

Experimenting Over a Long Distance - A Method to Facilitate Inter-cultural Experiments and its Application to a Trust Game

Gari Walkowitz*, Clemens Oberhammer & Heike Hennig-Schmidt

This version:

March 22, 2006

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 inter-cultural trust experiment with participants from Argentina, China and Germany we found striking evidence for transcontinental trust behaviour even in our anonymous one-shot setting. Except for Chinese senders' discrimination against Argentinean responders, no discrimination in trust and reciprocity behavior was observed. Nevertheless, significantly different levels of trust and reciprocity exist in the different national cultures.

Keywords: inter-cultural experiments, methodology, investment game, trust

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

*Corresponding author. Laboratory for Experimental Economics, Department of Economics, University of Bonn, Germany, Phone: +49 228 739192, Fax: +49 228 739193, e-mail: gari.walkowitz@uni-bonn.de. The authors thank Reinhard Selten and Eyal Winter for helpful comments and suggestions. Financial support by the Deutsche Forschungsgemeinschaft (HE 2790/2-1, SE 137/3-1) is gratefully acknowledged.

1 Introduction

When planning interactive experiments with geographically or administratively separated subject pools researchers face large logistic, financial and technical problems like 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. Thus, subjects that are not easily accessible might be excluded from experimental studies.

Globalization, however, also induces interaction with populations where western technical standards are not met. To account for this fact in experimental investigations, a method is needed allowing to incorporate subject pools that are technically difficult to access. This method should enable easy-to-run interactive experiments in a true international and inter-cultural setting ¹ leading to better mutual understanding and advice for practical work.

It is known from the literature that people hold different country-specific or culture-specific dispositions. Along with an individual's perception of other cultures these dispositions influence their behavior in inter-cultural 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. 2004 ³).

To overcome the deficiencies mentioned above we developed a new method for Experimenting over a Long Distance (ELD in the following) that allows to simultaneously run decentralized interactive experiments in geographically separated subject pools by standardized procedural protocols. ELD minimizes logistic effort and on-site technical requirements as well as travel expenditures. It is particularly suited for simple

¹In the following we define experiments as intra-cultural if behavior within one culture is examined. Cross-cultural experiments are those where behavior in two or more cultures is compared with no direct interaction of subjects belonging to different cultures. Inter-cultural experiments 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 Ph.D. students all studying at the European University Institute (EUI) in Florence.

games. We apply ELD to an adapted version of the investment/trust game (Berg et al. 1995) with participants from Argentina, China and Germany.

The paper is organized as follows. The next section describes the features of the ELD-method in detail. In section 3, we report results from ELD's application to an inter-cultural trust game. 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 easily be handled because subjects in fact do not interact. Organizational problems arise, however, in multi-person multi-stage designs at different locations where participants have to take sequential decisions under time restrictions imposed by time zones and disposable resources. 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 can 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, the responder receiving $3a$ 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 sender's action, the responder cannot make her decision without receiving information on the sender's choice. We solve this 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 responder indicate her choices for all possible sender'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 dif-

ferent points in time. For applications of the strategy method see Güth et al. (2003) and Bellemare et al. (2005).

2. *Pen-and-paper*: By using pen and paper, the experimental design becomes independent of equipment and software compatibility, thus reducing start-up costs. Moreover, experiments can be run in non-lab environments like classrooms. Pen and paper creates transparency with regard to procedures enhancing the credibility for participants not used to experimental methods.

3. *Remote-control organization*: When applying ELD, a central unit, the Chief Experimenter (CE) is responsible for overall planning and controlling the inter-cultural experiment. Local experimenters (LEs) are in charge of organizing and running the sessions at the locations involved (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. Instructions and decision sheets identical up to translation into the respective languages are prepared by CE and shipped to the corresponding LEs. Before running the experiment, CE needs special information on each participant necessary to ex-ante code and prepare the decision sheets and to randomly match players across subject pools.

At each location, participants randomly draw an ex-ante coded decision sheet before the experiment starts. Players learn about their counterpart's pool affiliation. According to research interests, information on additional characteristics and variables is provided. All sessions in all locations having been finished, CE collects all relevant information, computes all payoffs and transfers this information to all LEs. Figure 1 gives a schematic outline of the steps required when ELD is applied to three subject pools. Possible intra-cultural assignments are not shown (see point (ii) below).

