3/7.

[3]There also exists a Nash equilibrium in behavioral strategies, which consists of player 1 always choosing Out first and playing B with probability 1/8 in the subgame; while player 2 plays B with probability 7/10.

[4]Note that no Nash equilibrium in mixed/behavioral strategies does resist this forward induction argument.

and Holt, 1989; Cooper et al., 1992, 1993; Van Huyck et al., 1993; Balkenborg, 1994; Brandts and Holt, 1995; Cachon and Camerer, 1996; Shahriar, 2009).

However, if players focus on some collective goals and expect others to do the same, entering the subgame will be associated with a choice of B. As a result, stronger social ties with a group might lead to either effect: a stronger belief in individual rationality of partners that are more identifiable (group members) or a stronger belief in collective rationality by group members. In the former case, ((In,A),A) will be played. In the latter case the outcome will be ((In,B),B).

Specifically, the entrance game will enable us to observe if players linked by stronger social ties are more likely to expect coordination in the subgame and therefore more likely to enter the second stage of the game (when acting as player 1). In turn, reactions by player 2 will allow us to investigate whether and how – via coordination on either (A,A) or (B,B) – this intention is understood. The baseline game will serve us as control to see whether the first stage is always needed to signal intentions.

2.3 Varying social ties

We vary the strength of social ties by considering partners that come from more or less strongly linked 'in-groups'. More precisely, we investigate three levels of 'in-groups': the weakest level of social ties concerns our treatment *university*. In this treatment, participants know that they will interact with a fellow student from their own university. Note that this is the default in most laboratory experiments and therefore the possibility of social ties between such participants is assumed to be minimal. Our strongest level of social ties concerns our treatment *team* in which two players from the same volleyball team interact. Teams consist of 7 to 9 players and meet at least once per week for a two-hour training session. Note that interactions were anonymous in the sense that no participant could identify his interaction partner from the game. However it was common knowledge that both participants were members of the same team. A third treatment gives some intermediate level of social ties:

club. Here both participants were members of the same volleyball club, but not playing in the same team. The club had around 70 members and members might interact before and after training with players that were not from their own team.

We further elicited through questionnaires how well the players saw themselves linked to their teammates and how they considered the relationship between their teammates. We use these measures to determine subjective social ties. Participants responded to two types of scales.

The first scale (direct scale) asked with respect to each team member 'how do you think this person feels about you?' (see Figure 7 in the Appendix for an example). Participants could choose between 'likes me a lot', 'likes me', 'dislikes me' and 'is indifferent'.[5] Answers to this measure allow us to determine how well the individual feels 'liked' and thus connected to his team (index of subjective connectedness of the self to the group). Specifically, for every participant i, the corresponding coefficient of i's belief about *self* connectedness to the group G ($i \in G$) is determined by:

$$k_i^S = \frac{N_i}{|G| - 1}$$

where $|G|$ denotes the size of the team and N_i defines the number of individuals in G that participant i believes to strongly like him. Specifically, N_i indicates how many times the answer 'the other likes me a lot' was selected by i in the questionnaire. Note that k_i^S simply stands for the probability that individual i interacts with a person he believes to strongly like him.

Let us also define the average self connectedness K^S within the group G as follows:

$$K^S = \frac{\sum_{i \in G} k_i^S}{|G|}$$

We will use this measure later to determine whether an individual scores more or less high concerning beliefs about his own popularity compared to his

[5] Participants also answered for each team member whether they 'liked a lot', 'liked' or 'disliked' this person. Answers were strongly correlated with the indirect question.

team mates.

The second scale (indirect scale) aimed at eliciting ties between team members as perceived by the participant. To do so, each participant i was asked to indicate for any two members of his team whether he considered them to be 'friends' (for an example, see Figure 8 in the Appendix). The scale was presented in a visual intuitive form with all team members' photographs arranged in a circle, where participants were asked to indicate by a line any two members they thought to be friends (excluding themselves).[6] In the example from Figure 8, individual C responds to the questionnaire and indicates her belief that F is friend with A and G, that G is also friend with E, and that D and B are friends.

Based on answers to this measure, we construct an index of the individual belief about the groups connectedness k_i^G. Specifically, we hypothesize that in our game, behavior does not only depend on the individual's closeness to every other member, but also on the belief about every other member's closeness to each other. To illustrate this assumption, imagine a group of four individuals (Alice, Bob, Carol, and Daniel) and suppose it is common knowledge that Alice is equally close to Bob, Carol, and Daniel, while these three characters are not tied with each other. In the case where every individual is equally likely to interact with any other group member, Alice is indifferent between interacting with the three others (she is sure to interact with someone she is tied with). However, Bob, Carol, and Daniel are not indifferent: they all prefer to interact with Alice, which turns out to be a rather unlikely event with probability $p = 1/3$. As a result, Bob, Carol, and Daniel can be seen as weakly tied with the group. Concerning coordination, Alice thus needs to take this into account and should act as if she is a weekly tied participant (if she does not, she exposes herself to the risk of performing some group-regarding behavior that is not reciprocated).

For every participant i, the corresponding coefficient of i's belief about the *group* connectedness is calculated as follows:

[6]During the experiment, participants were notified that any link that would involve themselves in this question would simply be ignored.

$$k_i^G = \frac{N_{-i}}{M}$$

where N_{-i} represent the estimated number of links in the group G (according to i's beliefs) that do not involve i,[7] and M corresponds to the maximum number of individual links that are possible in the group without individual i:

$$M = \binom{|G|-1}{2} = \frac{(|G|-1)\cdot(|G|-2)}{2}$$

Note that k_i^G resembles the concept of a *local clustering coefficient*, which characterizes the probability that two randomly selected neighbors of i are tied with each other (Watts and Strogatz, 1998; Newman, 2003). As an illustrative example from Figure 8 in the Appendix, assuming the corresponding answer was made by individual C, we would obtain $k_C^G = \frac{4}{21}$.

Let us also define the average group connectedness K^G within some group G as follows:

$$K^G = \frac{\sum_{i\in G} k_i^G}{|G|}$$

3 Experimental Procedure

Participants in our experiments were students from the University of Toulouse (Capitole) who were also members of the main university volleyball club. During a preliminary meeting, every active member of the club was proposed to participate in our study. Upon acceptance, every participant was then photographed for later use in the questionnaire (see Figures 7 and 8 in the Appendix for examples).

The experiment was run in November 2011 during two training sessions. In total, 70 subjects participated (37 men and 33 women). At the beginning of the academic year (September 2011), volleyball players within the club were divided into 9 single-sex teams: 5 male teams and 4 female teams. Teams had

[7] A link not involving player i is a connection between two players j and h, where j and h are different from i.

between 7 and 9 members. Another 43 students were recruited from the same university as partners for the game played with another university student. Data from these observations are not discussed in this paper.

