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to Facilitate Intercultural Experiments**

by

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Abstract

We report a new method for Experimenting over a Long Distance (ELD) allowing to simultaneously run decentralized interactive experiments in geographically separated subject pools. Applying ELD to an intercultural trust experiment with participants from Argentina, China and Germany we found a striking evidence for transcontinental trust behavior. In addition to Chinese senders' discrimination of Argentinean players no discrimination in trust and reciprocity behavior was observed. Nevertheless, we found significantly different levels of trust and reciprocity in the different national cultures.

Keywords: intercultural experiments, investment game, trust

JEL classification: C72, C81, C91, F00, O57

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1 Introduction and motivation

When planning interactive experiments with geographically or administratively separated subject pools researchers face large logistic, financial and technical problems. These are incompatibility of computer equipment and software (if computers are available at all), high travelling expenses and communication costs, impeded or lacking accessibility of certain subject pools. As a consequence, subject pool selection might be biased towards populations where experimentation facilities are readily available. This causes the neglect of those subjects that are not easily accessible.

Globalization, however, does lead to interaction also between populations where western technical standards are often not met. Therefore, a method is needed allowing for incorporating subject pools that are technically difficult to access. This method should enable easy-to-run interactive experiments in a real international and intercultural setting ¹ leading to better mutual understanding and advice for practical work.

Individuals hold different country-specific or culture-specific dispositions that, along with their perception of other cultures, influence their behavior in intercultural decisions (Hofstede 2001). Most experimental studies comparing behaviour in different cultures are cross-cultural investigations ². Almost no studies involve true inter-cultural experiments (see however Boarini et al. 2002, Bornhorst et al. 2004³).

To overcome the deficiencies mentioned above we developed a new method for Experimenting over a Long Distance (abbreviated ELD in the following) that allows to simultaneously running decentralized interactive experiments in geographically

¹In the following we define experiments as intra-cultural experiments if behavior within one culture is compared. Cross-cultural experiments are those where behavior in two or more cultures is compared with no direct interaction of subjects belonging to different cultures. Intercultural comparisons investigate behaviour of subjects in different cultures interacting directly with each other.

²See for instance Willinger et al. 2003, Hennig-Schmidt et al. 2002, Anderson et al. 2000, Henrich et al. 2001, Roth et al. 1991, see also the survey by Oosterbeek et al. 2004.

³The subject pool of this experiment consists of PhD. students all located at the European University Institute (EUI) in Florence.

separated subject pools and to standardize procedure protocols. ELD minimizes logistic effort, technical requirements and travel expenditures. It is particularly suited for simple games. We apply ELD to an adapted version of the investment/trust game (Berg et al. 1995) with participants from Argentina, China and Germany. We refer to this game when explaining ELD in the following.

The paper is organized as follows. The next section describes the features of the ELD-method in detail. In section 3, we briefly report results. Section 4 discusses the method and concludes.

2 The ELD - Method

In separated subject pools, non-interactive one-shot single-player experiments as well as one-stage multi-player experiments can experimentally easily be handled because subjects do not actually interact. Organizational problems arise, however, in multi-person multi-stage designs where participants have to take sequential decisions under time restrictions imposed by time zones and disposable resources and at different locations. The crucial constraint in these experiments is the interdependence of consecutive decisions: One subject's choice depends on a prior decision of another person. ELD is designed to overcome this restriction by removing decision interdependence without creating incentive biases.

The usual sequential protocol for running investment game experiments is as follows. First, a sender and a responder get an endowment X . The sender has the opportunity to invest any integer $a \in [0, 1, \dots, X - 1, X]$ that is transferred to an anonymously matched responder. Each possible amount a chosen by the sender is tripled by the experimenter, thus the responder gets $3a$ for each a . Then the responder freely decides to transfer any integer $b \in [0, 1, \dots, 3a - 1, 3a]$ back to the sender. Being dependent on the first mover's action, the second mover can not make her decision without receiving information on the first mover's choice. We solve the problem of sequential interdependence by applying the following features.

1. *Strategy method* (Selten 1967): This method allows to organizationally disconnect the second stage of the game from the first stage. By having the second mover indicate her choices for all possible first mover's decisions, the sequential two-person two-stage game is converted into a two-person normal-form one-stage game for each subject. These correlated games can be played independently at different locations and different points in time.