⁴In addition to saving travel expenditure having the experiment run with local experimenters avoids self presentation effects (face saving) which are likely to occur with inexperienced subjects, especially in Asia (Bond and Hwang, 1986).

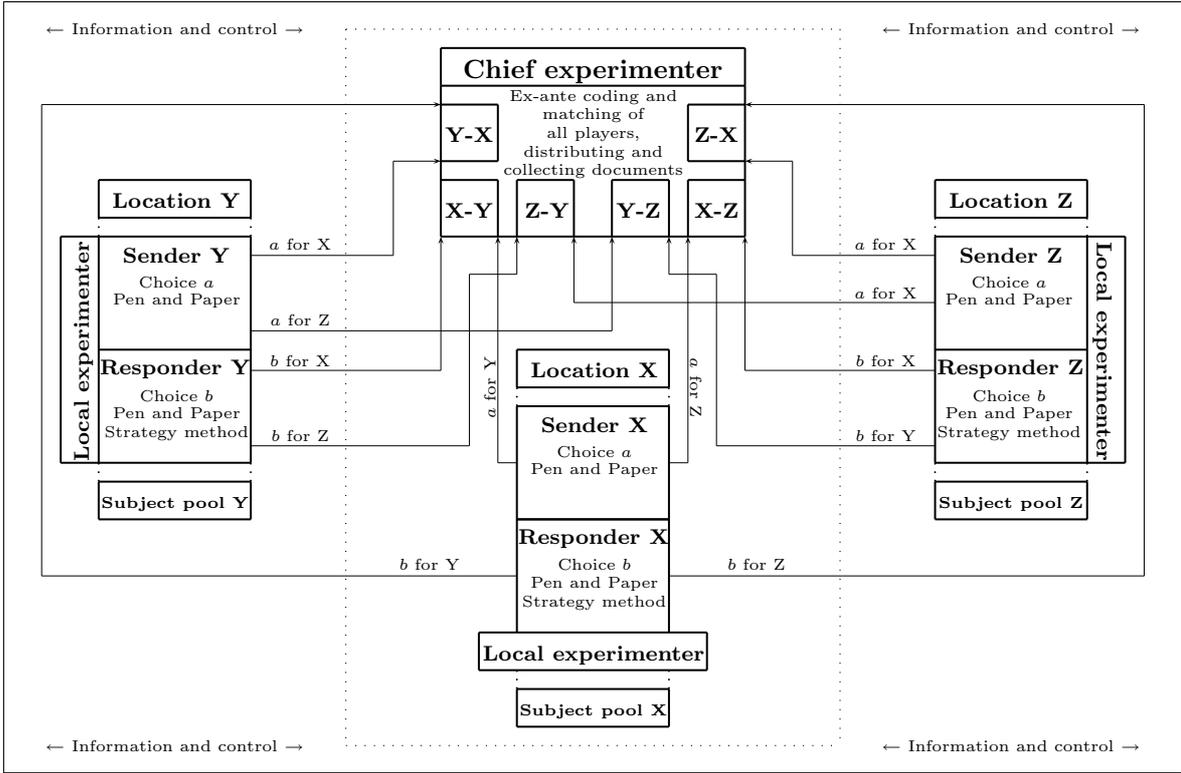


Figure 1: ELD outline for the investment game with three subject pools.

Besides organizational requirements other methodological aspects are important:

- (i) To ensure equivalence of instructions, they are to be translated into the languages of the participating locations using the back-translation method (Brislin 1970). If possible, CE should run pilot experiments with subjects of countries involved in the subsequent experiments. This can help to remove inconsistencies and misunderstandings of instructions and procedural 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 between members of their own and other subject pools within their home country/culture (c.f. Fershtman and Gneezy 2001).
- (iii) Each subject's minimal number of decisions is equal to the number of participating subject pools when intra-personal comparison is required.

With different player types and each subject having to decide in the role of *all* player types, the number of each player's decisions extends to the number of subject pools times the number of player types.

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

3 Application of ELD to an inter-cultural trust game experiment

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 implemented design features 1 to 3 and specifications i-iv described in section 2. We modified the original trust game design by doubling rather than tripling the amount a transferred by the sender. Moreover, senders were endowed with an amount X whereas responders did not get an endowment.

