Online Appendix
to
Efficient Coordination in Weakest-Link Games

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Contents

A Theoretical Benchmarks

The equilibrium concept of Nash (1950) leads to a huge multiplicity of equilibria in our NG and does not allow clear predictions. Therefore, we also look into the dynamics of the repeated game. In particular we are investigating a myopic best response process and its stochastically stable solution.

We show that for our framework and parameter settings the fully interlinked network with every player playing the lowest effort is the unique stochastically stable equilibrium. This also holds for the restricted case of the minimum effort game without neighborhood choice (BG). Finally, we briefly discuss similarities of our model to Ely (2002).

A.1 The One-Shot Neighborhood Game

In the one-shot game each player simultaneously chooses an effort level and the set of other players whom she wants to interact with. The payoff depends on the player's own effort level as well as on the effort levels in the neighborhood. More formally:

- $N = \{1, 2, 3, ..., n\}$ is a finite set of players.
- $E = \{1, 2, ..., 7\}$ is a finite set of effort levels.
- $s_i = (e_i, I_i)$ is the strategy of player i with $e_i \in E$ is the player's chosen effort level and $I_i \subseteq N \setminus \{i\}$ is the set of players with whom i wants to interact with.
- $s = (s_1, ..., s_n) = ((e_j, I_j))_{j\in N}$ is a strategy profile. Later we will interpret it as a state in a Markov process. With $s^{\tilde{e}}$ we denote the strategy profile where every player wants to interact with every other player and all play the same effort $\tilde{e}$, i.e. $s^{\tilde{e}} = ((\tilde{e}, N \setminus \{j\}))_{j\in N}$.
- $s_{-i} = (s_1, \ldots, s_{i-1}, s_{i+1}, \ldots, s_n) = ((e_j, I_j))_{j\in N\setminus\{i\}}$ is the vector of strategies of all players except i.
- S constitutes the set of all possible strategy profiles or all states in the Markov process.
- Given a strategy profile s, players i and j are linked if and only if both want to interact with each other, i.e. $j \in I_i$ and $i \in I_j$. If an interaction proposal of i with j is not reciprocated, i.e. $j \in I_i$ but $i \notin I_j$ then j is called a dangling link of i.

- Given a strategy profile s, the neighborhood of a player i is the set of all players to whom i is linked to, i.e. $N_i(s) = \{j | j \in I_i \wedge i \in I_j\}$. With $|N_i(s)|$ we denote the cardinality of $N_i(s)$, in other words the size of the neighborhood.

- For a given s player i's payoff is

$$\pi_i(s) = \frac{|N_i(s)|}{n-1} \left[a \left(\min_{j \in N_i(s) \cup \{i\}} \{e_j\} \right) - be_i + c \right]$$

  with $a > b > 0$ and $c > 0$.

- The parameter values used in our experimental setting NT are $n = 8$, $E = \{1, \ldots, 7\}$, $a = 20$, $b = 10$ and $c = 60$.[1]

A.2 Nash Equilibria

The concept of Nash equilibrium does not allow clear predictions of individual behavior.

Proposition A.1 *For any strategy s_i we can find a strategy profile $(s_i, s_{-i}) \in S$ which constitutes a Nash equilibrium.*

Proof: The proof is constructive. Assume player i plays $s_i = (e_i, I_i)$. Choose s_{-i} such that

1. there is no dangling link, neither between i and $N_i(s)$ nor within $N_i(s)$,

2. any two players i and j who are linked to each other play the same effort level ($e_i = e_j$).

In the resulting strategy profile s, no one can add other players to the neighborhood because of the lack of dangling links. Moreover no one has an incentive to exclude others from the own neighborhood or to change the effort level because all neighbors play the same effort level. Therefore no one wants to deviate from s.[2] ■

[1] We will briefly discuss the benchmarks for the other treatments later.

[2] Note that this construction does not yield all Nash equilibria.

A.3 The Markov Best Response Process

We mainly follow the approach and the notation of Young (1993) and Young (1998). Assume time to be discrete and successive ($t = 0, 1, 2, \dots$). We extend the notions of s, s_i, and s_{-i} by an additional index t that indicates time. In each step in time (from t to $t+1$) each player i with probability δ (independent draws) is allowed to update her strategy and plays a myopic best response $s_{i,t+1}$ to $s_{-i,t}$. If there are multiple best responses, she chooses one of them randomly. This construction constitutes a Markov process in discrete time within the state space of all strategy profiles S. The transition matrix P^0 has positive transition probabilities $P^0_{s_t,s_{t+1}}$ where such a best response exists and 0 otherwise. A state $s \in S$ is *accessible* from state $s' \in S$ if there exists a finite sequence of m positive transition probabilities from state s to state s'. We note this by ${}^mP^0_{s,s'} > 0$. Two states are said to *communicate* if they are mutually accessible from each other.

The communication property partitions S into equivalence classes, called *communication classes*. If from such a communication class there is no transition to a state outside the class, then the communication class is *recurrent*. If a recurrent class is a singleton, then the corresponding state is called *absorbing*.

We will show that each state with the complete network and everybody playing the same effort is an absorbing state. Further we will show that no other recurrent class exists. In order to analyze stochastic stability we introduce small perturbations to the process and investigate its limit for these perturbations approaching zero. We will show that the state with the complete network and the minimum effort played by all players is the only stochastically stable strategy profile.

A.4 Some Useful Observations

We state some almost trivial propositions that we will use later. The corresponding proofs are straightforward.

Proposition A.2 *Given an outcome $s = ((e_i, I_i), s_{-i})$. Then player i's payoff is independent of dangling links, i.e. $\pi_i((e_i, I_i), s_{-i}) = \pi_i((e_i, I'_i), s_{-i})$ with $I'_i = \{j | j \in I_i \wedge i \in I_j\}$.*

Proof: Dangling links are not decisive for the neighborhood of a player, i.e. $N_i((e_i, I_i), s_{-i}) = N_i((e_i, I'_i), s_{-i})$. Hence neither the removal nor the addition of dangling links change payoffs. ■

As a corollary to Proposition A.2 we get that any best response of player i remains a best response if dangling links to other players are removed or added.

Proposition A.3 *For $N_i(s) \neq \emptyset$ the condition $e_i = \min_{j \in N_i(s)}\{e_j\}$ is necessary for $s_i = (e_i, I_i)$ being a best response to $s_{-i} = ((e_j, I_j))_{j \in N \setminus \{i\}}$.*

Proof: Assume $N_i(s) \neq \emptyset$ and that the condition does not hold, then i can improve her payoff by adjusting e_i to $\min_{j \in N_i(s)}\{e_j\}$ while holding I_i constant. ■

A.5 Absorbing States and Recurrent Classes

Proposition A.4 *A state $s^{\tilde{e}}$ with $s_i^{\tilde{e}} = (\tilde{e}, N \setminus \{i\})$ for each player $i \in N$ and some $\tilde{e} \in E$ is an absorbing state.*

Proof: We have to show that $s_i^{\tilde{e}} = (\tilde{e}, N \setminus \{i\})$ is the only best response to $s_{-i}^{\tilde{e}} = ((\tilde{e}, N \setminus \{j\}))_{j \in N \setminus \{i\}}$ for each i.

Removing players from I_i strictly decreases $|N_i(s)|$ and therefore strictly decreases π_i. The marginal payoff change with respect to e_i is $-a + b$ (< 0) if i decreases e_i and $-b$ (< 0) if i increases e_i. Any combination of changes in effort and interaction also leads to negative payoff consequences. It follows that $s_i^{\tilde{e}}$ is the only best response to $s_{-i}^{\tilde{e}}$. This holds for each player. ■

Each of the absorbing states forms a recurrent class. In the following we will show that no other recurrent class exists. We do this by constructing a path of best responses from any $s \in S$ into the set of absorbing states.

Proposition A.5 *No other recurrent class than those defined by the absorbing states in Proposition A.4 exists.*

Proof: We introduce a hierarchy of sets of states into the state space. Let

S be the set of all possible states.

S' be the subset of S for which in any state s' players who are linked play the same effort level and no dangling links exist. This means that the network induced by s' consists of one or more components with all players within a component are playing the same effort level.

S'' be the subset of S' where in any state s'' the link relation is transitive, i.e. if i is linked to j and j to k then also i is linked to k. This means that the network induced by s'' consists of one or more fully interlinked components without dangling links and all players within a component are playing the same effort level.

S^a be the set of absorbing states.

It is obvious that $S \supset S' \supset S'' \supset S^a$. The first two inclusions follow by definition, the last inclusion follows from Proposition A.4.

The proof comprises three steps. We will show that for each state in the supersets S, S', and S'' a finite path of best responses exists into the respective subsets S', S'', and S^a and that players follow this path with positive probability. To ease the notation we will omit the time index.

Step $s \in S \to s' \in S'$

Assume state $s \in S$. The following algorithm generates a finite sequence of best responses that occurs with positive probability and leads to a state $s' \in S'$. Without loss of generality we assume here that at each time step only one agent updates her strategy.

1. Sort the players into a two lists A and B.[3]

   List A contains players that do not have any dangling link in their strategy and whose effort level is at most the minimum effort level of their neighborhood.

   List B contains the other players.

2. Take the first player i from list B and calculate all best responses to s_{-i}. There exists a best response s_i without dangling links and $e_i = \min_{j \in N_i(s)}\{e_j\}$ (see propositions A.2 and A.3). Update player i's strategy to such a best response and put him at the end of list A. The update of s_i may cause some players in A to violate the A-conditions. Put them at the end of list B.

3. If there are players left in B then continue with 2.

[3]We choose lists rather than sets because list B must enable an order for processing the elements (first in first out principle).

The generated sequence is finite because for each application of step 2 there is exactly one player moving from B to A. A move of a player i from A to B can only happen if a neighbor j moves from B to A and breaks up a link or decreases her effort level such that $e_j < e_i$. In the first case the link between i and j will be irreversibly deleted.[4] In the second case i updates by keeping the link and lowering e_i or by breaking the link. Since E is finite, lowering e_i can only happen a finite number of times before the link has to be broken. Because the breaking of a link is irreversible and there is only a finite number of links to be broken, there can only be a finite number of moves from A to B.

Step $s' \in S' \to s'' \in S''$

Assume state $s' \in S'$, i.e. N is partitioned into components $C_1, C_2, \ldots, C_k$. Each component is (not necessarily fully) connected and is free of dangling links. Each player within a component is playing the same effort level. Consider a component C_l in which effort level $\tilde{e}$ is played. Consider further a player $i \in C_l$ who plays strategy $s_i = (\tilde{e}, I_i)$ with $I_i \subseteq C_l$. Then strategy $(\tilde{e}, C_l \setminus \{i\})$ is a best response to s_{-i} because adding dangling links do not change payoffs (see Proposition A.2). There is a positive probability that a player j receiving an interaction offer from i may update her strategy. In this case j's best reply comprises closing the link to i because it does not change the minimum effort in the neighborhood but increases the neighborhood size. Hence, each missing link in the component C_l will be established with positive probability in finitely many steps. Therefore there is a positive probability that component C_l and all other components get internally fully connected in finitely many steps and we reach a state $s'' \in S''$.

Step $s'' \in S'' \to s^a \in S^a$

Assume state $s'' \in S''$. Assume two disjoint components $\underline{C}, \overline{C} \subset N$ and that each component is fully connected. Players in $\underline{C}$ and $\overline{C}$ play effort levels $\underline{e}$ and $\overline{e}$, respectively. Without loss of generality assume that $\overline{e} \geq \underline{e}$.

By the condition

$$\frac{|\underline{C}| + |\overline{C}| - 1}{n-1} (a\underline{e} - b\underline{e} + c) > \frac{|\overline{C}| - 1}{n-1} (a\overline{e} - b\overline{e} + c) \tag{1}$$

[4]Note that only players moving from B to A may change their strategy. Player j who is now in A could only reestablish the link to i, after she has been moved back to B. Since she will be put at the end of the list, i will have deleted the dangling link before j's next turn.

we distinguish two cases:

If condition (1) holds, then player $i \in \overline{C}$ prefers to play $\underline{e}$ and to link up to all players in both components rather than to stay with component $\overline{C}$. Because of Proposition A.2 it happens with positive probability that all players in $\underline{C}$ will create dangling links to all players in $\overline{C}$. Once this happens it becomes a best response for each player from $\overline{C}$ to connect to all players from $\underline{C}$ and switch to effort level $\underline{e}$.

If the converse of condition (1) holds, then

$$\frac{|\underline{C}| + |\overline{C}| - 1}{n-1} (a\underline{e} - b\underline{e} + c) \quad \leq \quad \frac{|\overline{C}| - 1}{n-1} (a\overline{e} - b\overline{e} + c) \tag{2}$$

$$\Rightarrow \frac{|\underline{C}| + |\overline{C}| - 1}{n-1} (a\underline{e} - b\underline{e} + c) \quad < \quad \frac{|\overline{C}|}{n-1} (a\overline{e} - b\overline{e} + c)\,. \tag{3}$$

This means that player $i \in \underline{C}$ prefers to join $\overline{C}$, to switch the effort level to $\overline{e}$ and to break all links to her neighbors from $\underline{C}$, rather than being connected to both components and to play an effort level of $\underline{e}$. Because of Proposition A.2 it will happen with positive probability that all players in $\overline{C}$ will offer to establish links with all players in $\underline{C}$. Once this happens it becomes a best response for all players from $\underline{C}$ to connect to all players from $\overline{C}$, switch the effort level to $\overline{e}$ and break the links with their old neighborhood. The resulting component is not completely connected but connects completely with positive probability and within finitely many steps (see step $s' \in S' \rightarrow s'' \in S''$).

Regardless of the result of condition 1 there is a positive probability that two components merge to one fully interlinked component $\underline{C} \cup \overline{C}$ where all players play the same effort level (either $\underline{e}$ or $\overline{e}$). A repeated application of this part of the proof shows that with finitely many steps and positive probability we reach a single fully interlinked component with all players playing the same effort level; i.e. we reach a state $s^a \in S^a$. ■

A.6 Stochastically Stable Equilibria

The Markov process with transition matrix P^0 has a multiplicity of recurrent classes, i.e. absorbing states. To investigate which of these absorbing states is stable against small but continuous, stochastic shocks, we introduce small perturbations. Each player who is supposed to update her strategy to a best response makes a mistake with probability ε (independent draws) and chooses a random strategy. Since every player may make a mistake independently, the transition probability $P^{\varepsilon}_{s,s'}$ is positive for any pair of states $s, s' \in S$ and positive ε. Each state in S can be reached from any other state in one time step. The resulting Markov process with transition matrix P^ε is therefore *irreducible* and *aperiodic*. Moreover the process is *regular perturbed* because the transition probabilities $P^\varepsilon_{s,s'}$ are polynomial expressions of ε. We define the resistance $r(s,s')$ such that $0 < \lim_{\varepsilon\to 0} P^\varepsilon_{s,s'}/\varepsilon^{r(s,s')} < \infty$. The interpretation of $r(s,s')$ is the number of mistakes it needs to get from state s to s'.