2. *Pen-and-paper*: By using pen and paper, the experimental design becomes independent of compatible equipment and software, reducing start-up costs. Moreover, experiments can be run in non-lab environments like classrooms. Procedures are more transparent and thus may be perceived as more credible by the participants.

3. *Remote-control organization*: When applying ELD, a central unit, the Chief Experimenter (CE) is responsible for overall planning and controlling of the intercultural experiment. Local experimenters (LEs) are in charge of organizing and running the sessions at the different locations (see figure 1)⁴ CE briefs LEs in advance by a detailed procedural script and an extensive instruction manual to ensure equivalent experimental conditions in all locations involved. He prepares instructions and decision sheets that are identical up to translation into the respective languages being shipped to the corresponding LEs. Before running the experiment, CE has to be provided with information on each participant necessary to ex-ante code and prepare the decision sheets and to match players randomly across subject pools. At each location, participants randomly draw an ex-ante coded decision sheet before the experiment starts. Players are informed about their counterpart's pool affiliation. According to research interests, information on additional characteristics and variables is provided. After all sessions in all locations having been finished, CE collects all relevant information, computes all payoffs and transfers this information to all LEs.

⁴We prefer to work with local experimenters to avoid self presentation effects (face saving) which are likely with inexperienced subjects, especially in Asia (Bond and Hwang, 1995).

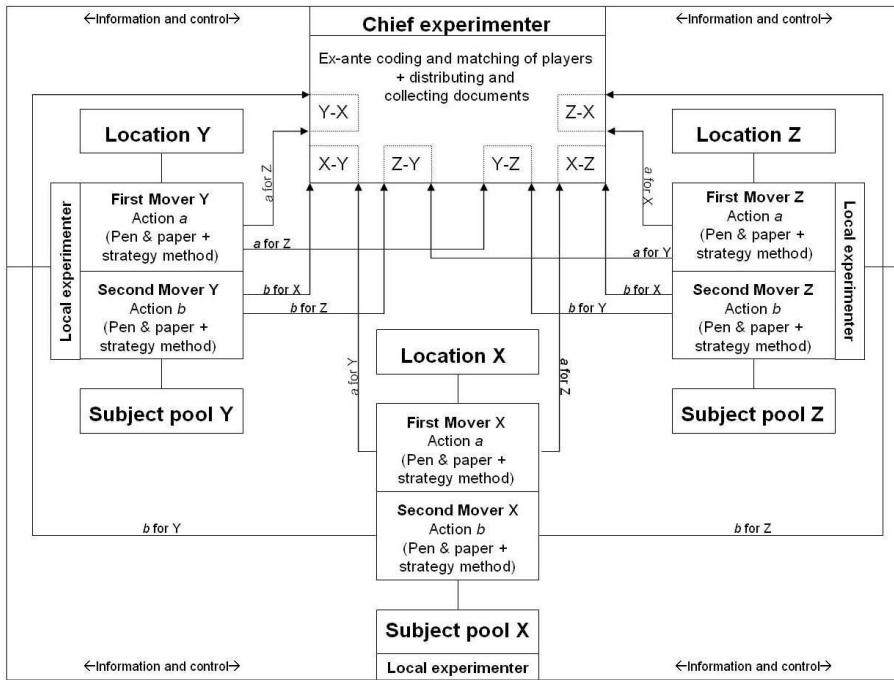


Figure 1: Schematic outline of ELD for the investment game with three subject pools

Figure 1 gives a schematic outline of the required steps when ELD is applied to three subject pools. Possible intra-cultural assignment is not shown (see point (ii) below).

Besides organizational requirements other methodological aspects are important:

(i) To ensure equivalence of instructions, they have to be translated into the languages of the participating locations using the back-translation method (Brislin 1970). It is advisable for the CE to run a series of pilot experiments with subjects stemming from the subject pools involved. This not only ensures equivalence of the instructions but also that participants fully understand all features of the experiment.

(ii) Inter-cultural comparison requires an intra-cultural control with at least two intra-cultural sub-pools to enable distinction between intra- and inter-cultural behavioral variations. Subjects may not only behave differently towards counterparts from various countries/cultures. They may also differentiate towards subject pool members within their own country/culture (c.f. Fershtman and Gneezy 2001).

(iii) Each subject's minimum number of decisions equals the number of participating subject pools when intra-personal comparison is desired. When different player types exist and each subject has to decide in the role of *all* player types, the number of each player's decisions equals the number of subject pools times the number of player types.