Experiments were divided into two parts, consisting of three decisions each. Before starting the experiment, a subject was randomly assigned to a player type - sender or responder - by drawing a decision sheet. The player type was kept throughout the first part of the experiment. Each sender (responder) was randomly matched with a responder (sender) of the other intra-cultural sub-pool as well as with a responder (sender) of *one* of the sub-pools in each of the other two countries. In the second part of the experiment, players changed types⁵, 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

⁵We decided to have subjects play as senders *and* as responders in order to get more data. Thus, every subject faced the same conditions.

only once and in a randomized order. Ex-ante matching was done before the decision sheets were mailed to the local experimenters.

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. Family names were collected during the recruiting process and filled in the decision sheets beforehand by the experimenters. In each round, senders received an endowment $X=10\text{ECU}$ ($1\text{ECU}=2\text{USD}$ ⁶). The experiment was run in September 2002. Participants on average earned 8.70USD in Argentina, 10.08USD in Germany, and 9.26USD in China.

Results: trust behaviour

We first look at trust behavior, i.e. the amount a transferred to the responders. Our data reveal that in spite of the anonymous inter-cultural one-shot situation of our experiment, individuals substantially deviate from the sub-game perfect equilibrium of no transfers even showing trust across borders. Summarizing over all treatment conditions, 86% of German and 100% of Argentinean and Chinese senders transfer a positive amount a .

Country	Measure	Germans	Argentinesans	Chinese	ø from
Germans	a	5.77	5.00	5.30	5.36
	b_a	33.79%	36.30%	38.01%	36.14%
Argentinesans	a	5.90	5.70	6.40	6.00
	b_a	54.17%	51.72%	49.94%	51.84%
Chinese	a	5.70	4.80	5.80	5.43
	b_a	52.07%	43.49%	51.32%	48.82%
ø towards	a	5.79	5.17	5.83	
	b_a	46.68%	43.84%	46.42%	

Table 1: Average senders’ trust behavior (amount a transferred by the sender) and responders’ reciprocity behavior (amount b_a transferred back by the responder as a percentage of $2a$). Column 6 shows the average transfer from a specific country. The last two lines display transfers towards a specific country.

This is remarkable because players show striking trust behavior in the inter-cultural context even though they received only parsimonious information about the charac-

⁶During the experiment, we applied this exchange rate to all participants. Since all decision makers must face the same reference currency exchange rates are not adapted to local purchasing power. We paid subjects an adapted show up fee to meet this concern.

teristics of the subjects they were matched with. Across countries, however, a significant difference in trust behaviour exists ($p=0.069$, Kruskal Wallis rank sum test, two-sided). 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 column 6 in table 1. Although Germans show the lowest trust on average, they do *not* discriminate with regard to matched players' origin. Neither do Argentines, who are strongly discriminated by Chinese, however (c.f. column 4/line 6 in table 1). See figure 2(a) for more details.

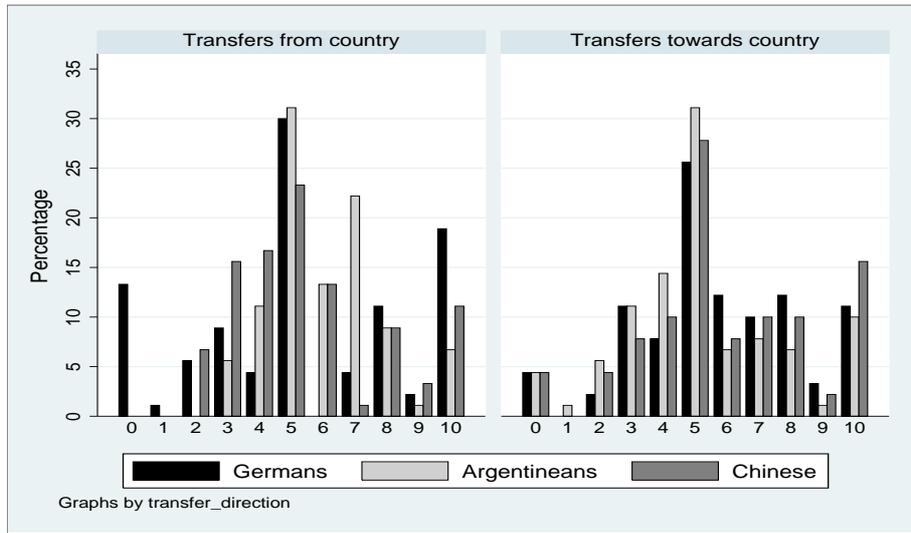


Figure 2 a, b: Distribution of senders' transfers a from and towards a country.