The experiment was run by paper and pencil during training sessions. Subjects first filled out a demographic questionnaire and answered to the direct and indirect scales for social ties. Social ties were elicited before the games were played to prevent an impact of game behavior on social tie measures. Presenting the questionnaire before the game further ensures that participants were aware of their social ties to the team and that they were aware that other participants had also been asked the same questions.

Every participant was then asked to report strategies for the baseline game and the entrance game according to three different types of reference groups. All treatment comparisons are therefore on a within-subject level. Indeed, within-subject comparison seems necessary for our research question, since social ties are necessarily individual characteristics. To control for order effects between the baseline game and the entrance game, the order of games was counterbalanced across subjects. The detailed instructions of both games are described in Sections B.2 and B.4 of the Appendix.

The three in-group treatments (team, club and university) were played by every subject and the order was inverted for half of the sessions. However, since answers were given by paper and pencil, participants were free to answer these questions in any order they wished. Participants responded by meta-strategy method for each possible treatment, i.e., all subjects had to indicate their decision if assigned the role of player 1, as well as their decision if assigned the role of player 2. This was made for both the baseline and the entrance game, and for each possible treatment, i.e. if playing with a university student, a club member, or a teammate (12 decisions as a whole). Participants were informed that only upon completion of the questionnaire, their role, the game, and the treatment selected for payout would be randomly determined.

The experiment lasted approximately one hour. Earnings were payed out during the next training sessions in December 2011. The payment method, which was specified to all subjects in the instructions (see Section B.1 from the

Appendix), consisted of randomly drawing one role (i.e., player 1 or player 2), one game (i.e., entrance game or baseline game), one treatment (i.e., university, club, or team), and one co-player (depending on the treatment). A subject's payoff was therefore defined according to his choice made as the selected player in the selected situation (which corresponds to the selected treatment in the selected game), and the selected co-player's choice in the same situation. Each effective payment was made individually and anonymously through random draws taken in front of the concerned participant.[8] Earnings included a 5 euros show-up fee. Mean earnings were about 19 euros[9] (standard deviation of 12 euros, with a maximum of 40 euros and a minimum of 5 euros).

4 Results

We will start the analysis by considering differences across the three different treatments (determining different types of partners). In addition to this exogenous variation of ties to the interaction partner, we will in a second part consider whether similar patterns can be observed when considering the subjective measures of social ties as defined above (through coefficients k_i^S and k_i^G).

4.1 Objective social ties

We first present descriptive statistics concerning the players' behavior in both the baseline game and the entrance game, for the three treatment scenarios (i.e., team, club and university). Note that in this case, the social ties are considered objective as their strength is exogenously controlled by changing the type of a participant's interaction partner. Since we observe no order effect regarding which game or treatment was presented first, we will in the following pool data from the different sessions.

[8] The random selection of the co-player was made through a random code name to preserve anonymity between subjects.

[9] Approximately 25 US dollars at the time of the experiment (1 euro = 1.4 US dollars).

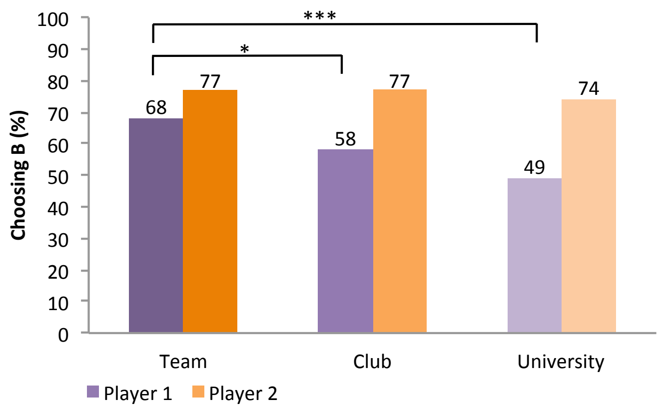


Figure 2: Behavior in the baseline game for all players in each type of matching. Significance levels based on Wilcoxon signed rank tests: $p < 0.01$ (***); $p < 0.1$ (*). Data recorded by meta-strategy method thus each bar consists of 69 observations.

4.1.1 Baseline game

We present choices in the baseline game, depending on whether the corresponding co-player is a teammate, a club member, or a fellow university student in Figure 2 (detailed results can be found in Table 4 of the Appendix).

Let us recall the predictions concerning the impact of social ties for player 1 and player 2. Specifically, for player 2, the own payoff maximizing outcome coincides with the outcome that is best for the group (i.e. (B,B)). Meanwhile player 1 faces a choice between the own payoff maximizing outcome (A,A) and the outcome that is considered as best for the group (B,B). Increasing social ties is therefore expected to increase the percentage of players 1 choosing option B. This is indeed what we observe. As we see in Figure 2, an increasing percentage of players 1 select option B when the social tie with the interaction group increases. We can reject the null hypothesis that player 1 is making the same choice when paired with a university student as when interacting with a teammate (Wilcoxon signed rank test, $p = 0.002$). For the intermediate level of the social tie (i.e. the club treatment), behavior is situated between the two extremes.

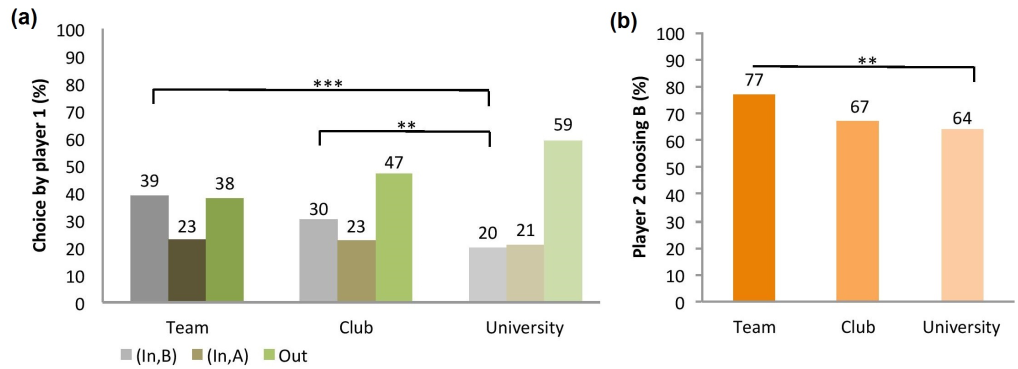


Figure 3: Behavior in the entrance game. Significance levels based on Wilcoxon signed rank tests: $p < 0.01$ (***); $p < 0.05$ (**). Data recorded by meta-strategy method thus 69 observations per treatment and player role.

When acting in the role of player 2, subjects clearly favor option B in all types of interactions.[10] Varying the strength of the social tie has no impact on choices by player 2. While this is in line with the prediction that self interest and group interest are not at conflict for player 2, this also implies that they do not seem to anticipate player 1 being influenced by the strength of the social tie. We will next use our observations from the entrance game to see whether player 2 is more likely to take the treatment difference into account when he knows that player 1 has to make an active choice to participate in the coordination game.

