NEIGHBORHOOD INFORMATION EXCHANGE AND VOTER PARTICIPATION: AN EXPERIMENTAL STUDY*

by

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ABSTRACT

We study the effect of social embeddedness on voter turnout by investigating the role of information about other voters' decisions. We do so in a participation game, in which we distinguish between early and late voters. Each late voter is told about one early voter's turnout decision. Cases are distinguished where the voters are allies (support the same group) or adversaries (with opposing preferences) and where they are uncertain about each other's preferences. Our experimental results show that the social context matters: this information increases aggregate turnout by approximately 50%. The largest effect is observed for allies. Early voters strategically try to use their first mover position and late voters respond to this.

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1. INTRODUCTION

The 'voter paradox' of why substantial portions of large electorates turn out to vote has puzzled economists since Downs (1957). In the Downsian framework, the probability of being pivotal in large-scale elections is negligible and, therefore, expected revenues from casting a vote fall short of the costs. Many theoretical and empirical papers have tried to explain the paradox, but not until the nineteen-eighties did rational choice models start to appear that show that turning out to vote might be rational in an instrumental sense (see Ledyard 1984, or Schram 1991, and the references given there).

For the rational choice approach, an important step forward was made by Palfrey and Rosenthal (1983). They model the turnout decision as a participation game and study it game-theoretically. In this game, there are two or more teams. Everyone has to make a private decision on whether or not to 'participate' in an action, where participation is costly. Participation is beneficial to every member in one's own team and harmful to members of other teams. The team with the higher number of 'participants' gets the (higher) reward.[1] Palfrey and Rosenthal show that in some cases Nash equilibria with sizeable levels of participation exist. However, when the game allows for substantial uncertainty about voters' preferences and costs, equilibria with high participation generally disappear (Palfrey and Rosenthal, 1985).

In this paper, we show that a voter's social environment can have a strong effect on the decision to vote. We do so, while maintaining the rational choice framework offered by the participation game. An important element of the social environment is the information exchanged within it. For the turnout decision, one piece of information that may be relevant is what other voters did. Because people generally do not all vote at the same time of day, this information is often available. We introduce it into the participation game by telling some voters the turnout decision of another voter in their surrounding. This is inspired by the idea that it is natural for interaction to take place before and during elections amongst individuals in small social environments or neighborhoods (*e.g.*, a family or working place). Of course, this interaction can be very complex and take on a variety of forms. To isolate the effects of the specific 'neighborhood information exchange' (NIE) we are interested in, we use laboratory experiments. Our experimental design is based on a model that extends the participation game to include NIE.

[1] The participation game simultaneously combines a between-group conflict for the higher reward with a within-group conflict, where each group member has an incentive to free ride on costly participation by other members of the own group.

In our model, we focus on neighborhoods that consist of two voters only.[2] Information exchange between these voters has two dimensions. First, neighbors know whether they support the same or opposing candidates (or that they are uncertain about each other's preferences). Second, one of them can observe whether her neighbor has cast a vote or not. For this we distinguish between early voters and late voters. By doing so, our study investigates a mix of sequential and simultaneous voting. Though such a mix seems to be realistic, our model cannot, for obvious reasons, represent all possible hybrids that exist outside the laboratory. Nevertheless, we are able to isolate three elements in the complex interaction between voters that may help us better understand the effect of information exchange between them. First, we carefully distinguish between behavior in distinct roles, *i.e*. early and late voters, and how this affects turnout. This distinction between the origin of the information (early voters) and its recipients (late voters) will allow us to study the strategic use of the turnout decision to influence other voters. Second, we are able to systematically investigate the way behavior differs when neighbors are allies or adversaries. It can make a big difference whether you observe someone vote for the candidate you support or for the opposing candidate. Third, we will investigate the importance of established bonds between group members. This is implemented by either keeping groups fixed over time or mixing them before each election. With fixed groups, aggregate behavior is more predictable, which may decrease the value of observing the neighbor's decision as compared to the case where group composition varies.

Our experimental results show strong effects of information exchange. It increases turnout by almost 50%. Moreover, the three elements we focus on matter. First, we observe that early voters use their first mover position in an attempt to influence their neighbor, and that late voters reciprocate a vote by their neighbor when they are allies. Second, segregation has a positive effect on turnout: participation is higher when neighbors are allies, *i.e.* when they support the same candidate. Third, established bonds add to the segregation effect: with fixed groups of allies, we observe the highest turnout. Our results lead us to the conclusion that participants use the structure of the game to implicitly coordinate towards higher turnout for the group they are in, even when high turnout is not part of the equilibrium we derive for the game. A combination of segregation and established bonds gives the most fertile ground for this implicit coordination.

[2] A restriction to two-person neighborhoods is an obvious limitation. However, we are interested in the effect of information per se, and for this, it suffices to focus on the simplest case. Moreover, we shall show that the effect is large, even for the two-person neighborhoods. Bigger and overlapping neighborhoods are an interesting topic for future research.

To the best of our knowledge, we are the first to systematically investigate the effect of information exchange on voter turnout. Moreover, our paper contributes to the limited experimental literature on participation games. Bornstein (1992) was the first to use experiments to study participation in small groups. Schram and Sonnemans (1996a,b) vary group size and compare elections of proportional representation to winner-takes-all elections. Hsu and Sung (2002) investigate participation for equally sized groups in electorates with up to 70 voters. Cason and Mui (2003) use the participation game to model reforms and study the impact of payoff uncertainty and varying costs. Finally, Großer *et al.* (2004) study the effect of preference uncertainty and differences between allied and floating voters. In all of these studies, relatively high rates of participation are found, albeit that lower turnout is observed than in most general elections around the world. In our experiments, we see turnout levels that are much higher than previously observed in experimental participation games. A typical result in previous studies that is replicated in our experiments is that standard Nash equilibria find little support. We will argue that this is because these equilibria do not allow for an (implicit) within-group coordination that we observe in our experiments.

Though neighborhood information exchange has not been studied in a participation game before, various studies of voting contain elements that are relevant for our set-up. Of special interest are results that relate to the influence on voter participation of (i) social embeddedness and communication and (ii) procedures that combine simultaneous and sequential voting. We briefly discuss these two strands of literature.

First, Putnam *et al.* (1993) argue that there is an important link between a society's social capital and the level of voter turnout at its elections. Carlson (1999) provides empirical support. One interesting aspect of social embeddedness is whether interaction takes place between allies or adversaries. Schram and van Winden (1991) argue that social pressure and examples set by group leaders (*i.e.*, allies) play an important role in a voter's decision. Communication is an important aspect of social embeddedness. Schram and Sonnemans (1996b) show that both group identity and within-group communication increase turnout in experimental participation games. Goren and Bornstein (2000) find the same; in addition, they also show that groups use the opportunity of communication to coordinate on a reciprocal strategy towards the other group. All in all, interaction and within-group communication appears to have a positive effect on voter participation.

Second, note that many elections involve elements of both simultaneous and sequential voting (*e.g.*, McKelvey and Ordeshook, 1985; Bartels, 1988; Morton and Williams, 1999, 2000; Dekel and Piccione, 2000; Battaglini, 2004).[3] Most of these models focus on the ability of sequential procedures to increase electoral efficiency by spreading private information. In our study, incomplete information is not essential. Rather, we are interested in the exchange of information about participation decisions within neighborhoods, where preferences are known (we only use incomplete information in one case, where voters do not know which candidate their neighbor supports).[4]

The remainder of this paper is organized as follows. Section 2 describes the NIE participation game and the experimental design and section 3 gives our experimental results and interprets them. We conclude in section 4.

2. THE NIE PARTICIPATION GAME AND EXPERIMENTAL DESIGN

The NIE participation game consists of two stages. There are two (equally sized) groups of players (voters) and within each group an equal number of senders (early voters) and receivers (late voters) of information is distinguished. At stage 1, each sender decides whether to participate or abstain. Each sender knows that (only) her receiver-neighbor will observe this decision. If the sender participates, she does not take part in stage 2. If she abstains, she again decides on participating or abstaining at stage 2, but this time she knows that this decision will not be observed. At stage 2, receivers decide whether or not to participate, knowing their sender-neighbor's stage 1 decision.[5] Note that neither senders nor receivers observe others' stage 2 decisions. The outcome of the game is determined by counting all stage 1 and 2 participation in the two groups, with the higher reward going to the members of the group with the highest participation (with a coin toss deciding in case of a tie). A formal description and analysis of our model is presented in Appendix A.

The computerized[6] experiment was run at the laboratory of the Center for Research in Experimental Economics and political Decision making (CREED) of the University of Amsterdam. Subjects were recruited from the university's undergraduate population. 168 subjects participated in 10 sessions. Each session lasted about 2 hours (*cf.* Appendix B for the

[3]In related studies, games are analyzed where a political action other than voting is followed by simultaneous voting (*e.g.* Lohmann, 1994a,b).

[4] Jackson (1983) empirically studies the effect on voter turnout of election night reporting, *i.e*. the projection of results before the end of the polls, during the 1980 US presidential election. Jackson reports that the projection (*i.e.*, information exchange) decreased the turnout of voters who had not yet participated.

[5]Notice the difference between our setup and standard models of information cascades and herding in economic (*e.g.*, Banerjee, 1992; Bikhchandani *et al.,* 1992) and social choice (*e.g*., Fey, 1996; Wit, 1997) environments. There, everybody is both sender and receiver, except for the first and the last player. In addition, contrary to the participation game, there is a common interest among players in these models.

[6] RatImage (Abbink and Sadrieh, 1995) was used to program the software.

read-aloud instructions). Earnings in the experiment are measured in tokens. At the end of a session token earnings were transferred to cash at a rate of 4 tokens to one Dutch Guilder (≈ € 0.45). On average, subjects earned 48.66 Guilders.