We extend the notion of r to recurrent classes. Let $R_1, R_2, \ldots, R_k$ be recurrent classes of the Markov process with transition matrix P^0. Let an ij-path be a sequence of states $\xi_{ij} = (s, s', \ldots, s^*)$ with $s \in R_i$ and $s^* \in R_j$. The resistance of ξ_{ij} is defined as $r(\xi_{ij}) = r(s,s') + r(s', s'') + \cdots + r(s^{\cdots}, s^*)$. The resistance between two recurrent classes i and j is defined as $r_{ij} = \min_{\xi_{ij}} \{r(\xi_{ij})\}$.

Our recurrent classes are the singleton states s^1, s^2, $\ldots s^7$. To find the stochastically stable state(s) we look at the resistance graph consisting of all recurrent classes of P^0 as nodes (in our case these are the absorbing states $s^1, \ldots, s^7$) and all resistances between them as edges. Therefore we need to derive the number of mistakes it needs to get from any absorbing state s^i to a basin of attraction of any other absorbing state s^j.

Assume that the system is in absorbing state $s^{e\prime}$ with every player playing effort level $e\prime$. Further assume that a set of m players makes mistakes that result in a variety of effort levels and that the following best response process leads to a new absorbing state $s^{e\prime\prime}$ with effort level $e\prime\prime$. According to Proposition A.3 a best responding connecting player plays the minimum effort level of all players she is connected/connecting to. Hence, during the best response process she does not introduce any new effort level but adapt to the existing ones. Once a particular effort level reaches a critical mass other players will follow. If $e\prime\prime$ reaches this critical mass starting from m mistakes with a variety of effort levels it will also reach this critical mass if the corresponding players jointly directly switch to $e\prime\prime$. Therefore, it is sufficient to look at cases where m players jointly deviate to another effort level.

Consider the system to be in an absorbing state $s^{\tilde{e}}$ with N fully interconnected and $e_i = \tilde{e}$ for all players i. Assume that $d_\downarrow$ players deviate to $\underline{e} < \tilde{e}$. The following condition must hold to make other players switching to $\underline{e}$ instead of breaking the links to the deviators:

$$a\underline{e} - b\underline{e} + c \geq \frac{n-1-d_\downarrow}{n-1}\left(a\tilde{e} - b\tilde{e} + c\right).$$

This resolves to

$$d_\downarrow \geq \frac{(n-1)(\tilde{e}-\underline{e})}{\tilde{e} + \frac{c}{a-b}}.$$

Consider $d_\uparrow$ players who deviate to $\overline{e} > \tilde{e}$. The following condition must hold to make players switching to $\overline{e}$ and cutting all the links to the players of the lower effort level, instead of not changing the strategy:

$$\frac{d_\uparrow}{n-1}\left(a\overline{e} - b\overline{e} + c\right) \geq a\tilde{e} - b\tilde{e} + c.$$

This resolves to

$$d_\uparrow \geq \frac{(n-1)\left(\tilde{e} + \frac{c}{a-b}\right)}{\overline{e} + \frac{c}{a-b}}.$$

In the remainder we focus on our parameter settings of the experiment. In short this means: $a = 20, b = 10, c = 60, E = \{1, 2, \ldots, 7\}$, and $N = \{1, 2, \ldots, 8\}$.[5] The following tables show the resistances between the absorbing states, i.e. the number of deviations needed to move from an absorbing state (row entry) to a basin of attraction of another absorbing state (column entry):

$r(s^i, s^j)$	s^1	s^2	s^3	s^4	s^5	s^6	s^7
s^1	0	7	6	5	5	5	4
s^2	1	0	7	6	6	5	5
s^3	2	1	0	7	6	6	5
s^4	3	2	1	0	7	6	6
s^5	3	2	2	1	0	7	6
s^6	3	3	2	2	1	0	7
s^7	4	3	3	2	2	1	0

An s^e-*rooted tree* T^{s^e} is a subgraph (i.e. a spanning tree) with $k-1$ edges connecting all k nodes with directed paths towards the root s^e. We define the resistance of a rooted tree $r(T^{s^e})$ as the sum of resistances of all $k-1$ edges. The *stochastic potential* of a recurrent class s^e is defined as the minimum resistance of all rooted trees $\min_{T^{s^e}} r(T^{s^e})$. We can now evoke Theorem 4 in Young (1993) and search for the recurrent classes that minimize the stochastic potential. These classes are stochastically stable.

Proposition A.6 *For our parameter settings the absorbing state s^1 is the only stochastically stable equilibrium of the minimum effort game with endogenous neighborhood choice.*

[5] There are more general results achievable. For the sake of brevity we focus on our central goal, the calculation of the theoretical benchmark for our experimental settings.

Proof: We have to show that s^1 is the state with the minimum stochastic potential. This means that among all rooted trees, those with the minimum total resistance (sum of all resistances among the edges) have the root s^1.

Consider a rooted tree T^m with root $s^m \neq s^1$ and total resistance $r(T^m)$. Then we can construct a new rooted tree T^{m-1} with root s^{m-1} by connecting s^m to s^{m-1} and removing the edge from s^{m-1} to state s^k on the path to s^m. The new tree has total resistance

$$r(T^{m-1}) = r(T^m) + r(s^m, s^{m-1}) - r(s^{m-1}, s^k) \leq r(T^m).$$

The last inequality holds because $r(s^m, s^{m-1}) \leq r(s^{m-1}, s^k)$ as can be verified from the table.

We can iterate this process till we construct T^1 with root s^1 and total resistance

$$r(T^1) = r(T^2) + r(s^2, s^1) - r(s^1, s^k) < r(T^2).$$

The last inequality holds because $r(s^2, s^1) < r(s^1, s^k)$ as can be verified from the table.

Hence, for any rooted tree T^m we find a chain of rooted trees such that $r(T^1) < r(T^2) \leq \cdots \leq r(T^m)$. Therefore the root of the tree with the minimum total resistance must be s^1. ■

A.7 The Case without Neighborhood Choice

For the case without neighborhood choice I_i is restricted to $I_i = N \setminus \{i\}$. A strategy is therefore $s_i = e_i$. Furthermore $N_i(s) = N \setminus \{i\}$ and hence $|N_i(s)| = n - 1$. This reduces the payoff function to

$$\pi_i(s) = a \min_{j \in N}\{e_j\} - be_i + c$$

Proposition A.7 *A state s with $s_i = \tilde{e}$ for each player $i \in N$ and some $\tilde{e} \in E$ is an absorbing state in the minimum effort game without neighborhood choice and no other recurrent class exists.*

Proof: This follows immediately from the restriction $I_i = N \setminus \{i\}$ and Proposition A.3.■

The resistance table is:

$r(s^i, s^j)$	s^1	s^2	s^3	s^4	s^5	s^6	s^7
s^1	0	7	7	7	7	7	7
s^2	1	0	7	7	7	7	7
s^3	1	1	0	7	7	7	7
s^4	1	1	1	0	7	7	7
s^5	1	1	1	1	0	7	7
s^6	1	1	1	1	1	0	7
s^7	1	1	1	1	1	1	0

Proposition A.8 *The only stochastically stable equilibrium of the standard minimum effort game (without endogenous neighborhood choice) is s^1, i.e. every player plays the lowest effort.*

The proof is identical to the proof of Proposition A.6.

A.8 Efficient Coordination in Ely (2002)

Ely (2002) investigates theoretically an evolutionary model that shares similarities with our setup.[6] In his model, players choose a location and play a 2×2 (stag hunt) coordination game with one randomly chosen neighbor and maximize their associated expected payffs. Different to our setup, in that model it can be shown that the efficient outcome is stochastically stable. This difference in findings is due to the crucial assumption that each player receives the expected payoff of only one game. Consequently the size of the neighborhood, i.e., the number of potential interaction partners does not matter, as long as there is at least one.[7]

In contrast, in our payoff function, we deliberatively model the tradeoff between the size of the neighborhood and the resulting strategic uncertainty by the proportionality factor $|N_i|/(n-1)$. In the following, we briefly discuss what happens in our model when

[6] We are grateful to an anonymous reviewer for pointing this out to us.

[7] Ely (2002) also discusses a setup where neighborhood size positively affects payoffs. In this version, in order to show that the efficient outcome is stochastically stable, it needs to be assumed that the neighborhood size effect is bounded from above and the population is sufficiently large.

we drop this factor, keep the rest of our framework, and require that at least two players are needed to interact for the game to take place.[8] The solution is not straightforward but it can be shown that from any state in S the state s^7 is reachable by a finite number of best responses. Informally, the following strategy is a best response to any s_{-i}: determine the highest effort level from all other players that offer to interact (including the existing links), link up to all those players who play this highest effort level, and cut the links to the others. Together with Proposition A.2 it can be shown that there is a positive probability to reach a fully connected component with more than two players playing the same effort level. Further, there is a positive chance that one of the players in this component gets completely isolated (all others cut their links). For a completely isolated player the effort level does not influence the payoff and, therefore, playing effort level 7 is one of the best responses. If this happens and additionally the player offers links to other players it becomes a best response for them to link up, play effort level 7, and cut the links to all neighbors providing lower effort. Again by Proposition A.2, further players might be invited to join the component and for them it is a best response to connect and to play effort level 7. Hence there is a positive probability to arrive at s^7.

However, in this setting s^7 is not an absorbing state. Since neighborhood size is unimportant it may happen that links are cut and that some players get isolated, play lower effort levels and collect other isolated players in their neighborhood again. The stochastically stable recurrent class contains not only s^7 but also states where players are not fully interlinked and where effort levels other than 7 are played.

A further difference of our setup to Ely (2002) is that he assumes that players update their strategy only if it leads to a strict improvement. In contrast, in our model players may switch back and forth between equally paying best responses. This difference crucially influences the dynamics of the best response process.

[8] If we would allow that each player could play the game with herself earning payoffs according to the payoff table, it is easy to see that the efficient outcome is stochastically stable: the immediate best response for each player is to cut all links and play an efficient effort level.

References

Ely, J. C. (2002). Local conventions. *Advances in Theoretical Economics*, 2(1).

Nash, Jr., J. F. (1950). Equilibrium points in n-person games. *Proceedings of the National Academy of Sciences*, 36(1):48–49.

Young, H. P. (1993). The evolution of conventions. *Econometrica*, 61:57–84.

Young, H. P. (1998). *Individual Strategy and Social Structure*. Princeton University Press.

B Additional Statistics

B.1 Random Effects Regressions

Table B.1: Comparison of BT and NT

	(1)	(2)	(3)
VARIABLES	effort	min. effort	welfare
NT	2.849***	3.569***	283.6***
	(0.659)	(0.755)	(77.89)
Constant	3.998***	2.933***	629.5***
	(0.491)	(0.562)	(58.05)
Observations	540	540	540
Number of groups	18	18	18

Note: BT is omitted category; standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B.2: Comparison of BT, NT, and NT-IL

VARIABLES	(1) effort	(2) min. effort	(3) welfare
NT	2.849***	3.569***	283.6***
	(0.539)	(0.623)	(68.94)
NT-IL	2.870***	3.573***	265.4***
	(0.552)	(0.638)	(70.62)
Constant	3.998***	2.933***	629.5***
	(0.401)	(0.464)	(51.39)
Observations	810	810	810
Number of groups	27	27	27
χ^2 tests		*p*-values	
NT vs NT-IL	0.9680	0.9947	0.7845

Note: BT is omitted category; standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.3: Comparison of BT, NT, and NT-AP

	(1)	(2)	(3)
VARIABLES	effort	min. effort	welfare
NT	2.849***	3.569***	283.6***
	(0.699)	(0.785)	(79.68)
NT-AP	1.588**	2.031**	181.1**
	(0.716)	(0.804)	(81.62)
Constant	3.998***	2.933***	629.5***
	(0.521)	(0.585)	(59.39)
Observations	810	810	810
Number of groups	27	27	27
χ^2 tests		*p*-values	
NT vs NT-AP	0.0626	0.0431	0.1842

Note: BT is omitted category; standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B.4: Comparison of BT, NT, BT-XL, and NT-XL

	(1)	(2)	(3)
VARIABLES	effort	min. effort	welfare
NT	2.849***	3.569***	283.6***
	(0.590)	(0.677)	(71.53)
BT-XL	-2.217***	-1.933**	863.1***
	(0.842)	(0.966)	(102.1)
NT-XL	2.830***	2.962***	1,814***
	(0.842)	(0.966)	(102.1)
Constant	3.998***	2.933***	629.5***
	(0.440)	(0.504)	(53.31)
Observations	720	720	720
Number of groups	24	24	24
χ^2 tests		p-values	
BT vs BT-XL	0.0085	0.0453	0.0000
BT-XL vs NT-XL	0.0000	0.0000	0.0000
NT vs NT-XL	0.9820	0.5183	0.0000

Note: BT is omitted category; standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B.5: Comparison of BT, NT, NT-SP

	(1)	(2)	(3)
VARIABLES	effort	min. effort	welfare
NT	2.849***	3.569***	283.6***
	(0.543)	(0.632)	(68.55)
NT-SP	2.764***	3.378***	268.0***
	(0.556)	(0.647)	(70.22)
Constant	3.998***	2.933***	629.5***
	(0.404)	(0.471)	(51.09)
Observations	810	810	810
Number of groups	27	27	27
χ^2 tests		p-values	
NT vs NT-SP	0.8721	0.7545	0.8140

Note: BT is omitted category; standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

B.2 Exclusion Rates and Responses to Exclusion in all NT treatments

Table B.6: NT – Exclusion Rates and Responses to Exclusion.

$t-1$	Effort of i relative to effort of j and efforts in j's neighborhood					
	$e_i^{+}: e_i \geq e_j$		$e_i^{-}: e_i < e_j$ but $e_i > \min_{k\in N_j}\{e_k\}$		$e_i^{--}: e_i < e_j$ and $e_i = \min_{k\in N_j}\{e_k\}$	
t	exclusion rates (in percent)					
	0.6 (84/14738)		23.6 (21/89)		38.5 (105/273)	
$t+1$	i's response (in percent)					
	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$
$e_i \uparrow$	11.8 (9)	2.6 (2)	71.4 (15)	9.5 (2)	61.6 (61)	10.1 (10)
$e_i =$	68.4 (52)	14.5 (11)	4.8 (1)	4.8 (1)	18.2 (18)	0.0 (0)
$e_i \downarrow$	1.3 (1)	1.3 (1)	9.5 (2)	0.0 (0)	10.1 (10)	0.0 (0)

Note: In panel t, number of cases where exclusion takes places and total number of cases (interactions in $t-1$) in parentheses. In panel $t+1$, $j \in I_i$ ($j \notin I_i$) indicates the cases where a subject i excluded in t by j proposes (does not propose) an interaction link to her excluder j in $t+1$. Number of cases (of exclusion) in parentheses; sum of cases in round $t+1$ can be lower than in round t due to exclusion in $t = 30$ for which no further round exists.

Table B.7: NT-IL – Exclusion Rates and Responses to Exclusion.