4.1.2 Entrance game

In the context of the entrance game, our first observation is that participants interacting with a team member in contrast to a university student are significantly more likely to enter the second stage of the entrance game (Wilcoxon signed rank test: $p = 0.004$). Recall that agents will only enter the second stage of the game if they believe that this will lead to an outcome that is on some dimension preferable to the outside option. Under the assumption

[10] Note that in this case, player 2's average behavior is close to the optimal mixed strategy i.e., playing B with probability 7/10.

that others will maximize own income and that others expect the agent to do the same, this might lead to the forward induction reasoning that results in choosing A in the subgame. If however agents focus on some collective goals and expect others to do the same, entering the subgame will be associated with a choice of B. As a result, stronger social ties with a team might lead to either effect: a stronger belief in individual rationality of partners that are more identifiable (teammates) or a stronger belief in collective rationality by team members.

We present choices concerning both roles in the entrance game, depending on whether interacting with a teammate, a club member, or a fellow university student in Figure 3. For player 1, we focus on strategies (In,A), (In,B), and Out.

Figure 3(a) allows us to reject the hypothesis that social ties promote forward induction focused on individual rationality. Indeed, the proportion of subjects selecting strategy (In,A) is similar in all treatments. On the other hand, Figure 3(a) shows that subjects are significantly more likely to choose (In,B) when interacting at the team level than at the university level (39% vs 20%, Wilcoxon signed rank test: $p = 0.003$). This shows a significant fraction of participants that switch from selecting Out when interacting with a fellow university student, to selecting (In,B) when interacting with an individual from their team.

We further observe no significant difference between player 1's behavior in the second stage of the entrance game (i.e., after choosing In) and choices in the baseline game from Section 4.1.1. Among the subjects who played In in the first stage, we observe that option B is selected for: 63% (team), 56% (club) and 48% (university) of participants. As this behavior is very similar to that in the baseline game from Figure 2 (Wilcoxon signed rank tests: $p = 0.405$ in team treatment, $p = 0.527$ in club treatment, $p = 0.257$ in university treatment), we conclude that the outside option of the entrance game has only a negligible effect on player 1's behavior in the coordination game. In other words, right after playing In, player 1 tends to consider the subgame as a new independent game. We will get back to this observation in Section 4.3 when discussing the joint meta-strategy behind the veil of ignorance whether the agent will act as player 1 or 2.

We now turn to the question of whether choices in the role of player 2 are also unaffected by the outside option. Matched with fellow university students, we observe that choices as player 2 are indeed influenced by the outside option as forward induction would assume. Specifically 64% of players 2 choose B in the entrance game, while 74% choose this option in the baseline game (Wilcoxon signed rank test: $p = 0.07$). We further observe from Figure 3(b) that, when playing with a team member, player 2 chooses B significantly more often than when interacting with a university student (Wilcoxon signed rank test: $p = 0.049$). These results therefore confirm the hypothesis that social ties help people to coordinate on the most group beneficial outcome.

4.2 Subjective social ties

We will now extend our analysis to include the subjective measures of social ties as defined in Section 2.3. As discussed previously, every subject in our experiment was asked to provide subjective information about whether they believed their teammates to like them and how much they considered their teammates to be friends with each other. Using these answers, we calculate two subjective measures of social ties for each individual i: k_i^S and k_i^G.

To analyze the relation between these measures and behavior in our games, we categorize participants as ranking either above (H^S and H^G) or below (L^S and L^G) the average answers in their own team (i.e., K^S and K^G respectively). By doing so, we avoid the possible confound that some teams might be more closely tied than others and focus on the relative part of the measure.

Table 1 summarizes the classification with respect to the group average concerning (a) self connectedness (K^S) and (b) group connectedness (K^G). The two measures show no statistically significant correlation (Pearson's chi-squared test: χ^2=1.464, $p = 0.226$). We therefore consider these two types of measures separately throughout the following analysis.

The objective of the next sections is to identify subjective measures that

	Category	Condition	N
(a)	H^S	$k_i^S \geq K^S$	38
	L^S	$k_i^S < K^S$	31
(b)	H^G	$k_i^G \geq K^G$	30
	L^G	$k_i^G < K^G$	39

Table 1: Classifications based on subjective reports relative to average in group concerning (a) self connectedness (K^S), and (b) group connectedness (K^G).

allow us to replicate the previous observed results for the objective variation of social connectedness. While the previous section focused on a comparison between participants paired with team members, club members, or fellow university students, this section will compare behavior at the *team level* for participants scoring either high or low on the different subjective measures.

4.2.1 Baseline game

We start our analysis with observations from the baseline game. Recall that in Section 4.1.1 we found a significant treatment effect for choices of player 1. We will thus focus, in the following, on choices by player 1 when interacting with another team member. Our comparison will be between individuals categorized as either 'high' or 'low' for either our measure of self connectedness (H^S and L^S respectively) or group connectedness (H^G and L^G respectively). As a control, we will also present results concerning choices when interacting with a fellow university student. Recall that both connectedness measures were recorded with respect to team members. A good measure of the social connectedness at the team level should therefore show no effect on choices when interacting with an individual at the university level.

Figure 4(a) summarizes choices for self and group connectedness at the team level (see also Tables 5 and 6 in the Appendix). We observe an effect for both self and group connectedness, marginal in the first case (Mann-Whitney test comparing H^S vs L^S: $p = 0.109$) and significant in the latter (Mann-Whitney test comparing H^G vs L^G: $p = 0.018$). In both cases, participants reporting high values concerning connectedness are more likely to choose the

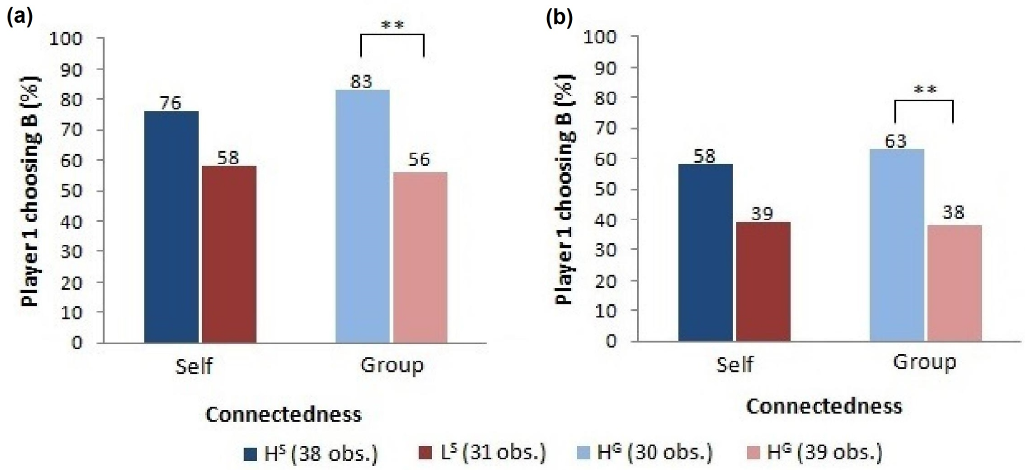


Figure 4: Player 1's behavior in the baseline game. (a) Team treatment; (b) University treatment. Significance levels based on Mann-Whitney tests: $p < 0.05$ (**). Data recorded by meta-strategy method thus 69 observations per treatment.

group beneficial outcome B.