Each electorate consists of 12 voters: two groups of 6 subjects each. Given that we do not know the structure of the correlations across observations, we treat the electorate as the only independent unit of observation, giving us 14 such observations. Each subject is either sender or receiver throughout the experiment and knows her role from the beginning of the session. There are always 3 senders and 3 receivers in each group and 6 neighborhoods (each consisting of 1 sender and 1 receiver) in each electorate.[7]

Our first treatment is related to the matching protocol of subjects within an electorate, where we distinguish 'partners' and 'strangers' (*cf.* Andreoni, 1988). In 'partners', subjects in an electorate are randomly allocated to groups at the beginning of the first round, and groups remain constant thereafter. In 'strangers', subjects are randomly reallocated to the two groups at the beginning of each round. A natural interpretation of partners versus strangers in this context is that partners constitute an electorate of voters who remain loyal to their party across elections. Strangers can be seen as 'floating voters' who may switch from one party to another between elections (*cf.* Großer *et al.* 2004). Of course, partners and strangers are varied in a between-subject design.

Our second treatment is varied in a within-subject design. This deals with the information about the neighbor's vote. If voters are '*informed*', we distinguish rounds in which neighbors are from the same ('*allies*') and different ('*adversaries*') groups, and rounds in which '*allies*' and '*adversaries*' each occur with probability of 0.5 ('*uncertain*'). As a control, we organized four '*uninformed*' electorates in which no information about others' votes was provided. In these sessions we keep the decision structure as close as possible to '*informed*' by maintaining the two decision making stages described above as well as the labels 'sender' and 'receiver'. In the analysis below, we will refer to subjects in these sessions as neighbors, senders, and receivers even though no information was exchanged between them.

Each session lasts 99 decision rounds. 33 rounds use the information condition '*allies*', 33 use '*adversaries*', and 33 use '*uncertain*'.[8] This is varied in a random, predetermined manner.

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[7] In 4 sessions, two electorates participated simultaneously, and 6 sessions were held with one electorate each. In sessions with more than one electorate, there is no interaction of any kind between subjects in different electorates. This is known to all subjects.

[8] We chose to vary the structure of preferences in neighborhoods in a within-subject design (33 rounds of each information condition) in order to restrict the number of electorates needed. On the other hand, we decided to study the uninformed case in separate sessions in order to link our experiment to previous experimental participation games. As a consequence, uninformed subjects made 99 decisions in the same setting, whereas

In each round, each subject in the winning group receives a revenue of 4 tokens and each subject in the losing group of 1 token. Participation costs are 1 token (avoiding negative payoffs). Table 1 summarizes treatments and parameters.

TABLE 1: SUMMARY OF TREATMENTS AND PARAMETERS

Treatment	# Rounds (per info-condition)	Revenue win(lose)	Parti-cipation costs	Size of electorate (groups)	# Senders (receivers) per group	Indepen-dent obser-vations
Informed Partners (IP)	99 (33)	4 (1)	1	12 (6)	3 (3)	5
Informed Strangers (IS)	99 (33)	4 (1)	1	12 (6)	3 (3)	5
Uninformed Strangers (US)	99 (33)	4 (1)	1	12 (6)	3 (3)	4

Note: 'I' = 'informed', 'U' = 'uninformed', 'P' = 'partners', and 'S' = 'strangers'.

In appendix A, we derive quasi-symmetric Nash equilibria for our experimental parameters.[9] One such equilibrium is in pure strategies and involves all voters casting a vote. Others involve behavioral strategies (cf. table A1 in appendix A), which allow us to formulate five hypotheses with respect to the comparative statics in our design:

H1: Turnout is higher when neighbors are adversaries than when they are allies.

H2: When they are allies, senders participate at a higher rate than receivers.

H3: Senders participate at higher rates at stage 2 than at stage 1.

H4: Receivers participate more after observing abstention than after observing a vote.

H5: After observing a vote, receivers are more likely to participate if the neighbor is an adversary than in case of an ally.

We will return to these comparative statics based on Nash equilibria, when presenting our results.

We have no theoretical basis to predict the effect of our strangers versus partners treatment. Though Schram and Sonnemans (1996a) report higher turnout for partners in a standard participation game, the effect of NIE might differ for the two, so it is unclear whether we should expect the same result. Intuitively, the information value of observing a neighbor's decision will be lower when groups are fixed as compared to the case where group

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informed subjects made 33 decisions in each of the three conditions. The differences between uninformed and informed are so strong (and stay strong if we only consider the first 33 or the last 33 rounds of uninformed), that we are confident that the number of rounds did not affect the results that we will present below.

[9] Goeree and Holt (forthcoming) show that a logit equilibrium can account for the Schram and Sonnemans (1996a) data and Cason and Mui (2003) show the same for their own data. Our model is too complex to derive logit equilibria, however.

composition varies. In partners, aggregate behavior is supposedly more predictable because the stable environment allows one to gather information about participation across rounds. This intuition predicts that NIE is more important for strangers than for partners.

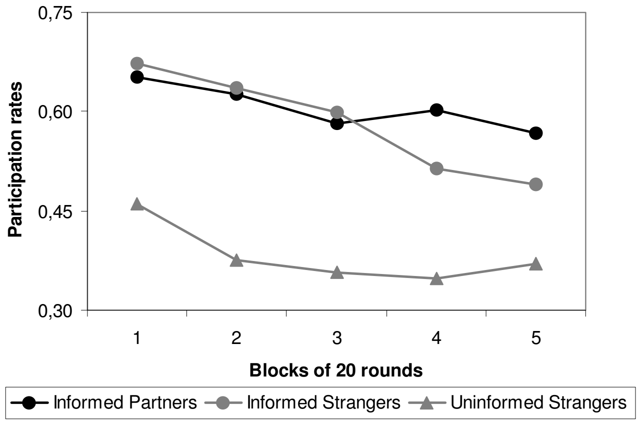
3. EXPERIMENTAL RESULTS

This section presents and analyzes our experimental results. We start with overall participation for all treatments, followed by an investigation of participation rates in the three information conditions. Then, our focus will be on behavior of senders and receivers. After discussing electoral efficiency and realized earning distributions, we will try to put the pieces of the puzzle together and get a grasp of what the effect of NIE is. For our analysis we use nonparametric statistics as described in Siegel and Castellan, Jr. (1988). For the reasons mentioned above all of our tests will be conducted at the electorate level.

3.1 AGGREGATE PARTICIPATION RATES

Figure 1 gives aggregate participation rates averaged over blocks of 20 rounds each (19 rounds in the last block).

FIGURE 1: AGGREGATE PARTICIPATION RATES.



RESULT 1: *Neighborhood information exchange increases turnout.*

Aggregate average participation rates are substantially higher when information is exchanged (IS) than when it is not (US). IS starts at an average participation of 67% in rounds 1-20 and ends at 49% in rounds 81-99. At the same time, average participation in US varies between

46% and 37%. The null hypothesis of no difference is clearly rejected at the electorate level: there is not one observation in US that exceeds those in IS (one-tailed Wilcoxon-Mann-Whitney test, 1% significance level).

RESULT 2: *The stability of group composition does not affect turnout.*

In our design, the stability of group composition is varied by way of our partners versus strangers treatments. The 'loyal voters' in IP start at an average participation rate of 65% and end at 57%. The floating voters in IS decrease from 67% participation to 49%. A Wilcoxon-Mann-Whitney test cannot reject the null hypothesis of no difference (10% significance level, two-tailed test).[10]

When there is no information exchange (US), aggregate participation rates are at similar levels to those observed in previous experimental studies on participation games. For example, Schram and Sonnemans (1996a) report average turnout rates of 31% (42%) for the winner-takes-all case with two groups of 6 players in strangers (partners). For strangers, this is somewhat lower than what we observe in US (38%). Aggregate participation rates in the two informed treatments are much higher than previously observed for both partners and strangers.

3.2 PARTICIPATION RATES AND NEIGHBORS' PREFERENCES

Figure 2 shows participation rates disaggregated for the treatments *allies*, *adversaries*, and *uncertain* for IP and IS, respectively.[11]

RESULT 3: *When information is exchanged, turnout is highest amongst allies and lowest when neighbors do not know each other's preferences.*

We observe the same ranking of participation in both figures, with average participation rates highest in *allies* and lowest in *uncertain*. This ranking is observed in all blocks of rounds, except one. A Friedman two-way analysis of variance by ranks rejects the null hypothesis of no ordering in favor of this ranking at the 5% significance level for IP and at 1% significance for IS.

[10] Figure 1 suggests that a difference may occur in the last two blocks. The test does not reject the null hypothesis of no differences for these blocks either, however.

[11] The number of observations per block differs across information conditions because each condition is used 33 times in a predefined random sequence. In block 1 (2; 3; 4; 5), *allies* was used 6 (9; 6; 5; 7), *adversaries* 5 (7; 8; 8; 5), and *uncertain* 9 (4; 6; 7; 7) times.

FIGURE 2A: PARTICIPATION RATES IN INFORMED PARTNERS (IP).

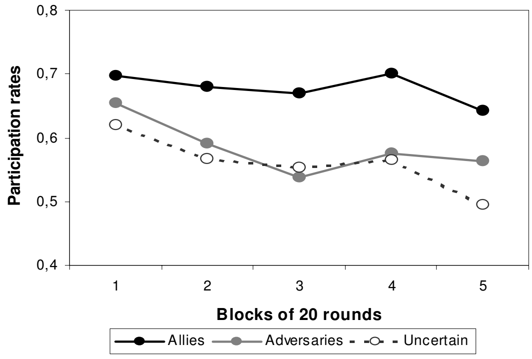
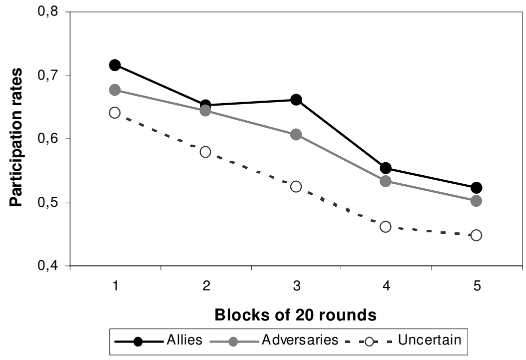


FIGURE 2B: PARTICIPATION RATES IN INFORMED STRANGERS (IS).