$t-1$	Effort of i relative to effort of j and efforts in j's neighborhood					
	$e_i^+ : e_i \geq e_j$		$e_i^- : e_i < e_j$ but $e_i > \min_{k \in N_j}\{e_k\}$		$e_i^{--} : e_i < e_j$ and $e_i = \min_{k \in N_j}\{e_k\}$	
t	exclusion rates (in percent)					
	0.2 (32/12875)		3.5 (5/142)		24.5 (83/339)	
$t+1$	i's response (in percent)					
	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$
$e_i \uparrow$	12.5 (4)	3.1 (1)	0.0 (0)	40.0 (2)	51.8 (43)	22.9 (19)
$e_i =$	65.6 (21)	15.6 (5)	0.0 (0)	0.0 (0)	18.1 (15)	1.2 (1)
$e_i \downarrow$	3.1 (1)	0.0 (0)	40.0 (2)	20.0 (1)	3.6 (3)	2.4 (2)

Note: In panel t, number of cases where exclusion takes places and total number of cases (interactions in $t-1$) in parentheses. In panel $t+1$, $j \in I_i$ ($j \notin I_i$) indicates the cases where a subject i excluded in t by j proposes (does not propose) an interaction link to her excluder j in $t+1$. Number of cases (of exclusion) in parentheses; sum of cases in round $t+1$ can be lower than in round t due to exclusion in $t = 30$ for which no further round exists.

Table B.8: NT-AP – Exclusion Rates and Responses to Exclusion.

$t-1$	Effort of i relative to effort of j and efforts in j's neighborhood					
	$e_i^+ : e_i \geq e_j$		$e_i^- : e_i < e_j$ but $e_i > \min_{k \in N_j}\{e_k\}$		$e_i^{--} : e_i < e_j$ and $e_i = \min_{k \in N_j}\{e_k\}$	
t	exclusion rates (in percent)					
	0.6 (61/10954)		5.8 (27/462)		21.2 (183/862)	
$t+1$	i's response (in percent)					
	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$
$e_i \uparrow$	14.8 (9)	6.6 (4)	51.9 (14)	3.7 (1)	55.7 (102)	10.4 (19)
$e_i =$	47.5 (29)	16.4 (10)	25.9 (7)	3.7 (1)	20.2 (37)	3.8 (7)
$e_i \downarrow$	8.2 (5)	6.6 (4)	14.8 (4)	0.0 (0)	8.2 (15)	1.6 (3)

Note: In panel t, number of cases where exclusion takes places and total number of cases (interactions in $t-1$) in parentheses. In panel $t+1$, $j \in I_i$ ($j \notin I_i$) indicates the cases where a subject i excluded in t by j proposes (does not propose) an interaction link to her excluder j in $t+1$. Number of cases (of exclusion) in parentheses; sum of cases in round $t+1$ can be lower than in round t due to exclusion in $t = 30$ for which no further round exists.

Table B.9: NT-XL – Exclusion Rates and Responses to Exclusion.

$t-1$	Effort of i relative to effort of j and efforts in j's neighborhood					
	$e_i^{+}: e_i \geq e_j$		$e_i^{-}: e_i < e_j$ but $e_i > \min_{k \in N_j}\{e_k\}$		$e_i^{--}: e_i < e_j$ and $e_i = \min_{k \in N_j}\{e_k\}$	
t	exclusion rates (in percent)					
	0.4 (153/41830)		45.8 (299/653)		73.2 (374/511)	
$t+1$	i's response (in percent)					
	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$
$e_i \uparrow$	16.2 (24)	4.7 (7)	87.0 (260)	1.7 (5)	77.0 (288)	8.6 (32)
$e_i =$	54.1 (80)	20.9 (31)	6.7 (20)	0.0 (0)	9.4 (35)	2.4 (9)
$e_i \downarrow$	4.1 (6)	0.0 (0)	4.3 (13)	0.3 (1)	2.7 (10)	0.0 (0)

Note: In panel t, number of cases where exclusion takes places and total number of cases (interactions in $t-1$) in parentheses. In panel $t+1$, $j \in I_i$ ($j \notin I_i$) indicates the cases where a subject i excluded in t by j proposes (does not propose) an interaction link to her excluder j in $t+1$. Number of cases (of exclusion) in parentheses; sum of cases in round $t+1$ can be lower than in round t due to exclusion in $t = 30$ for which no further round exists.

Table B.10: NT-SP – 'Exclusion' Rates and Responses to 'Exclusion'.

$t-1$	Effort of i relative to effort of j and efforts in j's neighborhood					
	$e_i^+ : e_i \geq e_j$		$e_i^- : e_i < e_j$ but $e_i > \min_{k \in N_j}\{e_k\}$		$e_i^{--} : e_i < e_j$ and $e_i = \min_{k \in N_j}\{e_k\}$	
t	'exclusion' rates (in percent)					
	1.0 (124/12686)		11.1 (26/234)		20.0 (145/726)	
$t+1$	i's response (in percent)					
	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$	$j \in I_i$	$j \notin I_i$
$e_i \uparrow$	7.8 (18)	2.6 (6)	58.3 (14)	12.5 (3)	56.1 (166)	11.1 (33)
$e_i =$	70.0 (161)	12.6 (29)	20.8 (5)	4.2 (1)	23.3 (69)	1.4 (4)
$e_i \downarrow$	6.1 (14)	0.9 (2)	0.0 (0)	4.2 (1)	5.7 (17)	2.4 (7)

Note: In panel t, number of cases where 'exclusion' takes places and total number of cases (interaction proposals in $t-1$) in parentheses. In panel $t+1$, $j \in I_i$ ($j \notin I_i$) indicates the cases where a subject i 'excluded' in t by j proposes (does not propose) an interaction link to her 'excluder' j in $t+1$. Number of cases (of 'exclusion') in parentheses; sum of cases in round $t+1$ can be lower than in round t due to 'exclusion' in $t=30$ for which no further round exists.

B.3 Individual Groups: Average Effort, Minimum Effort, Interaction Frequencies

B.3.1 Average and Minimum Effort

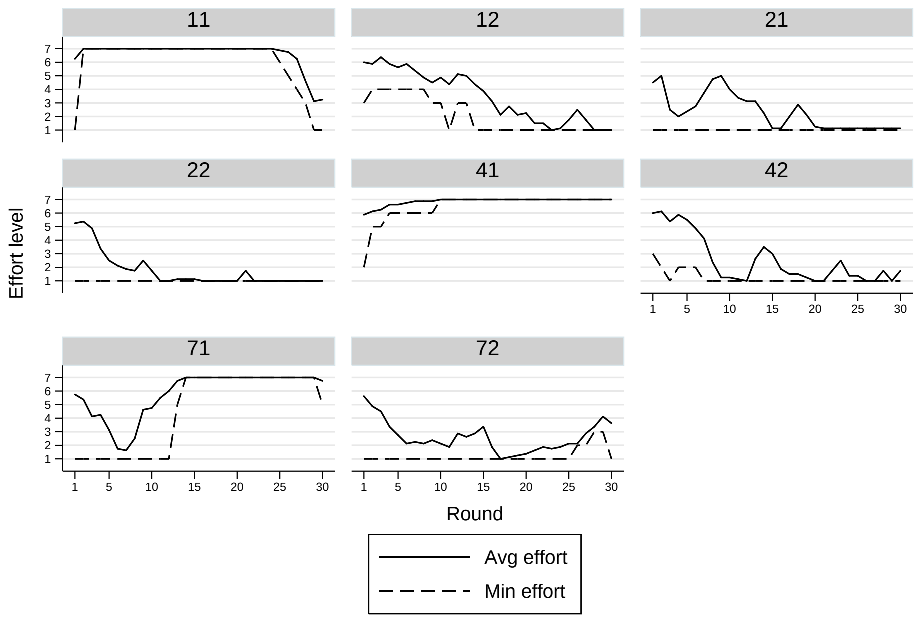

Figure B.1: BT - Average and Minimum Effort in Individual Groups

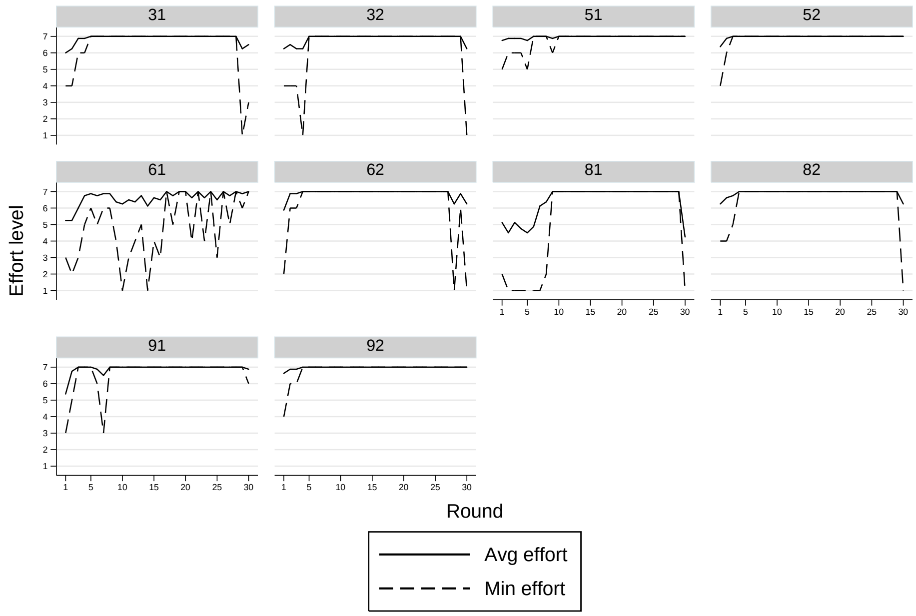

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Figure B.2: NT - Average and Minimum Effort in Individual Groups

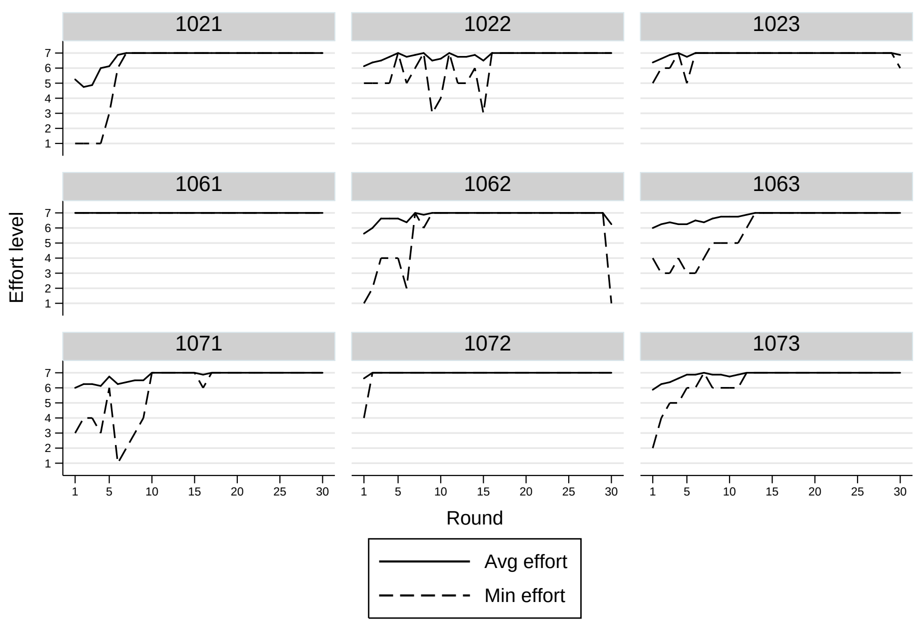

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Figure B.3: NT-IL - Average and Minimum Effort in Individual Groups