(iv) For each choice, a subject has to be provided with a decision sheet separately accessible in order to prevent him from changing prior decisions or recouping information from previous choices.

3 Application to an intercultural trust game

Procedure

We applied ELD to a trilateral inter-cultural trust study with student participants from Argentina (Universidad Nacional de La Plata; Universidad Nacional de Tucumán), PR China (University of Finance and Economics; Tongji University, both Shanghai) and Germany (Humboldt University, Berlin; Medical University, Lübeck). 90 subjects participated; 15 per sub-pool. We used design features 1 to 3 and specifications i-iv of section 2. We modified the trust game design by doubling rather than tripling the amount a transferred by the sender. Moreover, senders were endowed with an amount X whereas receivers got no endowment.

Experiments were divided into two parts, consisting of three decision rounds each. Before starting the experiment, a subject was randomly assigned to a player type - sender or receiver - by drawing a prepared decision sheet. This assignment was kept throughout the first part of the experiment consisting of three rounds. Each sender (receiver) was randomly matched with a receiver (sender) of the other intra-cultural sub-pool and with a receiver of one of the sub-pools in each of the other two countries. In the second part of the experiment, players changed types, the decision and assignment procedure being identical to the first part. This was made explicit before the experiment started. The experimental protocol guaranteed each player's interaction with a counterpart from Argentina, China and Germany in each part of the experiment only once and in a randomized order. Ex-ante matching was done before the decision sheets were mailed to the local experimenters.

To get more data we decided to have subjects play in both roles, i.e. as senders *and* as receivers. This was made common knowledge at the beginning of the experiment. Thus every subject faced the same conditions.

To signal the counterpart’s cultural affiliation and to avoid a direct demand effect, a participant was informed on the counterpart’s family name and the university’s official name. In each round, senders received an endowment $X=10\text{ECU}$ ($1\text{ECU}=2\text{USD}$). The experiment was run in September 2002. Participants on average earned 8.70 USD in Argentina, 10.08 USD in Germany, and 9.26 USD in China.

Results

We first look at trust behavior, i.e. the amount a transferred to the receivers. Our data reveal that in the anonymous inter-cultural one-shot situation of our experiment, individuals substantially deviate from the sub-game perfect equilibrium of no transfers by showing trust even across borders. 86% of German and 100% of Argentinean and Chinese senders transferred a positive amount a to the assigned responder. This is remarkable given that subjects did not receive additional information on their assigned players’ individual characteristics or previous behavior. Trust behavior is weakly significantly different across countries ($p=0.069$, Kruskal Wallis test). Argentines show the highest average trust level ($a=6.00$, $sd=1.74$), followed by Chinese ($a=5.43$, $sd=2.36$) and Germans ($a=5.36$, $sd=3.26$), see figure 2(a) and table 1.

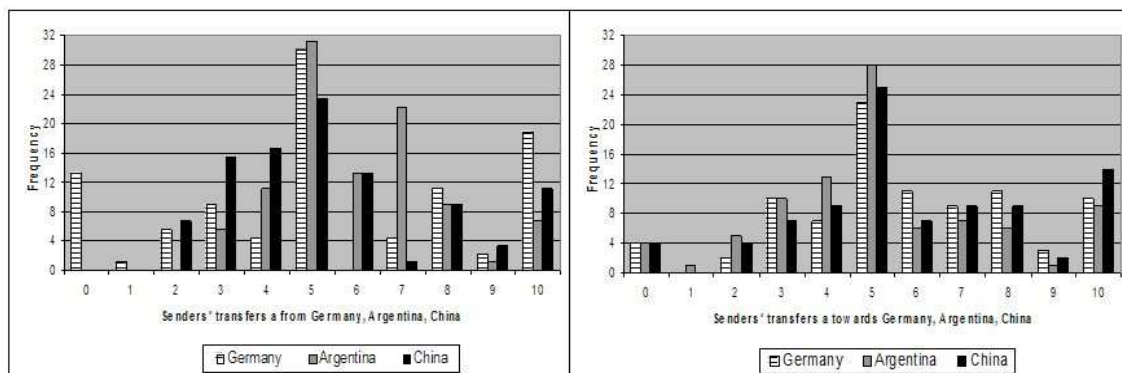


Figure 2 a,b: Average senders’ trust per country (a) and towards country (b)

		towards				
		Germany	Argentina	China	\emptyset	
from	Germany	a	5.77	5.00	5.30	5.36
		b	33.79	36.30	38.01	36.14
	Argentina	a	5.90	5.70	6.40	6.00
		b	54.17	51.72	49.94	51.84
	China	a	5.70	4.80	5.80	5.43
		b	52.07	43.49	51.32	48.82
	\emptyset	a	5.79	5.17	5.83	
		b	46.68	43.84	46.42	