Note the distinct dynamics across information conditions. When voters are loyal to their party (IP), participation remains stable (at approximately 70%) for allies. [12] In *adversaries* and *uncertain*, however, turnout decreases from the first to the second block of rounds and then remains more or less stable (except for a drop in the last block of *uncertain*). With floating voters (IS), participation decreases more or less steadily across rounds.

We can use result 3 to test the first of the comparative static predictions that we derived from the Nash equilibria for our game.

TEST OF H1. H1 predicts that turnout is higher when neighbors are adversaries than when they are allies. We observe the opposite in Result 3. In section 3.7, we will discuss what may be driving this **rejection** of the equilibrium prediction.

3.3 COMPARING PARTICIPATION RATES FOR SENDERS AND RECEIVERS

Table 2 gives the participation rates per treatment, role, and stage across all rounds. We start with a comparison of participation by senders and receivers.

RESULT 4: *Senders participate at a higher rate than receivers do.*

There are 7 possible comparisons for sender and receiver turnout (3 conditions each in IP and IS, plus US). Only when neighbors are uncertain about each others' preferences in IP do we observe (non-significant) higher turnout for receivers. Aggregating across *allies*, *adversaries*

[12]This result supports studies suggesting that segregation (*i.e.*, *allies*) increases participation (Butler and Stokes 1974; Ragin 1986; Takács 2001, 2002). That participation is lowest with uncertainty may seem surprising. Intuitively, one would expect participation in *uncertain* to lie between that in *allies* and *adversaries*. Apparently, the additional source of uncertainty drives down participation. A similar observation is made in Großer *et al.* (2004), where participation rates are lower when uncertainty about others' preferences is introduced.

TABLE 2: PARTICIPATION RATES

Treatment		Participation rates						
		Senders			Receivers			All
		Stage 1	Stage 2*	Total	Turnout observed	Abstention observed	Total	Total
IP	*allies*	.634	.251	.726	.631	.619	.626	.676
	adversaries	.277	.432	.589	.518	.589	.570	.579
	uncertain	.371	.279	.546	.659	.533	.580	.563
	Total	.427	.321	.621	.603	.580	.592	.606
IS	*allies*	.619	.268	.721	.586	.430	.526	.624
	adversaries	.388	.434	.654	.557	.513	.530	.592
	uncertain	.366	.298	.555	.580	.473	.512	.533
	Total	.458	.333	.643	.574	.472	.523	.583
US	Total	.379	.121	.455	---	---	.309	.382

*Turnout as a fraction of senders making a decision at stage 2.

and *uncertain*, we always observe higher turnout by senders, though the difference is relatively low in IP (3%-points), compared to IS (12%-points) and US (15%-points). Wilcoxon signed ranks tests reject the null hypothesis of no difference for IS and US in favor of higher rates for senders (10% significance level, one-tailed tests), but cannot reject it for IP at the same significance level. When testing for *allies*, *adversaries* and *uncertain* separately, we reject the null in favor of higher turnout by senders in 3 out of 6 cases.

The higher participation of senders than receivers in US (where no information is exchanged) comes as a surprise. Note that receivers participate at the same rate (31%) as subjects where no NIE takes place (Schram and Sonnemans, 1996a). This result suggests an influence on participation by senders of the two-stage decision procedure itself. We can think of three possible explanations. First, there may be a 'timing effect' where first movers behave differently than second movers, even when no information is exchanged (see, *e.g.*, Rapoport, 1997; Weber *et al.*, 2004). Second, the labels 'sender' and 'receiver' may cause a framing effect (*e.g.*, Tversky and Kahneman, 1981), provoking senders to participate more. Third, the freedom to delay the decision, *i.e.* because the exact same alternative occurs again at stage 2, may be an explanation for our finding. Because US is only used as a benchmark, we will not elaborate on this finding. It is important to note that participation by both senders and receivers in all of the IP and IS conditions is (much) higher than that of senders in US. It is on this higher turnout that we focus.

TEST OF H2. H2 predicts that, when allies, senders participate at a higher rate than receivers do. This is **supported** by the numbers in table 2. One-tailed Wilcoxon signed ranks tests show that the higher turnout of senders is not statistically significant when the allies are partners (at the 10%-level), but it is when they are strangers (5%-level). When IP and IS are aggregated, the difference is statistically significant as well (1%-level).

3.4 SENDER BEHAVIOR

In aggregate, senders' participate most in IS and least in US (*cf.* table 2). Wilcoxon-Mann-Whitney tests show that the differences between IP and US (62% *vs.* 46%) and IS and US (64% *vs.* 46%) are statistically significant at the 1% level, but the null that senders participate at the same rate in IS and IP (64% *vs.* 62%) is not rejected at the 10% level (all one-tailed tests).

We can use table 2 to have a closer look at result 3, that turnout is highest amongst allies, followed by adversaries. From table 2 it appears that this ranking is mainly caused by the senders. Differences across information conditions appear to be smaller for receivers. For example, in strangers, there is almost no difference in aggregate receiver behavior across the conditions. In fact, for receivers, the differences are not significant in either IP or IS (Friedman two-way analysis of variance by ranks, 10% significance level). In contrast, the differences are significant in both IP (5%-level) and IS (1%-level) for senders. Apparently, senders play a crucial role in the aggregate result.

Of course, senders have two possibilities to participate. Table 2 and Figure 3 show participation rates at each of the two stages.

RESULT 5: *Senders attempt to influence their neighbor. If the receiver is an ally, senders mainly vote at stage 1. If the receiver is an adversary, senders participate more at stage 2.*

Table 2 and Figure 3 show substantially higher sender participation rates for allies at stage 1 than at stage 2 in both IP (63% *vs.* 25%) and IS (62% *vs.* 27%). The difference is statistically significant (5%-level, one-tailed Wilcoxon signed ranks test) in both cases. For adversaries, we observe the opposite: senders' participation rates are lower at stage 1 than at stage 2 (28% *vs.* 43% in IP; 39% *vs.* 43% in IS). The difference is significant (5%-level, one-tailed Wilcoxon signed ranks test) for IP, but not for IS (at the 10% level). In *uncertain*, senders participate at a higher rate at stage 1 than at stage 2 (37% *vs.* 28% in IP; 37% *vs.* 30% in IS), but the differences are much smaller than in *allies* and insignificant at the 10% level.

Note that 'senders' in our control treatment US participate at higher rates at stage 1 than at stage 2 (38% *vs.* 12%). This holds for each electorate. In fact, at stage 1 they participate at the same rate as senders do in *adversaries* or *uncertain* when information is exchanged. This

FIGURE 3A: SENDERS' PARTICIPATION RATES AT STAGES 1 AND 2 IN IP.

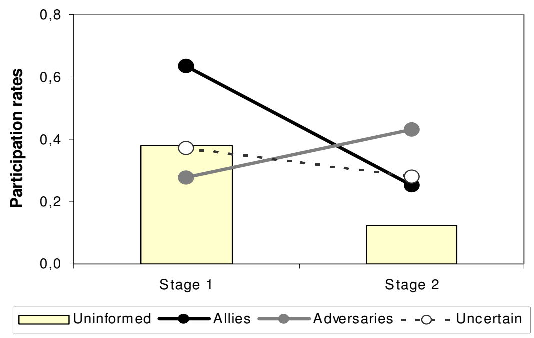
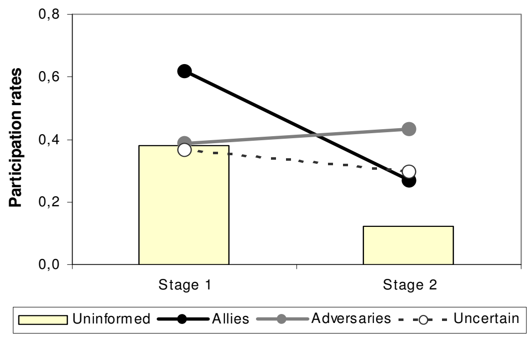


FIGURE 3B: SENDERS' PARTICIPATION RATES AT STAGES 1 AND 2 IN IS.



appears to imply that there is a tendency to participate at a base rate of 30-40% by senders at stage 1, unless they are matched with an ally, in which case their turnout is almost twice as high. In the absence of information, receivers participate at approximately this base rate as well. At stage 2, the 'uninformed' base rate is at approximately 10-15%. In *allies* and *uncertain*, senders participate at somewhat higher rates than this, but the most noticeable fact is that senders whose neighbors are adversaries vote at a much higher rate (43%) at stage 2, when their decision is not observed.

Participation levels of senders and their patterns of behavior are similar for partners and strangers. In this respect, our conjecture that information exchange is more important in strangers is not supported for senders. However, senders are trying to influence their receiver-neighbors. If their choices have different effects on receivers in partners than in strangers, there may be an indirect effect of senders' behavior on the role of information exchange. We will discuss this in the next subsection. Here, we close with a result for the comparative statics.

TEST OF H3. H3 predicts that senders' turnout rates are higher at stage 2 than at stage 1. Result 5 shows that this is **rejected** for allies and **supported** for adversaries.

3.5 RECEIVER BEHAVIOR

Our focus is on the response of informed receivers to their neighbor's stage 1 decision. Uninformed receivers' behavior serves as a benchmark. We have two results.