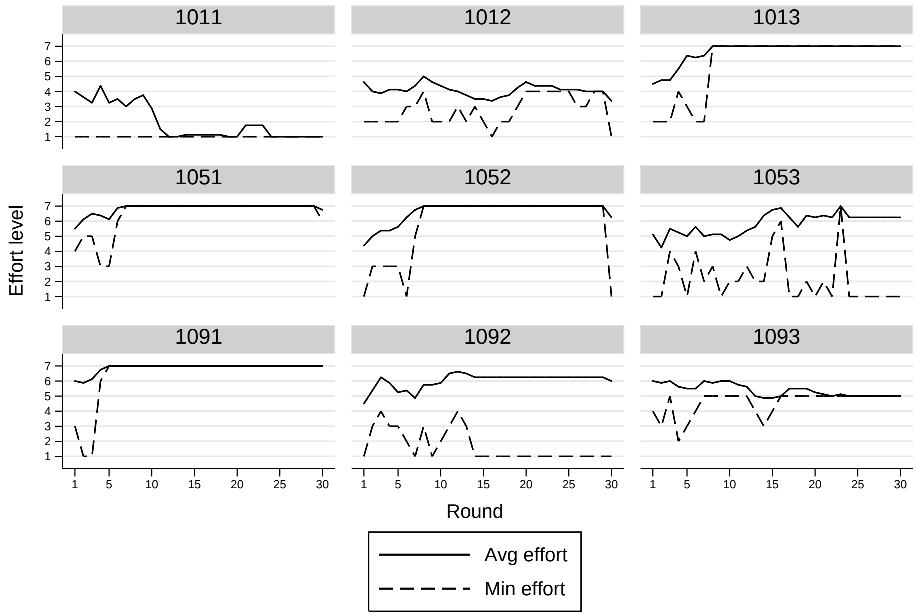

Figure B.4: NT-AP - Average and Minimum Effort in Individual Groups

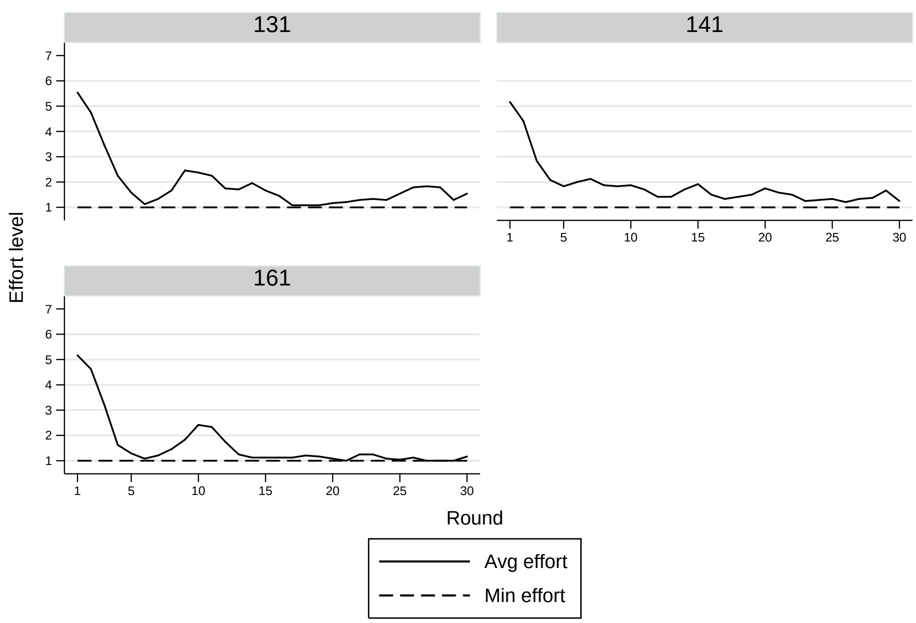

Figure B.5: BT-XL - Average and Minimum Effort in Individual Groups

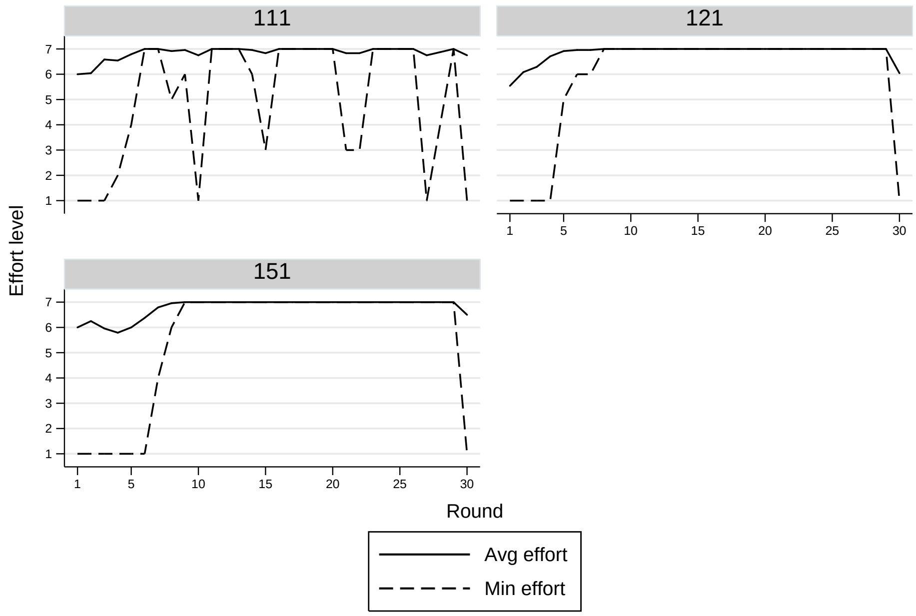

Figure B.6: NT-XL - Average and Minimum Effort in Individual Groups

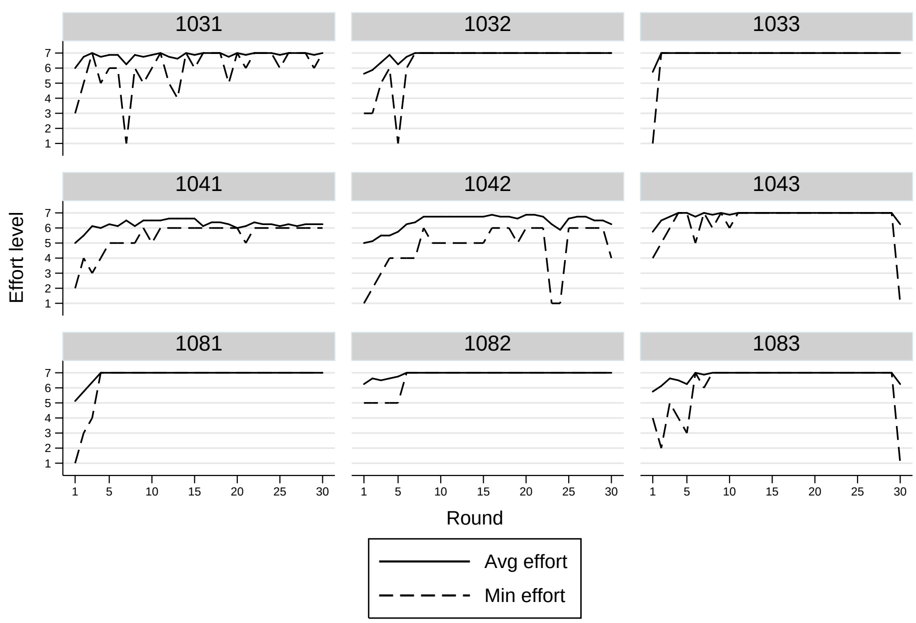

Figure B.7: NT-SP - Average and Minimum Effort in Individual Groups

B.3.2 Interaction and Exclusion Frequencies

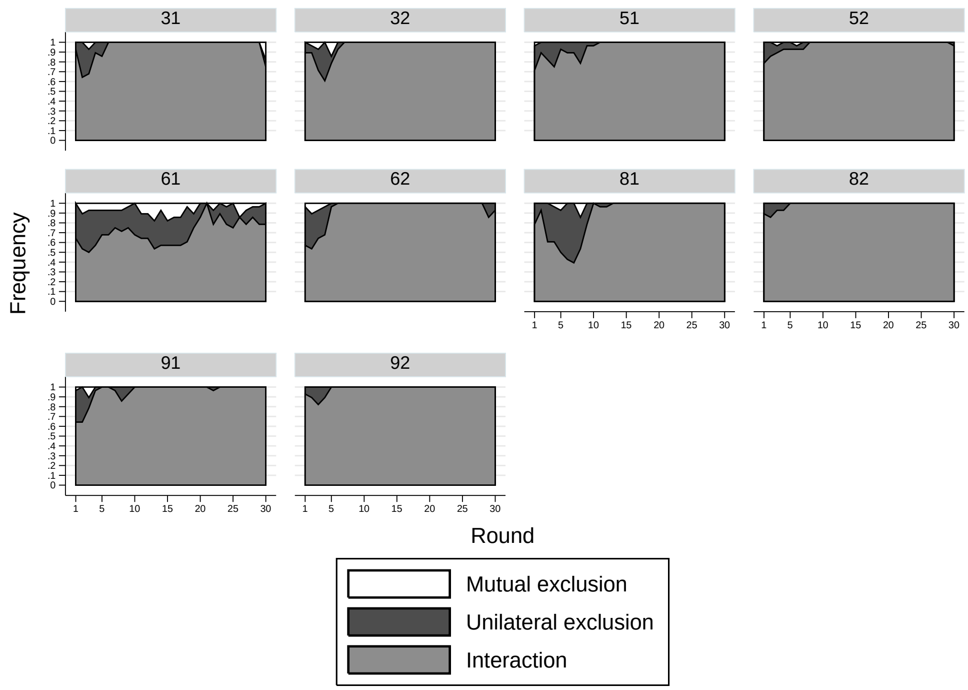

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Figure B.8: NT - Interaction and Exclusion Frequencies in Individual Groups

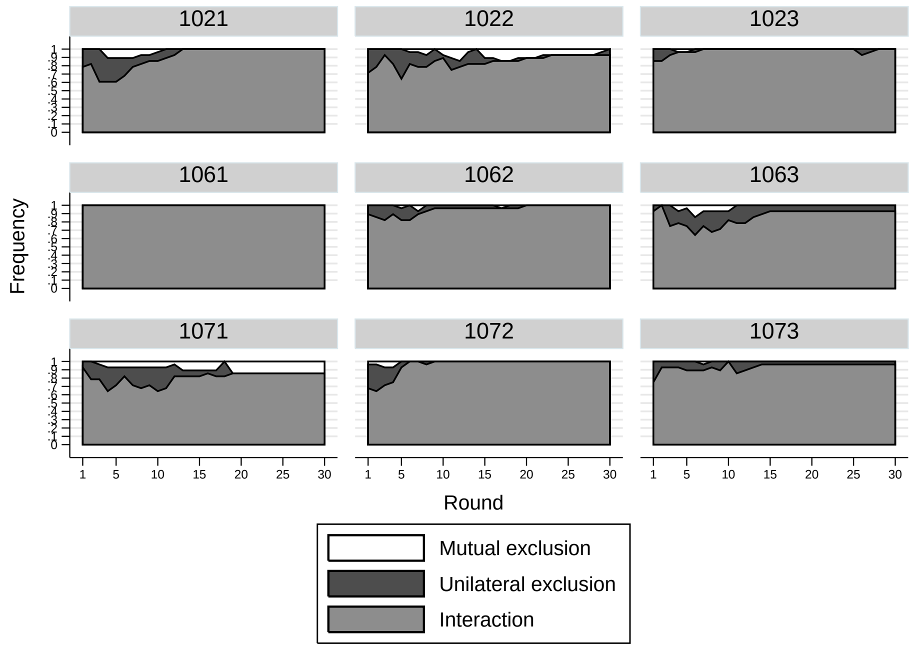

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Figure B.9: NT-IL - Interaction and Exclusion Frequencies in Individual Groups

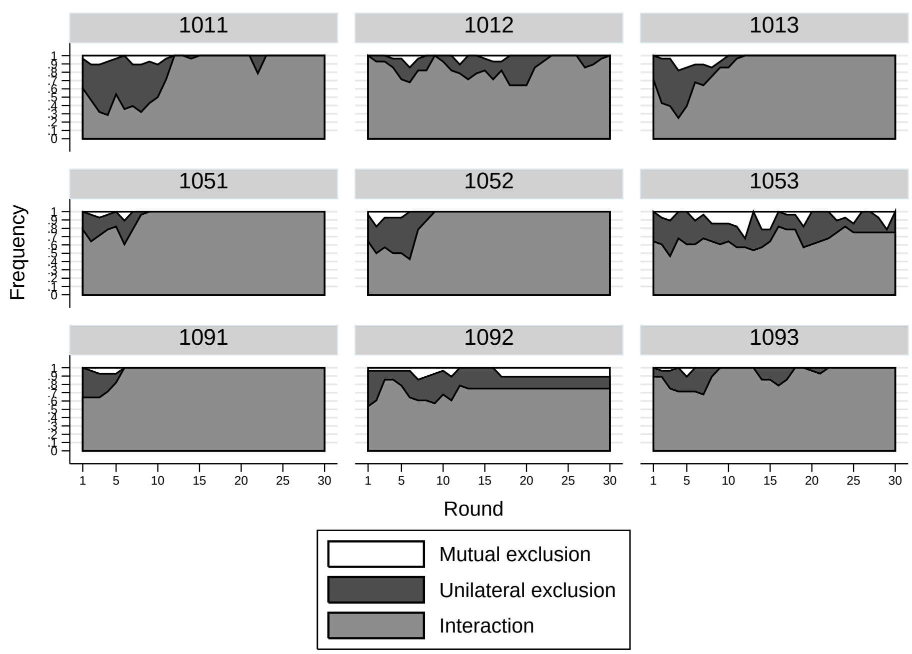

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Figure B.10: NT-AP - Interaction and Exclusion Frequencies in Individual Groups

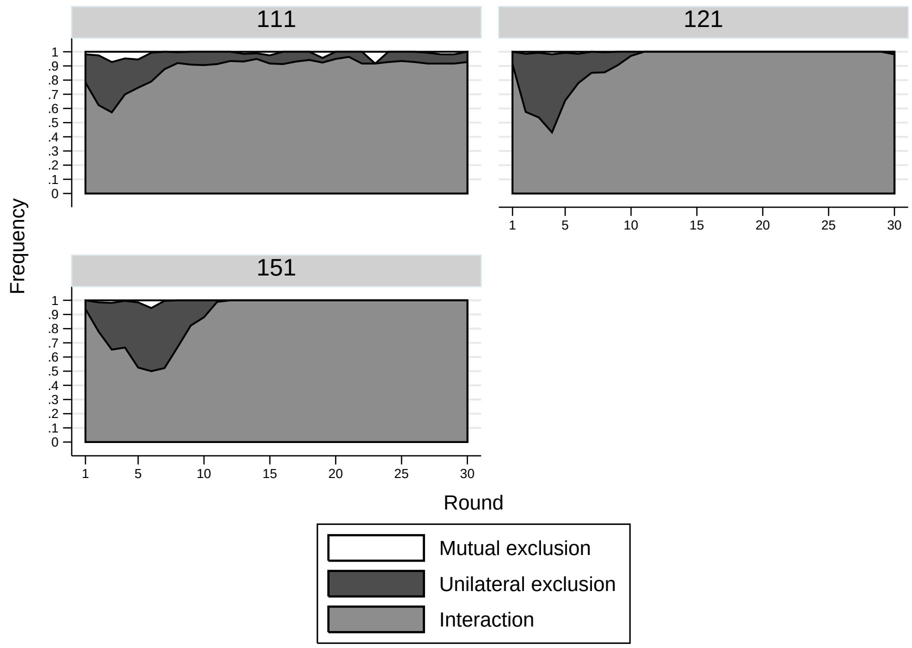

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Figure B.11: NT-XL - Interaction and Exclusion Frequencies in Individual Groups

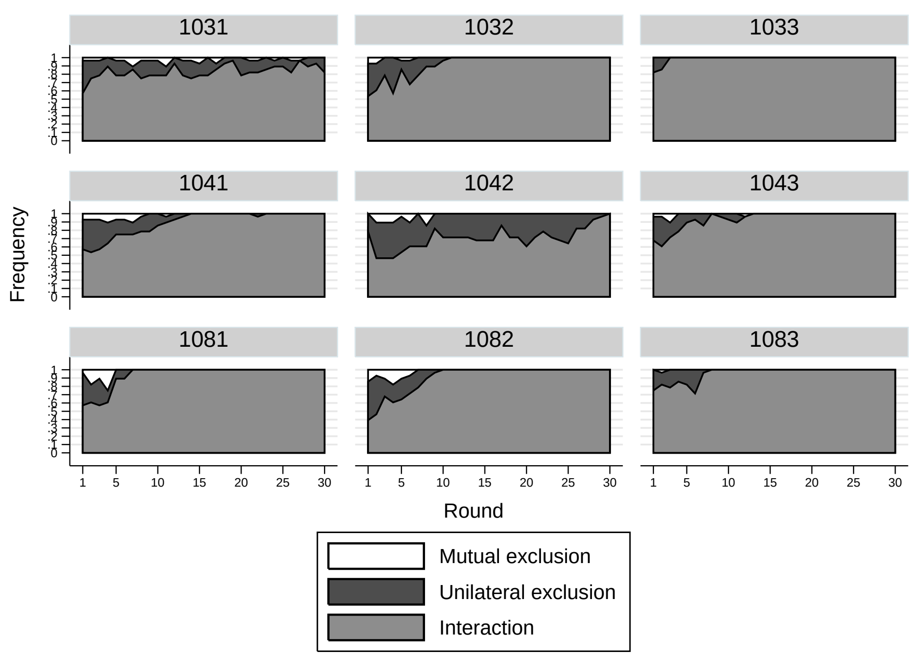

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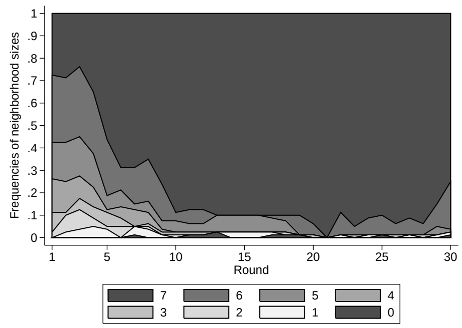
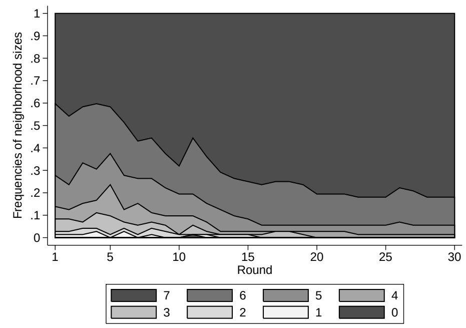
Figure B.12: NT-SP - Interaction and Exclusion Frequencies in Individual Groups