Looking at choices by the same groups of participants in the university treatment (see Figure 4(b)), we can now disentangle whether the effect is due to an increased concern for others in the team or whether the measures also pick up some other effect. Indeed in both cases, the same tendency observed in the team treatment is also observed in the university treatment (Mann-Whitney test in the university treatment: H^S vs L^S : $p = 0.115$; H^G vs L^G: $p = 0.042$). Both measures thus seem to be related to individual characteristics that lead agents to make more group beneficial choices in general. One possible interpretation could be that participants scoring high on either of the connectedness measures are genuinely fair, regardless of their partner's identity. An alternative interpretation is that these individuals can more easily detect outcome (B,B) as the focal point that might help solve the coordination problem. Following this interpretation, they play B to maximize the welfare of the group in the 'team' treatment and to maximize their own individual payoff in the 'university' treatment. Indeed, it is worth recalling that, besides being

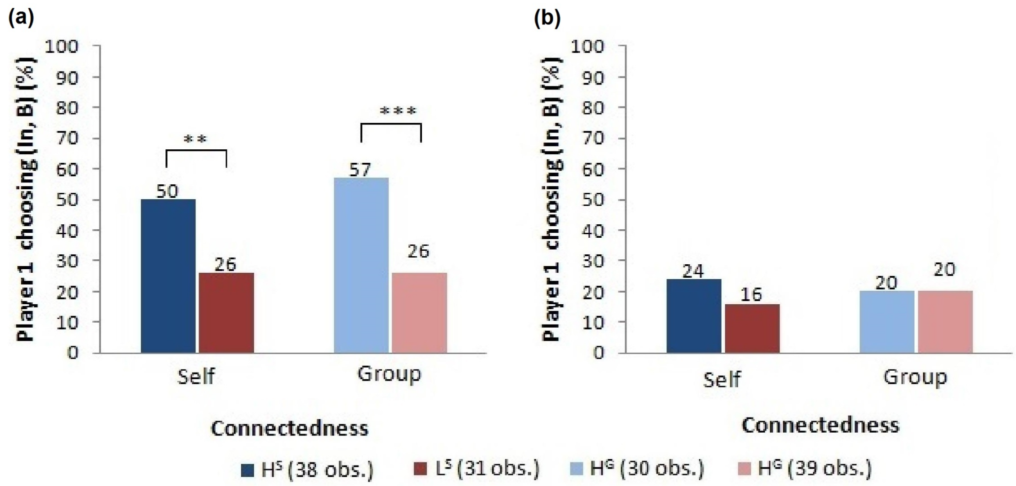


Figure 5: Player 1's behavior in the entrance game. (a) Team treatment; (b) University treatment. Significance levels based on Mann-Whitney tests: $p < 0.05$ (**); $p < 0.01$ (***). Data recorded by meta-strategy method thus 69 observations per treatment.

the fairest outcome, (B,B) is also a Nash equilibrium in the baseline game. To distinguish between these two hypotheses, we will next analyze the results from the entrance game.

4.2.2 Entrance game

Recall that in the entrance game, a treatment effect was observed as well for player 1 as for player 2 when interacting with a team member (see Section 4.1.2). The focus by both players on action B is striking given that the outcome ((In,B),B) is not a Nash equilibrium.

As in the previous section, we now present behavior by player 1 and player 2 in the team treatment in Figures 5(a) and 6(a) respectively (see also Tables 7-12 in the Appendix). We observe from Figure 5(a) that both the group and the individual connectedness measures are correlated with player 1's decision to select strategy (In,B) (self connectedness: 50% vs 26%; Mann-Whitney test: $p = 0.042$; group connectedness: 57% vs 26%; Mann-Whitney test:

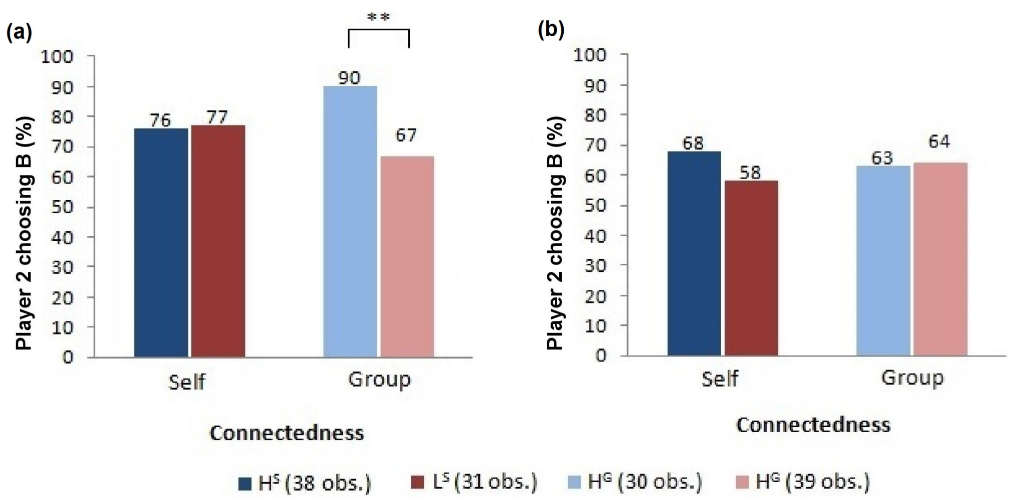


Figure 6: Player 2's behavior in the entrance game. (a) Team treatment; (b) University treatment. Significance levels based on Mann-Whitney tests: $p < 0.05$ (**). Data recorded by meta-strategy method thus 69 observations per treatment.

$p = 0.009$). However, when we turn to behavior as player 2, we observe a difference between the two measures (see Figure 6(a)). Recall that player 2 in this game has to understand the possible reasons that might lead player 1 to enter the game. Behavior as player 2 is very similar no matter the reports of the individuals' self connectedness (proportion of selecting B: 76% vs 77%). Thus believing that one is liked by many other players is not sufficient to conclude that these other players would in an anonymous interaction take a risky choice (B vs A) with *any* person from the team. Meanwhile, we observe that the group connectedness measure is significantly coorelated with player 2's choice (proportion of selecting B: 90% vs 67%; Mann-Whitney test: $p = 0.016$). Thus players that believe in a high interconnectedness in their team are more likely to believe that player 1 enters the game to play the group beneficial outcome.