RESULT 6: *Receivers participate at a higher rate in partners than in strangers.*

Contrary to senders, receivers behave differently in partners and strangers. Their turnout is lower in strangers (59% vs. 52%); both are substantially higher than the 31% in US (*cf.* table 2). One-tailed Wilcoxon-Mann-Whitney tests reject the null hypothesis of no differences in favor of higher rates for receivers in both informed conditions than in *uninformed* (1% significance level) and in IP than in IS (10%-level). This holds for *allies*, *adversaries*, and *uncertain* and for both observed decisions of their sender-neighbors (the only exception is that receivers vote at a higher rate in IS than in IP after observing a vote in *adversaries*). Moreover, aggregate participation by receivers is lower than by senders, especially in IS (*cf.* result 4).

RESULT 7: *Receivers reciprocate allied senders' stage 1 decisions in strangers.*

For partners (IP), responses to senders' stage 1 decisions vary: participation rates after observing a sender vote are equal to those after abstention in *allies* (63% *vs*. 62%), they are lower in *adversaries* (52% *vs*. 59%), and higher in *uncertain* (66% *vs*. 53%). Only the latter difference is statistically significant at the 10%-level (one-tailed Wilcoxon signed ranks tests). In contrast, in IS we always observe higher participation rates after senders participate than when abstention is observed (*allies*: 59% *vs*. 43%; *adversaries*: 56% *vs*. 51%; *uncertain*: 58% *vs*. 47%). Wilcoxon signed ranks tests reject the null of no difference for *allies* and *uncertain* at the 10%-level (one-tailed tests), but cannot reject it for *adversaries*.

Contrary to senders, this result for receivers supports our conjecture that information exchange is more important in strangers than in partners. Note an important element of our design: receiver responses to sender stage 1 decisions remain unobserved by sender-neighbors, making it impossible for receivers to directly inform their neighbors about their decision. In partners, however, indirect information is passed on across rounds by way of aggregate (group) turnout(s). This seems to outweigh local neighborhood exchange (for more, see section 3.7). As a consequence, receivers do not respond systematically to sender-neighbors' stage 1 decisions in partners.

TEST OF H4. H4 predicts that receivers respond to observed abstention by participating more. This is **rejected** by our data, especially for the strangers treatment.

TEST OF H5. H5 compares receivers' responses to an observed vote and predicts a higher turnout for receivers-adversaries. Table 2 **rejects** this prediction: in both IP and IS, receivers vote more after seeing an ally vote than after participation by an adversary.

3.6 EFFICIENCY AND EARNINGS

The efficiency of an allocation is simply defined as the sum of actual round earnings divided by 30 (with a minimum of 60%).[13] Realized efficiency is inversely related to aggregate turnout. Because of the high participation in both *informed* treatments, average efficiency is relatively low at 76% in IP and 77% in IS. In US it is 85%. It follows directly from results 1 and 2 that the differences between *informed* and *uninformed* are statistically significant.

As for earnings, we know from result 4 that senders vote at a higher rate than receivers. Because the number of senders and receivers in the winning (and losing) groups are always equal, a direct implication is that senders earn less than receivers do. Finally, we consider the distributions of earnings for the various treatments. These are plotted in figure 4.

FIGURE 4: EARNING DISTRIBUTION PER TREATMENT.

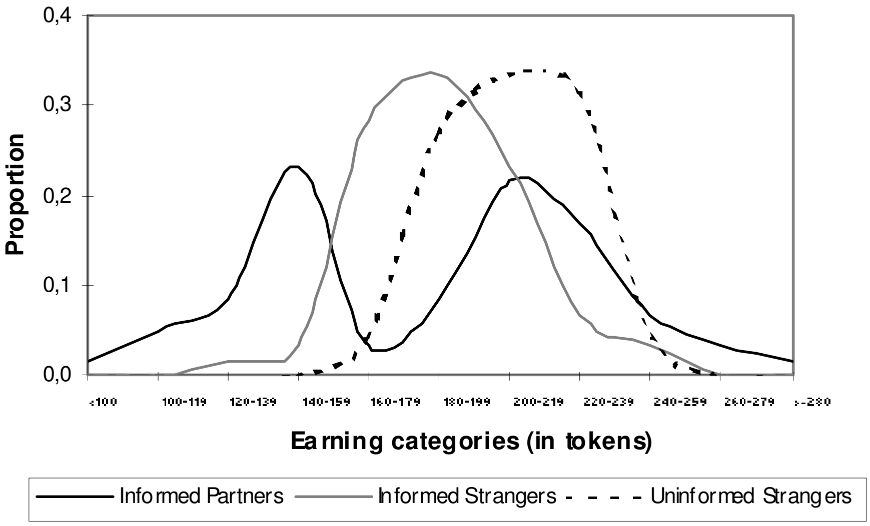


Figure 4 clearly shows a more dispersed distribution of earnings in IP than in IS and US. The earning distributions of IS and US are singled peaked, whereas that of IP has two peaks. Mean earnings are highest in US, because of the lower turnout. A closer inspection reveals that in partners-electorates there is typically domination by one group in terms of the number of victories. Hence, the weaker group is represented by lower earnings (left peak in figure 4) than the stronger group (right peak).[14]

[13]Groups are of equal size and in all cases the sum of revenues is the same, independent of participation and which group wins. Any participation is costly. Hence, efficiency requires that nobody participates. With our parameters, the efficient sum of earnings per round is 6x4+6x1=30. The lowest efficiency occurs when everyone votes. In this case, earnings are 6x3+6x0=18.

[14] Lijphart (1997) discusses the problems arising in democracies where turnout is unequal across groups.

3.7 INTERPRETING THE RESULTS

In this subsection, we provide a general picture of the effect of neighborhood information exchange on participation. We do so by formulating a conjecture of what is taking place in our experiment and providing statistical tests for it. The processes described can account for results 1-7 and for our conclusions with respect to H1-H5.

The core of our conjecture is an implicit coordination between subjects.[15] This may take various forms in our experiment. An important distinction is between coordination at the *neighborhood*- and *group*-levels. We start the discussion with a second distinction, however, that between *intra*- and *inter*-group coordination. Within groups, coordination is to higher levels of participation, in order to 'beat' the other group. Between groups, coordination aims at reducing participation in order to decrease costs (*i.e.*, increase efficiency). Coordination in participation games has been observed, before. Schram and Sonnemans (1996b) and Goren and Bornstein (2000) report an increase in participation, when within-group communication is introduced. Both studies use partners. The communication allows for explicit, though not binding, coordination. In essence, their results suggest that intra-group coordination (towards participation) dominates inter-group coordination (towards abstention). In our experiments, we did not allow for communication. Therefore, *explicit* coordination is not possible. Our conjecture is based on the idea that NIE allows for *implicit* coordination, however. We will see that intra-group coordination is dominant here as well.

Next, consider the level at which coordination takes place. Introducing NIE gives participants an opportunity to (implicitly) coordinate within their neighborhoods. This is possible in partners as well as in strangers. On the other hand, (implicit) coordination at the group level can arise across rounds in partners, but not in strangers. As a consequence, we predicted the relative importance of NIE to be lower in partners than in strangers. Therefore, we distinguish between the ways in which NIE works in both treatments.

Our major finding holds for both, partners and strangers, however: NIE substantially increases overall participation. Interaction within neighborhoods has a strong effect *per se*. For strangers, this follows directly from a comparison between IS and US (58% *vs*. 38%; *cf*. result 1). For partners, we note that Schram and Sonnemans (1996a) report an average turnout of 42% without NIE, which is much lower than the 61% we observe. Moreover (as in the studies mentioned above), we observe no inter-group coordination towards (efficient) abstention.

[15] Here, our aim is to provide a unified description of the behavioral patterns observed in our experiment. We do not intend to neglect voters' individual incentives. Coordination (explicit or implicit) allows individuals to better achieve their individual goals in repeated interactions, however.

First consider *strangers*, where implicit coordination seems impossible at the group level. Here, subjects rely much more on a period-by-period coordination within neighborhoods. The difference between allies and adversaries turns out to be important.[16] When neighbors are allies, senders signal their preference for joint participation by voting early and we see a strong response by receivers. They reciprocate a vote by their neighbor by voting themselves at much higher rates than after observing abstention. The situation is completely different when neighbors are adversaries. Senders no longer take the initiative to coordinate at higher levels of participation. Receivers realize this and do not respond to the observed decision. They (rightfully) assume that observed abstention is uninformative about second stage sender behavior. This process can account for results 1, 3 (for the *allies-adversaries* comparison), 4, 5, and 7 for strangers, for our confirmation of H2 and H3 (for *adversaries*), and for our rejection of H1, H3 (for *allies*), H4, and H5.

In *partners*, there is an additional opportunity for implicit coordination by establishing bonds across rounds. Once again, implicit intra-group coordination appears to be taking place, again triggered by sender behavior. When neighbors are allies, senders try to provoke high levels by high participation at stage 1 (when they are adversaries, senders withhold their 'signals'). This is successful, because it boosts the 'coordinated' level of turnout to almost 70%. However, contrary to strangers, this is not caused by direct reciprocation by receivers. Even receivers who observe abstention vote at higher rates (62%, for *allies*). We attribute this to them experiencing higher levels of own group participation in all rounds. In this way, the senders' 'signals' have an effect across rounds just as much as within rounds. It lifts the 'coordinated' turnout to a higher level. This partners-effect gives rise to distinct turnout levels across groups, yielding the bimodal distribution of earnings described above. These combined NIE- and partners-effects, triggered by senders, can account for results 1, 3 (for the *allies-adversaries* comparison), 4, 5, and 7 for partners. It also accounts for our confirmation of H2 and H3 (for *adversaries*), and for our rejection of H1, H3 (for *allies*), H4, and H5.