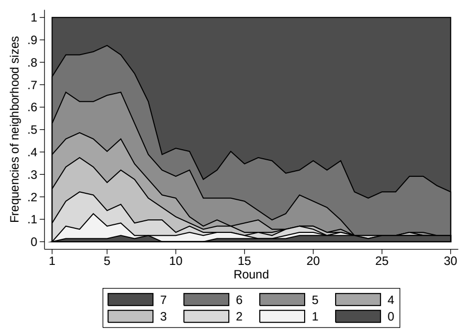
B.4 Frequencies and Development of Neighborhood Sizes over Rounds



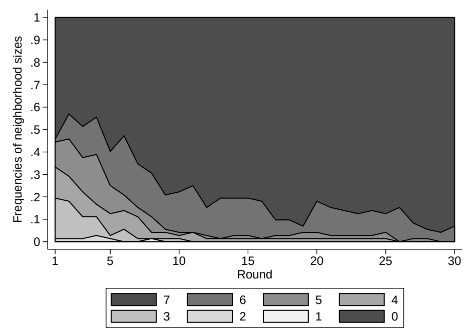
(a) NT



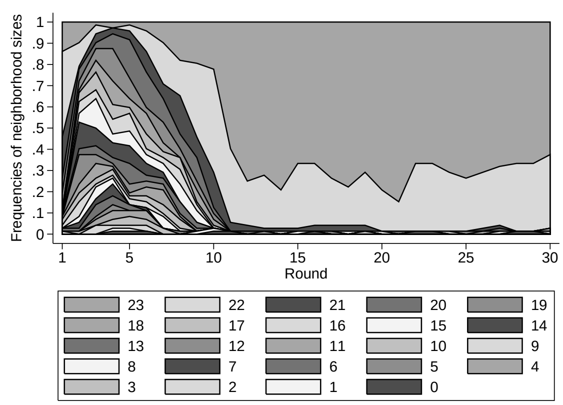
(b) NT-IL



(c) NT-AP



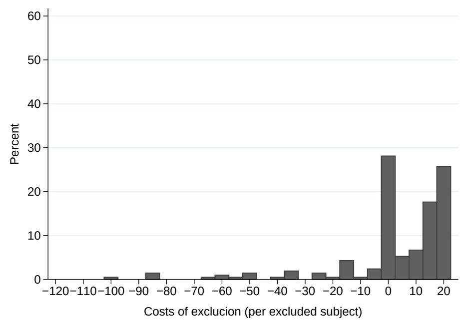
(d) NT-SP



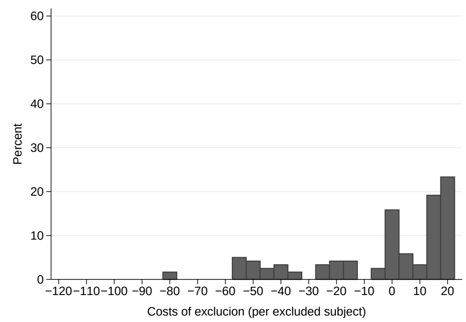
(e) NT-XL

Figure B.13: Frequencies of Interaction Neighborhood Sizes over Rounds (all NT's)

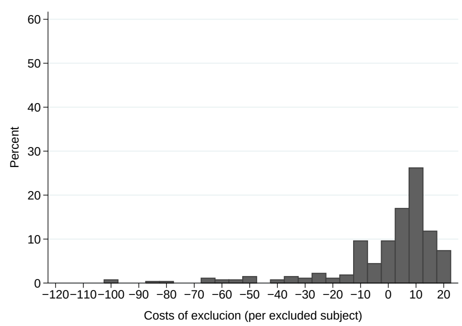
B.5 Distribution of Costs and Benefits of Exclusion for Excluding and Excluded Subjects



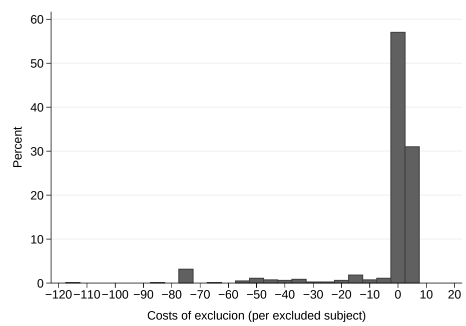
(a) NT



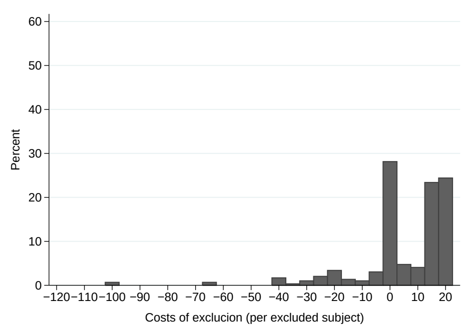
(b) NT-IL



(c) NT-AP

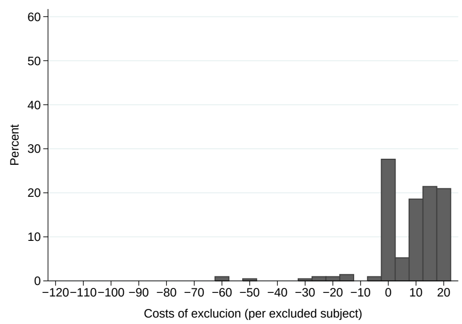


(d) NT-XL

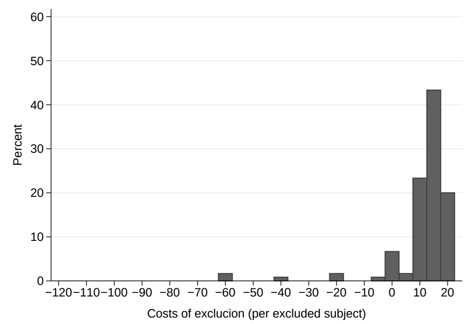


(e) NT-SP

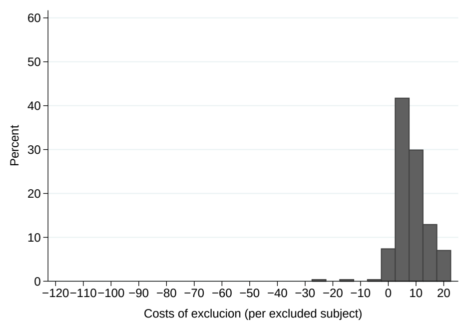
Figure B.14: Distribution of Costs (positive) and Benefits (negative) for *Excluding* Subjects (measured per act of exclusion, all NT's)



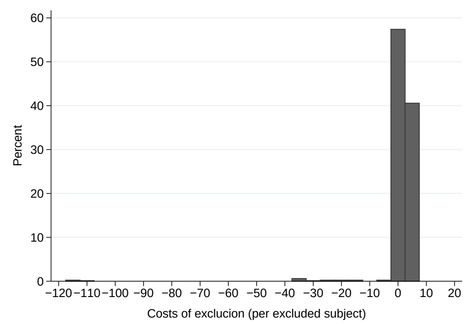
(a) NT



(b) NT-IL



(c) NT-AP



(d) NT-XL

Note: NT-SP is not shown because exclusion costs (benefits) for excluded subjects are zero by design in this treatment.

Figure B.15: Distribution of Costs (positive) and Benefits (negative) for *Excluded* Subjects (measured per act of exclusion, all NT's)

C Experiment Instructions

[**Remark:** In the following we present the instructions and control questions for the neighborhood treatment NT. The instructions for the baseline treatment BT were identical except the paragraphs marked with [**NT**] and [*****]. Paragraphs with [**NT**] were only given in the neighborhood treatment. Paragraphs with [*****] were given in both treatments but appropriately reformulated for the baseline treatment. A complete set of instructions is available from the authors.]

C.1 Instructions for NT

Introduction

Welcome to this decision-making experiment. In this experiment you can earn money. How much you earn depends on your decisions and the decisions of other participants. During the experiment your earnings will be counted in points. At the end of the experiment you get your earned points paid out privately and confidentially in cash, according to the exchange rate:

2 points = 1 eurocent.

It is important that you have a good understanding of the rules in the experiment. Therefore, please read these instructions carefully. In order to check that the instructions are clear to you, you will be asked a few questions at the end of the instructions. The experiment will start only after everybody has correctly answered the questions. At the end of the experiment you will be asked to fill in a short questionnaire. Thereafter you will receive your earnings.

During the whole experiment, you are not allowed to communicate with other participants in any other way than specified in the instructions.

If you have a question, please raise your hand. We will then come to you and answer your question in private.

Explanation Experiment

During the experiment every participant is in a **group of eight**, that is in a group with seven other participants. The group you are in will not change during the experiment. You will not receive any information about the identity of the persons in your group, neither during the experiment, nor after the experiment. Other participants will also not receive any information about your identity.

Each person in your group is indicated by a letter. You will receive the name "**me**". The other seven persons in your group will be indicated by the letters **A, B, C, D, E, F** and **G**. The same letter always refers to the same person.

The experiment consists of 30 rounds. In each round you can earn points. Your total earnings in this experiment is the sum of your earnings in each of the 30 rounds.

[*] In each round, you - and each other person in your group - will have to make two decisions which will influence your earnings. You have to make a **decision** called **"With whom would you like to interact?"** and a **decision** called **"Which number do you choose?"** Your decisions and the decisions of the other participants in your group will influence your earnings (as well as the earnings of the other group members). These decisions are explained in detail below.

Note: During the whole experiment, during all 30 rounds the other participants in your group will stay the same persons

Decisions (in one single round)

[NT] Decision: "With whom would you like to interact?"

[NT] You have to decide with whom you would like to interact. You can **propose** an interaction to any other person in your group and you can make as many proposals as you want. (You can also decide not to make any proposal.) Your interaction proposals - together with the proposals of the other persons in your group - determine with whom you actually interact (in the respective round) as explained below:

- **[NT]** You will interact with a person to whom you proposed to interact only if the other person also proposed to interact with you. That is, **mutual consent** is needed for an interaction to actually take place.

- **[NT]** You will not interact with another person if either only you or only the other person proposed to interact.
- **[NT]** You will not interact with another person if neither of you proposed to interact with each other.

[NT] For convenience we will call those persons in your group with whom you **interact: your neighbors**. Your neighbors are therefore those persons to whom you proposed to interact and who at the same time also proposed to interact with you.

Decision: "Which number do you choose?"

In each round, each person in your group has to choose one number from 1 to 7; i.e. either 1, 2, 3, 4, 5, 6, or 7. Your earned points in each round depend on

1. your **own choice of number**
2. **[*]** the **smallest number** chosen by your neighbors ***and*** yourself
3. **[NT]** the number of neighbors you have

[NT] Note: You can not choose different numbers for different neighbors. You can, however, choose different numbers as well as different persons to interact with in the different rounds.

Here is the payoff table:

		Smallest number chosen by your group including yourself						
		7	6	5	4	3	2	1
	7	130	110	90	70	50	30	10
	6	-	120	100	80	60	40	20
Your	5	-	-	110	90	70	50	30
chosen	4	-	-	-	100	80	60	40
number	3	-	-	-	-	90	70	50
	2	-	-	-	-	-	80	60
	1	-	-	-	-	-	-	70

[*] Since one's choice can be a number from 1 to 7, the smallest number can range from 1 to 7. Your payoff is determined by the cell in the row of "your chosen number" and the column of the "smallest number chosen by your neighbors and yourself". An example is given below.

[*] In the table there are cells with "-". This indicates that such a combination of "your chosen number" and the "smallest number chosen by your neighbors and yourself" is not possible. For example, if "your chosen number" is 4, the smallest number chosen by your neighbors and yourself cannot be 7, 6, or 5.

[**NT**] Your earned points in a round will be the payoff as given in the table multiplied by

$$\frac{\text{number of neighbors}}{7}.$$

[**NT**] For each person in your group with whom you do not interact (i.e. all persons who are not your neighbors) you earn 0 points. For example, if you have no neighbors in a round, then you earn 0 points in that round.

Examples:

[*] Suppose you have four neighbors. You chose 3 and the smallest number chosen by your neighbors and yourself was 3, you earn 4/7 * 90 = 51 3/7 points.

[*] Suppose you have three neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 3, you earn 3/7 * 70 = 30 points.

[*] Suppose you have four neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 4, you earn 4/7 * 90 = 51 3/7 points.

[*] Suppose you have three neighbors. You chose 7 and the smallest number chosen by your neighbors and yourself was 4, you earn 3/7 * 70 = 30 points.

Information about Computer Screen (in one single round)

You now get information about the computer screen that you will see during the experiment. You received a print-out of the computer screen **(Example screen 1)** from us. Take this print-out in front of you. The screen consists of two windows: **History** and **Decision**.

- **History:** This window holds information about past round(s). At the beginning of a new round you will automatically receive information in this window about decisions made in the previous round, (In the example, this is round 2; see upper part of the screen). In the window there are 8 circles, named **me, A, B, C, D, E, F** and **G**. **Me** always refers to you. The letters refer to the other seven persons in your group.
  - **[NT]** A **thick complete** line between two persons (letters or 'me') indicates that they both proposed to interact with each other, that is they were neighbors and, hence, did actually interact with each other. (See, e.g., the line between **me** and **D** on the example screen).
  - **[NT]** A **thin incomplete** line between two persons indicates that only one of them proposed to interact. That is, they were not neighbors and, hence, did not interact with each other. Such a line starts on the side of the person that proposed to interact, and stops just before the circle of the person that did not want to interact. (See, e.g., the line between **me** and **F** on the example screen: **me** proposed to interact with **F**, but **F** did not propose to interact with **me**.)
  - **[NT]** No line between two persons indicates that neither of them proposed to interact. That is, they were not neighbors and hence, did not interact with each other.
  - Next to the letters you see numbers between 1 and 7. These numbers indicate the chosen numbers of the persons in your group. The number next to letter A shows the chosen number of A. The number next to letter B shows the chosen number of B and so forth. (For example in screen 1, persons **A** and **G** have chosen number 5, while the persons **me** and **E** have chosen number 7.)
  - At the bottom of this window you find two buttons called **Previous Round** and **Next Round**. You can use these buttons to look at the decisions in all previous rounds. The button **Most Recent Round** brings you back to the last round played.
  - Your **earnings** (in points) in the corresponding round can be found just above the graph next to **Round Earnings**.

- **Decision:** In this window you see which round you are in and here you have to make your decisions.
  1. **[NT] With whom would you like to interact?** Below this question you see the seven letters which refer to the seven other participants in your group. You can propose to interact with another person in your group by clicking the button "yes" (the first button), that is the first button to the right of that person's letter. If you

do not want to interact with a person or if you want to remove a proposal to interact, you activate the button "no", that is the second button to the right of that person's letter. **Note:** At the beginning of each new round the buttons (i.e. proposals) you have chosen in the previous round will be activated. In each new round you can change your choices, i.e., proposals (not) to interact in the way described above.