Table 1: Average trust behavior (amount a transferred by the sender) and reciprocity behavior (amount b transferred back by the responder as a percentage of $2a$)

Although Germans show the lowest average trust, they do *not* discriminate between matched players' origin. Argentineans also do not discriminate in trust. Yet they are strongly discriminated by Chinese.

Trust towards countries is significantly different as well ($p=0.008$, Friedman test). Chinese students are trusted most ($a=5.83$, $sd=2.63$) followed by Germans ($a=5.79$, $sd=2.49$). Argentineans received the lowest transfers ($a=5.17$, $sd=2.46$), see table 1 and figure 2(b).

We now turn to reciprocity behavior, i.e. the amount b transferred back to the senders. Reciprocity behavior turns out to be highly significantly different across countries ($p=0.000$, Kruskal Wallis test). Germans show a significantly lower average reciprocity level (36.14% of the received amount $2a$ are transferred back to the sender, $sd=22.35$) than Argentineans (51.84%, $sd=20.02$) and Chinese (48.82%, $sd=23.22$). Argentineans and Chinese on average transfer half of the surplus back, with $b \approx 2a/2$. Germans, however, tend to equally distribute the total *joint* profit with $b = 1/2[(X - a) + 2a]$, see figure 3.

No country was significantly discriminated by other countries' participants concerning reciprocity behavior.

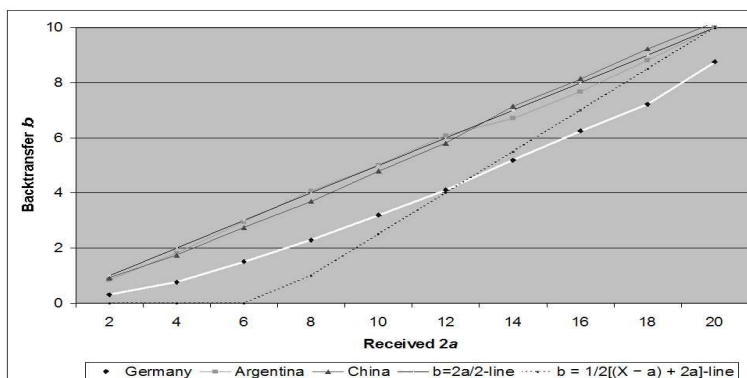


Figure 3: Average responders' back-transfer strategies

German participants received the highest total payoff because of the facts that (i) Germans made the lowest own transfers a whereas Argentinean and Chinese subjects showed significantly higher reciprocity levels, (ii) Argentineans and Chinese players showed high trust behavior and Germans made the lowest back transfers b .

For a detailed evaluation of the experiment see Walkowitz (2005).

4 Discussion and conclusion

ELD proved to be a powerful method for running interactive inter-cultural experiments and standardizing procedure protocols. It allows to combine intra-cultural and inter-cultural research by having subjects actually interact with each other. ELD can be applied to any number of subject pools and participants. No computer-equipped laboratory is needed. Sessions are decentralized. They do not have to be run strictly simultaneously thus avoiding time constraints. Initiation costs are low, decisions sheets being shipped by mail.

ELD's potential drawbacks should not be neglected either. ELD can best be applied to simple experiments with few decision stages. When a large number of subject pools is involved the resulting high number of choices might cause spill-over effects in that early decisions influence later choices. The pen-and-paper method does not permit computerized data collection and thus is prone to calculation and matching errors. The strategy method may induce different behavior as compared to subjects who are confronted with actual choices (see, however, Brandts and Charness 2000). Furthermore, the decision protocol may be rather complex to some subjects who are not accustomed to take part in experiments.

The strategy method, on the other hand, makes subjects think about every possible choice and the implications thereof. For this reason, we believe the data we have been retrieving are based on intensive reasoning. Having subjects play in both roles might also influence behavior⁵.