To test our conjecture, we estimate a model of sender and receiver behavior, and compare the results to both the predictions of quasi-symmetric Nash equilibria (see table A1 in appendix A) and our conjecture on implicit within-group coordination.[17] We do so separately for partners and strangers. The panel model we estimate is given by:

[16] When the neighbors' preferences are uncertain, we observe intermediate results for both partners and strangers.
[17] Our experimental results show no support for the pure strategies in which everybody participates. Hence, we do not consider them further.

$$D_{i,t}^{S} = \beta_0^S + \beta_1^S \frac{t}{100} + \beta_2^S ALLIES_t + \beta_3^S V_{i,t-1}^{-i} + \varepsilon_{i,t} + \mu_i$$
$$D_{i,t}^{R} = \beta_0^R + \beta_1^R \frac{t}{100} + \beta_2^R ALLIES_t + \beta_3^R V_{i,t-1}^{-i} + \beta_4^R T_{i,t} + \beta_5^R (T_{i,t} \times ALLIES_t) + \varepsilon_{i,t} + \mu_i, \tag{1}$$

where *i* denotes the voter and *t* denotes the round. $D_{i,t}^{S}$ ($D_{i,t}^{R}$) is a dummy variable equal to 1 if a sender votes at stage 1 (if a receiver votes) and 0, otherwise.[18] $ALLIES_t$ is a dummy variable distinguishing rounds where neighbors are allies from those where they are adversaries (we disregard the rounds where it is uncertain who the neighbor supports because we have no comparative static Nash predictions for this case). $V_{i,t-1}^{-i}$ is equal to the number of votes cast by other members of the voter's group in the previous round. It is used to capture the cross-round effects in our conjecture for partners. The dummy variable $T_{i,t}$ is equal to 1 (0) if receiver *i*'s sender-neighbor voted in round *t*. $\varepsilon_{i,t}$ and μ_i are error terms, where the latter is a random effect used to correct for the panel structure in our data. The β's are coefficients to be estimated.

Table 3 presents the predictions for the coefficients and the results of our random effects probit estimation.[19] Note that the results always support either the Nash predictions or our conjecture (or both). However, our conjecture finds much more support: all predictions except two are corroborated by the data. The first unexpected result (based on a test result at the 10%-significance level) is that receivers in partners respond negatively to a vote by an adversary-sender ($T_{i,t} = 1$ and $T_{i,t} \times ALLIES_t = 0$). On the one hand, this supports the Nash prediction, on the other hand, it could also be a straightforward statistical consequence of the dominance of one group over the other in terms of the number of victories (*cf.* subsection 3.6). Voters who observe turnout (abstention) by an adversary-neighbor are more likely to be in the dominated (dominant) group, hence, more likely to abstain (vote). The other unexpected result is that receivers in strangers vote less when allies than when adversaries. It seems that (as predicted by the Nash equilibrium) receivers have a lower propensity to participate when allies, unless they are stimulated by their sender-neighbors ($T_{i,t} \times ALLIES_t = 1$).

Our results reject many of the Nash predictions. To some extent this may be a consequence of our restriction to quasi-symmetric equilibria or of not allowing for cross-round effects in the finitely repeated game. If we drop either of the restrictions, a plethora of

[18] We only consider senders' stage 1 behavior because this is what our conjecture is most explicit about. Moreover, we include the round (scaled by dividing by 100) in the equation to allow for learning effects.

[19] This empirical analysis serves to test our conjecture by investigating individual choices. Therefore, we no longer use the electorate as the unit of observation, but the individual. The random effects specification corrects for correlations between an individual's choices across rounds.

TABLE 3: RANDOM EFFECTS PROBIT ESTIMATION RESULTS

Coef-ficient	Partners			Strangers		
	Nash[1]	**Conjecture[2]**	**Estimate**	**Nash[1]**	**Conjecture[2]**	**Estimate**
β_0^S	n.p.	n.p.	-1.17 (7.73)*	n.p.	n.p.	-0.40 (2.61)*
β_1^S	n.p.	n.p.	-0.07 (0.57)	n.p.	n.p.	-0.15 (1.12)
β_2^S	+	+	1.32 (16.96)*	+	+	0.83 (11.93)*
β_3^S	0	+	0.09 (2.89)*	0	0	0.04 (1.33)
β_0^R	n.p.	n.p.	-0.09 (0.46)	n.p.	n.p.	0.53 (3.48)*
β_1^R	n.p.	n.p.	-0.08 (0.69)	n.p.	n.p.	-0.93 (7.17)*
β_2^R	–	0	0.10 (0.29)	–	0	-0.33 (3.42)*
β_3^R	0	+	0.11 (3.78)*	0	0	0.03 (0.29)
β_4^R	–	0	-0.20 (1.82)**	–	0	-0.05 (0.50)
β_5^R	–	0	0.23 (1.63)	–	+	0.52 (3.73)*

Notes: Results for the random effects estimates are available from the authors. The coefficients are defined in eq. (1). Absolute *z*-values are given in parentheses. * indicates significance at the 1%-level and ** indicates significance at the 10%-level. For the predictions: 'n.p.' = no prediction; '–' = negative coefficient predicted; '0' = prediction is that there is no effect; '+' = positive effect predicted. A shaded cell for a prediction indicates that it is *supported* by our data.

[1]The Nash predictions are the same for partners and strangers. Specifically, the signs predicted here follow from the quasi symmetric Nash equilibria described in section 2; the signs for the β_2's follow from table A1 in appendix A; the '0' for the β_3's is because no cross-round effects are predicted for this finite game (see the discussion in the main text). The negative signs for β_4 and β_5 are predicted by H4 and H5, respectively.

[2]From our conjecture it follows that senders vote more at stage 1, if allies ($\beta_2^S > 0$, for partners and strangers); that receivers are not affected by the information condition ($\beta_2^R = 0$, for partners and strangers); that senders and receivers respond positively to their own group turnout in previous rounds (β_3's positive) for partners but not so (β_3's = 0) for strangers; that receivers do not respond to a sender's vote in partners ($\beta_4^R = \beta_5^R = 0$) and only respond positively to an allied sender's vote in strangers ($\beta_4^R = 0; \beta_5^R > 0$).

equilibria appear, however. In essence, letting these restrictions go implies that the Nash concept loses its predictive power. In contrast, the straightforward predictions derived from our conjecture find support in the data.

We conclude that implicit intra-group coordination at the neighborhood- and group-level for partners and only at the neighborhood-level in strangers can explain most of our findings. In both cases, senders play an important coordinating role. This implicit coordination also explains why the Nash equilibria predict poorly, because these do no allow for any kind of coordination. Two results still need to be explained. Our result 2 (that aggregate participation levels are the same for fixed groups and changing groups) implies that the two types of implicit coordination yield comparable turnout rates for partners and strangers. Result 6 (that receivers participate more in partners than in strangers) is a consequence of receivers' role in group-level coordination in partners. Other findings that remain unexplained are: (i) senders vote at a higher rate at stage 1 than at stage 2, even without NIE. As discussed above, we can think of a number of reasons why this might be the case; (ii) the uncertainty created in our treatment *uncertain* decreases participation. This explains the last part of result 3, but will not be elaborated, further.

4. CONCLUSIONS

Many social scientists are aware that social embeddedness matters for behavior in public goods settings in general and for voter participation in particular. Putnam *et al.* (1993), for example, argue that there is an important link between a society's social capital and its civilians' voter participation. Empirical support for this idea is given by Carlson (1999). This social capital or embeddedness has many dimensions, however. One important element is information about others' behavior. In this study, we have isolated this element by focusing on the exchange of information within 'neighborhoods' of two voters in an electorate. We did so by extending the traditional participation game to allow for 'neighborhood information exchange' (NIE). At a first stage, 'sender-voters' decide whether or not to participate and their receiver-neighbor observes this decision. In case they abstain, senders again decide whether or not to participate at a second stage, this time simultaneously with the receivers. Sender- and receiver-neighbors are either known to be allies or adversaries or are uncertain about each other's preferences.

The experimental results we find for the NIE-participation game strongly support the notion that this information matters. We find substantially higher participation when information is exchanged than is usually observed in experimental participation games. Participation is higher when neighbors are allies than when they are adversaries. It is highest when allies can also establish bonds across rounds. These mutually reinforcing effects suggest a positive influence of segregation on turnout. We also find that senders strategically use their first mover position to influence receivers. They participate substantially more when being observed by an ally than they do at the second stage, when they are not observed. The reverse holds when neighbors are adversaries. In response, receiver-neighbors (in strangers) participate more when they observe an ally-sender participating.

Though some of the comparative statics we derived from Nash equilibria are supported by our data (notably the higher participation by senders when their neighbor is an ally), many are not. Overall, we find little empirical support for these equilibria, similar to previous findings in public goods experiments in general and experimental participation games in particular.

Though it is conceivable that other equilibrium notions might provide a better underpinning of our results, it is not the goal of this study to provide these. At this stage of research, our aim is predominantly empirical (albeit based on a solid theoretical foundation). We are interested in observing the effect of NIE on the participation rates of distinct types of voters. The result is unambiguous: NIE increases participation. We have conjectured about the processes that are driving this result and have provided statistical evidence is support of this conjecture. Our explanation centers around (implicit) within-group coordination between subjects, taking place at both the group and the neighborhood levels for partners and within neighborhoods for strangers. In both cases, first stage behavior by senders appears to play an important role.

Our experiment can be best understood as an attempt to get a grasp of what is happening in the outside-the-laboratory world, in which the social environment is extremely more complex than just the exchange of information between two neighbors. The control we have in the laboratory allows us to search for explanations, one step at a time. In our view, an interesting research field can be opened by systematically varying the structure of neighborhoods and the content of information exchanged between voters. We are optimistic that looking at social embeddedness can provide us with important insights into the long-lasting paradox of voting.

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APPENDICES

APPENDIX A: The NIE Participation Game

In this appendix, we formally describe the NIE-participation game and derive quasi-symmetric Nash equilibria for it.

1 THE GAME

The NIE participation game has two stages. We assume an even and equal number of risk neutral players (voters) $N = N_A = N_B$ in each of two groups $i = A, B$. Half of the voters in each group is of the type S (ender), denoted by $j_{i,S}$, $i = A, B$, and the other half of the type R (eceiver), $j_{i,R}$, $i = A, B$. Hence, each group consists of $N_{i,S} = N/2$ senders and $N_{i,R} = N/2$ receivers. Each voter knows her own type.