As before, we can also compare these results to behavior when interacting with a fellow university student. We observe from Figures 5(b) and 6(b) that there exists no significant correlation between the connectedness measures and choices at the university level. This clearly indicates that subjective beliefs concerning self and group connectedness are only related to behavior (as player 1 and player 2) when interacting with a team member. It thus seems that subjective beliefs about self and group connectedness are rather correlated with an ability to identify the focal nature of the (B,B) outcome and not to a higher level of fairness (see hypotheses at the end of Section 4.2.1).

4.3 Behind the veil of ignorance

Recall that in our experiment, strategies were elicited by meta-strategy method for the case of being selected as either player 1 or player 2. This allows us to add to the previous discussion, an analysis of behavior in the 'original position' of the meta-game before actual roles were assigned (Rawls, 1971).

To analyze behavior in the meta-game, we need to consider equilibria for the higher order symmetric game. We will denote strategies for this game as (x_1, x_2), where x_1 indicates the choice when assigned to the role of player 1 and x_2 the choice for the role of player 2.

In the baseline game, four distinct strategies exist: (A,A), (B,B), (A,B) and (B,A). The payoff matrix concerning expected earnings from the transformed game can be found in Table 13 of the Appendix. We can easily see that there exist three different pure-strategy Nash equilibria: (1) both players selecting (A,A); (2) both players selecting (B,B); and (3) one player selecting (A,B) while the other chooses (B,A). Note that the third solution is not consistent with making a decision in Rawls' original position, since the latter implies to select the same strategy that one expects others to select. Furthermore, of all the above strategies, only (A,A) and (B,B) are evolutionary stable.

Observed behavior of meta-strategies for the baseline game is shown in Table 2. When interacting with another university student, 39% of participants select strategy (A,B) in this game. Note that this is coherent with participants expecting their interaction partner to act differently (e.g. to choose (B,A)). In other words, participants seem to strongly identify with each player role (i.e., they do not use Rawls' original position to make their decision): when they act as player 1, they do not consider what they would do as player 2, and vice

Strategies	treatment		
	team	**club**	**university**
(A,A)	14%	14%	13%
(A,B)	19%	29%	**39**%
(B,A)	10%	10%	13%
(B,B)	**57**%	**47**%	34%

Table 2: Meta-strategies in the original position of the baseline game across treatments (69 observations per treatment).

versa.

However we observe a change in behavior when we consider the team treatment. A Wilcoxon signed rank test indeed indicates that (B,B) is selected significantly more often in the team treatment (57%) than in the university treatment (34%, $p < 0.001$). Considering the independence of strategies played in the role of player 1 and player 2 further emphasizes this result. We observe no correlation in the case of the university treatment (Pearson's chi-squared test, χ^2=0.384, $p = 0.535$) but a significant correlation in the team treatment (Pearson's chi-squared test, χ^2=5.694, $p = 0.017$). For further details, see Table 15 in the Appendix. In other words, these results suggest that increasing social ties leads people to take Rawls' original position into account.

Similar results can be obtained for the entrance game. In this case, six distinct strategies need to be considered (see Table 14 for the payoff matrix).[11] The transformed entrance game has three pure-strategy Nash equilibria: (1) both players selecting ((In,A),A); (2) both players selecting (Out,B); (3) one player selecting ((In,A),B) while the other chooses (Out,A). As in the baseline game, the latter solution is not consistent with making a decision in Rawls' original position. In this case, of the six strategies available, only ((In,A),A) is evolutionary stable.

Similarly to the baseline game, we observe that, in the entrance game, social ties still lead people to act as if they were in the original position (see Table 3). A Wilcoxon signed rank test again reveals that ((In,B),B) is selected

[11]For simplicity, we omit counterfactual strategies (i.e., ((Out,A),$\cdot$) and ((Out,B),$\cdot$)) that are irrelevant to this analysis.

Strategies	treatment		
	team	**club**	**university**
((In,A),A)	12%	7%	10%
((In,A),B)	12%	16%	12%
((In,B),A)	4%	9%	7%
((In,B),B)	**35**%	22%	13%
(Out,A)	7%	17%	19%
(Out,B)	30%	**29**%	**39**%

Table 3: Meta-strategies in the original position of the entrance game across treatments (69 observations).

significantly more often in the team treatment (35%) than in the university treatment (13%, $p < 0.001$). More precisely, in the case of the university treatment, we observe no correlation between players' choices in both roles (Pearson's chi-squared test, χ^2=0.950, $p = 0.622$). However in the team treatment, a significant correlation is observed (Pearson's chi-squared test, χ^2=8.897, $p = 0.012$). For further details, see Table 16 in the Appendix. Specifically note that in the team treatment, the fairest outcome ((In,B),B) becomes the modal choice.

Finally we consider the implications of these results with respect to our subjective measures of connectedness in the particular case of interactions between teammates. In the context of the baseline game, being closely tied with other team members according to the group connectedness measure makes participants select (B,B) significantly more often (73% in group H^G; 46% in group L^G; Mann-Whitney test: $p = 0.024$). On the other hand, this effect does not replicate through the alternative self connectedness measure (63% in group H^S; 52% in group L^S; Mann-Whitney test: $p = 0.337$). Furthermore, looking at behavior in the entrance game reveals similar results: being closely tied with other team members according to the group connectedness measure makes participants select ((In,B),B) significantly more often (57% in group H^G; 18% in group L^G; Mann-Whitney test: $p < 0.001$). Unlike in the baseline game, using the self connectedness measure replicates this effect (47% in group H^S; 19% in group L^S; Mann-Whitney test: $p = 0.016$). These results, which are illustrated in greater details through Figures 9 and 10 from the Appendix, indicate that both self and group connectedness lead to choices that are more in tune with choices that should be taken in Rawls' original position.

5 Discussion

The experimental study presented in this paper provides clear evidence that an increase of social ties can help individuals solve asymmetric coordination problems. We will now discuss to which degree existing theories can explain these results.

Relevant theories of social preferences cannot fully explain the effect of social ties that we observe. For example an increase in inequity aversion (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999) would predict the choice of Out for player 1 in the entrance game. Our results show the opposite tendency. Alternatively, assuming that social ties correlate with stronger reciprocal fairness (Charness and Rabin, 2002) would predict strong degrees of miscoordination in the baseline game. Again we observe the opposite result. For more details, see Attanasi et al. (2014).

Coordination on the (B,B) outcome in the baseline game, and on the ((In,B),B) outcome in the entrance game can however be explained by theories of team reasoning (Bacharach, 1999; Sugden, 2000, 2003). When an individual engages in team reasoning, he identifies himself as a member of a group and conceives that group as a unit of agency acting in pursuit of some collective objective (Sugden, 2000). In other words, such an individual will act for the interest of his group by identifying and implementing a strategy profile that maximizes the collective payoff of the group.