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

Results: reciprocity behaviour

We now turn to reciprocity behavior, i.e. the amount b transferred back to the senders. In a first step we analyse the amount b_a from the response vector of each responder that matches the sender's actual choice a . Reciprocity behavior conditional on sender's actual behavior turns out to be highly significantly different across countries ($p=0.000$, Kruskal Wallis rank sum test, two-sided). 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 Argentines (51.84%, $sd=20.02$) and Chinese (48.82%, $sd=23.22$), see table 1.

In a second step we investigate responders' reciprocity behavior using all information from the complete data set obtained by the strategy method. Argentines and Chinese on average tend to transfer half of the doubled amount a back, with $b \approx 2a/2$. Germans, however, tend to equally distribute the total *joint* profit $b = 1/2[(X - a) + 2a]$, considering the current sum of sender's *and* responder's temporary income. For higher amounts $2a > 12$ Germans diverge negatively from this behavior (figure 3a).

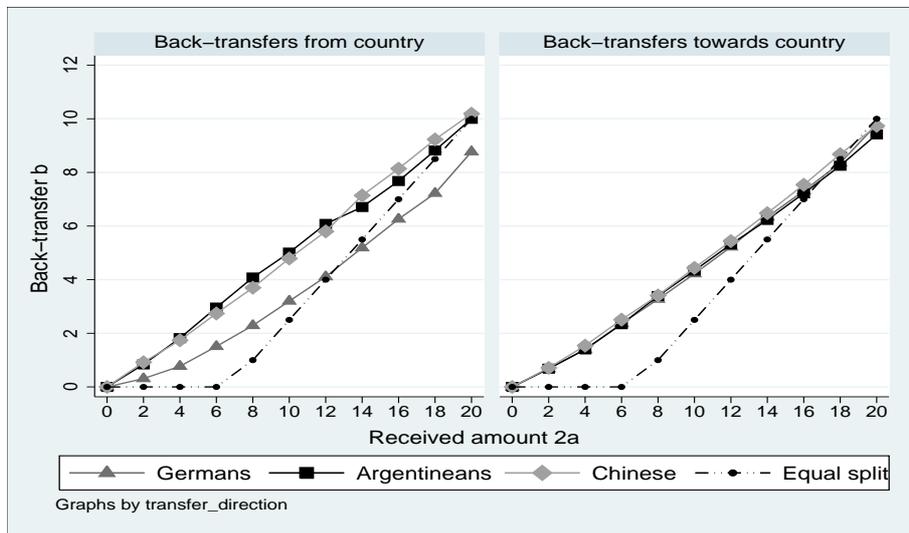


Figure 3a, b: Average responders' back-transfer strategies from and towards a country.

Contrary to trusting behavior, participants do not discriminate between countries in reciprocity (see table 1 and figure 3b).

Averaging over senders and responders, German participants receive the highest payoff because:

- (i) Germans make the lowest transfers a whereas Argentinean and Chinese subjects show significantly higher reciprocity levels than Germans,
- (ii) Argentines and Chinese players show high trusting behavior while Germans make 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. By applying standard experimental methods in a new way ELD allows to combine intra-cultural and inter-cultural research and enables actual inter-cultural interaction. ELD can be applied to any number of subject pools and participants. Restrictions as to computer-equipped laboratories are avoided as are costs for programming. Since sessions are decentralized they need not to be run simultaneously thus circumventing time constraints. Initiation costs are low because decisions sheets are 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. Having subjects play in both roles might also influence behavior (see Burks et al., 2003).

The strategy method may induce different behavior compared to subjects in a „hot“ environment (see, however, Brandts and Charness 2000). Furthermore, the decision protocol may be rather complex to subjects not used to participating in experiments. On the other hand, having subjects think about every possible choice and the implications thereof requires intensive reasoning on their part. We, therefore, believe the choices to be valid and reliable data.

Given our research agenda, ELD proved an important research method in particular when the usual experimental protocol cannot be applied or turns out to be highly costly.