DEFINITION 1 (neighborhood ϑ)
A neighborhood ϑ is a matched pair of exactly one sender and one receiver.

Denote the neighbor of $j_{i,S}$ by $n(j_{i,S})$ and the neighbor of $j_{i,R}$ by $n(j_{i,R})$. Each voter is member of exactly one neighborhood. Hence, there are *N* neighborhoods in the electorate.

DEFINITION 2 (matching protocol Θ)
We distinguish three matching protocols Θ. The sender and receiver in a neighborhood are either from

1. the same group, $\vartheta \in \Theta_{allies} \Rightarrow \left[j_{i,S} \in i \Leftrightarrow n(j_{i,S}) \in i\right] \wedge \left[j_{i,R} \in i \Leftrightarrow n(j_{i,R}) \in i\right]$;
2. different groups, $\vartheta \in \Theta_{adversaries} \Rightarrow \left[j_{i,S} \in i \Leftrightarrow n(j_{i,S}) \quad i\right] \wedge \left[j_{i,R} \in i \Leftrightarrow n(j_{i,R}) \quad i\right]$;
3. an uncertain group, $\vartheta \in \Theta_{uncertain}$, where Θ_{allies} occurs with probability $0 < prob(\Theta_{allies}) < 1$ and $\Theta_{adversaries}$ with $prob(\Theta_{adversaries}) = 1 - prob(\Theta_{allies})$.

All *N* neighborhoods ϑ have the same matching protocol, which is common knowledge. The interpretation of definition 2 is that voters either know with certainty which candidate their neighbor supports (Θ_{allies} and $\Theta_{adversaries}$), or have only probabilistic knowledge ($\Theta_{uncertain}$) about her preferences. In the following, if the matching protocol Θ_m, $m = allies, adversaries, uncertain$, is not explicitly mentioned, a general case valid for all matching protocols will be under consideration.

The following structure and rules of the game are common knowledge to all players. At stage 1 all $N_{A,S} + N_{B,S}$ senders simultaneously decide whether to vote $v^1_{j_{i,S}} = 1$, or abstain, $v^1_{j_{i,S}} = 0$, $i = A, B$, where superscript '1' refers to stage 1. Each receiver $j_{i,R}$ observes (only) the sender $n(j_{i,R})$'s decision and no other voter observes this decision. Senders who turn out to vote at stage 1 have no further decision to make, whereas senders who abstain at stage 1 have to decide again on voting at stage 2.

At stage 2, all $N_{A,R} + N_{B,R}$ receivers and all senders who abstained at stage 1 simultaneously decide whether to vote, $v^2_{j_{i,S}} = 1$; $v_{j_{i,R}} = 1$, or abstain, $v^2_{j_{i,S}} = 0$; $v_{j_{i,R}} = 0$, $i = A, B$, where superscript '2' indicates stage 2 for senders. After all decisions have been made, voters are told the aggregate outcome of the election (the total number of votes cast in each group). No additional information about any other voter's turnout decision is given.

Aggregate turnout for $i = A, B$, is given by:

$$V_i \equiv \sum_{j_{i,S}} \left(v^1_{j_{i,S}} + v^2_{j_{i,S}}\right) + \sum_{j_{i,R}} v_{j_{i,R}}\,, \tag{A1}$$

where $v^1_{j_{i,S}} + v^2_{j_{i,S}} \in \{0,1\}$, because senders can cast only one vote. For later use, we define the aggregate turnout of other voters in the same group as sender $j_{i,S}$, or receiver $j_{i,R}$, $i = A, B$, by

$$V_i^{\;j_{i,S}} \equiv V_i \quad \left(v^1_{j_{i,S}} + v^2_{j_{i,S}}\right); \tag{A2a}$$

$$V_i^{\;j_{i,R}} \equiv V_i \quad v_{j_{i,R}}\,. \tag{A2b}$$

Revenues (the gross payoff to each member of the winning group) are denoted by *w* and assumed to be equal for senders and receivers in a group ($w_{j_i} = w_{j_{i,S}} = w_{j_{i,R}}$, $i = A, B$):

$$w_{j_i}(V_i, V_{-i}) = \begin{cases} 0 & if \quad V_i < V_{-i} \\ ½ & if \quad V_i = V_{-i} \\ 1 & if \quad V_i > V_{-i}\,, \end{cases} \tag{A3}$$

$i = A, B$, where $-i$ refers to the opposing group. Furthermore, we assume identical participation costs to all voters, independent of type and stage, within the range $c \in (0,1)$, $\forall j_{i,S}$, $\forall j_{i,R}$, $i = A, B$. The common knowledge payoffs (denoted by π) for senders $j_{i,S}$, and receivers $j_{i,R}$, $i = A, B$, are then given by

$$\pi_{j_{i,S}} = w_{j_i}(V_i, V_{-i}) - (v^1_{j_{i,S}} + v^2_{j_{i,S}})c\,; \tag{A4a}$$

$$\pi_{j_{i,R}} = w_{j_i}(V_i, V_{-i}) - v_{j_{i,R}}c\,. \tag{A4b}$$

In what follows, it will be useful to define the number of senders in group i, who vote at stage 1 by

$$S_i \equiv \sum_{j_{i,S}} v^1_{j_{i,S}}\,. \tag{A5}$$

In case of matching protocol Θ_{allies}, S_i is also the number of receivers in i who observe a sender voting at stage 1. For matching protocol $\Theta_{adversaries}$, this number is given by S_{-i}.

2 NASH EQUILIBRIA

For this game, we derive Nash equilibria. Because of the extensive (but straightforward) computations involved, we only give the general structure of the way in which these are derived.[20] More details are available from the authors. Because notations can become cumbersome, we apply Kuhn's theorem (1953) by analyzing 'behavioral' rather than mixed strategies. This will allow us to consider strategies at each stage separately as opposed to strategies for the complete game.

First, we consider the four situations a voter in group $i = A, B$, facing matching protocol Θ_m, $m = allies,\ adversaries, uncertain$, might be in:

1) a sender deciding on $v^1_{j_{i,S}}(\Theta_m)$ at stage 1;

2) a sender having abstained at stage 1, $v^1_{j_{i,S}}(\Theta_m) = 0$, and deciding on $v^2_{j_{i,S}}(\Theta_m)$ at stage 2;

3a) a receiver deciding on $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 0, \Theta_m)$ at stage 2 after observing her neighbor abstaining at stage 1;

3b) a receiver deciding on $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 1, \Theta_m)$ at stage 2 after observing her neighbor voting at stage 1.

Behavioral strategies for each of these situations are, respectively, the probabilities:

1) $s_{j_{i,S}}(\Theta_m)$ that $v^1_{j_{i,S}}(\Theta_m) = 1$; (A6a)

2) $a_{j_{i,S}}(\Theta_m)$ that $v^2_{j_{i,S}}(\Theta_m) = 1$; (A6b)

3a) $a_{j_{i,R}}(\Theta_m)$ that $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 0, \Theta_m) = 1$; (A6c)

3b) $t_{j_{i,R}}(\Theta_m)$ that $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 1, \Theta_m) = 1$. (A6d)

A voter will vote with probability 1 if the expected benefits minus the costs c are higher than the expected benefits from abstention. She will mix when the two are equal. This yields the following four turnout conditions (A7)-(A10) for the situations distinguished.

CONDITION 1 (senders, stage 1):
Sender $j_{i,S}$ will vote with probability 1 at stage 1 ($s_{j_{i,S}}(\Theta_m) = 1$) iff

$$Exp_{strat_1}\left[Exp_{strat_2}\left[\pi_{j_{i,S}} \middle| v^1_{j_{i,S}}(\Theta_m) = 1\right]\right] > Exp_{strat_1}\left[Exp_{strat_2}\left[\pi_{j_{i,S}} \middle| v^1_{j_{i,S}}(\Theta_m) = 0\right]\right],$$

[20] Given the results in Goeree and Holt (forthcoming) and Cason and Mui (2003), it would also be interesting to derive logit equilibria for this game. The game is too complex to derive these, however.

where expectation operators are due to (i) strategic uncertainty about others' decisions at stage 1 ($strat_1$); and (ii) strategic uncertainty about others' decisions at stage 2 ($strat_2$), given the number of votes at stage 1 in each group. Elaborating gives:

$$\sum_{S_i=1}^{N/2} \sum_{S_{-i}=0}^{N/2} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,s}} + 1 > V_{-i} \middle| (\Theta_m, S_i, S_{-i}) \right] + \frac{1}{2} prob\left[V_i^{-j_{i,s}} + 1 = V_{-i} \middle| (\Theta_m, S_i, S_{-i}) \right] \right] - c$$

$$> \sum_{S_i=0}^{N/2-1} \sum_{S_{-i}=0}^{N/2-0} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,s}} > V_i \middle| (\Theta_m, S_i, S_{-i}) \right] + \frac{1}{2} prob\left[V_i^{-j_{i,s}} = V_{-i} \middle| (\Theta_m, S_i, S_{-i}) \right] \right] - v_{j_{i,s}}^2 c \,, \qquad \text{(A7)}$$

$i = A, B$, for $m = allies, adversaries$. The $prob[S]$ terms in (A7) refer to the stage 1 votes by senders in the two groups.[21] The first term after the multiplication operator on the left (right) hand side of the inequality describes the probability that this sender's group i will win the election if she votes (abstains) and the second term describes the probability that i will tie the election if $j_{i,S}$ votes (abstains) at stage 1. Note that, in case of abstention at stage 1, the sender still has to account for possible costs at stage 2.