Given our research agenda, and weighing pros and cons, we consider ELD an important research method especially when other methods are inapplicable or particularly costly.

Applying ELD enabled us to run an inter-cultural trust experiment. We found a striking evidence for transcontinental trust behavior even though players were not provided with additional information about assigned players' individual characteristics. In addition to Chinese senders' discrimination of Argentinean players no discrimination in trust and reciprocity behavior was observed. Nevertheless, we found significantly different levels of trust and reciprocity in the different national cultures. This heterogeneity in the manifestation of social mechanisms might cause serious frictions and misunderstandings in direct intercultural exchange. More experiments on behavior in actual interchange are required to support our findings and to assess the impact for cross-cultural relationships. This is an important agenda for future research.

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⁵Burks et al. (2003) found support for their reduced responsibility-hypothesis saying that subjects who play in both roles show less trust and reciprocity.

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5 Appendix

Please see attached instructions.

Instructions

1. Introduction

Thank you for participating in our international experiment. Please read the following instructions very carefully. If you have any questions, please raise your hand. We will then answer your question at your desk in private. During the experiment we will not answer any of your questions. In case you still have questions, please read these instructions again. During the whole experiment it is very important that you do not communicate with any of the other participants. We therefore ask you not to talk to each other.

In this experiment you can earn money. Your individual earnings from the experiment depend on *your own* decisions and on the decisions of *other* participants taken in the experiment. Please keep the code number handed out in this experiment carefully. It is necessary to receive your payment. Without code number we cannot pay out your earnings.

Right after the experiment, you will receive a *fixed* fee of 5 \$ which is *independent* from the decisions you take in today's experiment. This fixed fee is paid in addition to the money you earned in the experiment.

During the experiment, you are involved into an interaction with *randomly* assigned other participants. These randomly assigned participants take their decisions at a *different* point in time than you do, without having knowledge about your decisions. You are *not* told who this other participant is, neither during the experiment nor in any point in time after the experiment. The persons who today participate with you in the experiment are not assigned to you.

After this introduction we will ask you some questions to check your understanding of the experimental rules. Then the experiment itself will start. After the experiment, we will ask you to fill in a questionnaire which we need for a statistical analysis of the experimental data.

2. The general design of the experiment

The experiment consists of two parts A and B, each divided in three similar decision rounds. During one part, pairs of two participants are formed who interact throughout the whole part. At the beginning of the first part it is randomly determined which person you are in this part. You can either be person A – and start with part A – or person B - and start with part B. There is the same number of A-persons and B-persons in the experiment. Within the three decision rounds in each part, each participant takes decisions *keeping the same role*, either as person A or as person B. The protocol for the second part is identical to the first part. However, in this part you are the opposite person – if you were person A in the first part you are now person B, and vice versa. You will not interact with a person that is sitting with you in this room now. During the whole experiment, each person interacts with an assigned other person *only once*.

The procedure for one round is as follows:

At the beginning of *each* round, *each* person A receives an initial endowment X of 10 ECU (ECU=Experimental Currency Unit). Person B receives no endowment. The exchange rate from ECU to \$ is 5 ECU = 1 \$.

Person A can now choose to either send an *integer part, all or nothing* of his initial endowment X to a randomly matched person B. This means, he can choose any integer a from the interval $[0,10]$ of his initial endowment he wants to send to person B. Each amount a chosen by person A is *doubled*. Thus, person B does not receive the amount a originally sent by person A but she receives *two times* as much, i.e. $2a$.

Here is an example: If person A sends 4 ECU, person B receives 8 ECU. If person A sends 6 ECU, person B receives 12 ECU.

During the experiment, person B is *not* told which amount a person A *actually* chose. Therefore, person B does not know how large $2a$ actually is. Person B now has to decide how much she wants to transfer back to person A. Since person B does not know the actual amount a or $2a$ respectively having been sent by person A she has to decide for *each possible* value of the doubled amount $2a$ how much she wants to transfer back to person A. The amount person B transfers back to person A is b . Person B can decide whether she wants to transfer back an *integer part, all or nothing* of $2a$ to person A. The amount b transferred back is *not* multiplied. Person A receives no information about person B's *actual* decisions during the experiment.

Person B's decision table for one round looks as follows:

Person A sent you a :	You receive $2a$:	Which amount b do you want to transfer back?
0	0	
1	2	
2	4	
3	6	
4	8	
5	10	
6	12	
7	14	
8	16	
9	18	
10	20	

After B's decision on b , the *first* decision round has finished for both persons. The general procedure of the following second and third decision round corresponds to the procedure of the first decision round.