2. **Which number do you choose?** In the small window next to **My Number** you type in the number you want to choose.

[*] When you are satisfied with all your decisions (that is, with **both** the proposals (not) to interact and your chosen number), you have to confirm these decisions by clicking on the button **"Ok"**.

[*] **Note:** After each round you will receive information about all the decisions made (that is, all interaction proposals made and the number choices) by all persons in your group. All other persons in your group will also receive information about all your decisions. This is the end of the instructions. You will now have to answer a few questions to make sure that you understood the instructions properly. If you have any questions please raise your hand. After you have answered all questions please raise your hand. We will then come to you to check your answers. The experiment will begin only after everybody has correctly answered all questions.
If you are ready please remain seated quietly.

Control Questions

With how many other persons are you in a group (excluding yourself)?

Are all persons in your group always (in all rounds) the same? yes no

Look at the arbitrary example of the screen above. Answer the following questions based on this example.

What is the smallest number that is played in your group?

Who played this smallest number?

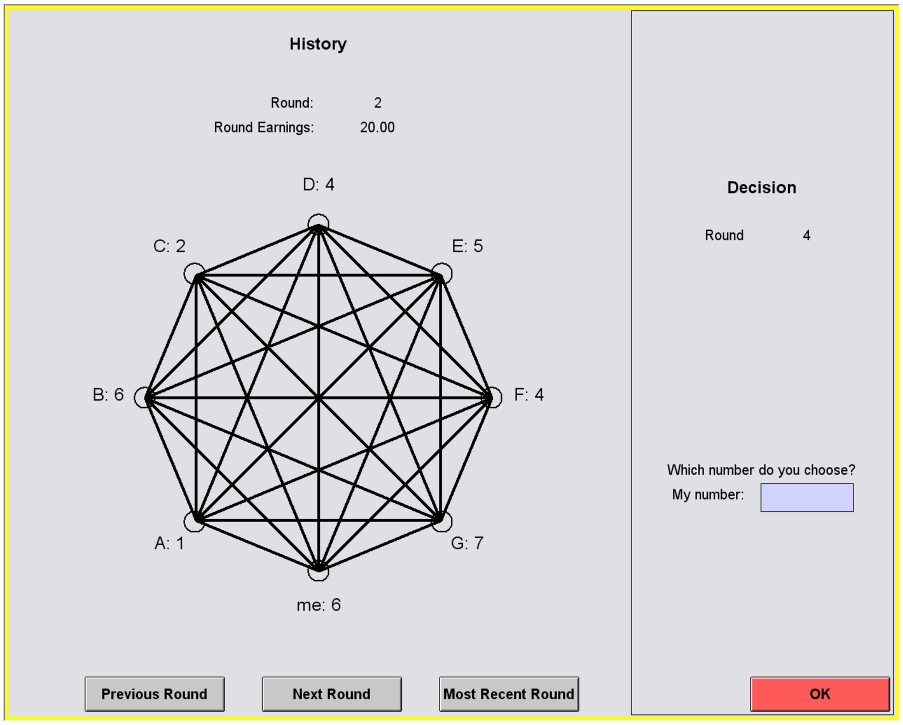


Figure C.1: [**BT**] Example screen

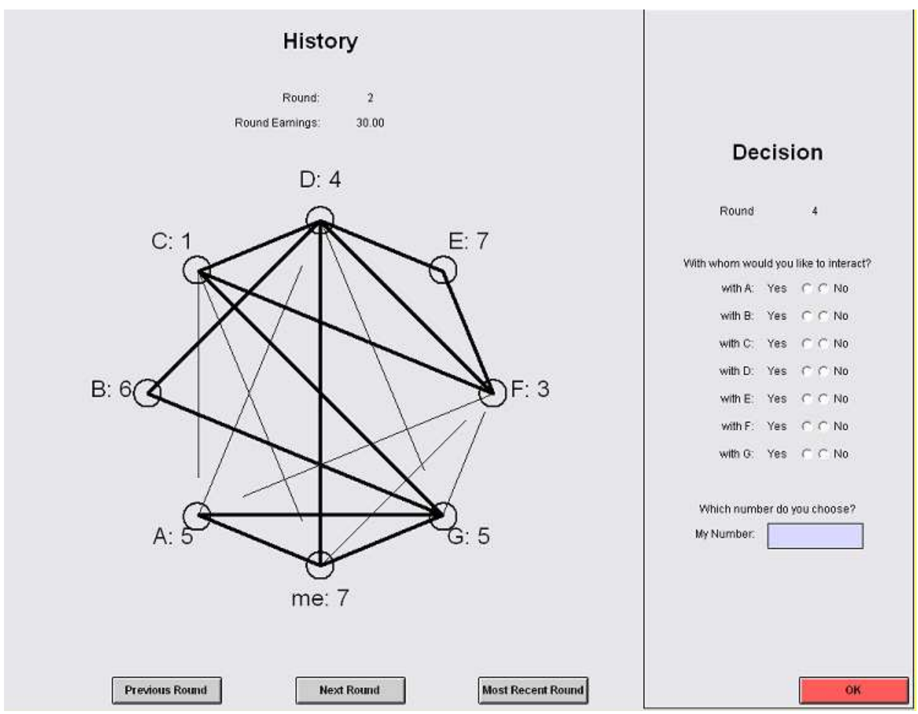


Figure C.2: [**NT**] Example screen

[**NT**] What is the smallest number that is played among your neighbours and yourself?

[**NT**] Who played this smallest number?

How many points did you ('Me') earn in the previous round?

How many points did player E earn in the previous round?

Which persons in your group chose number 3 in the previous round?	○ A	○ B	○ C	○ D	○ E	○ F	○ G
[**NT**] With whom did you interact in the previous round? In other words, who were your neighbours?	○ A	○ B	○ C	○ D	○ E	○ F	○ G
[**NT**] With whom did you propose to interact in the previous round?	○ A	○ B	○ C	○ D	○ E	○ F	○ G
[**NT**] Who proposed to interact with you in the previous round?	○ A	○ B	○ C	○ D	○ E	○ F	○ G
[**NT**] With whom did person E interact in the previous round? In other words, who were the neighbours of person E?	○ Me	○ A	○ B	○ C	○ D	○ F	○ G

C.2 Instructions for BT-XL and NT-XL

[**Remark:** The instructions for large groups were equivalent to the smaller group instructions, except that subjects were called "**me, N1, N2, ..., N23**" rather than "**me, A, B, ..., G**", the calculation examples have been modified, and the layout of the history window has been slightly modified.]

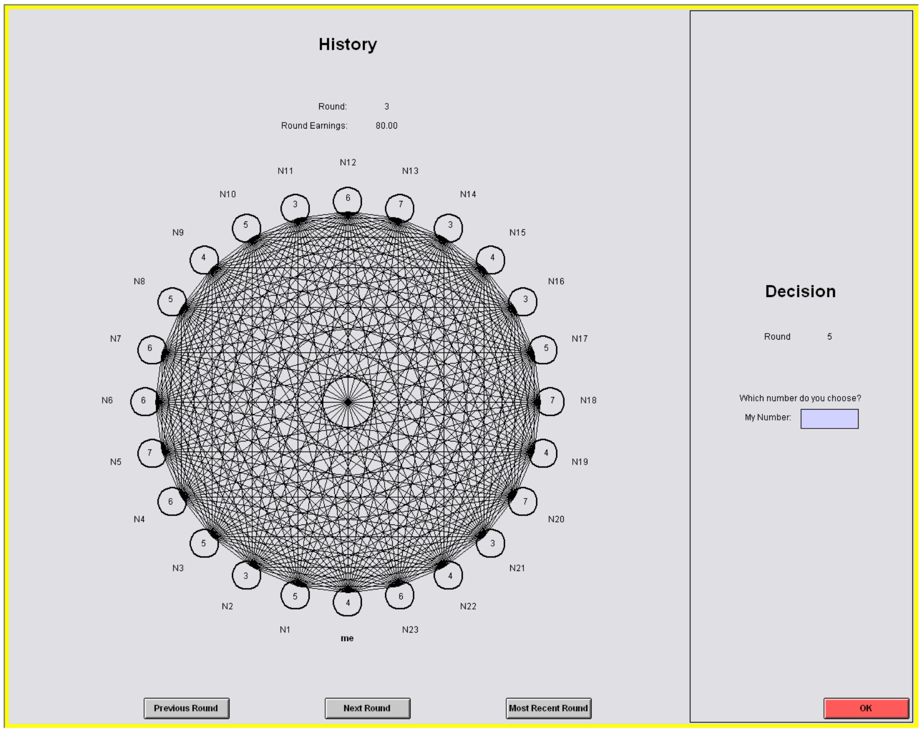


Figure C.3: [**BT-XL**] Example screen

C.3 Instructions for NT-IL

Introduction

Welcome to this decision-making experiment. In this experiment you can earn money. How much you earn depends on your decisions and the decisions of other participants.

During the experiment your earnings will be counted in points. At the end of the experiment you get your earned points paid out privately and confidentially in cash, according to the exchange rate:

2 points = 1 eurocent.

It is important that you have a good understanding of the rules in the experiment. Therefore, please read these instructions carefully. In order to check that the instructions are clear to you, you will be asked a few questions at the end of the instructions. The experiment will start only after everybody has correctly answered the questions. At the end of the experiment you will be asked to fill in a short questionnaire. Thereafter you will receive your earnings.

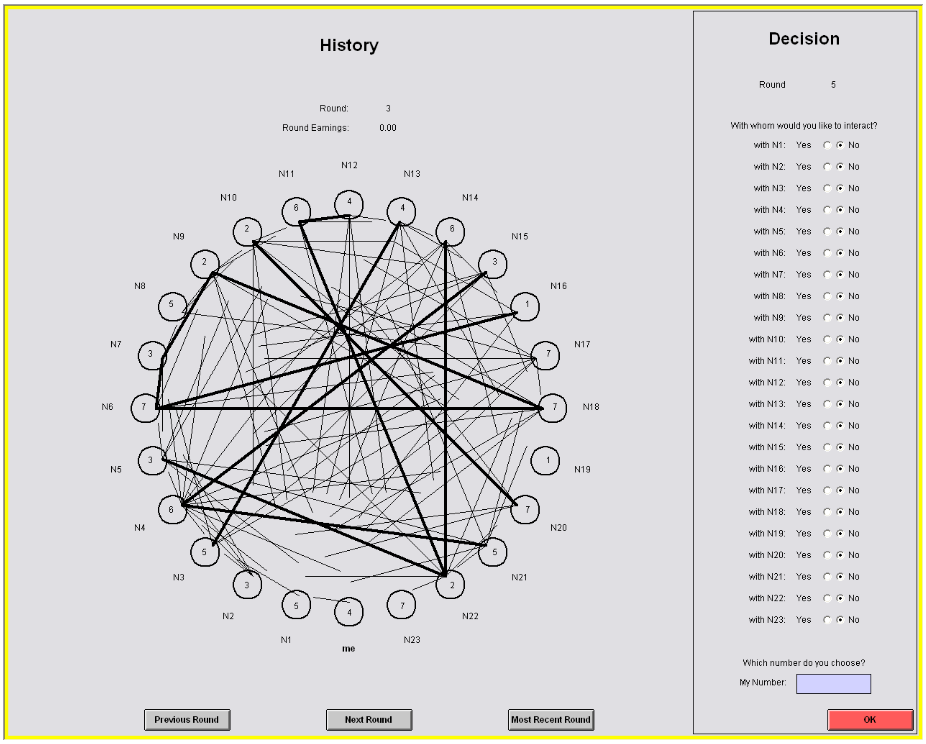


Figure C.4: [**NT-XL**] Example screen

During the whole experiment, you are not allowed to communicate with other participants in any other way than specified in the instructions.

If you have a question, please raise your hand. We will then come to you and answer your question in private.

Explanation Experiment

During the experiment every participant is in a **group of eight**, that is in a group with seven other participants. The group you are in will not change during the experiment. You will not receive any information about the identity of the persons in your group, neither during the experiment, nor after the experiment. Other participants will also not receive any information about your identity.

Each person in your group is indicated by a letter. You will receive the name "**me**". The other seven persons in your group will be indicated by the letters **A, B, C, D, E, F** and **G**.

The same letter always refers to the same person.

The experiment consists of 30 rounds. In each round you can earn points. Your total earnings in this experiment is the sum of your earnings in each of the 30 rounds.

In each round, you - and each other person in your group - will have to make two decisions which will influence your earnings. You have to make a **decision** called **"With whom would you like to interact?"** and a **decision** called **"Which number do you choose?"** Your decisions and the decisions of the other participants in your group will influence your earnings (as well as the earnings of the other group members). These decisions are explained in detail below.

Note: During the whole experiment, during all 30 rounds the other participants in your group will stay the same persons

Decisions (in one single round)

Decision: "With whom would you like to interact?"

You have to decide with whom you would like to interact. You can **propose** an interaction to any other person in your group and you can make as many proposals as you want. (You can also decide not to make any proposal.) Your interaction proposals - together with the proposals of the other persons in your group - determine with whom you actually interact (in the respective round) as explained below:

- You will interact with a person to whom you proposed to interact only if the other person also proposed to interact with you. That is, **mutual consent** is needed for an interaction to actually take place.
- You will not interact with another person if either only you or only the other person proposed to interact.
- You will not interact with another person if neither of you proposed to interact with each other.

For convenience we will call those persons in your group with whom you **interact: your neighbors**. Your neighbors are therefore those persons to whom you proposed to interact, irrespective of whether those other persons proposed to interact with you.

Decision: "Which number do you choose?"

In each round, each person in your group has to choose one number from 1 to 7; i.e. either 1, 2, 3, 4, 5, 6, or 7.

Your earned points in each round depend on

1. your **own choice of number**
2. the **smallest number** chosen by your neighbors ***and*** yourself
3. the number of neighbors you have

Note: You can not choose different numbers for different neighbors. You can, however, choose different numbers as well as different persons to interact with in the different rounds.

Here is the payoff table:

		Smallest number chosen by your neighbors including yourself						
		7	6	5	4	3	2	1
	7	130	110	90	70	50	30	10
	6	-	120	100	80	60	40	20
Your	5	-	-	110	90	70	50	30
chosen	4	-	-	-	100	80	60	40
number	3	-	-	-	-	90	70	50
	2	-	-	-	-	-	80	60
	1	-	-	-	-	-	-	70

Since one's choice can be a number from 1 to 7, the smallest number can range from 1 to 7. Your payoff is determined by the cell in the row of "your chosen number" and the column of the "smallest number chosen by your neighbors and yourself". An example is given below.

In the table there are cells with "-". This indicates that such a combination of "your chosen number" and the "smallest number chosen by your neighbors and yourself" is not possible. For example, if "your chosen number" is 4, the smallest number chosen by your neighbors and yourself cannot be 7, 6, or 5.