CONDITION 2 (senders, stage 2): Similarly, sender $j_{i,S}$ will vote with probability 1 at stage 2 iff the expected payoff of turnout is higher than that of abstention:

$$\sum_{S_i=0}^{N/2-1} \sum_{S_{-i}=0}^{N/2-0} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,s}} + 1 > V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] + \frac{1}{2} prob\left[V_i^{-j_{i,s}} + 1 = V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] \right] - c$$

$$> \sum_{S_i=0}^{N/2-1} \sum_{S_{-i}=0}^{N/2-0} prob\,[S_i] prob\,[S_{-i}] \times \left[prob\left[V_i^{-j_{i,s}} > V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] + \frac{1}{2} prob\left[V_i^{-j_{i,s}} = V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] \right],$$

$i = A, B$, for $m = allies, adversaries$. Rearranging gives

$$\sum_{S_i=0}^{N/2-1} \sum_{S_{-i}=0}^{N/2-0} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,s}} + 1 = V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] + prob\left[V_i^{-j_{i,s}} = V_{-i} \middle| \left(\Theta_m, v_{j_{i,s}}^1 = 0, S_i, S_{-i}\right) \right] \right] > 2c \,. \qquad \text{(A8)}$$

CONDITION 3a (receivers at stage 2 after observing abstention): Given $v_{n(j_{i,R})}^1 = 0$, the expected payoff from voting exceeds that from abstention when:

$$\sum_{S_i=0}^{N/2-x} \sum_{S_{-i}=0}^{N/2-y} prob\,[S_i] prob\,[S_{-i}] \times \left[prob\left[V_i^{-j_{i,R}} + 1 > V_{-i} \middle| \left(\Theta_m, v_{n(j_{i,R})}^1 = 0, S_i, S_{-i}\right) \right] + \frac{1}{2} prob\left[V_i^{-j_{i,R}} + 1 = V_{-i} \middle| \left(\Theta_m, v_{n(j_{i,R})}^1 = 0, S_i, S_{-i}\right) \right] \right] - c$$

[21] Note that $S_i \in \{1,...,N/2\}$ if a sender participates at stage 1 and $S_i \in \{0,...,N/2\}$ if she abstains. This is reflected in the summation in (eq. A7).

$$> \sum_{S_i=0}^{N/2-x} \sum_{S_{-i}=0}^{N/2-y} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,R}} > V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 0, S_i, S_{-i}\right)\right] + \frac{1}{2} prob\left[V_i^{-j_{i,R}} = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 0, S_i, S_{-i}\right)\right]\right],$$

$i = A,B$, where $x = 1$; $y = 0$ for $m = allies$, and $x = 0$; $y = 1$ for $m = adversaries$.[22] Rearranging gives

$$\sum_{S_i=0}^{N/2-x} \sum_{S_{-i}=0}^{N/2-y} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,R}} + 1 = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 0, S_i, S_{-i}\right)\right] + prob\left[V_i^{-j_{i,R}} = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 0, S_i, S_{-i}\right)\right]\right] > 2c\,. \tag{A9}$$

CONDITION 3b (stage 2): (receivers at stage 2 after observing a vote): Given $v^1_{n(j_{i,R})} = 1$, the expected payoff from voting exceeds that from abstention when:

$$\sum_{S_i=x}^{N/2} \sum_{S_{-i}=y}^{N/2} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,R}} + 1 > V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right] + \frac{1}{2} prob\left[V_i^{-j_{i,R}} + 1 = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right]\right] - c$$

$$> \sum_{S_i=x}^{N/2} \sum_{S_{-i}=y}^{N/2} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-j_{i,R}} > V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right] + \frac{1}{2} prob\left[V_i^{-j_{i,R}} = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right]\right],$$

$i = A,B$, where $x = 1$; $y = 0$ for $m = allies$, and $x = 0$; $y = 1$ for $m = adversaries$.[23] Rearranging gives

$$\sum_{S_i=x}^{N/2} \sum_{S_{-i}=y}^{N/2} prob[S_i] prob[S_{-i}] \times \left[prob\left[V_i^{-jR} + 1 = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right] + prob\left[V_i^{-j_{i,R}} = V_{-i} \middle| \left(\Theta_m, v^1_{n(j_{i,R})} = 1, S_i, S_{-i}\right)\right]\right] > 2c \tag{A10}$$

The conditions for $\Theta_{uncertain}$ are a probability mix of the respective conditions with probabilities $prob(\Theta_{allies})$ and $prob(\Theta_{adversaries})$. This gives a game of incomplete information.

Next, we define the equilibria considered for this NIE participation game.[24]

DEFINITION 3 (Quasi-symmetric equilibrium)
An equilibrium in behavioral strategies in the NIE participation game is quasi-symmetric if it holds that:

$$\begin{aligned} & s_{j_{i,S}} = s_{h_{k,S}} \equiv s \in [0,1],\ \forall j_{i,S},\ h_{k,S},\quad i,k = A,B, \\ & a_{j_{i,S}} = a_{h_{k,S}} \equiv a_S \in [0,1],\ \forall j_{i,S},\ h_{k,S},\quad i,k = A,B, \\ & a_{j_{i,R}} = a_{h_{k,R}} \equiv a_R \in [0,1],\ \forall j_{i,R},\ h_{k,R},\quad i,k = A,B, \text{ and} \\ & t_{j_{i,R}} = t_{h_{k,R}} \equiv t \in [0,1],\ \forall j_{i,R},\ h_{k,R},\quad i,k = A,B. \end{aligned} \tag{A11}$$

[22] In *allies*, $S_i \in \{0,...,N/2-1\}$ because i observed a stage 1 abstention in the own group. Similarly $S_{-i} \in \{0,...,N/2-1\}$ in *adversaries*.
[23] Now, i observes a stage 1 vote, so $S_i \in \{1,...,N/2\}$ in *allies* and $S_{-i} \in \{1,...,N/2\}$ in *adversaries*.
[24] It is common to focus on quasi-symmetric equilibria for participation games (*e.g.*, Palfrey and Rosenthal, 1983). Dropping quasi-symmetry yields a plethora of Nash equilibria with no obvious refinements to guide predictions.

In words, all voters in any particular decision situation play the same behavioral strategy, independent of the group they are in. This reduces our equilibrium analysis to four strategies. The equilibrium is denoted by 'quasi-symmetric' because strategies are not limited to be symmetric across players in different positions.

PROPOSITION (Quasi-symmetric Nash equilibria in pure strategies):

(*i*) If $c > 1/2$, the only Nash equilibrium is where nobody votes: $v^1_{j_{i,S}}(\Theta_m) = 0$, $v^2_{j_{i,S}}(\Theta_m) = 0$, $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 0, \Theta_m) = 0$, $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 1, \Theta_m) = 0$, $\forall j_{i,S}$, $\forall j_{i,R}$, $i = A, B$, $m = allies, adversaries, uncertain$.

(*ii*) If $c < 1/2$, the only Nash equilibria in pure strategies are where everybody votes: $\left[v^1_{j_{i,S}}(\Theta_m) = 1 \wedge v^2_{j_{i,S}}(\Theta_m) = 0\right] \vee \left[v^1_{j_{i,S}}(\Theta_m) = 0 \wedge v^2_{j_{i,S}}(\Theta_m) = 1\right]$, $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 0, \Theta_m) = 1$, and $v_{j_{i,R}}(v^1_{n(j_{i,R})} = 1, \Theta_m) = 1$, $\forall j_{i,S}$, $\forall j_{i,R}$, $i = A, B$, $m = allies, adversaries, uncertain$.

Proof (straightforward application of Palfrey and Rosenthal, 1983, for equal group sizes).

To find quasi-symmetric equilibria in behavioral strategies (separately for the distinct information conditions Θ_m), first the decision at stage 2 is elaborated (backwards induction), using conditions (A8), (A9) and (A10) stated as equalities. The probabilities in these equations are tedious but straightforward combinations of binomials using the probabilities defined in definition 3. This gives three equations for the four probabilities s, a_S, a_R, and t. Senders at stage 1 anticipate the best responses implicit in these equations and will mix with a probability s that equates the expected value of voting and abstaining (eq. A7), once again involving a combination of binomials. This gives a fourth equation for the four probabilities.
For the parameters of our experiments (*cf.* section 2), we can derive these quasi-symmetric Nash equilibria for the stage game. Normalizing revenue to lie between 0 and 1, we have $c = 1/3$. Following the proposition, we conclude that everyone casting a vote (with senders casting it either at stage 1 or at stage 2) is a Nash equilibrium in pure strategies[25]. For $m = allies$ and $m = adversaries$, the quasi-symmetric equilibria in behavioral strategies[26] for the stage game are given in table 2. For $m = uncertain$, no such equilibria exist. Using backwards induction, these equilibria hold for each round, in partners and strangers.[27] Table A1 presents the equilibria in behavioral strategies.

TABLE A1: QUASI-SYMMETRIC NASH EQUILIBRIA IN BEHAVIORAL STRATEGIES

Treatment		s	a_S	Expected turnout senders	T	a_R	Expected turnout receivers	Expected turnout
Informed	*allies*	.791	1	1	.119	1	.303	.652
		.689	1	1	.560	1	.697	.848
	adversaries	.406	.839	.904	.764	1	.904	.904
	uncertain	–						
Uninformed		.107 or .893*						

Strategies: s = senders at stage 1; a_S = senders at stage 2; t = receivers after observing participation, a_R = receivers after observing abstention.
*Any combination of probabilities s and a_S that yields $s + (1 - s)a_S$ = .107 or .893 is an equilibrium.