Applying ELD we were able to conduct an inter-cultural trust experiment that would have been extremely difficult - if not impossible - to run as a computer experiment. We found striking evidence for transcontinental trust even in our one-shot anonymous setting. Except for Chinese senders' discrimination against Argentineans no discrimination in trust and reciprocity behavior was observed. Nevertheless, significantly different levels of trust and reciprocity exist in the different national cultures. This heterogeneity in social preferences and trust mechanisms might cause serious

frictions and misunderstandings in direct inter-cultural exchange. More experiments with actually matched players are required to assess the impact of culture-specific attitudes on cross-border relationships.

Literature

- Anderson, L. R., Y. V. Rodgers, and R. R. Rodriguez (2000): Cultural differences in attitudes toward bargaining, *Economics Letters* 69(1), 45-54.
- Bellemare, C., S. Kröger (2004): On representative social capital, *IZA Discussion Paper Series*, IZA DP No. 1145.
- Bellemare, C., S. Kröger and A. v. Soest (2005): Actions and Beliefs: Estimating Distribution-Based Preferences Using a Large Scale Experiment with Probability Questions on Expectations, *IZA Discussion Paper Series*, IZA DP No. 1666.
- Berg, J., J. Dickhaut, and K. McCabe (1995): Trust, reciprocity, and social history, *Games and Economic Behavior*, 10(1), 122-142.
- Boarini, R., J.-F. Laslier, and S. Robin (2002): Interpersonal comparison of utility in bargaining: Evidence from a transcontinental ultimatum game, *Working Paper*, Laboratoire d'Econométrie de l'Ecole Polytechnique, Paris.
- Bond, M. H. and K. Hwang (1986): The psychology of the Chinese people, in M. H. Bond (Ed.): *The social psychology of the Chinese people*, Hong Kong, Oxford University Press 1986, S. 213-266.
- Bornhorst, F., A. Ichino, K. Schlag, and E. Winter (2004): Trust and trustworthiness among Europeans South - North Comparison, *CEPR Discussion Paper No. 4378*.
- Brandts, J., and G. Charness (2000): Hot vs. cold Sequential responses and preference stability in experimental games, *Experimental Economics* 2(3), 227-238.
- Brislin, R. W. (1970): Back-translation for cross-cultural research, *Journal of Cross-cultural Psychology* 1, 185-216.

- Burks, S. V., J. P. Carpenter, and E. Verhoogen (2003): Playing both roles in the trust game, *Journal of Economic Behavior & Organization* 51, 195- 216.
- Fershtman, C. and U. Gneezy (2001): Discrimination in a segmented society - An experimental approach, *Quarterly Journal of Economics* 116(1), 351-371.
- Güth, W., C. Schmidt and M. Sutter (2003): Fairness in the mail and opportunism in the internet: A newspaper experiment on ultimatum bargaining, *German Economic Review* 4(2), 243-265.
- Hennig-Schmidt, H., Zh. Li and Ch. Yang (2002): Does power influence bargaining outcomes? A video experimental study in Germany and the People's Republic of China, in: *Conference Proceedings of XXVII. Annual Colloquium on Research in Economic Psychology*, Turku, Finland, 161-167.
- Henrich, J., R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis, and R. McElreath (2001): In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies, *American Economic Review* 91(2), 73-78.
- Hofstede, G. (2001): *Cultures Consequences, Comparing values, behaviors, institutions and organizations across nations*, 2nd Edition, Sage Publications, Thousand Oaks.
- Oosterbeek, H., R. Sloof and G. van de Kuilen (2004): Cultural differences in ultimatum game experiments, *Experimental Economics*, 7(2), 171-188.
- Roth, A. E., V. Prasnikar, M. Okuno-Fujiwara, and S. Zamir (1991): Bargaining and market behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo An experimental study, *American Economic Review* 81(5), 1068-1095.
- Selten, R. (1967): Die Strategiemethode zur Erforschung des eingeschränkt rationalen Verhaltens im Rahmen eines Oligopolexperimentes, in H. Sauer mann (Ed.): *Beiträge zur experimentellen Wirtschaftsforschung*, J.C.B. Mohr (Paul Siebeck), Tübingen, 136-168.
- Walkowitz, G. (2005): Trust and Reciprocity in Transnational Interactions - An Inter-Cultural Experimental Game with Germans, Argentineans and Chinese, University of Bonn, *mimeo*.

Willinger, M., C. Keser, C. Lohmann, and J.-C. Usunier (2003): A comparison of trust and reciprocity between France and Germany Experimental investigation based on the investment game, *Journal of Economic Psychology* 24(3), 447-466.

Appendix