Under Bacharach's concept of *unreliable team interaction* (Bacharach, 1999), a given player identifies with a team with a certain probability p and chooses the action which maximizes the team benefit. With probability $1 - p$ the player is self-interested and maximizes his own benefit. In the context of our experiment, given a sufficiently high probability of team reasoning, the players should coordinate on the (B,B) outcome in the baseline game, and on the

((In,B),B) outcome in the entrance game. Following this theory, our results imply that players in the team treatment are more likely to use team reasoning than in the university treatment (especially when they believe in strong group connectedness within their team). However, note that the theory only considers binary types of reasoning: either one follows team reasoning, or not. Yet, given the multiple levels of self evoked by social identity theory, we might consider a more gradual notion of group identification. As a result, existing theories of team reasoning fail to fully capture the possibility of different levels of social connectedness (see Attanasi et al. (2014) for more details regarding team reasoning and its main limitation in the context of social ties).

Another theory, which can explain the observed behavior in our experiment, is the theory of *empathetic preferences* (see Binmore, 1994, 1998, 2005). Binmore argues that an individual may be equipped with some empathetic preferences, which consist in combining his actual own preferences with his preferences when *imagining* himself to be in the other person's position. For example, in the context of the baseline game, an empathizing player 1 would compare his own preferences while being himself (i.e., player 1) with his preferences while being player 2.[12] If making a decision based on such an interpersonal comparison of preferences, player 1 is said to *empathize* with player 2. The idea is thus linked to Rawls' concept of the original position (see Section 4.3). According to the analysis of the meta-strategies discussed in Section 4.3, we can thus say that players empathize more with each other in the presence of social ties. However, Binmore's theory can also not fully capture the concept of gradual social ties as it does not quantify the degree of empathizing behavior, that is, how choices are altered for intermediate levels of empathy.

Finally, the model of *homo moralis* (Alger and Weibull, 2013, p. 2276) can also be used to interpret our results. Homo moralis faces a trade-off between maximizing his own material payoff, and doing 'the right thing,' that is, choose

[12]Binmore points out that, when projecting himself to be in player 2's position, player 1 must not consider his own preferences as player 1, he must instead imagine himself while having player 2's preferences: since player 2 prefers outcome (B,B) to outcome (A,A), player 1 should share this preference when putting himself in player 2's position, even though he prefers (A,A) to (B,B) as player 1.

a strategy that, if used by all individuals, would lead to the highest possible payoff." Given our experimental findings, the degree of morality seems to be stronger in the presence of stronger social ties. It should however be noted that this model assumes a symmetric game structure and thus strictly has to be related to the findings discussed in Section 4.3 (i.e., assuming participants make their decision behind the veil of ignorance).

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A Measurement of subjective connectedness

Figures 7 and 8 illustrate the kind of questions that were used in our experiment. Note that the individuals' faces have been voluntarily blurred to ensure anonymity.

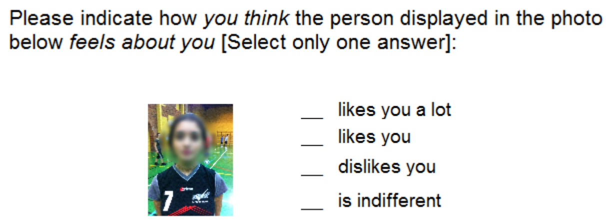


Figure 7: Measuring an individual's self connectedness with another team member.

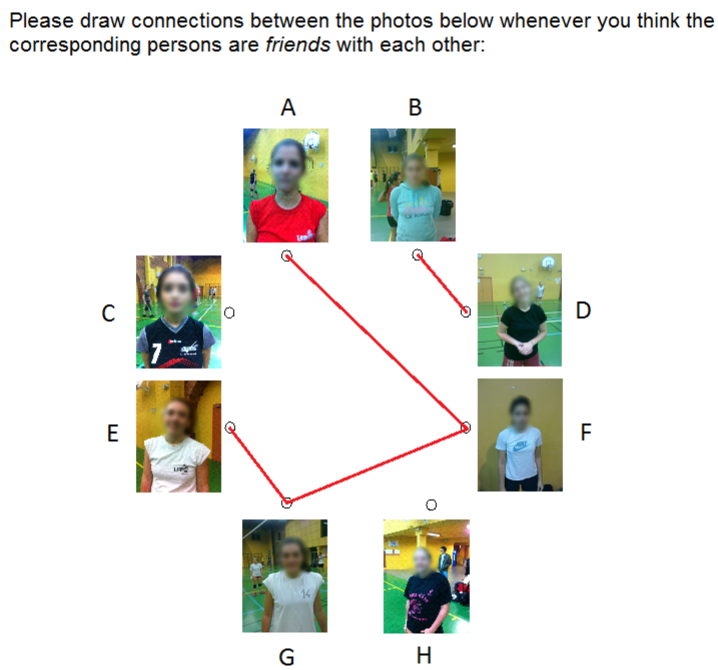


Figure 8: Measuring individual C's belief of the group connectedness.

B Experimental Instructions

B.1 Preliminary Instructions

We are going to present two games that you will have to play with some unknown participants. One of these games will then be drawn in order to determine your actual earnings.

Each game considers two players. You will be asked to take a decision as *player 1* **and** as *player 2*. At the end of the experiment, we will randomly assign one of these two roles to you.

Your actual earning will then depend on your decision in the role that will be assigned to you as well as your partner's decision in the selected game. Therefore, each of your decisions is important. So please take every question seriously by carefully answering them.

Moreover your participation to this experiment relies on the fact that you answered every single question.

If anything is unclear or if you have any question, please do not hesitate to raise your hand so that we can bring you the clarification that you need.

B.2 Instructions of the baseline game

During this experiment, you will interact with some randomly selected player in a game that is defined as follows.

In the first stage, some initial amount are given to both you and your opponent:

- **20 euros** for *player 1*
- **10 euros** for *player 2*

No decision needs to be taken by any player during this stage.

In the second stage, every player will then have to choose simultaneously between two distinct moves **A** and **B**.

In the second stage:

- If every player chooses to play **A**, 5 euros will be withdrawn from *player 2*'s initial amount and 15 euros will be added to *player 1*'s initial amount. Thus *player 1* will get 35 euros while *player 2* will get 5 euros.

- If every player chooses to play **B**, 5 euros will be withdrawn from *player 1*'s initial amount and 25 euros will be added to *player 2*'s initial amount. Thus *player 1* will get 15 euros while *player 2* will get 35 euros.

- If the players' choices are different from each other, then both players' amount will be reset to zero (each will thus get 0 euro).

The following table summarizes the various choices and payoffs from the second stage:

	A	**B**
A	(1): 35 (2): 5	(1): 0 (2): 0
B	(1): 0 (2): 0	(1): 15 (2): 35

This simultaneous decision ends both the second stage and the game. All along the game, both players will remain anonymous to one another. You will receive the corresponding amount if this game is eventually being selected.

These instructions concern the three situations described below.