Note that there are two equilibria for $m = allies$.[28] Moreover, equilibria are the same for partners and strangers. Table A1 shows that expected overall participation is higher for *adversaries* (.904) than for *allies* (.652 and .848). Uninformed provides the lowest (.107) and a very high (.893) expected turnout, which makes it difficult to formulate comparative statics predictions vis-à-vis the informed cases. For informed, a comparison of equilibria does provide such predictions, however. In the equilibria for *allies,* senders participate at substantially higher

[25] This is easy to confirm for the parameters chosen. A unilateral deviation from 100% turnout saves 1 token but decreases the expected revenue from 2.5 to 1.
[26] In some cases, some voters do not mix in equilibrium.
[27] We abstract from coordination on Pareto dominant equilibria by means of punishment by playing the inefficient pure strategy equilibrium where everybody participates.
[28] The two equilibrium strategies for receivers are also a 'low' (.303) and 'high' (.697) equilibrium in the standard participation game (Palfrey and Rosenthal, 1983) with the same voting costs but two groups of equal size 3. This is intuitive, since all 6 senders vote with probability 1 in allies, hence creating a tie and the remaining receivers play a participation game of three against three.

rates than receivers in both equilibria (1 *vs*. .303 and 1 *vs*. .697), whereas they participate at equal rates (.904) in the equilibrium for *adversaries*. Also, note that in all cases, in equilibrium, senders participate at higher rates at stage 2 than at stage 1. Note that stage 2 participation rates are defined as the fraction of senders that abstained at stage 1. As a fraction of all senders, participation is higher at stage 1 than at stage 2 in *allies* (.791 *vs*. .209 and .689 *vs*. .311), and higher at stage 2 in *adversaries* (.406 *vs*. .498). Finally, equilibrium participation by receivers is higher after observing abstention than after observing a sender casting a vote. The difference is largest for *allies*.

We use these results in section 2, to derive comparative static predictions for our treatments.

APPENDIX B: Translation of instructions for treatment IP [*IS, US*]

Welcome to our experiment on decision-making. Depending on your *own choices* and the *choices of other participants*, you may earn money today. Your earnings in the experiment are expressed in *tokens*. 4 tokens are worth one Guilder. At the end of the experiment your total earnings in tokens will be exchanged into Guilders and paid to you in cash. The payment will remain *anonymous*. No other participant will be informed about your payment.

Please remain quiet and do not communicate with other participants during the entire experiment. Raise you hand if you have any question. One of us will come to you to answer them.

Rounds, 'your group' and the 'other group'

The experiment consists of *99 rounds*. At the *beginning of the experiment* the computer program will randomly split all participants into two different *populations* of 12 participants. In addition, at the *beginning of the experiment* the computer program will randomly divide the participants in each population into *two groups* of 6 participants [*IS and US: At the beginning of each round (...)*]. The group you are part of will be referred to as *your group* and the group in your population which you are not part of will be called the *other group*. Note that you will remain in the same population *and* group in the whole experiment [*IS and US: Note that you will remain in the same population in the whole experiment. However, in each round participants in your electorate will be reallocated to groups.*]. You will not know which of the participants belongs in the other group and which to your group. You will have nothing to do with participants in the other population in this experiment. [*Additionally in IS and US: No matter what round you are in, the number of participants in the other group is always 6 and the number of participants in your group is also always 6 (12 in total).*]

Types 'sender' and 'receiver'

At the *beginning of the experiment* the computer program will randomly appoint all participants to be either *sender* or *receiver*. Each participant has the same chance of 50% to be a sender and 50% to be a receiver. However, the computer program arranges it such that each population has 6 senders and 6 receivers. You will be told whether you are a sender or a receiver at the start of the experiment. **Your type sender or receiver will not change during the entire experiment.** When groups are formed at the start of the experiment [*IS and US: at the start of a round*] the computer program will also ensure that there are exactly 3 senders and 3 receivers in each group.

The following table shows the number of senders and receivers in each group.

	Number of senders	*Number of receivers*	*Total number*
Other group	**3**	**3**	6
Your group	**3**	**3**	6

Table: *Senders and receivers in the other group and in your group.*

Matching of senders and receivers [*not for US*]

At the start of *each round* the computer program will randomly match *one* sender and *one* receiver to each other. Hence, if you are a sender you will be connected to one receiver and if you are a receiver you will be connected to one sender. **Note that couples will be rematched at the start of each round.**

Three situations [*not for US*]

At the start of *each round* the computer program will randomly determine *one* of the following three *situations* (each situation has the same chance of 1/3 of being chosen):

All senders and receivers who are matched with each other are from the
1. *same* group (the other group *or* your group),
2. *different* groups (the other group *and* your group), or
3. *unknown* groups (with a chance of 50% from the same group and with a chance of 50% from different groups).

The chosen situation in a round applies to *all* participants, senders and receivers, in a population. Hence, within a round it cannot be the case that some participants in a population are in a different situation than other participants in the same population. Which of the three situations applies will be announced to you and all other participants at the *start of each round*.

[A summary is given of the most important points so far]

Part 1 and part 2 of a round and choices

Each round will consist of two parts: *part 1* and *part 2*. In each round choices will have to be made. We now explain the choices, which of the participants will be asked to make choices, and when they are made.

Choices part 1:

In *part 1* of *each* round *only* senders will be asked to make choices. Receivers will not make a choice yet. *Each* sender will face an identical choice problem. They will be asked to make *one choice*. Senders can choose between the following two alternatives:

- '*Choice A*': no costs involved (**0 tokens**).
- '*Choice B*': costs are **1 token**.

After *all* senders have made a choice in *part 1*, *each* receiver will be informed about the choice, however, *only* about the one made by the sender connected to her or him. Only the receiver will receive information about the sender in the same couple. Beyond that, no one gets any information about choices by others. [*This paragraph is not used in US; instead: This choice is private, no other participant is informed about it.*]

Senders choosing choice *B* in part *1* are not asked to make a choice in part *2*. Senders choosing choice *A* in part *1* will be asked to make a choice in part *2* as well.

Choices part 2:

In *part 2* of *each round*, *all* senders choosing *A* in part *1* *and* *all* receivers will be asked to make choices. Each of these participants will face an identical choice problem. They will be asked to make *one choice*. Like in part *1* they will choose between the following two alternatives:

- '*Choice A*': no costs involved (**0 tokens**).
- '*Choice B*': costs are **1 token**.

The choices in part *2* will not be announced to anyone. Hence, in part *2* receivers are *not* informed about the choice of the sender with whom they are connected. **Note that each receiver will only get information in part 1 about the choice of the sender connected to her or him, not in part 2. Senders will never get information about the choices of others.** [*This paragraph is not used in US; instead: the individual choices in part 2 are not announced to anyone either.*]

Earnings

After *all* participants in part *2* have made their choices, the computer program will count the number of *B*-choices per group *in both parts*, part *1 and* part *2*, and will compare the numbers in both groups. There are **3** possible outcomes that are relevant for your *revenue* in the following way. You will receive the revenue irrespective of the choice you made and whether you are a sender or a receiver.

(1) The number of *B*-choices in your group **exceeds** the number of *B*-choices in the other group. In this case *each* participant in your group (inclusive yourself) will get a revenue of **4 tokens**. *Each* participant in the other group will get **1 token**.
(2) The number of *B*-choices in your group **is smaller than** the number of *B*-choices in the other group. In this case *each* participant in your group (inclusive yourself) will get a revenue of **1 token**. *Each* participant in the other group will get **4 tokens**.
(3) The number of *B*-choices in your group **is equal to** the number of *B*-choices in the other group. In this case the computer program will randomly determine the group in which *each* participant gets a revenue of **4**

tokens (each group has the same chance of 50% of being chosen). *Each* participant in the group that is not chosen will get **1 token**.

Your *round earnings* are calculated in the following way: *round earnings = round revenue – round costs*. Your *total earnings* are the sum of all of your round earnings.

The following table gives your possible round earnings:

Your possible round earnings:

Your choice	*Your group has more B-choices*	*Your group has less B-choices*	*Equal number of B-choices in both groups*
Choice *A*	**4 tokens**	**1 token**	**4** *or* **1 token** (50% chance each)
Choice *B*	**3 tokens**	**0 token**	**3** *or* **0 token** (50% chance each)

Computer screen

The computer screen has four main windows.

(1) The *Status* window shows your *type sender or receiver*, the actual *round number*, *part 1 or part 2*, and the *total earnings* up to the previous round.

(2) The *Previous round* window depicts the following information about the previous round:
   - (a) The *situation*, regarding the matching between sender and receiver [*not for US*].
   - (b) If you are a receiver, the *choice in part 1(in the previous round) of the sender who is connected to you* [*not for US*].
   - (c) The number of *B-choices in your group*.
   - (d) The number of *B-choices in the other group*.
   - (e) Your *choice*.
   - (f) Your *revenue*.
   - (g) Your *costs*.
   - (h) Your *round earnings*.

(3) In the *Choice* window you will find two *buttons*. Press the button "Choice *A*" or the button "Choice *B*" with the mouse, or press the key "*A*" or "*B*". When you have chosen you will have to wait until all participants have made their choices. If you are a receiver, this window will also inform you about the choice in part *1* in the actual round of the sender you are connected to [*this sentence not for US*].

(4) The *Result* window shows the result of the *actual* round (both part *1* and part *2*). This happens after each participant in part *2* has made a choice. Each *yellow* rectangle shown represents one *B*-choice of your group and each *blue* rectangle represents one *B*-choice of the other group. After a few seconds the result will also appear in numbers.

At the upper bound of the screen you will find a *Menu bar*. You can use this to access the *Calculator* and *History* functions. The calculator can be handled with the number pad at the right side of your keyboard or with the mouse buttons. The function 'history' shows all information of the last *sixteen* rounds as this had appeared in the window 'Previous round'. At the lower bound of your screen the *Information bar* is located. There you are told the actual status of the experiment.

Further procedures

Before the 99 rounds of the experiment start, we will ask you to participate in *three training-rounds*. You will have to answer questions in order to proceed further in these training-rounds. In the training-rounds you are not matched with other participants but with the computer program. **You cannot draw conclusions about choices of other participants based on the results in the training-rounds.** The training-rounds will not count for your payment.

We will now start with the three trainings-rounds. If you have any questions, please raise then your hand. One of us will come to you to answer them.