Your earned points in a round will be the payoff as given in the table multiplied by

$$\frac{\text{number of neighbors}}{7}.$$

For each person in your group with whom you do not interact (i.e. all persons who are not your neighbors) you earn 0 points. For example, if you have no neighbors in a round, then you earn 0 points in that round.

Examples:

Suppose you have four neighbors. You chose 3 and the smallest number chosen by your neighbors and yourself was 3, you earn 4/7 * 90 = 51 3/7 points.

Suppose you have three neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 3, you earn 3/7 * 70 = 30 points.

Suppose you have four neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 4, you earn 4/7 * 90 = 51 3/7 points.

Suppose you have three neighbors. You chose 7 and the smallest number chosen by your neighbors and yourself was 4, you earn 3/7 * 70 = 30 points.

Information about Computer Screen (in one single round)

You now get information about the computer screen that you will see during the experiment. You received a print-out of the computer screen **(Example screen 1)** from us. Take this print-out in front of you. The screen consists of two windows: **History** and **Decision**.

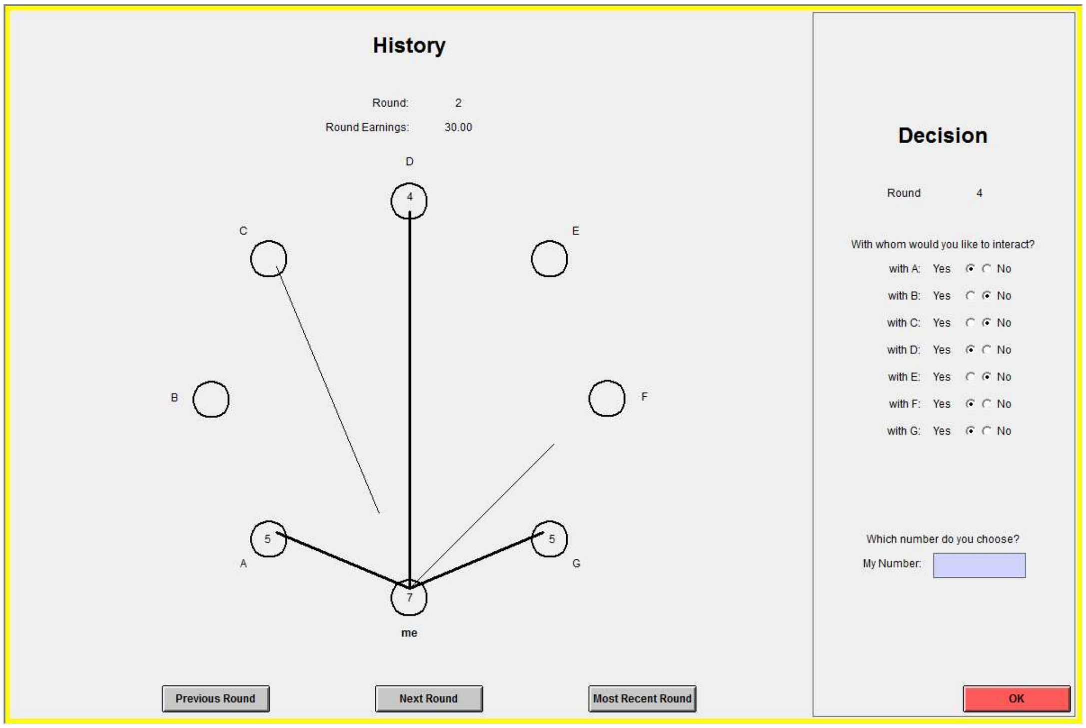


Figure C.5: [**NT-IL**] **Example screen**

- **History:** This window holds information about past round(s). At the beginning of a new round you will automatically receive information in this window about decisions made in the previous round, (In the example, this is round 2; see upper part of the screen). In the window there are 8 circles, named **me, A, B, C, D, E, F** and **G**. **Me** always refers to you. The letters refer to the other seven persons in your group.

  – A **thick complete** line between me and another person indicates that both of you proposed to interact with each other, that is, you were neighbors and, hence, did actually interact with each other. (See, e.g., the line between **me** and **D** on the example screen.)

  – A **thick complete** line between me and another person indicates that only one of you proposed to interact. Such a line starts on the side of the person that proposed to interact, and stops just before the circle of the person that did not want to interact. (See, e.g., the line between **me** and **F** on the example screen: **me** proposed to interact with **F**, but **F** did not propose to interact with **me**. At the same time **C** proposed to interact with **me**, but **me** did not propose to interact with **C**) .

- No line between **me** and another person indicates that neither of you proposed to interact. That is, you were not neighbors and hence, did not interact with each other

- Whenever there are **thick** complete lines between **me** and other persons, you see a number between 1 and 7 in the circle next to the corresponding persons' letter. These numbers indicate the chosen numbers of your neighbors. For example in screen 1, persons **A** and **G** have chosen number 5, while **me** chose number 7.

- At the bottom of this window you find two buttons called **Previous Round** and **Next Round**. You can use these buttons to look at the decisions in all previous rounds. The button **Most Recent Round** brings you back to the last round played.

- Your **earnings** (in points) in the corresponding round can be found just above the graph next to **Round Earnings**.

• **Decision:** In this window you see which round you are in and here you have to make your decisions.

1. **With whom would you like to interact?** Below this question you see the seven letters which refer to the seven other participants in your group. You can propose to interact with another person in your group by clicking the button "yes" (the first button), that is the first button to the right of that person's letter. If you do not want to interact with a person or if you want to remove a proposal to interact, you activate the button "no", that is the second button to the right of that person's letter. **Note:** At the beginning of each new round the buttons (i.e. proposals) you have chosen in the previous round will be activated. In each new round you can change your choices, i.e., proposals (not) to interact in the way described above.

2. **Which number do you choose?** In the small window next to **My Number** you type in the number you want to choose.

When you are satisfied with all your decisions (that is, with **both** the proposals (not) to interact and your chosen number), you have to confirm these decisions by clicking on the button **"Ok"**.

Note: After each round you will only receive information about the numbers chosen by the persons with whom you interacted, and the interaction proposals that you made or were made to you. The other persons in your group will also only receive information about the numbers chosen by the persons with whom they interacted, the interaction proposals they made, and the interaction proposals made to them.

This is the end of the instructions. You will now have to answer a few questions to make sure that you understood the instructions properly. If you have any questions please raise your hand. After you have answered all questions please raise your hand. We will then come to you to check your answers.

The experiment will begin only after everybody has correctly answered all questions.

If you are ready please remain seated quietly.

Control Questions

With how many other persons are you in a group (excluding yourself)? Are all persons in your group always (in all rounds) the same? yes no

Look at the arbitrary example of the additional screen. Answer the following questions based on this example.

What is the smallest number that is played in your group in round 2?

Who played this smallest number?

[NT] What is the smallest number that is played among your neighbors and yourself in round 2?

[NT] Who played this smallest number?

[NT-AP, NT-SP]Which persons in your group chose number 7 in round 2?	◯ A	◯ B	◯ C	◯ D	◯ E	◯ F	◯ G

[NT-IL]Which persons in your group for sure chose number 7 in round 2?	yes	◯	◯	◯	◯	◯	◯	◯
	no	◯	◯	◯	◯	◯	◯	◯
	don't know	◯	◯	◯	◯	◯	◯	◯
		A	B	C	D	E	F	G

With whom did you ('me') interact in round 2? In other words, who were your neighbors?	◯ A	◯ B	◯ C	◯ D	◯ E	◯ F	◯ G

[NT-AP, NT-IL] With whom did you ('me') propose to interact in round 2?	◯ A	◯ B	◯ C	◯ D	◯ E	◯ F	◯ G

Who proposed to interact with you in round 2?	◯ A	◯ B	◯ C	◯ D	◯ E	◯ F	◯ G

[NT-AP, NT-SP] With whom did person E interact in round 2? In other words, who were the neighbors of person E?	◯ Me	◯ A	◯ B	◯ C	◯ D	◯ F	◯ G

How many points did you ('Me') earn in round 2?

[NT-AP, NT-SP How many points did player E earn in round 2?

[NT-AP, NT-IL]Do you have enough information to calculate the earned points of player G in round 2?	yes	◯
	no	◯
	don't know	◯

C.4 Instructions for NT-AP

Introduction

Welcome to this decision-making experiment. In this experiment you can earn money. How much you earn depends on your decisions and the decisions of other participants.

During the experiment your earnings will be counted in points. At the end of the experiment you get your earned points paid out privately and confidentially in cash, according to the exchange rate:

2 points = 1 eurocent.

It is important that you have a good understanding of the rules in the experiment. Therefore, please read these instructions carefully. In order to check that the instructions are clear to you, you will be asked a few questions at the end of the instructions. The experiment will start only after everybody has correctly answered the questions. At the end of the experiment you will be asked to fill in a short questionnaire. Thereafter you will receive your earnings.

During the whole experiment, you are not allowed to communicate with other participants in any other way than specified in the instructions.

If you have a question, please raise your hand. We will then come to you and answer your question in private.

Explanation Experiment

During the experiment every participant is in a **group of eight**, that is in a group with seven other participants. The group you are in will not change during the experiment. You will not receive any information about the identity of the persons in your group, neither during the experiment, nor after the experiment. Other participants will also not receive any information about your identity.

Each person in your group is indicated by a letter. You will receive the name "**me**". The other seven persons in your group will be indicated by the letters **A, B, C, D, E, F** and **G**. The same letter always refers to the same person.

The experiment consists of 30 rounds. In each round you can earn points. Your total earnings in this experiment is the sum of your earnings in each of the 30 rounds.

In each round, you - and each other person in your group - will have to make two decisions which will influence your earnings. You have to make a **decision** called **"With whom would you like to interact?"** and a **decision** called **"Which number do you choose?"** Your decisions and the decisions of the other participants in your group will influence your earnings (as well as the earnings of the other group members). These decisions are explained in detail below.

Note: During the whole experiment, during all 30 rounds the other participants in your group will stay the same persons

Decisions (in one single round)

Decision: "With whom would you like to interact?"

You have to decide with whom you would like to interact. You can **propose** an interaction to any other person in your group and you can make as many proposals as you want. (You can also decide not to make any proposal.)

Interacting with another person means that this other person's behavior will affect your earnings. Your behavior will affect the other person's earnings only if the other person proposed to interact with you.

Your interaction proposals determine with whom you actually interact (in the respective round) as explained below:

- You will interact with a person to whom you proposed to interact only if the other person also proposed to interact with you. That is, **mutual consent** is needed for an interaction to actually take place.
- You will not interact with another person if either only you or only the other person proposed to interact.

- You will not interact with another person if neither of you proposed to interact with each other.

For convenience we will call those persons in your group with whom you **interact: your neighbors**. Your neighbors are therefore those persons to whom you proposed to interact and who at the same time also proposed to interact with you.

Decision: "Which number do you choose?"

In each round, each person in your group has to choose one number from 1 to 7; i.e. either 1, 2, 3, 4, 5, 6, or 7.

Your earned points in each round depend on

1. your **own choice of number**
2. the **smallest number** chosen by your neighbors ***and*** yourself
3. the number of neighbors you have

Note: You can not choose different numbers for different neighbors. You can, however, choose different numbers as well as different persons to interact with in the different rounds.

Your earnings consist of two parts, Part 1 and Part 2.

Here is the payoff table for Part 1:

		Smallest number chosen by your neighbors including yourself						
		7	6	5	4	3	2	1
	7	140	120	100	80	60	40	20
	6	-	120	100	80	60	40	20
Your	5	-	-	100	80	60	40	20
chosen	4	-	-	-	80	60	40	20
number	3	-	-	-	-	60	40	20
	2	-	-	-	-	-	40	20
	1	-	-	-	-	-	-	20

Since one's choice can be a number from 1 to 7, the smallest number can range from 1 to 7. Your Part 1 payoff is determined by the cell in the row of "your chosen number" and the column of the "smallest number chosen by your neighbors and yourself". An example is given below.

In the table for Part 1 there are cells with "-". This indicates that such a combination of "your chosen number" and the "smallest number chosen by your neighbors and yourself" is not possible. For example, if "your chosen number" is 4, the smallest number chosen by your neighbors and yourself cannot be 7, 6, or 5.

Your earned points of Part1 in a round will be the payoff as given in the table multiplied by

$$\frac{\text{number of neighbors}}{7}.$$

For each person in your group with whom you do not interact (i.e. all persons who are not your neighbors) you earn 0 points for Part 1. For example, if you have no neighbors in a round, then for Part 1 you earn 0 points in that round.

In addition to the Part 1 earnings you will receive points that depend only on your own choice of number, independent of your number of neighbors. Here is the earnings table for Part 2:

		Points
	7	0
	6	10
Your	5	20
chosen	4	30
number	3	40
	2	50
	1	60

Examples:

Suppose you have four neighbours. You chose 3 and the smallest number chosen by your neighbours and yourself was 3, your Part 1 earnings are 4/7 * 60 = 34 2/7 points and your Part 2 earnings are 40. Hence, you earn 34 2/7 + 40 = 74 2/7 points.

Suppose you have three neighbours. You chose 5 and the smallest number chosen by your neighbours and yourself was 3, your Part 1 earnings are 3/7 * 60 = 25 5/7 points and your Part 2 earnings are 20. Hence, you earn 25 5/7 + 20 = 45 5/7 points.

Suppose you have four neighbours. You chose 5 and the smallest number chosen by your neighbours and yourself was 4, your Part 1 earnings are 4/7 * 80 = 45 5/7 points and your Part 2 earnings are 20. Hence, you earn 45 5/7 + 20 = 65 5/7 points.

Suppose you have three neighbours. You chose 7 and the smallest number chosen by your neighbours and yourself was 4, your Part 1 earnings are 3/7 * 80 = 34 2/7 points and your Part 2 earnings are 0. Hence, you earn 34 2/7 + 0 = 34 2/7 points.

Information about Computer Screen (in one single round)

You now get information about the computer screen that you will see during the experiment. You received a print-out of the computer screen **(Example screen 1)** from us. Take this print-out in front of you. The screen consists of two windows: **History** and **Decision**.

- **History:** This window holds information about past round(s). At the beginning of a new round you will automatically receive information in this window about decisions made in the previous round, (In the example, this is round 2; see upper part of the screen). In the window there are 8 circles, named **me, A, B, C, D, E, F** and **G**. **Me** always refers to you. The letters refer to the other seven persons in your group.
  - A **thick complete** line between two persons (letters or 'me') indicates that they both proposed to interact with each other, that is they were neighbors and, hence, did actually interact with each other. (See, e.g., the line between **me** and **D** on the example screen.)