B.3 Questions for the baseline game

In the context of the previous game, you will play with **X** [13] *(select one answer per question).*

- Please indicate your choice if you are acting as **player 1**:

  In the second stage, you play:

[13] Depending on the matching process, **X** may stand for "a university student", "a club member", or "a teammate". Each subject answered the following two questions (as player 1 and as player 2) for all three values of **X** (See Section 3 for details about the matching process).

○ A ○ B

- Please indicate your choice if you are acting as **player 2**:

  In the second stage, you play:

  ○ A ○ B

Note that the three previous pair of questions (with, as opponent: a university student, a club member, or a teammate) are independent from one another. Please make sure to answer each of them.

B.4 Instructions of the entrance game

During this experiment, you will interact with some randomly selected player in a game that is defined as follows.

In the first stage, some initial amount are given to both you and your opponent:

- **20 euros** for *player 1*
- **10 euros** for *player 2*

Then, the two following options become available to *player 1*:

- The **"Out"** option implies that every player keeps their initial amount and the game ends.
- The alternative option (**"In"**) implies entering a second stage where each player will have to take another decision. In the latter case, both players will then have to choose simultaneously between two distinct moves **A** and **B**.

In the second stage:

- If every player chooses to play **A**, 5 euros will be withdrawn from *player 2*'s initial amount and 15 euros will be added to *player 1*'s initial amount. Thus player 1 will get 35 euros while *player 2* will get 5 euros.

- If every player chooses to play **B**, 5 euros will be withdrawn from *player 1*'s initial amount and 25 euros will be added to *player 2*'s initial amount. Thus *player 1* will get 15 euros while *player 2* will get 35 euros.

- If the players' choices are different from each other, then both players' amount will be reset to zero (each will thus get 0 euro).

The following table summarizes the various choices and payoffs from the second stage:

	A	**B**
A	(1): 35 (2): 5	(1): 0 (2): 0
B	(1): 0 (2): 0	(1): 15 (2): 35

This simultaneous decision ends both the second stage and the game. All along the game, both players will remain anonymous to one another. You will receive the corresponding amount if this game is eventually being selected.

These instructions concern the three situations described below.

B.5 Questions for the entrance game

In the context of the previous game, you will play with **X** [14] *(select one answer per question).*

- Please indicate your choice while you are acting as **player 1**:

  In the first stage, you play:

[14] Depending on the matching process, **X** may stand for "a university student", "a club member", or "a teammate". Each subject answered the following two questions (as player 1 and as player 2) for all three values of **X** (See Section 3 for details about the matching process).

○ In ○ Out

In the second stage (assume that you played **"In"** first), you play:

○ A ○ B

- Please indicate your choice while you are acting as **player 2**:

  In the second stage (assume that your opponent played **"In"** first), you play:

  ○ A ○ B

Note that the three previous pair of questions (with, as opponent: a university student, a club member, or a teammate) are independent from one another. Please make sure to answer each of them.

C Additional tables

Throughout this section, all figures include Wilcoxon signed rank test results concerning mean rank differences in behavior across treatments (i.e., team, club, university). Moreover, some tables also include Mann-Whitney test results that allow comparing behavior across the various groups from Table 1. Note that in all statistical tests, only p values lower than 0.2 are displayed in the tables. p values larger than 0.2 are classified as not significant (n.s.).

C.1 Baseline game

players	**Matching types**			**Wilcoxon signed rank test** (p values)		
	team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
1	68%	58%	49%	0.002	0.090	0.109
2	77%	77%	74%	n.s.	n.s.	n.s.

Table 4: Choosing B in the baseline game for each player in each type of matching (69 observations).

Groups	**Player**	**Matching types**			**Wilcoxon signed rank test** (p values)		
		team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^S (38 obs.)	1	76%	68%	58%	0.008	n.s.	0.102
	2	79%	74%	74%	n.s.	n.s.	n.s.
L^S (31 obs.)	1	58%	45%	39%	0.058	n.s.	n.s.
	2	74%	80%	74%	n.s.	n.s.	n.s.
H^S **vs** L^S (p values)	1	0.109	0.053	0.115			
	2	n.s.	n.s.	n.s.			

Table 5: Choosing B in the baseline game based on groups H^S ($k_i^S \geq K^S$) and L^S ($k_i^S < K^S$).

Groups	Player	Matching types			Wilcoxon signed rank test (p values)		
		team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^G (30 obs.)	1	83%	73%	63%	0.014	0.179	0.179
	2	83%	83%	73%	0.179	n.s.	0.083
L^G (39 obs.)	1	56%	46%	38%	0.035	n.s.	n.s.
	2	72%	72%	74%	n.s.	n.s.	n.s.
H^G **vs** L^G (p values)	1	0.018	0.024	0.042			
	2	n.s.	n.s.	n.s.			

Table 6: Choosing B in the baseline game based on groups H^G ($k_i^G \geq K^G$) and L^G ($k_i^G < K^G$).

C.2 Entrance game

Tables 7, 9 and 11 depict player 1's choice in the entrance game. Note that these tables ignore counterfactual strategies (i.e., strategies (Out,A) and (Out,B)). Moreover, these tables include Wilcoxon signed rank tests that compare how often did subjects perform a given strategy (e.g., (In,A)) with how often did they choose any other strategy (e.g., (In,B) or Out) in any two treatments. Tables 8, 10 and 12 depict player 2's choice in the entrance game, together with Wilcoxon signed rank tests.

Choices	Matching types			Wilcoxon signed rank test (p values)		
	team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
(In,A)	23%	23%	21%	n.s.	n.s.	n.s.
(In,B)	39%	30%	20%	0.003	0.157	0.035
Out	38%	47%	59%	0.004	0.083	0.059

Table 7: Player 1's behavior in the entrance game (69 observations).

Matching types			Wilcoxon signed rank test (p values)		
team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
77%	67%	64%	0.049	0.108	n.s.

Table 8: Choosing B for player 2 in the entrance game (69 observations).

Groups	Choices	Matching types			Wilcoxon signed rank test (p values)		
		team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^S (38 obs.)	(In,A)	18%	8%	13%	n.s.	0.102	n.s.
	(In,B)	50%	39%	24%	0.007	n.s.	0.034
	Out	32%	53%	63%	0.001	0.011	0.157
L^S (31 obs.)	(In,A)	29%	42%	32%	n.s.	n.s.	n.s.
	(In,B)	26%	19%	16%	0.180	n.s.	n.s.
	Out	45%	39%	52%	n.s.	0.157	n.s.
H^S **vs** L^S (p values)	(In,A)	n.s.	0.001	n.s.			
	(In,B)	0.042	0.073	n.s.			
	Out	0.193	n.s.	n.s.			

Table 9: Player 1's behavior in the entrance game based on groups H^S ($k_i^S \geq K^S$) and L^S ($k_i^S < K^S$).

Groups	Matching types			Wilcoxon signed rank test (p values)		
	team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^S (38 obs.)	76%	71%	68%	n.s.	n.s.	n.s.
L^S (31 obs.)	77%	61%	58%	0.083	0.095	n.s.
H^S **vs** L^S (p values)	n.s.	n.s.	n.s.			