Actual payments of the experimental earnings of person A and person B are made after having finished all experimental sessions. By assigning person A's *actual* decision a to person B's decision b being valid for person A's actual decision a , individual payment for each round can be calculated.

Person A's individual profit G_A for one round is:

Initial endowment X
- amount a sent
+ amount b transferred back by person B
= G_A, Person A's individual profit for one round

Person B's individual profit G_B for one round is:

Doubled amount a , sent by person A
- amount b transferred back by person B to person A
= G_B, Person B's individual profit for one round

Example: Person A decides to send 4 ECU to person B in one round. Then, person B receives 8 ECU. Person B decides to transfer 5 ECU back.

Person A's individual profit G_A of is:

Initial endowment X	10 ECU
- amount a sent	- 4 ECU
+ amount b transferred back by person B	+ 5 ECU
= G_A, Person A's individual profit for one round	= 11 ECU

Person B's individual profit G_B is:

Doubled amount a , sent by person A	8 ECU
- amount b transferred back by person B to person A	- 5 ECU
= G_B, Person B's individual profit for one round	= 3 ECU

The individual *total experimental payoff* for each participant is calculated by the sum of the payoffs in all six rounds plus the show up fee of 5 \$ paid today.

3. The detailed experimental procedure

In the following, we precisely explain how the experiment proceeds and which consecutive decisions you have to take.

After having read this instruction very carefully, we will answer your questions in private. Please raise your hand if you have questions. Before the experiment starts, we again will ask all participants whether they fully understood the instructions of the experiment.

We then will give you a short exercise to check your understanding of the experimental rules. After having solved these quizzes, the experiment will start.

Start of the experiment

At the beginning, each participant randomly draws a first decision sheet. This decision sheet contains your personal code number. Please keep this code number very carefully. You will need this code number for being paid your experimental earnings. Furthermore, it guarantees full anonymity and confidentiality. By using this procedure, we are not able to assign answers and decisions made in the experiment to single persons.

Decision procedure for part A

Round 1

- You are told that you are person A
- Person A is paid an initial endowment of $X=10$ ECU by the experimenters. At this moment, person A *owns* this amount and can dispose of it.
- Now person A is told that a person B was randomly assigned to him by the experimenters. Person A learns the family name, the name of the university and the country where the assigned person B is studying. With this participant, person A is interacting during this round.
- Person A now decides which amount a he *actually* wants to sent to the randomly assigned participant B. He can chose any integer from the interval $[0,10]$.
- After having decided on a , the first decision round for person A has finished.

Round 2

The procedure of this decision round for person A is identical to the procedure of round 1. However, in this round a *different* interacting person B is randomly assigned to person A. This means that in this second round person A does *not* interact with the same person B from round 1.

Round 3

The procedure of decision round 3 for person A is identical to the procedure of the previous rounds 1 and 2. However, again a *different* interacting person is randomly assigned to person A. This means that in this third round, person A does *not* interact with one of the persons B in rounds 1 or 2. During the whole experiment, each person interacts with an assigned person B *only once*.

This part has now finished.

Decision procedure for part B

Round 1

- You are told that you are person B
- Now person B is told that a person A was randomly assigned to her by the experimenters. Person B learns the family name, the name of the university and the country where the assigned person A is studying. With this participant, person B is interacting during this round.
- For each possible value of $2a$, person B is now asked which amount she wants to transfer back to person A. Person B now indicates an integer *for all 11 possible amounts* of $2a$ concerning the amount b person B wants to transfer back to person A.
- After having decided on b , the first decision round for person B has finished.

Round 2

The procedure of this decision round for person B is identical to the procedure of round 1. However, in this round a *different* interacting person A is randomly assigned to person B. This means that in this second round person B does *not* interact with the same person A from round 1.

Round 3

The procedure of decision round 3 for person B is identical to the procedure of the previous rounds 1 and 2. However, again a *different* interacting person is randomly assigned to person B. This means that in this third round, person B does *not* interact with one of the persons A in rounds 1 or 2. During the whole experiment, each person interacts with an assigned person A *only once*.

This part has now finished.

At the end of the experiment we would like you to answer some questions which we need for the statistical analysis of our experiment.