  - A **thin incomplete** line between two persons indicates that only one of them proposed to interact. Such a line starts on the side of the person that proposed to interact, and stops just before the circle of the person that did not propose to interact. (See, e.g., the line between **me** and **F** on the example screen: **me** proposed to

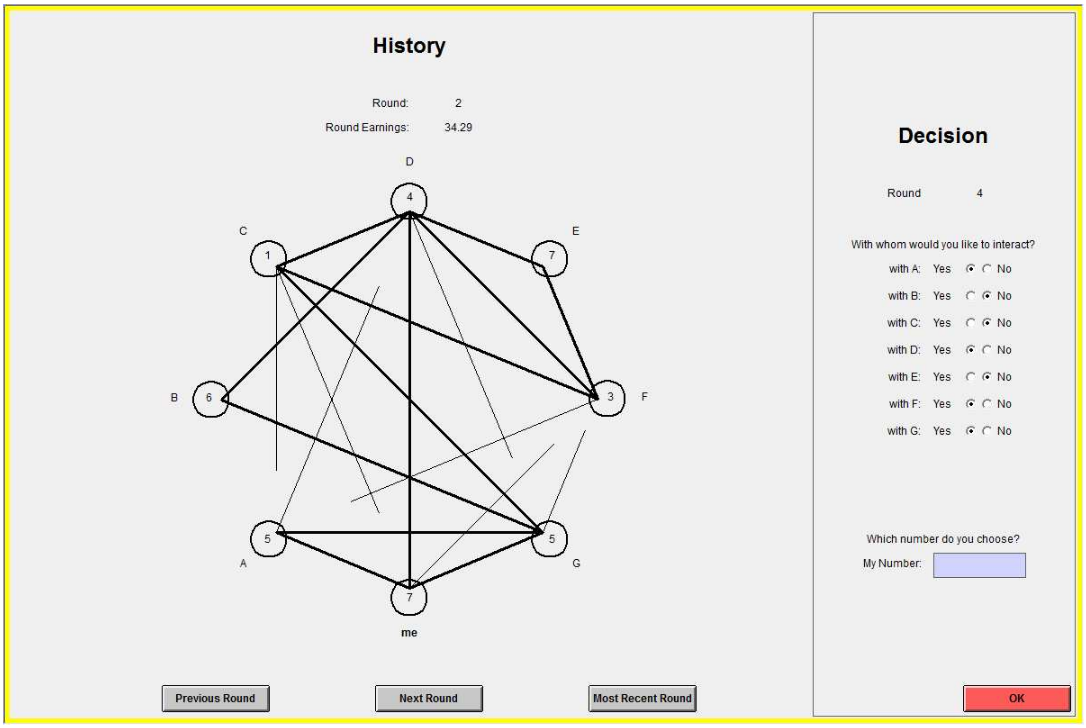


Figure C.6: [**NT-AP**] **Example screen**

interact with **F**, but **F** did not propose to interact with me.).

- No line between two persons indicates that neither of them proposed to interact. That is, they were not neighbors and hence, did not interact with each other.

- In the circles you see numbers between 1 and 7.These numbers indicate the chosen numbers of the persons in your group. The number in the circle next to letter **A** shows the chosen number of **A**. The number in the circle next to letter **B** shows the chosen number of **B** and so forth. (For example in screen 1, persons **A** and **G** have chosen number 5, while the persons **me** and **E** have chosen number 7.)

- At the bottom of this window you find two buttons called **Previous Round** and **Next Round**. You can use these buttons to look at the decisions in all previous rounds. The button **Most Recent Round** brings you back to the last round played.

- Your **earnings** (in points) in the corresponding round can be found just above the graph next to **Round Earnings**.

- **Decision:** In this window you see which round you are in and here you have to make your decisions.

  1. **With whom would you like to interact?** Below this question you see the seven letters which refer to the seven other participants in your group. You can propose to interact with another person in your group by clicking the button “yes” (the first button), that is the first button to the right of that person’s letter. If you do not want to interact with a person or if you want to remove a proposal to interact, you activate the button “no”, that is the second button to the right of that person’s letter. **Note:** At the beginning of each new round the buttons (i.e. proposals) you have chosen in the previous round will be activated. In each new round you can change your choices, i.e., proposals (not) to interact in the way described above.

  2. **Which number do you choose?** In the small window next to **My Number** you type in the number you want to choose.

  When you are satisfied with all your decisions (that is, with **both** the proposals (not) to interact and your chosen number), you have to confirm these decisions by clicking on the button **“Ok”**.

Note: After each round you will receive information about all the decisions made (that is, all interaction proposals made and the number choices) by all persons in your group. All other persons in your group will also receive information about all your decisions.

This is the end of the instructions. You will now have to answer a few questions to make sure that you understood the instructions properly. If you have any questions please raise your hand. After you have answered all questions please raise your hand. We will then come to you to check your answers.

The experiment will begin only after everybody has correctly answered all questions.

If you are ready please remain seated quietly.

C.5 Instructions for NT-SP

Introduction

Welcome to this decision-making experiment. In this experiment you can earn money. How much you earn depends on your decisions and the decisions of other participants.

During the experiment your earnings will be counted in points. At the end of the experiment you get your earned points paid out privately and confidentially in cash, according to the exchange rate:

2 points = 1 eurocent.

It is important that you have a good understanding of the rules in the experiment. Therefore, please read these instructions carefully. In order to check that the instructions are clear to you, you will be asked a few questions at the end of the instructions. The experiment will start only after everybody has correctly answered the questions. At the end of the experiment you will be asked to fill in a short questionnaire. Thereafter you will receive your earnings.

During the whole experiment, you are not allowed to communicate with other participants in any other way than specified in the instructions.

If you have a question, please raise your hand. We will then come to you and answer your question in private.

Explanation Experiment

During the experiment every participant is in a **group of eight**, that is in a group with seven other participants. The group you are in will not change during the experiment. You will not receive any information about the identity of the persons in your group, neither during the experiment, nor after the experiment. Other participants will also not receive any information about your identity.

Each person in your group is indicated by a letter. You will receive the name "**me**". The other seven persons in your group will be indicated by the letters **A, B, C, D, E, F** and **G**. The same letter always refers to the same person.

The experiment consists of 30 rounds. In each round you can earn points. Your total earnings in this experiment is the sum of your earnings in each of the 30 rounds.

In each round, you - and each other person in your group - will have to make two decisions which will influence your earnings. You have to make a **decision** called **“With whom would you like to interact?”** and a **decision** called **“Which number do you choose?”** Your decisions and the decisions of the other participants in your group will influence your earnings (as well as the earnings of the other group members). These decisions are explained in detail below.

Note: During the whole experiment, during all 30 rounds the other participants in your group will stay the same persons

Decisions (in one single round)

Decision: “With whom would you like to interact?”

You have to decide with whom you would like to interact. You can **propose** an interaction to any other person in your group and you can make as many proposals as you want. (You can also decide not to make any proposal.)

Interacting with another person means that this other person’s behavior will affect your earnings. Your behavior will affect the other person’s earnings only if the other person proposed to interact with you.

Your interaction proposals determine with whom you actually interact (in the respective round) as explained below:

- You will interact with a person to whom you proposed to interact, irrespective of whether this other person proposed to interact with you or not. In that case, the other person’s behavior will affect your earnings.
- You will not interact with another person if only the other person proposed to interact with you. In that case, the other person’s behavior will not influence your earnings, but

your behavior will influence the other person's earnings.

- You will not interact with another person if neither of you proposed to interact with each other. In that case the other person's behavior will not affect your earnings and your behavior will not affect the other person's earnings.

For convenience we will call those persons in your group with whom you **interact: your neighbors**. Your neighbors are therefore those persons to whom you proposed to interact, irrespective of whether those other persons proposed to interact with you.

Decision: "Which number do you choose?"

In each round, each person in your group has to choose one number from 1 to 7; i.e. either 1, 2, 3, 4, 5, 6, or 7.

Your earned points in each round depend on

1. your **own choice of number**
2. the **smallest number** chosen by your neighbors ***and*** yourself
3. the number of neighbors you have

Note: You can not choose different numbers for different neighbors. You can, however, choose different numbers as well as different persons to interact with in the different rounds.

Here is the payoff table:

		Smallest number chosen by your neighbors including yourself						
		7	6	5	4	3	2	1
	7	130	110	90	70	50	30	10
	6	-	120	100	80	60	40	20
Your	5	-	-	110	90	70	50	30
chosen	4	-	-	-	100	80	60	40
number	3	-	-	-	-	90	70	50
	2	-	-	-	-	-	80	60
	1	-	-	-	-	-	-	70

Since one's choice can be a number from 1 to 7, the smallest number can range from 1 to 7. Your payoff is determined by the cell in the row of "your chosen number" and the column of the "smallest number chosen by your neighbors and yourself". An example is given below.

In the table there are cells with "-". This indicates that such a combination of "your chosen number" and the "smallest number chosen by your neighbors and yourself" is not possible. For example, if "your chosen number" is 4, the smallest number chosen by your neighbors and yourself cannot be 7, 6, or 5.

Your earned points in a round will be the payoff as given in the table multiplied by

$$\frac{\text{number of neighbors}}{7}.$$

For each person in your group with whom you do not interact (i.e. all persons who are not your neighbors) you earn 0 points. For example, if you have no neighbors in a round, then you earn 0 points in that round.

Examples:

Suppose you have four neighbors. You chose 3 and the smallest number chosen by your neighbors and yourself was 3, you earn 4/7 * 90 = 51 3/7 points.

Suppose you have three neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 3, you earn 3/7 * 70 = 30 points.

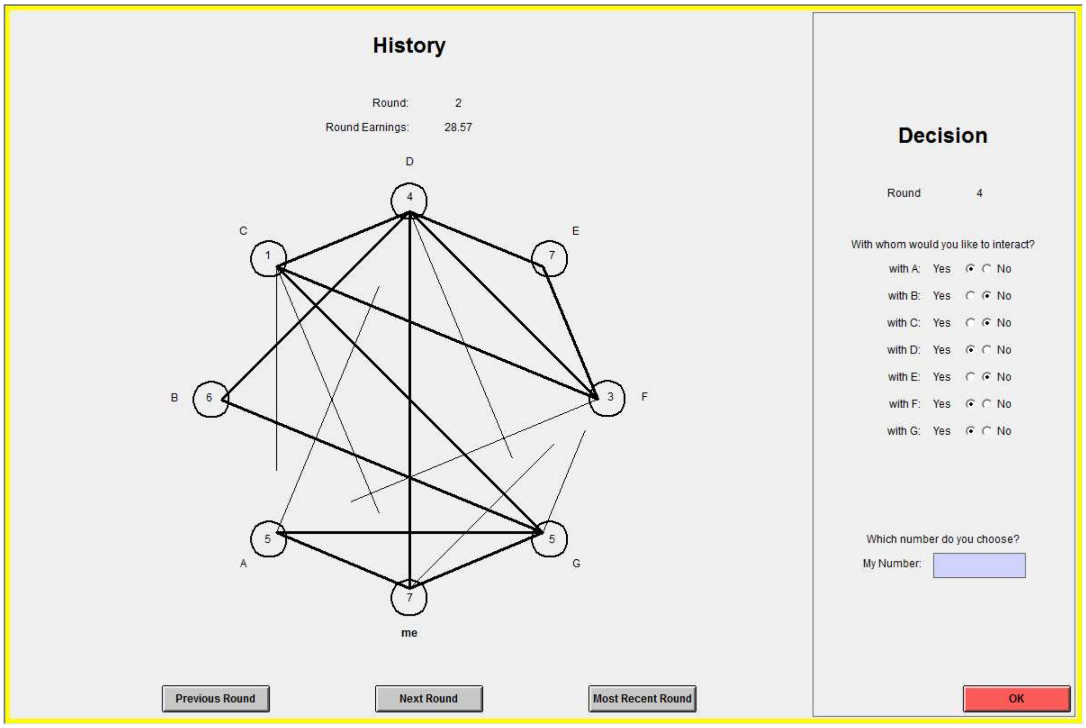


Figure C.7: [**NT-SP**] **Example screen**

Suppose you have four neighbors. You chose 5 and the smallest number chosen by your neighbors and yourself was 4, you earn 4/7 * 90 = 51 3/7 points.

Suppose you have three neighbors. You chose 7 and the smallest number chosen by your neighbors and yourself was 4, you earn 3/7 * 70 = 30 points.

Information about Computer Screen (in one single round)

You now get information about the computer screen that you will see during the experiment. You received a print-out of the computer screen **(Example screen 1)** from us. Take this print-out in front of you. The screen consists of two windows: **History** and **Decision**.

- **History:** This window holds information about past round(s). At the beginning of a new round you will automatically receive information in this window about decisions made in the previous round, (In the example, this is round 2; see upper part of the screen). In the window there are 8 circles, named **me, A, B, C, D, E, F** and **G**. **Me** always refers to you. The letters refer to the other seven persons in your group.

- A **thick complete** line between two persons (letters or 'me') indicates that they both proposed to interact with each other, that is they were neighbors and, hence, did actually interact with each other. See, e.g., the line between **me** and **D** on the example screen.

- A **thin incomplete** line between two persons indicates that only one of them proposed to interact. Such a line starts on the side of the person that proposed to interact, and stops just before the circle of the person that did not propose to interact. See, e.g., the line between **me** and **F** on the example screen: **me** proposed to interact with **F**, but **F** did not propose to interact with me. **F** is a neighbor of **me**, but **me** is not a neighbor of **F**. In other words, behavior of **F** influences the earnings of **me**, but behavior of **me** does not influence the earnings of **F**.

- No line between two persons indicates that neither of them proposed to interact. That is, they were not neighbors and hence, did not interact with each other.

- In the circles you see numbers between 1 and 7.These numbers indicate the chosen numbers of the persons in your group. The number in the circle next to letter **A** shows the chosen number of **A**. The number in the circle next to letter **B** shows the chosen number of **B** and so forth. (For example in screen 1, persons **A** and **G** have chosen number 5, while the persons **me** and **E** have chosen number 7.)

- At the bottom of this window you find two buttons called **Previous Round** and **Next Round**. You can use these buttons to look at the decisions in all previous rounds. The button **Most Recent Round** brings you back to the last round played.

- Your **earnings** (in points) in the corresponding round can be found just above the graph next to **Round Earnings**.

• **Decision:** In this window you see which round you are in and here you have to make your decisions.

1. **With whom would you like to interact?** Below this question you see the seven letters which refer to the seven other participants in your group. You can propose

to interact with another person in your group by clicking the button "yes" (the first button), that is the first button to the right of that person's letter. If you do not want to interact with a person or if you want to remove a proposal to interact, you activate the button "no", that is the second button to the right of that person's letter. **Note:** At the beginning of each new round the buttons (i.e. proposals) you have chosen in the previous round will be activated. In each new round you can change your choices, i.e., proposals (not) to interact in the way described above.

2. **Which number do you choose?** In the small window next to **My Number** you type in the number you want to choose.

When you are satisfied with all your decisions (that is, with **both** the proposals (not) to interact and your chosen number), you have to confirm these decisions by clicking on the button **"Ok"**.

Note: After each round you will receive information about all the decisions made (that is, all interaction proposals made and the number choices) by all persons in your group. All other persons in your group will also receive information about all your decisions.

This is the end of the instructions. You will now have to answer a few questions to make sure that you understood the instructions properly. If you have any questions please raise your hand. After you have answered all questions please raise your hand. We will then come to you to check your answers.

The experiment will begin only after everybody has correctly answered all questions.

If you are ready please remain seated quietly.