Table 10: Choosing B for player 2 in the entrance game based on groups H^S ($k_i^S \geq K^S$) and L^S ($k_i^S < K^S$).

Groups	Choices	Matching types			Wilcoxon signed rank test (p values)		
		team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^G (38 obs.)	(In,A)	13%	23%	13%	n.s.	n.s.	n.s.
	(In,B)	57%	30%	20%	0.002	0.021	0.180
	Out	30%	47%	67%	0.002	0.058	0.058
L^G (31 obs.)	(In,A)	31%	23%	28%	n.s.	n.s.	n.s.
	(In,B)	26%	31%	20%	n.s.	n.s.	0.102
	Out	43%	46%	52%	n.s.	n.s.	n.s.
H^G **vs** L^G (p values)	(In,A)	0.091	n.s.	0.140			
	(In,B)	0.009	n.s.	n.s.			
	Out	n.s.	n.s.	n.s.			

Table 11: Player 1's behavior in the entrance game based on groups H^G ($k_i^G \geq K^G$) and L^G ($k_i^G < K^G$).

Groups	Matching types			Wilcoxon signed rank test (p values)		
	team	**club**	**university**	**team** vs **university**	**team** vs **club**	**club** vs **university**
H^G (30 obs.)	90%	70%	63%	0.011	0.057	n.s.
L^G (39 obs.)	67%	64%	64%	n.s.	n.s.	n.s.
H^G **vs** L^G (p values)	0.016	n.s.	n.s.			

Table 12: Choosing B for player 2 in the entrance subgame based on groups H^G ($k_i^G \geq K^G$) and L^G ($k_i^G < K^G$).

D Behind the veil of ignorance

Tables 13 and 14 represent respectively the payoff matrices of the baseline game and the entrance game when played behind the veil of ignorance.

Player X	**Player Y**			
	(A,A)	(A,B)	(B,A)	(B,B)
(A,A)	20	2.5	17.5	0
(A,B)	17.5	0	35	17.5
(B,A)	2.5	10	0	7.5
(B,B)	0	7.5	17.5	25

Table 13: Average payoffs for row Player X in the transformed baseline game.

Player X	**Player Y**					
	((In,A),A)	((In,A),B)	((In,B),A)	((In,B),B)	(Out,A)	(Out,B)
((In,A),A)	20	2.55	17.5	0	22.5	5
((In,A),B)	17.5	0	35	17.5	22.5	5
((In,B),A)	2.5	10	0	7.5	5	12.5
((In,B),B)	0	7.5	17.5	25	5	12.5
(Out,A)	12.5	12.5	10	10	15	15
(Out,B)	10	10	27.5	27.5	15	15

Table 14: Average payoffs for row Player X in the transformed entrance game.

Tables 15 and 16 depict tests of independence of behavioral variables in the baseline game (playing A/B as player 1 vs playing A/B as player 2) and the entrance game (playing (In,A)/(In,B)/Out as player 1 vs playing A/B as player 2) respectively.

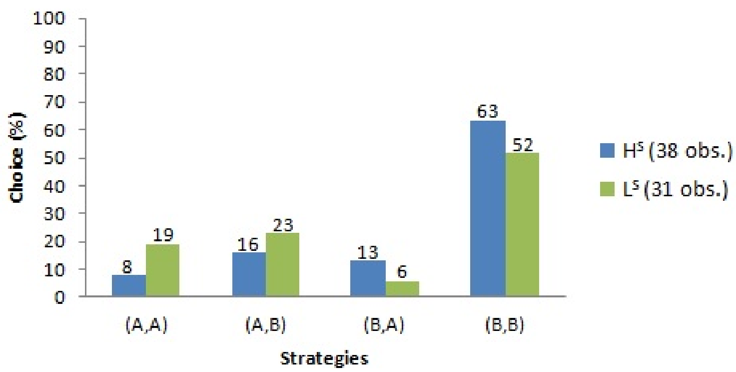
Decision as player 1 (A/B) vs decision as player 2 (A/B) (Pearson's chi-squared test)	**Matching types**		
	team	**club**	**university**
χ^2	5.694	1.729	0.384
p value	0.017	0.189	0.535

Table 15: Independence of decisions as both players in the baseline game (69 observations).

Decision as player 1 ((In,A)/(In,B)/Out) vs decision as player 2 (A/B) (Pearson's chi-squared test)	**Matching types**		
	team	**club**	**university**
χ^2	8.897	0.495	0.950
p value	0.012	0.781	0.622

Table 16: Independence of decisions as both players in the entrance game (69 observations).

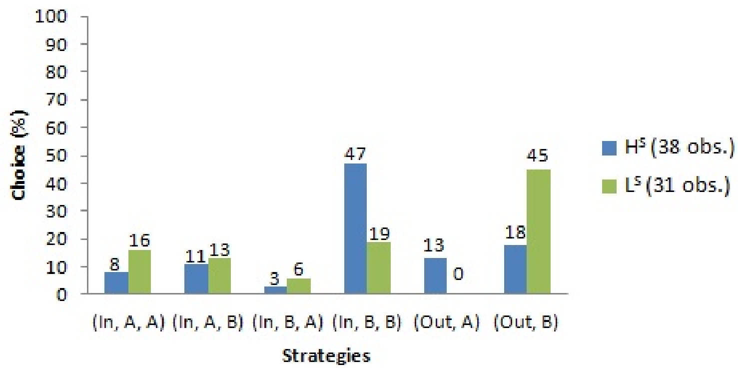
Figures 9 and 10 illustrate the observed behavior in the baseline game and the entrance game respectively, under the assumption that those games are played behind the veil of ignorance.



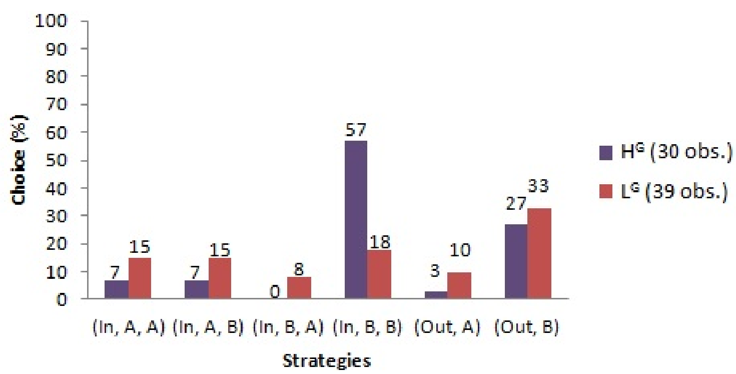
(a) Classification based on self connectedness

(b) Classification based on group connectedness

Figure 9: Behavior in the original position of the baseline game (Team treatment).



(a) Classification based on self connectedness



(b) Classification based on group connectedness

Figure 10: Behavior in the original position of the entrance game (Team treatment).